Final Report

V 15/10/2010

METRI 2

Marine Environments Tests and Research Infrastructure - 2

Transnational Access

implemented as

Specific Support Action

Contract number: RITA-CT-2006-026010

Project coordinator: Jack Pichon

Project website: http://www.ifremer.fr/metri/

Reporting period: from 01/03/2009 to 31/08/2010

Project funded by the European Community
under the "Structuring the European Research Area" specific programme

Research Infrastructures Action

Table of contents

Introduction

- **Final Report**

  The final report covers all the periods from the contract start date. It gives a brief summary of the project with, in annex, a copy of the annual reports. It is composed of the following parts:

  A. an activity report which is a summary of the annual reports ad
  B. a management report (financial information) including a summary table of the resources deployed during the whole project,

  In annex the 4 annual reports of the project.

  The Final Report was prepared according to the templates (cover page, table of contents) given by European Community.

  This final report covers the period from March 1 st of 2006 to August 31 st of 2010 (extended date of the end of the contract).

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A. ACTIVITY REPORT

1.1. Summary of the activities and major achievements

The project started the 1 st of March 2006 as soon as the co ntract was signed. This Final and covers the period from the 1st of March 2006 up to the 31st of August 2010 which is the date of the completion of the contract.

Globally twenty-nine projects was selected and finally twenty four were actually performed at the end of the contract. They are involving the wave basin of Brest (9 projects), the water circulation of Boulogne/mer (7 projects), the material laboratory of Brest (5 projects) and the hyberbaric testing tanks of Brest (3 projects).

1.2. Management overview

During the project, the main tasks were management operations consisting especially in:

- Supervising the French company (EGIDE) which is subcontractor for the financing of user access (travel expenses, insurances, subsidence…);
- Promoting Metri;
- Preparing and organizing the infrastructures and the activities.

The principle of Metri is to provide free access to five different research facilities of Ifremer. In the frame of the former commissions of project selection, the basins of Boulogne and Brest were mainly concerned (hydrodynamic thematic) with 18 selected projects (14 performed in total). The area of behaviour of material was less represented with 8 selected projects (5 finally performed).
The last difficulty to be outlined was to succeed in programming the activities of all selected projects in order to achieve them before the end of the contract. An extension of time for the completion of the contract was obtained from the EC to September 2010 (previous date was February 2009). This extension has certainly permitted to perform all the selected proposals and to reach a quantity of activities very close to the maximum objective of the contract.

1.3. Description of the publicity concerning the new opportunities for access

Mainly during the year 2007 and 2008, many promotion tasks were carried out for Metri 2. The continuation of these actions were performed also at the beginning 2009. Any how in 2009 the amount of received proposals was sufficient to fulfil the requirement of the contract.

They can be considered in various categories as follows:

Metri brochure:
The pamphlet was prepared by a skilled designer for Metri 1, it shows on a 4 pages document (A4 format -strong paper) the five facilities and the access conditions for Metri. It has shown its

adaptability for Metri 2 as being clear, well illustrated and suitable to be distributed in various opportunities (visitors to Ifremer, congress, mailing…).

Participation in congress, seminars or exhibitions
Many participations to various manifestations were performed in 2006, 2007, 2008 and 2009 (see previous reporting in annex).

Web site
The web site of Metri was updated in 2009. A continuous updating was also performed during this last period to consider the evolution of the activities.
It is remained closely linked to the Ifremer web site and includes a specific page which precise instructions to applicants. It also describes the progress of works with a description of the performed or selected projects:

http://www.fremer.fr/metri/

1.4. Description of the selection procedure

The selection procedure to select users is conducted according to the conditions of the contract between Ifremer and the E.C.

A **pre-selection** is made at first by the project manager and his Ifremer team to identify proposals which fall out of scope for **technical feasibility**, confidentiality of results, ethic issues…

A **user group selection panel** was constituted to select the user proposals; this panel is composed with a minimum of 6 experts in the field, at least half of them are independent and external to the staff of the infrastructure.
The user group selection panel is in charge of the **evaluation of proposals** and have to rank them in order of priority taking into account the Criteria of eligibility:

- The scientific and technological merit of the intended project
- The community interest for the research project
- Technical feasibility of experimentation in regard of IFREMER facilities

With priority given to:

- The countries where few such Infrastructures exist
- The research teams who have not previously used the Infrastructure.
- The teams integrating young researchers.

Four selection meeting were performed from 2006 to 2008 (see previous reporting), the **fourth and finally the last one took place on September 25th 2008** in Brest with the agenda as for the other meetings of this type:

- Reminder of the role of the selection (expert) panel: Evaluation and ranking of proposals (See enclosed the list in annex 1)
- Reminder of the main lines of METRI project:
- Presentation of Ifremer facilities dedicated to METRI:
    - Deep wave pool of Brest
    - Water circulation flume tank of Boulogne/mer
    - Hyperbaric testing tanks
    - Laboratory for evaluation and calibration of marine sensor
    - Laboratory for testing of behaviour and ageing of materials

- Pre-selection and review of proposed projects regarding contract conditions
- Review of the project regarding technical and scientific matters (see previous report)
- Conclusion – recommendation – ranking of the projects (see hereunder table)
- Visit of Ifremer Brest Infrastructure dedicated to METRI (laboratories, basins…)

A detailed report showing all presentations, discussions and conclusion was drawn up for each selection meeting and sent to the participants and to the EC officer in Brussels

1.5. Transnational Access activity

During the realisation of the contractreport (from March 2006 up to September 2010), 24 projects were performed at the research facilities of Ifremer with:

- 9 for the wave basin of Brest (72 days)
- 7 for the flume of Boulogne/mer (55 days)
- 5 for the laboratory of material of Brest (64 days)
- 3 for the hyperbaric laboratory of Brest (35 days)

Which gives 216 days in total (200 days were planned in the initial proposal).

It may be noted that no activity has been performed or even selected for the laboratory of metrology as it was not possible during the project to find interesting or eligible proposal in spite of many efforts for the promotion of this topic.
It can be also remarked that the activity was slightly above what was initially planned (+8% in tems of duration), this is due mainly to the interest of the proposed projects.

Some other figures of the project could be underlined:

- 9 represented countries (United Kingdom, Greece, Portugal, Nederland, Spain, , Poland, Belgium, Norway and Finland)
- 9 projects in the topic of marine energy (MEC)
- 7 projects in the topic of new materials
- 62 users from 13 SME, 6 universities or 5 institutes

All these figures are compiled in the following table:

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Metri 2 - Projects and users - main figures																		
		Country	Period		Infrastructure/Nr of days				Type of user			Topic					Nr of users
Project Acronym	User name		AR	Dates	Wave basin Brest	Flume of Boulogne	Hyperbaric laboratory Brest	Laboratory of materials Brest	SME	University	Technical Institute	MEC	Materials	Hydrodynamic	Oil Industry	Oceanography	
Tidalgeneration	Tgl Ltd	UK	AR1	Feb. 2007		10			●			1					4
Chaintest	Welding Institute	UK		Mar. 2008	6				●						1		11
Cormarent	Cormarent Ltd	UK		July 2007		10			●			1					3
Ecofys	Ecofys	NI	AR2	Aug. 2007	11				●			1					6
NTUA1	University of Athens	Gr		Jun. 2007	10						●			1	⊙		3
Uni Soton	Southampton U	UK		Feb. 2008		5				●		1		⊙			2
TTI	Tensiontech	UK		Dec. 2007				20	●				1		⊙		2
Verderg	Verdeg Eng. Ltd	UK		Sept. 2008		5			●				1				3
Aquaflora	Aquaflora	PI		Nov. 2008	5				●				1				1
Bexco (2 phases)	Bexco	Be		Dec. 2008				10	●				1				2
Cranfield 1	U of Cranfield	UK		June 2008	6					●		1					2
FEUP (2 phases)	University of Porto	Pt	AR3	Dec. 2008				13			●		1		⊙		2
Future Fibre (2 phases	Future Fibre	SP		Sept. 2008				13	●				1		⊙		1
Soton VIV	Southampton U	UK		Nov. 2008		10				●				1	⊙		2
Uni Soton2	Southampton U	UK		Oct. 2008		5				●		1					-
TSC1	Tec software Consult.	UK		Jan. 2008			5		●						1		2
UPV	University of Valence	SP		Fev. 2008			10				●					1	2
MSG	Marine Subsea Group	Nw		Nov. 2009			10		●				⊙		1		2
NTUA2	University of Athens	Gr		May 2009	7						●			1	⊙		3
Cranfield2	U of Cranfield	UK		July 2009		10				●		1		⊙			1
MAMK	University of Mikkeli	Fi	AR4	Nov. 2009				8		●			1		⊙		1
TSC2	Tec software Consult.	UK		Jun. 2009	5				●						1		1
Tidal Stream	Feldon Ltd	UK		Apr. 2009	12				●			1					3
IST	Instituto Tecnico Lisboa	Pt		Apr. 2010	10						●	1		⊙			3
Total per category					*72*	*55*	*25*	*64*				*9*	*7*	*3*	*4*	*1*	
Global		***9***				***216***								***24***			***62***
												⊙	*Secondary topic*				

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A brief description of these activities is also given in the following tables which are classified by year of activity:

1.6. Scientific output of the users at the facility

Many papers have been published following the trials. A brief description of each is given in the four documents in annex.:.

1.7. User meetings

Most part of the discussions for the preparation of the projects was held by Email or phone. Anyhow some preparatory meeting has been held in our facilities before the completion of the trials (see also details in annex).

B. MANAGEMENT REPORT (FINANCIAL INFORMATION)

1. Justification of the resources deployed

- **The effort dedicated to project management tasks** of all Metri is estimated to more than 1000 hours. The corresponding hourly rate is 51.79 € (figure coming from art 3.3.4 of Ifremer proposal for Metri 2 – doc. nr ERT MS 05030).

  The charged amount is then: **51.79 €.**

  The spent time dedicated to the preparation and the operations for the project users is not charged as being included in the cost of experimental days.

  The figures come from the data given by the electronic management system and the accounting department of Ifremer.

- **The eligible costs claimed to the contract** for each period are in the following tables corresponding each at an annual report (see also annex):

From tables annex 1 of Metri 2 - RITA Contract Nr 026010

AR1

Table of Eligible Costs - Metri Annual Report 1	Nr	Rate	Amount	Total/categories
Specific activities				***36171.13***
Transnational Access - basin of Boulogne/days	10	3617.113	36171.13	
Other activities:				***6151.57***
Expert panel travel and subsidencies	1		1050.99	
TGL travel and subsidencies	1		4075.32	
Indirect costs			1025.26	
Management activities				***17095.44***
Human effort/hours	101	51.79	5230.79	
Travels, congress, Exhibitions			4833.26	
Advertising			4182.15	
Indirect costs			2849.24	
Total				***59418.14*** **€**

AR2

Table of Eligible Costs - Metri Annual Report 2	Nr	Rate	Amount	Total/categories
Specific activities				***206712.03***
Transnational Access - material laboratory of Brest/days	20	2117.78	42355.60	
Transnational Access - wave basin of Brest/days	27	3407.89	92013.03	
Transnational Access - current basin of Boulogne/days	20	3617.17	72343.40	
Other activities:				***21962.25***
Expert panel travel and subsidencies	1		1151.92	
Travel and subsidencies - users	1		20810.33	
Management activities				***14069.19***
Human effort/hours	100	51.79	5179.00	
Travels, congress, Exhibitions			8890.19	
Advertising			0.00	
Total AR2				***242743.47*** **€**

AR3

Table of Eligible Costs - Metri Annual Report 3	Nr	Rate	Amount	Total/categories
Specific activities				***159528.89***
1. Transnational Access - deep wave basin of Brest/days	11	3407.89	37486.79	
2. Transnational Access - water circulation basin of Boul	15	3617.17	54257.55	
3. Transnational Access - hyperbaric testing tank laborato	15	2401.19	36017.85	
4. Transnational Access - material behaviour laboratory o	15	2117.78	31766.70	
Other activities:				***13440.17***
Expert panel travel and subsidencies	1		1576.13	
Travel and subsidencies - users	1		11864.04	
Management activities				***3107.40***
Human effort/hours	60	51.79	3107.40	
Travels, congress, Exhibitions	0			
Advertising	0			
Total AR3				***176076.46*** **€**

AR4

Table of Eligible Costs - Metri Annual Report 4	Nr	Rate	Amount	Total/categories
Specific activities				***237467.48***
1. Transnational Access - deep wave basin of Brest/days	34	3407.89	115868.26	
2. Transnational Access - water circulation basin of Boul	10	3617.17	36171.70	
3. Transnational Access - hyperbaric testing tank laborato	10	2401.19	24011.90	
4. Transnational Access - material behaviour laboratory o	29	2117.78	61415.62	
Other activities:				***41839.71***
Expert panel travel and subsidencies	0			
Travel and subsidencies - users	1		41839.71	
Management activities				***32213.38***
Human effort/hours	622	51.79	32213.38	
Travels, congress, Exhibitions	0			
Advertising	0			
Total AR4				***311520.57*** **€**

Total for the whole project	***789758.64*** **€**

2. Forms C - Financial Statements

*The **Form C - Financial Statement**s is generally provided in an Excel separate document (electronic form – see documents in annex for the pdf form).*

*As requested an **Audit certificate** is submitted with the Forms C (separate attached document) was provided for each annual report (see document in annex)*

Ifremer

AUDIT CERTIFICATE

We Ifremer, established in Centre de Brest, Technopole de Brest-Iroise, BP 70, 29280 Plouzané, France, represented for signature of this audit certificate by THOMAS Valerie accountant public, hereby certify that:

- We have conducted an audit relating to the cost declared in the Financial Statement(s) per activity of Ifremer hereinafter referred to as contractor, to which this audit certificate is attached, and which is to be presented to the Commission of the European Communities under **contract 026010 (RITA) METRI II** for the following period covered by the EC contract from **01/03/09 to 31/08/10**.
- We confirm that our was carried out in accordance with generally accepted auditing standards respecting ethical rules and on the basis of the relevant provisions of the above-referenced contract and its annexes.

  The above mentioned Financial Statement(s) per activity were examined and all tests of the supporting documentation and accounting records deemed necessary were carried out in order to obtain reasonable assurance that, in our opinion, based on our audit :

  - The amount of total eligible cost **311 520,57 € (three hundred and eleven thousand five hundred and twenty euros and fifty seven cents)** declared in Box 2 of the attached Financial Statement(s) per Activity is complying with the following cumulative conditions :
    - ✓ They are actual and reflect the contractor's economic environment
    - ✓ They are determined in accordance with the contractor's accounting principles
    - ✓ They have been incurred during the period covered by Financial Statement(s) per Activity concerned by this audit certificate
    - ✓ They are recorded in the accounts of the contractor at the date of the establishment of this audit certificate
    - ✓ They are exclusive of any non-eligible costs identified below which are established in the second paragraph of article II.19 of the above mentioned contract with the Commission of the European Communities :
      - ❖ Any identifiable indirect taxes, including VAT or duties;
      - ❖ Interest owed;
      - ❖ Provisions for possible future losses or charges;
      - ❖ Exchange losses;
      - ❖ Costs declared, incurred or reimbursed in respect of another Community project;
      - ❖ Return on capital;
      - ❖ Debt and debt service charges;
      - ❖ Excessive or reckless expenditure;
      - ❖ Any cost which does not meet the conditions established in Article II.19.1 of your contract with the Commission of the European Communities.
    - ✓ They have been claimed according to the following cost reporting FC/UF model cost which the contractor is eligible to use according to article II.22 of the above mentioned contract with the Commission of the European Communities;
  - As declared on the box 3 of the attachment Financial Statement(s) per Activity, the total amount of receipts for the periods covered by this (those) Financial Statement(s) per Activity is equal to 0 €.

Institut français de Recherche pour l'Exploitation de la Mer

Etablissement public à caractère industriel et commercial

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- As declared on the box 4 of the attachment Financial Statement(s) per Activity, the total amount of interest yielded by the pre-financing received from Commission of the European Communities for the periods covered by this (those) Financial Statement(s) per Activity is equal to 0.

- Accounting procedures used in the recording of eligible costs and receipts respect the accounting rules of the State in which the contractor is established and permit the direct reconciliation between the costs and receipts incurred for the implementation of the project covered by the EC contract and the overall statement of accounts relating to the contractor's overall business activity;
- Our company Tresor Public is qualified to deliver this audit certificate in full compliance with the second and third paragraphs of article II.26 of the contract;
- As declared in the box 6 of attached Financial Statement(s) per Activity, the contractor paid for this audit certificate a price equal to 0 in which VAT is equal to 0.

DATE , SIGNATURE et CACHET DE L'ACS

Brest le 8/12/10

L'Agent Comptable Secondaire
du Centre IFREMER de BREST
Valérie THOMAS

3. Summary financial report

*The **Summary financial report (Appendix 2)** consolidating the costs is given in a separate excel document (see annex)*

See also the report on the distribution of the community and financial contribution (following table corresponding to AR4).

Report on the Distribution of the Community's contribution

Type of Instrument		Project Title	METRI	Contract N°	026010

Part I — Community's prefinancing (or payment) sent to the coordinator (1)

	Reporting Period 1		Reporting Period 2		Reporting Period 3		Reporting Period 4		Final payment		Total Amount (I) (3)
	From	To	From	To	From	To	From	To			
	1/03/2006	28/02/2007	1/03/2007	29/02/2008	1/03/2008	28/02/2009	1/03/209	1/09/2010			
	Date	Amount (A)	Date	Amount (B)	Date	Amount (F)	Date	Amount (G)	Date	Amount (H)	
Total (X)	25/04/2006	280 000.00	26/02/2008	91 418.74	24/07/2008	114 743.47	24/07/2009	135 276.46			621 438.67

Part II — Distribution of the Community's prefinancing (or payment) between contractors according to the consortium

Contractor n°	Organisation Short Name	Country Code	Reporting Period 1		Reporting Period 2		Reporting Period 3		Reporting Period 4		Final payment		Total Amount (I') (6)
			Date(s) (5)	Amount(s) (A') (5)	Date(s) (5)	Amount(s) (B') (5)	Date(s) (5)	Amount(s) (F') (5)	Date(s) (5)	Amount(s) (G') (5)	Date(s) (5)	Amount(s) (H') (5)	
1	IFREMER	F	15/04/2007	59 418.74	15/04/2008	242 743.47	15/04/2008	176 076.46	15/09/2010	311 520.57			789 759.24
			Total	59 418.74	Total	242 743.47	Total	176 076.46	Total	311 520.57	Total		789 759.24
Total (Y)			Total	59 418.74	Total	242 743.47	Total	176 076.46	Total	311 520.57	Total		789 759.24

Part III — Difference between Community's prefinancing (or payment) sent to the coordinator and Total Distribution of the Community's prefinancing (or payment) between contractors according to the consortium decision(s) (4)

	Reporting Period 1	Reporting Period 2	Reporting Period 3	Reporting Period	Final payment	Total Amount
Community's prefinancing (or payment) not yet distributed between contractors (Z) (7)	220581.26	-151324.73	-61332.99	-176244.11		-168320.57

Page n° /	1	1

I certify that the information set out in this(these) form(s) is accurate and correct and agreed by all contractors.

Name (8)	Surname (8)	Signature of the administrative official authorised to commit the organisation of the coordinator (8)
Le Guen	Yvon	

Explanatory notes

(1): To be filled in only by the Commission services.
(2): Established in conformity with articles 4.2 and 6 of the contract.
(3): (I) = (A) + (B) + (C) + (D) + (E) + (F) + (G) + (H)
(4): To be filled in only by the coordinator.
(5): Insert the dates (dd/mm/yyyy) and the amounts (x,xxx.xx €) transferred to a contractor (including the coordinator) for a reporting period.
(6): (I') = (A') + (B') + (C') + (D') + (E') + (F') + (G') + (H')
(7): (Z) = (X) - (Y)
(8): One the following persons : authorised contact person or first or second administrative official authorised to sign the contract, as mentioned in your Contract Preparation Form (Form A2b)

ANNEX

The annexes consist of all the annual reports including all the document given in a pdf form (excel table and access database for each period of the project)

Annex 1 - Annual Report Nr1 - AR1

Annex 2 - Annual Report Nr2 - AR2

Annex 3 - Annual Report Nr3 - AR3

Annex 4 – Annual Report Nr4 - AR4

1st Annual Report

V 15/10/07

METRI 2

Marine Environments Tests and Research Infrastructure - 2

Transnational Access

implemented as

Specific Support Action

Contract number: RITA-CT-2006-026010

Project coordinator: Jack Pichon

Project website: http://www.ifremer.fr/metri/

Reporting period: from 01/06/2006 to 01/03/2007

Project funded by the European Community
under the "Structuring the European Research Area" specific programme

Research Infrastructures Action

Table of contents

Introduction

- **Annual Report**

  The Annual report covers each successive period of 12 months from the contract start date. It is composed of the following parts:

  A. an activity report

  B. a management report (financial information) including: - a justification of the resources deployed,

  - the Form C Financial Statement (which may require an Audit certificate if provided for under Article 7.2 of the contract),

  C. a report on the distribution of the community financial contribution,

  The Annual Report was prepared according to the templates (cover page, table of contents, …) given by European Community.

A. ACTIVITY REPORT

1. Progress report

1.1. Summary of the activities and major achievements

The project started the 1st of March 2006 as soon as the contract was signed. The reporting period begins at this date.

During this period the main operations were dedicated to the launching of the project with especially:

- Participations in congress and workshop
- Actions for promotion of Metri 2
- Organization of the selection panel and the first selection meeting
- Preparation of the 7 projects selected by the expert panel.

These seven projects involve the wave basin of Brest (2 projects) and the water circulation of Boulogne/mer (5 projects). 5 proposals concern marine energy turbines, one concerns riser behaviour in the petroleum offshore industry and one concerns a study of modelling of seabed roughness.

During this period, only one experimentation concerning a marine current turbine was performed in Boulogne on a 1/30th scale model. Data for the improvement of the efficiency was collected.

1.2. Management overview

During this first period the main tasks were management operations consisting especially in:

- Subcontracting to a French organisation (EGIDE) the financing of user access (travel expenses, insurances, subsistences…)
- Defining the composition of the expert panel for the study and the selection of the proposals (foreign experts, experts in and out of Ifremer)
- Promoting Metri with mailing, participation to congress, publicity
- Preparing the installation and the equipment for the first project carried out at Boulogne with the Tidalgeneration Ltd team

The principle of Metri is to provide access to five different research facilities of Ifremer. In the frame of this first session, only the basins of Boulogne and Brest were concerned with mainly a hydrodynamic thematic. An effort shall be done for the following session to better promote the other involved facilities (hyperbaric tank, material testing and marine sensor laboratories).

A difficulty was encountered in the planning of the user access because the basins are very often booked by clients and require to be adapted to the user demands.. An effort shall therefore be

done to schedule more precisely and more efficiently the access of each users who shall have to define as early as possible their wish, even at the level of the proposal form.

1.3. Description of the publicity concerning the new opportunities for access

During the year 2006 and at the beginning of 2007, several promotion tasks were carried out for Metri 2 ; they can be split in different categories as follows:

Metri brochure:
The pamphlet was prepared by a skilled designer for Metri 1, it shows on a 4 pages document (A4 format -strong paper) the five facilities and the access conditions for Metri. It is still adapted for Metri 2 and was distributed in various opportunities (visitors to Ifremer, congress, mailing…).

Participation in congress, seminars or exhibitions

Location	Date	Object	Presentation
Le Havre - France	January 2006	Franco-British Marine Energy Seminar	Oral presentation of Metri by Yvon Le Guen
London - England	March 2006	Oceanology International O I 2006 Congress	Oral presentation of Metri by Yvon Le Guen
Glasgow-Scotland	May 2006	FISHING Commercial exhibition	Presentation of a new Metri poster prepared for this opportunity by the business department of Ifremer
Bremerhaven - Germany	October 2006	International Conference Ocean Energy	Contacts for Metri with M. Paillard– information on Metri given to coordination committee
Tallin - Estonia	December 2006	Workshop un the frame of ECONET (network France-Russia-Estonia)	Presentation of Metri by M. Le Boulluec at Cybernetic Institute of Technology University (Tallinn)
Paris - France	October 2006	Astelab - Mesurexpo	Exhibition of measurement and electronical equipment – business stand for Ifremer and Metri
Brussels - Belgium	October 2006	Research Infrastructure in FP7 – information session	Attending to the session and contact with EC representatives

Advertisements
Two advertisements were published in international professional magazines:

International Ocean Systems (Teddington UK)
Half page advertisement in the March/April issue on file

Materials World (UK)
half page advertisement in full colour in March issue including a display board in the on-line exhibition (Supplier Marketplace) for a period of 3 months (see. www.iom3.org/mp/)

Web site

The web site of Metri was fully renewed and updated to Metri 2. It is closely linked to the Ifremer web site and includes a specific page which details instructions to applicants.
http://www.fremer.fr/metri/

1.4. Description of the selection procedure

The selection procedure to select users is conducted according to the conditions of the contract between Ifremer and the E.C.

A **preselection** is made at first by the project manager and his Ifremer team to identify proposals which fall out of scope for **technical feasibility**, confidentiality of results, ethic issues…

A **user group selection panel** was constituted to select the user proposals; this panel is composed with a minimum of 6 experts in the field, at least half of them are independent and external to the staff of the infrastructure.
The user group selection panel is in charge of the **evaluation of proposals** and have to rank them in order of priority taking into account the Criteria of eligibility:

- The scientific and technological merit of the intended project
- The community interest for the research project
- Technical faisibility of experimentation in regard of IFREMER facilities

With priority given to:

- The countries where few such Infrastructures exist.
- The research teams who have not previously used the Infrastructure.
- The teams integrating young researchers.

The first selection meeting (1st session) took place on October 5th 2006 and the agenda included:

- Reminder of the role of the selection (expert) panel: Evaluation and ranking of proposals. For this first session, the 6 experts were: C. Marec, S. Fennel, J. L'Her, M. Le Boulluec, G. Germain and M. Paillard (Y Le Guen and J. Pichon acting in this meeting as Infrastructure and project managers).
  - See enclosed the list in annex 1
- Reminder of the main lines of METRI project:
  - Contract condition (36 months of duration, 20 teams to be welcome and shared in the 5 facilities of Ifremer);
  - Eligibility of research team (member states of EC and associated states, France excepted, capacity of dissemination of the knowledge, possible access for SME's);

    - Grant: Access to facilities including support and travel costs are covered by the EC funding;
- Reminder of different promotion operations done for METRI (website, brochure, exhibitions in London and Le Havre)
- Presentation of Ifremer facilities dedicated to METRI:
    - Deep wave pool of Brest
    - Water circulation flume tank of Boulogne/mer
    - Hyperbaric testing tanks
    - Laboratory for evaluation and calibration of marine sensor
    - Laboratory for testing of behaviour and ageing of materials
- Pre-selection and review of proposed projects regarding contract conditions
    - See enclosed the list in annex 2
- Review of the project regarding technical and scientific matters
- Conclusion –recommendation – ranking of the projects
- Visit of Ifremer Brest Infrastructure dedicated to METRI (laboratories, basins…)

At the end of the meeting a global schedule was discussed with the expert panel , it shows all the proposals with a ranking, an approval and comments.

No project was actually rejected, but two projects proposed by the Technologic Institute of Lisbon were postponed awaiting for more explanation on technical details. The applicant was informed of that and informed the project manager that the projects were not actually ready to be carried out.

A detailed report showing all presentations , discussions and conclusion was done and sent to the EC officer in Brussels

1.5. Transnational Access activity

Tidal Generation Ltd was the only project performed during the period, it carried out 1/30th scale model testing of a 1MW tidal turbine prototype at the IFREMER flume tank (Boulogne-sur-Mer) from 19th Feb – 2nd March 2007. The purpose of this testing was:

- to investigate the dynamic behaviour of TGL's turbine
- to test the turbine power control strategy
- to measure the turbine efficiency
- to validate TGL's analytical rotor modelling tool
- to investigate fault case behaviour

TGL built the model to be tested in two mounting configurations, "fixed upstream" and "free hinge downstream".

Testing in the fixed upstream configuration allowed the performance characteristics of the rotor to be measured over the full range of current and rotational speeds. The measured performance of the turbine over its working range of current and rotational speed was within 5% of TGL's analytical model predictions. The load predictions on the structure were also within 5% of model predictions.

Two power control strategies were tested to investigate sensitivity of turbine power output to natural turbulent fluctuations in the flow. Again close correlation was achieved with TGL's

analytical model. Sufficient data was gathered to inform the design of the control system for the full scale 1MW machine that TGL is developing, allowing fluctuations in rotor torque and power to be minimised.

Free hinge downstream testing showed that the turbine was dynamically stable across the full range of current and rotational speeds in this mounting configuration. As intended, the rotor assumed a substantially horizontal orientation when generating.

Finally, the "gridloss" fault case scenario was simulated to investigate the loads acting on the turbine at full runaway. This data has helped TGL to develop an appropriate safety strategy for the full scale machine in the event of loss of reaction torque.

1.6. Scientific output of the users at the facility

IFREMER team helped TGL to achieve its ambitious programme of new concept of rotor for marine tidal turbine, and enable to install foundation in 2007 and the grid-connected power generation machine in early 2008. This will lead to availability of a commercial product around 2011.

A paper entitled Facilities for Marine Current Energy Converter characterization has been accepted for a presentation at EWTEC 2007, It will be presented jointly by 3 project users: Verderg, Tidalgeneration LTD and Southampton University.

The following abstract of the presentation is published in the EWTEC newsletter:

The utilization of marine currents for power production offers a sustainable option to augment traditional power technologies and enhance the expansion of renewables. The marine current resource is potentially large and could generate a significant part of European country's electricity requirements. Energy from marine currents is highly predictable making it an attractive option amongst other renewable technologies. Many devices are designed around underwater wind turbine, known as a marine current turbine [1], but other systems are based on more new concepts.

After the first call for METRI II proposal (a european project offering a free of charge access to IFREMER* Marine Environment Tests and Research Infrastructure), some marine energy converter systems were accepted for hydrodynamic tests in Ifremer flume tank (Figure 1). Two of them concerns marine current turbine systems, one from the University of Southampton for a "classical" pile-mounted tidal turbine concept [2], [3], the other one being envisaged by Tidal Generation Ltd for a fully submerged machine in deep water [4] (figure 2). The third concept, considered here, is an innovative marine current and wave energy system, based on Venturi principle which generates a pressure gradient used to draw water from a submerged pipe network [5] (figure 3).
Some of those systems are in a stage of concept validation for which an evaluation of the ability to exploit tidal or marine currents is needed. This ability is dependent on turbine and/or Venturi effect performances and specific trials are necessary to evaluate the behaviour of each

* French Research Institute for Exploitation of the Sea (http://www.ifremer.fr/metri/)

system. The impact on the environment is also important to evaluate because changes in water surface elevation and/or seabed modification can appear.

Experimental campaigns carried out for those projects under METRI 2 program will perform in the Ifremer free surface hydrodynamic water tunnel (during the fourth months of 2007). The flume tank is 18 m long by 4 m wide and 2 m deep with a side observation window of 8 m x 2 m (this large window placed on one side of the tunnel allows to observe the behaviour of the models during trials and to carry out video sequences). The flow turbulence is less than 5 % and the flow velocity range is 0.1 to 2.2 m/s. Some performance and flow (velocities and turbulence intensities in the wake of the system) measurements will be carried out on:

a/ a 1/30 scale model of a marine current turbine studied by Southampton University to increase the knowledge of how such devices will perform when installed in arrays of farms of several machines (measurements of hydrodynamic load on the structure and flow characterization behind the structure by laser velocimetry techniques),

b/ a 1/30 scale model of the Tidal Generation Ltd concept (measurements of hydrodynamic load on the structure, the power output and the dynamic behaviour, and flow characterization behind the structure by laser velocimetry techniques),

c/ 1/40 scale model of an array of 27 profiled tubes for VerDerg Ltd CFD validations (flow characterization around the structure by laser velocimetry techniques and measurements of surface elevation and pressure in tubes).

The exploitation of the results (which should be obtained before the end of March for b/ and c/ and before the end of June for a/) should not be finished for the final paper, but the experimental set-up and the testing programs will be presented in detail. In all the cases, the experimental results obtained during those trials will be shown at the congres.

1.7. User meetings

Most part of the discussion for the preparation of the projects was held by Email or phone. However for Verderg and Sutton, two meetings were managed in Ifremer facilities of Boulogne.

For Verderg Limited (5/12/06)

Were present : S. Chapman, D. Wood, P. Roberts, (Verderg)

B. Gaurier, G. Germain (Ifremer)

The objective was to present and visit the research facilities and to define in details the trial that Verderg intended to carry out.

For the 5 days planned for trial it has been agreed to focus the studies on the current flow inside a tube at a 1/40 scale model. Drawings and sketch were discussed and approved. In parallel Verderg decided to take in charge the measurements in relation with absorbed power due to Venturi effect.

A paper for EWTEC 2007 will be prepared jointly (see item 1.8).

The foreseen schedule of trial is for week 13 in Boulogne (26 to 30 March 2007)

For the University of Southampton (12/10/06)

Were present : A. Bahaj, L. Meyers, J. Chaplin (Southampton University)
B. Gaurier, G. Germain (Ifremer)

The objective was also to present and visit the research facilities and to define in details the trial asked by Southampton University.

Preliminary trials founded by DTI will allow to characterise wake effect on the model of current turbine. Consequently the trials in the frame of Metri will complete these first experiments and are planned after September 2007.

1.8. Update of the non-confidential Project information

The main scientific information coming from the progress of the project are given in paragraph 1.6 with the abstract of the newsletter which was published for EWTEC 2007 (European wave and Tidal Energy Conference, Porto, Portugal – 11-14 September 2006).
This paper will be also summarized to update the database of project information (Annex 5)

Annexes

The annexes are produced by completing the relevant forms in the reporting MS Access 2002 Database that each co-ordinator has received by e-mail from the ***Commission****.*
A printed copy of the forms is inserted in the paper copy of the Annual Report.

Annex 1 - Composition of the Users Selection Panel *(section 1.4)*
*[See "****Selection Panel****" form in the above mentioned MS Access Database.]*

Annex 2 - List of User-Projects *(section 1.5)*
*[See "****List of User-Projects****" form in the above mentioned MS Access Database.]*

Annex 3 - List of Users *(section 1.5)*
*[See "****List of Users****" form in the above mentioned MS Access Database.]*

Annex 4 - List of Publications *(section 1.6)*

Annex 5 - Updated non-confidential Project information *(section 1.8)*
*[See "****Database Report****" form in the above mentioned MS Access Database.]*

List of Panel members

Contract ID 026010 **Reporting Period** AR1

Infrastructure Short Name	Family_Name	First_Name	Gender	Nation-ality	Home Institution			Email	Additional Information
					Institution Name	Town	Country		
METRI	Fennel	Sheena	F	IE	Marine Institute	Galway	IE	sheena.fennell@marine.ie	Oceanographic Services
METRI	Waldmann	Christoph	M	DE	University of Bremen	Bremen	DE	waldmann@marum.de	Marum
METRI	Bozano	Roberto	M	IT	Consiglio Nazionale delle Ricerche (CNR)	Genova	IT	boz@ge.issia.cnr.it	Instituti di studi sui Sistemi Intelligenti (ISSIA)
METRI	Tziavos	Christo	M	GR	National Center for Marine Research	Athens	GR	ctziav@ncmr.gr	
METRI	Le Menn	Marc	M	FR	Service Hydrographique et Océanographique de la Marine (SHOM)	Brest	FR	lemenn@shom.fr	Département Ingenierie des équipements scientifiques
METRI	L'Her	Joel	M	FR	CETMEF	Brest	FR	joel.lher@equipement.gouv.fr	Costal and fluvial environment Department
METRI	Marec	Claudie	F	FR	INSU (Institut National des sciences de l Univers)	Brest	FR	claudie.marec@ipev.fr	Atelier national de l'équipement océanographique
METRI	Cognard	Jean-Yves	M	FR	ENSIETA	Brest	FR	jean-yves.cognard@ensieta.fr	Ecole Nationale Superieure d' Ingenieurs des Techniques de l'Armement
METRI	Le Boulluec	Marc	M	FR	IFREMER	Brest	FR	marc.le.boulluec@ifremer.fr	Service hydrodynamique et Océano météo
METRI	Germain	Gregory	M	FR	IFREMER	Boulogne sur Mer	FR	gregory.germain@ifremer.fr	Service hydrodynamique et Océano météo à Boulogne
METRI	Paillard	Michel	M	FR	IFREMER	Brest	FR	michel.paillard@ifremer.fr	Département des technologies des systèmes instrumentaux

List of UserProjects

UserProject Acronym

Tidalgeneration Ltd

Title Tidal generation limited - 1/30th test of a marine current turbine

Scientific Field

Main Field	Energy
FP6 Priority or Specific discipline	FP6 - Sustainable energy systems

Objectives

The research team of Tidal Generation Limited (TGL) came in Boulogne /mer in February 2007 (4 people during 2 weeks) to proceed at new trials concerning the study of a new concept of rotor at scale 1/30.
This experimentation will help making key decisions about the rotor configuration and Powertrain. There are currently several options, and the company has planned this tank testing project to facilitate the decision making.
The scale model will have a rotor diameter of 0.6m, requiring a channel depth of at least 1.5m. The required flow rate is up to 1.7m/s. A summary of the model parameters is included in the project description.
The scale model will be fully instrumented to monitor rotor dynamics and foundation loads. We will require datalogging for up to 10 analogue voltage and 2 digital channels. Data capture rate of 80Hz will be sufficient. We intend to use our own video capture equipment, but would like to have backup facilities available.
Flow measurements that we require included mean flow velocity variation with time, turbulence intensity and velocity shear profile with depth.

Achievements

Tidal Generation Ltd carried out 1/30th scale model testing of a 1MW tidal turbine prototype at the IFREMER flow tank (Boulogne-sur-Mer) from 19th Feb – 2nd March 2007. The purpose of this testing was:

- to investigate the dynamic behaviour of TGL's turbine
- to test the turbine power control strategy
- to measure the turbine efficiency
- to validate TGL's analytical rotor modelling tool
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TGL built the model to be tested in two mounting configurations, "fixed upstream" and "free hinge downstream".

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Two power control strategies were tested to investigate sensitivity of turbine power output to natural turbulent fluctuations in the flow. Again close correlation was achieved with TGL's analytical model. Sufficient data was gathered to inform the design of the control system for the full scale 1MW machine that TGL is developing, allowing fluctuations in rotor torque and power to be minimised.

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Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	2	WCTB	10

List of Users

Contract ID 026010 **Reporting Period** AR1

UserProject Acronym	Family Name	First Name	Gender	Birth year	Nationality	Resear. status	User Background			Home Institution				User e-mail	New user	Groupleader	Remote user	Num. of visits	Dur. of stay	T and S reimb.
							Sci. Field 1	Sci. Field 2	Sci. Field 3	Type	Name	Town	Country							
Tidalgeneration Ltd	Dodd	Daniel	M	1983	GB	TEC	Engineering & Technology			UNI	Bristol University	Bristol	GB	dd2646@bristol.ac.uk	Y	N	N	1	8	Y
Tidalgeneration Ltd	Huxley-Reynard	Chris	M	1974	GB	TEC	Engineering & Technology			SME	Tidal Generation Ltd	Bristol	GB	chris.hr@tidalgeneration.co.uk	Y	Y	N	1	8	Y
Tidalgeneration Ltd	King	Jeremy	M	1981	GB	TEC	Engineering & Technology			UNI	Bristol University	Bristol	GB	jk3552@bristol.ac.uk	Y	N	N	1	8	Y
Tidalgeneration Ltd	Minto	James	M	1983	GB	TEC	Engineering & Technology			SME	Tidal Generation Ltd	Bristol	GB	james.minto@todalgeneration.co.uk	Y	N	N	1	8	Y

Database Report

Contract ID 026010 **Reporting Period** AR1

Project Web site http://www.ifremer.fr/metri

Objectives

Project summary

Under this contract, access for user groups will be provided to the Infrastructure entitled Marine Environment Test and Research Infrastructure (METRI). This Infrastructure, located at Brest and Boulogne-sur-mer in France is owned and operated by IFREMER, the French Research Institute for Sustainable Sea Exploitation.
Within the Infrastructure, access will be made available to the five following installations.

- the deep wave testing basin,
- the water circulation testing basin,
- the hyperbaric testing tank laboratory,
- the material behaviour testing laboratory,
- the marine sensor evaluation laboratory.

During the contract duration, it is expected that 20 short term projects will be selected and that a minimum of 40 users will benefit from access to this Infrastructure. The total number of experimental days to be provided is 200 for the five installations.
This access will be provided free of charge to the user groups given access to the Infrastructure under this contract and will include all logistical, technical and scientific support that is normally provided to external users
of the Infrastructur

Access Modalities

Project Achievements

A paper entitled Facilities for Marine Current Energy Converter characterization has been accepted for a presentation at EWTEC 2007, It will be presented conjointly with by 3 project users :Verderg, Tidalgeneration LTD and Southampton University.

An The following abstract of this the presentation is published in the EWTEC newsletter:

The utilization of marine currents for power production offers a sustainable option to augment traditional power technologies and enhance the expansion of renewables. The marine current resource is potentially large and could generate a significant part of European country's electricity requirements. Energy from marine currents is highly predictable making it an attractive option amongst other renewable technologies. Many devices are designed around underwater wind turbine, known as a marine current turbine [1], but other systems are based on more new concepts.

After the first call for METRI II proposal (a european project offering a free of charge access to IFREMER* Marine Environment Tests and Research Infrastructure), some marine energy converter systems were accepted for hydrodynamic tests in Ifremer flume tank (Figure 1). Two of them concerns marine current turbine systems, one from the University of Southampton for a “classical” pile-mounted tidal turbine concept [2], [3], the other one being envisaged by Tidal Generation Ltd for a fully submerged machine in deep water [4] (figure 2). The third concept, considered here, is an innovative marine current and wave energy system, based on Venturi principle which generates a pressure gradient used to draw water from a submerged pipe network [5] (figure 3).
Some of those systems are in a stage of concept validation for which an evaluation of the ability to exploit tidal or marine currents is needed. This ability is dependent on turbine and/or Venturi effect performances and specific trials are necessary to evaluate the behaviour of each system.

The impact on the environment is also important to evaluate because changes in water surface elevation and/or seabed modification can appear.

Experimental campaigns carried out for those projects under METRI II 2 program will perform in the Ifremer free surface hydrodynamic water tunnel (during the fourth months of 2007). The flume tank is 18 m long by 4 m wide and 2 m deep with a side observation window of 8 m x 2 m (this large window placed on one side of the tunnel allows to observe the behaviour of the models during trials and to carry out video sequences). The flow turbulence is less than 5 % and the flow velocity range is 0.1 to 2.2 m/s. Some performance and flow (velocities and turbulence intensities in the wake of the system) measurements will be carried out on:

a/ a 1/30 scale model of a marine current turbine studied by Southampton University to increase the knowledge of how such devices will perform when installed in arrays of farms of several machines (measurements of hydrodynamic load on the structure and flow characterization behind the structure by laser velocimetry techniques),
b/ a 1/30 scale model of the Tidal Generation Ltd concept (measurements of hydrodynamic load on the structure, the power output and the dynamic behaviour, and flow characterization behind the structure by laser velocimetry techniques),

c/ 1/40 scale model of an array of 27 profiled tubes for VerDerg Ltd CFD validations (flow characterization around the structure by laser velocimetry techniques and measurements of surface elevation and pressure in tubes).

The exploitation of the results (which should be obtained before the end of March for b/ and c/ and before the end of June for a/) should not be finished for the final paper, but the experimental set-up and the testing programs will be presented in detail. In all the cases, the experimental results obtained during those trials will be shown at the congres.

Eligible Proposals 9 ***Selected Proposals*** 7

B. MANAGEMENT REPORT (FINANCIAL INFORMATION)

1. Justification of the resources deployed

- **The effort dedicated to project management tasks** in the first year of operation of Metri is estimated to 101 hours. The corresponding hourly rate is 51.79 € (figure coming from art 3.3.4 of Ifremer proposal for Metri 2 – doc. nr ERT MS 05030).

  The charged amount is then: **5230.79 €.**

  The spent time dedicated to the preparation and the operations for the project users is estimated to 7.4 men-month, amount which will not be charged as being include in the cost of experimental days.

  These figures comes from the data given by the accounting department of Ifremer.

- **The eligible costs claimed to the contract** during the reporting period (tabular form) are as follows:

From tables annex 1 of Metri 2 - RITA Contract Nr 026010 and CFP A3.3a

Table of Eligible Costs - Metri Annual Report 1	**Nr**	**Rate**	**Amount**	**Total/categories**
Specific activities (including indirect costs)				***36171.13***
Transnational Access - basin of Boulogne/days With a fraction of unit cost charged at 90% In which subcontracting is estimated to 3533.63€	10	3617.113	36171.13	
Other activities:				***6151.57***
Expert panel travel and subsidencies	1		1050.99	
TGL travel and subsidencies	1		4075.32	
Indirect costs			1025.26	
Management activities				***17095.44***
	10			
Human effort/hours	1	51.79	5230.79	
Travels, congress, Exhibitions			4833.26	
Advertising			4182.15	
Indirect costs			2849.24	
Total				***59418.74*** ***€***

[No major deviations with respect to the planned budget.]

2. Forms C - Financial Statements

*The **Form C - Financial Statements (Appendix 1)** is provided in an Excel separate document (electronic form).*

*As requested an **Audit certificate** is submitted with the Forms C(separate attached document)*

Form C - Model of Financial Statement per Activity for a Specific Support Action / Transnational Access to Infrastructures

(to be completed by each contractor)

Type of instrument	Specific Support Action	Type of Action *(if necessary)*	Transnational Access to Infrastructures
Project Title (or Acronym)	Metri	Contract n°	026010

Contractors's legal name	Ifremer		
Legal Type			
Contact Person	Jack Pichon	Telephone	33 2 98 22 41 54
Telecopy	33 2 98 22 45 35	E-mail	jack.pichon@ifremer.fr
Cost model used (AC/FC or FCF) / (UF: User Fee)(*)	FC/UF	Indirect costs (Real or Flat Rate of 20% of Direct costs, except subcontracting)	Flat Rate of 20% of Direct costs, except subcontracting (**)
Period from	01/03/2006	To	01/03/2007

(*) If UF is used under "other specific activities: transnational access/connectivity", please mention the two cost models used (eg. FC/UF or FCF/UF or AC/UF)

(**) Except otherwise agreed in Article 9 [special clauses] of the contract.

1- Resources (Third party(ies))

Are there any resources made available on the basis of a prior agreement with third parties identified in Annex I of the contract? (Yes / No)	No

If Yes, please provide the following information

Third Party 1 (Y1)	Legal name		Cost model used	
Third Party 2 (Y2)	Legal name		Cost model used	

If necessary add another Form C

2- Declaration of eligible costs (in €)

Please complete only the activity covered by the relevant instrument (and type of action) indicated above and as mentioned in Article II.25 and/or in Annexes I and III of the contract.
If you are a contractor using the additional cost model (AC):
- indicate only your additional eligible costs, except for Management of the Consortium Activity for which you may indicate your full eligible costs;
- do not declare eligible direct additional costs specifically covered by contributions from third parties as mentioned in Articles II.20 and II.23.a and b of the contract.
If you are a contractor using a full cost model (FC/FCF), indicate your full eligible costs
The costs declared should distinguish between direct and indirect costs
If necessary, adjustments to previous period(s) may be included where appropriate.

	Type of Activity													
	Research and Technological Development / Innovation (A)		Demonstration (B)		Training (C)		Management of the Consortium (D)		Other Specific Activities: Transnational Access (E)		Other Specific Activities (E)		Total (G) = (A)+(B)+(C)+(D)+(E)+(F)	
	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)
Direct costs							14246.20		30732.05		5126.31		50104.56	
Of which subcontracting									3533.63					
Indirect costs							2849.24		5439.68		1025.26		9314.18	
Adjustments to previous period(s)														
Total costs							17095.44		36171.73		6151.57		59418.74	

3- Declaration of receipts (in €)

If you are a contractor using the additional cost model (AC), indicate only receipts covered by Article II.23.c of the contract.
If you are a contractor using a full cost model (FC/FCF), indicate receipts covered by Article II.23 of the contract.

	Type of Activity													
	Research and Technological Development / Innovation (A)		Demonstration (B)		Management of the Consortium (C)		Other Specific Activities: Coordination / Networking (D)		Other Specific Activities: Transnational Access / Connectivity (E)		Other Specific Activities (E)		Total (G) = (A)+(B)+(C)+(D)+(E)+(F)	
	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)
Total receipts														

4- Declaration of interest generated by the pre-financing (in €)	
To be completed only by the coordinator.	
Did the pre-financing (advance) you received by the Commission for this period earn interest? (Yes / No)	No
If yes, please indicate the amount (in €)	

5- Request of FP6 Financial Contribution (in €)	
For this period, the FP6 Community financial contribution requested is equal to (amount in €)	59418.74

6- Audit certificates			
According to the contract, does this Financial Statement need an audit certificate (or several in case of Third party(ies)) delivered by independent auditor(s)? (Yes / No)			Yes
If Yes, does this(those) audit certificate(s) cover only this Financial Statement per Activity? (Yes / No)			Yes
If No, what are the periods covered by this(those) audit certificate(s) ?	From - to		
What is the total cost of this(those) audit certificate(s) (in €) per independent auditor(s) ?			

Audit certificate of the contractor (X)			
Legal name of the audit firm	Ifremer Accounting Agency	Cost of the certificate	0
Audit certificate(s) of the third party(ies) (Ys) *(if necessary)*			
Y1 : Legal name of the audit firm		Cost of the certificate	
If necessary add another Form C.		Total (Z) = (X) + (Ys)	
Reminders: *The cost of an audit certificate is included in the costs declared under the activity "Management of the Consortium". The required audit certificate (s) is (are) attached to this Financial Statement*			

7- Conversion rates

Costs incurred in currencies other than EURO shall be reported in EURO.

Please mention the conversion rate used (only one choice is possible) – Please note that the same principle applies for receipts.

Contractor	
- Conversion rate of the date of incurred actual costs? (YES / NO)	
- Conversion rate of the first day of the first month following the period covered by this Financial Statement? (YES/NO)	
Third Party(ies) *(if necessary)*	
Third Party 1 (Y1)	
- Conversion rate of the date of incurred actual costs? (YES / NO)	No
- Conversion rate of the first day of the first month following the period covered by this Financial Statement? (YES/NO)	No

If necessary add another Form C.

8- Contractor's Certificate

We certify that:

- the costs declared above are directly related to the resources used to reach the objectives of the project ;
- the receipts declared above are directly related to the resources used to reach the objectives of the project ;
- the costs declared above fall within the definition of eligible costs specified in Articles II.19, II.20, II.21, II.22 and II.25 of the contract, and, if relevant, in Annex III and Article 9 (special clauses) of the contract ;
- the receipts declared above fall within the definition of receipts specified in Article II.23 of the contract ;
- the interest generated by the pre-financing declared above falls within the definition of Article II.27 of the contract ;
- the necessary adjustments, especially to costs reported in previous Financial Statement(s) per Activity, have been incorporated in the above Statement ;
- the above information declared is complete and true ;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives.

Contractor's Stamp	Name of the Person responsible for the work	Name of the duly authorised Financial Officer
	Jack Pichon	**Yvon Le Guen**
	Date	**Date**
	14/06/2007	**14/06/2007**
	Signature	**Signature**
		Yvon LE GUEN Coordinateur du Programme Infrastructures Expérimentales Moyens d'Essais

Ifremer

AUDIT CERTIFICATE

PROJET : METRI 2
Contrat européen RITA 026010
Date de départ du projet : 1er mars 2006
Durée : 36 mois

I Rosy Charnolé, auditor, hereby that :

- I have conducted an audit relating to the cost declared in the Financial Statement per activity attached to this certificate and presented to the Commission of the European Communities under contract 026010 (RITA) METRI II.
- The period covered by this audit is : from 01/03/06 to 01/0307
- The amount subject to verification is : 59418.74 EUROS (fifty nine thousands four hundred eighteen euros and seventy four cents)

  - I may certified that the costs incurred during that period meet conditions required by the contract ;
  - All costs are eligible of the project en fulfil all the following conditions :

    - ✓ they are They are actual, economic and necessary for the implantation of the project ;
    - ✓ They are determined in accordance with Ifremer's accounting principles;
    - ✓ They have been incurred during the period covered by the statement
    - ✓ 59418.74 euros amount eligible costs of the project I costs are eligible costs

This audit certificate is providing according to art II.26 –1- of the contract.

18 OCT. 2007

L'Agent Comptable Secondaire
du Cente IFREMER de BREST

Rosy CHARNOLE

Institut français de Recherche pour l'Exploitation de la Mer

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3. Summary financial report

*The **Summary financial report (Appendix 2)** consolidating the costs is given in a separate excel document (electronic form).*

Summary Financial Report

Type of Instrument	SSA-TA	Project Title (or Acronym)	METRI	Contract N°	26010
Reporting period number		From (dd/mm/yyyy)	01-mars-06	To (dd/mm/yyyy)	01-mars-09	Page	1/1

Contractor n°	Organisation Short Name	Cost model(s) used		Eligible costs (in €)	Type of activities												Total eligible costs (G)=(A)+(B)+(C)+(D)+(E)+(F)			Receipts		
					Research and Technological Development / Innovation (A)			Management of the consortium (D)			Other Specific Activities: Transnational Access (E)			Other Specific Activities (F)								
		For Transnational Access	For any other activities		Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	UF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)
26010	IFREMER	UF	FC	Direct eligible costs				31 785.38			467 607.20			119 520.00			618 912.58	0.00	0.00			
				of which direct eligible costs of subcontracting				*0.00*			*62 170.11*			*0.00*			62 170.11	0.00	0.00			
				Indirect eligible costs				6 357.07			81 087.42			23 904.00			111 348.49	0.00	0.00			
				Adjustment on previous period(s)				38 142.45			548 694.62			143 424.00			730 261.07	0.00	0.00			
				Total eligible costs				***38 142.45***	***0.00***	***0.00***	***548 694.62***	***0.00***	***0.00***	***143 424.00***	***0.00***	***0.00***	730 261.07	0.00	0.00			
Total eligible costs								38 142.45	0.00	0.00	548 694.62	0.00	0.00	143 424.00	0.00	0.00	730 261.07	0.00	0.00	#REF!	#REF!	#REF!
								38 142.45			548 694.62			143 424.00			730 261.07			#REF!		
Requested EC contribution for the reporting period (in €) without taking into account receipts								17 095.44	0.00	0.00	36 171.73	0.00	0.00	6 151.57	0.00	0.00	59 418.74					
								17 095.44			36 171.73			6 151.57								
Requested EC contribution for the reporting period (in €) taking into account receipts [=Periodic Invoice]																	59 418.74					
Amount of the financial interests generated by the prefinancing																						

C. REPORT ON THE DISTRIBUTION OF THE COMMUNITY FINANCIAL CONTRIBUTION

*The **Report on the distribution between contractors** made during the reporting period of the Community financial contribution **(Appendix 3)** is given on a separate Excel document (electronic form)*

Report on the Distribution of the Community's contribution

Type of Instrument		Project Title	METRI	Contract N°	026010

Part I — Community's prefinancing (or payment) sent to the coordinator (1)

	Reporting Period 1 (2)		Reporting Period 2 (2)		Reporting Period 6 (2)		Reporting Period 7 (2)		Final payment		Total Amount (I) (3)
	From	To	From	To	From	To	From	To			
	1/03/2007	1/03/2009									
	Date	Amount (A)	Date	Amount (B)	Date	Amount (F)	Date	Amount (G)	Date	Amount (H)	
Total (X)	25/04/2006	280 000.00									280 000.00

Part II — Distribution of the Community's prefinancing (or payment) between contractors according to the consortium decision(s) (4)

Contractor n°	Organisation Short Name	Country Code	Reporting Period 1		Reporting Period 2		Reporting Period 6		Reporting Period 7		Final payment		Total Amount (I') (6)
			Date(s) (5)	Amount(s) (A') (5)	Date(s) (5)	Amount(s) (B') (5)	Date(s) (5)	Amount(s) (F') (5)	Date(s) (5)	Amount(s) (G') (5)	Date(s) (5)	Amount(s) (H') (5)	
1	IFREMER	F	15/04/2007	59 418.74									59 418.74
			Total	59 418.74	Total	0.00	Total	0.00	Total	0.00	Total	0.00	59 418.74
Total (Y)			Total	59 418.74	Total	#REF!	Total	#REF!	Total	#REF!	Total	#REF!	59 418.74

Part III — Difference between Community's prefinancing (or payment) sent to the coordinator and Total Distribution of the Community's prefinancing (or payment) between contractors according to the consortium decision(s) (4)

	Reporting Period 1	Reporting Period 2	Reporting Period 6	Reporting Period 7	Final payment	Total Amount
Community's prefinancing (or payment) not yet distributed between contractors (Z) (7)	220581.26	#REF!	#REF!	#REF!	#REF!	220581.26

I certify that the information set out in this(these) form(s) is accurate and correct and agreed by all contractors.

Name (8)	Surname (8)	Signature of the administrative official authorised to commit the organisation of the coordinator (8)
Yvon	Le Guen	Yvon LE GUEN Coordinateur du Programme Infrastructures Expérimentales Moyens d'Essais

Explanatory notes

(1): To be filled in only by the Commission services.
(2): Established in conformity with articles 4.2 and 6 of the contract.
(3): (I) = (A) + (B) + (C) + (D) + (E) + (F) + (G) + (H)
(4): To be filled in only by the coordinator.
(5): Insert the dates (dd/mm/yyyy) and the amounts (x,xxx.xx €) transferred to a contractor (including the coordinator) for a reporting period. If there are more than one transfer to a contractor during a reporting period, identify each date and each relating transferred amount.
(6): (I') = (A') + (B') + (C') + (D') + (E') + (F') + (G') + (H')
(7): (Z) = (X) - (Y)
(8): One the following persons : authorised contact person or first or second administrative official authorised to sign the contract, as mentioned in your Contract Preparation Form (Form A2b)

2nd Annual Report

V 15/03/08

METRI 2

Marine Environments Tests and Research Infrastructure - 2

Transnational Access

implemented as

Specific Support Action

Contract number: RITA-CT-2006-026010

Project coordinator: Jack Pichon

Project website: http://www.ifremer.fr/metri/

Reporting period: from 01/03/2007 to 29/02/2008

Project funded by the European Community
under the "Structuring the European Research Area" specific programme

Research Infrastructures Action

Table of contents

Introduction

- **Annual Report**

  The Annual report covers each successive period of 12 months from the contract start date. It is composed of the following parts:

  A. an activity report
  B. a management report (financial information) including:
  - a justification of the resources deployed,
  - the Form C Financial Statement (which may require an Audit certificate if provided for under Article 7.2 of the contract),

  C. a report on the distribution of the community financial contribution,

  The Annual Report was prepared according to the templates (cover page, table of contents, …) given by European Community.

A. ACTIVITY REPORT

1. Progress report

1.1. Summary of the activities and major achievements

The project started the 1st of March 2006 as soon as the contract was signed. This second Annual report covers the period from the 1st of March 2007 up to the 29th of February 2008.

During this period the main operations were dedicated to the launching of the project with especially:

- Participations in congress and workshop
- Actions for promotion of Metri 2
- Organization of the second and third selection meeting
- Preparation and/or realization of the thirteen projects selected by the expert panel (session 1, 2 and 3)

These thirteen projects involve the wave basin of Brest (5 projects), the water circulation of Boulogne/mer (5 projects),the material laboratory of Brest (2 projects)and the hyberbaric testing tanks of Brest (1 project).
During this period, seven experimentations or tests were performed at Boulogne-sur-mer and Brest.

1.2. Management overview

During this second period the main tasks were management operations consisting especially in:

- Supervising the French company (EGIDE) which is subcontractor for the financing of user access (travel expenses, insurances, subsistences…)
- Organizing the two sessions of commission for the study and the selection of the proposals (foreign experts, experts in and out of Ifremer)
- Promoting Metri with mailing, participation to congress, publicity
- Preparing the installation and the equipment for the projects which were carried out during the period of AR2.
- Also preparing the selected projects for year 2008.

The principle of Metri is to provide access to five different research facilities of Ifremer. In the frame of the passed commission of project selection, the basins of Boulogne and Brest were mainly concerned (hydrodynamic thematic) with 13 selected projects (7 performed). The area of behaviour of material is less represented with only 3 select projects (1 performed for AR2). An effort shall be done for the following session to better promote the other involved facilities (hyperbaric tank, material testing and marine sensor laboratories).

A difficulty was still encountered in the planning of the user access because the facilities are booked by external and internal clients and require to be adapted to the user demands. An effort

shall therefore continue to schedule more precisely and more efficiently the access of each user team who shall have to define as early as possible their wish, even at the level of the proposal form.
The last difficulty to be outlined is probably to succeed in programming the activities of all selected projects in order to achieve them before the end of the contract. At the level of AR 2, only 8 projects (including 1 in AR 1) are completed while a total of 13 projects were programmed.
The projects are often delayed due to the problem of availability of the users or of the availability of the infrastructure itself. A extension of time for the completion of the contract with 20 projects could be a solution.

1.3. Description of the publicity concerning the new opportunities for access

During the year 2006 and at the beginning 2007, many promotion tasks were carried out for Metri 2. The continuation of these actions were performed end 2007 and at the beginning 2008.
They can be considered in various categories as follows:

Metri brochure:
The pamphlet was prepared by a skilled designer for Metri 1, it shows on a 4 pages document (A4 format -strong paper) the five facilities and the access conditions for Metri. It has shown its adaptability for Metri 2 as being clear, well illustrated and suitable to be distributed in various opportunities (visitors to Ifremer, congress, mailing…).

Participation in congress, seminars or exhibitions (2006, recall of AR1)

Location	Date	Object	Presentation
Le Havre - France	January 2006	Franco-British Marine Energy Seminar	Oral presentation of Metri
London - England	March 2006	Oceanology International O I 2006 Congress	Oral presentation of Metri
Glasgow-Scotland	May 2006	FISHING Commercial exhibition	Presentation of a new Metri poster.
Bremerhaven - Germany	October 2006	International Conference Ocean Energy	Contacts for Metri with M. Paillard.
Tallin - Estonia	December 2006	Workshop ECONET (France-Russia-Estonia)	Presentation of Metri by M. Le Boulluec (Tallinn)
Paris - France	October 2006	Astelab - Mesurexpo	Exhibition of measurement and electronical equipment
Brussels - Belgium	October 2006	Research Infrastructure in FP7 – information session	Session and contacts with EC representatives

Participation in congress, seminars or exhibitions (2007 and beginning 2008)

Location	Date	Object	Presentation
Lisbon - Portugal	May 2007	Hydralab – general meeting	
Lorient - France	October 2007	Itechmer - Fishing exhibition	Contacts with exhibitors
Budapest - Hungary	Nov 2007	Hydralab – general meeting	
Paris - France	February - 2008	Nidays - ibition of National Instruments	Contacts with exhibitors for Metri with M. Paillard.
London - England	March 2008	Oceanology International O I 2008 Congress	Presentation of Metri on Ifremer stand – contacts

			with exhibitors and visitors

Advertisements
Two advertisements were published in international professional magazines in 2007:

- **International Ocean Systems** (Teddington UK)
  Half page advertisement in the March/April issue on file
- **Materials World** (UK)
  half page advertisement in full colour in March issue including a display board in the on-line exhibition (Supplier Marketplace) for a period of 3 months

This action was already described in the Annual Report Nr 1.

Web site
The web site of Metri was fully renewed and updated in 2007. It is closely linked to the Ifremer web site and includes a specific page which precise instructions to applicants. It also describes the progress of works with a description of the performed or selected projects
http://www.fremer.fr/metri/

1.4. Description of the selection procedure

The selection procedure to select users is conducted according to the conditions of the contract between Ifremer and the E.C.

A **pre-selection** is made at first by the project manager and his Ifremer team to identify proposals which fall out of scope for **technical feasibility**, confidentiality of results, ethic issues…

A **user group selection panel** was constituted to select the user proposals; this panel is composed with a minimum of 6 experts in the field, at least half of them are independent and external to the staff of the infrastructure.
The user group selection panel is in charge of the **evaluation of proposals** and have to rank them in order of priority taking into account the Criteria of eligibility:

- The scientific and technological merit of the intended project
- The community interest for the research project
- Technical feasibility of experimentation in regard of IFREMER facilities

With priority given to:

- The countries where few such Infrastructures exist
- The research teams who have not previously used the Infrastructure.
- The teams integrating young researchers.

The **second selection meeting (2nd session)** took place on **September 9th 2007** and the agenda included:

- Reminder of the role of the selection (expert) panel: Evaluation and ranking of proposals. For this second session, the 6 experts were: R. Bozzano (ISSIA-Italy), J. Y. Cognard (ENSIETA – FR), P. Davies (Ifremer), G. Germain (Ifremer) and X. Bompais (Ifremer), (Y Le Guen and J. Pichon acting in this meeting as Infrastructure and project managers).
  - See enclosed the list in annex 1
- Reminder of the main lines of METRI project:
  - Contract condition (36 months of duration, 20 teams to be welcome and shared in the 5 facilities of Ifremer);

  - Eligibility of research team (member states of EC and associated states, France excepted, capacity of dissemination of the knowledge, possible access for SME's);
  - Grant: Access to facilities including support and travel costs covered by the EC funding;
- Reminder of various promotion operations done for METRI (website, brochure, exhibitions)
- Presentation of Ifremer facilities dedicated to METRI:
  - Deep wave pool of Brest
  - Water circulation flume tank of Boulogne/mer
  - Hyperbaric testing tanks
  - Laboratory for evaluation and calibration of marine sensor
  - Laboratory for testing of behaviour and ageing of materials
- Pre-selection and review of proposed projects regarding contract conditions
  - See enclosed the list in hereunder table.
- Review of the project regarding technical and scientific matters (see table hereafter)
- Conclusion –recommendation – ranking of the projects
- Visit of Ifremer Brest Infrastructure dedicated to METRI (laboratories, basins…)

METRI2 - SESSION 2

Proposals - September 2007

N°	Organism	Project Title	Localisation	Contact1	Contact2	Brief Description	Infrastucture	Time
10	**TWI**	**Chaintest**	Cambridge UK	Stephen Williams			Deep wave bassin Brest	**1 week**
	The Welding Institute with other possible members	Autonomous robotic system for the inspection of mooring chains that tethet oshore oil and gas structure to the ocean floor		stephen.williams@twi.co.uk		*It concerns the development of a crawling vehicle that travels down mooring chains for cleaning and non-destructive testing systems. The Brest facility will provide suficient depth and space to allow a test chain to be suspended and the robot to be easily deployed*		
11	**Southampton University**	**VIV-WIO**	UK	John Chaplin	Peter Bearman		Flume of Boulogne	**15 days**
	Imperial College London	Vortex-induced and wake-induced vibrations of a cylinder		j.r.chaplin@soton.ac.uk	p.bearman@impe	*The low-induced vibration of one cylinder in the wake of another is the subject of renewed interestin connection with interactions between verticlal tension risers in deep water. Currents in ocean and weak interactions may produce delections contributing to fatigue damage and increasing the probability of clashing.*		
12	**TTI**	**Marine rope strength**	Shoonhoven NL	Nicholas O'Hear	Stephen Banfield		Material lab. Brest	**2x2 weeks**
	Tension Technology International		Willingdon UK	ohear@tensiontech.com	banield@tensionte	*the purpose is to conduct a systemetic development to optimize large parallel strand ropes which are finding increasing in the marine industry. Few results from systematic studies of constructional parameters are available.*		
13	**MSG**	**Full size subsea buyancy**	Strandgata NW	Jimmy Kieffer			Hyperbaric lab. Brest	**4-5 weeks**
	Marine Subsea Group AS			jimmy.kieffer@msgmarine.no		*Measurement of elastic buyancy loss and water absorbtion of full size subsea buoyancy module. Correlation with down-sized samples and estimation of area-to-volume influence.*		

At the end of the meeting a global schedule was discussed with the expert panel , it shows all the proposals with a ranking, an approval and comments.

No project was actually rejected, but the decision about two projects (Chaintest and MSG) was postponed awaiting for more explanation on technical details.

A detailed report showing all presentations, discussions and conclusion was drawn up and sent to the EC officer in Brussels

The **third selection meeting (3rd session)** took place on **February 9th 2008,** the agenda was similar to one's of the 2nd session (see here above paragraph).

The panel of experts was composed as follows: C. Waldmann (MARUM-Germany), J. Y. Cognard (ENSIETA – FR), J. L'Her (CETMEF-FR), P. Davies (Ifremer), Ph. Warnier (Ifremer), M. Le Boulluec (Ifremer) and X. Bompais (Ifremer), (J. Pichon acting in this meeting as project managers).

Proposals recapitilation - February 2008

Nr	Organism	Project Title	Localisation	Contact1	Contact2	Rough Description	Infrastucture	Time
14	**NTUA**	**Wave current/cylinder**	Athens GR	Spyros Mavrakos	Ionnas Chatjigeorgiou		Deep wave bassin Brest	2 weeks
	National Technical University of Athens (N.T.U.A.)	Wave current interaction with vertical cylinder		mavrakos@naval.ntua.gr	chatzi@naval.ntua.gr	*The project aims at carrying out measurements concerning the interaction of arrays of circular cylinders in a combined waves and current field. The novelty of the project is the consideration of moderate current velocities that will correspond to relatively high Strouhal numbers, approx. ¼*		
15	**Cranfield University**	**Tests/Orecon MRC1**	Cranfield UK	Florent Trarieux	Brennan Feargal		Wave basin Brest	2 weeks
	Higher Education Institution	Reduced scale testing of the wave energy converter ORECon MRC1		f.trarieux@cranfield.ac.uk	f.brennan@cranfield.ac.	*Reduced scale testing of the wave energy converter ORECon MRC1in regular and irregular waves for performance evaluation and design optimisation.*		
16	**Ashland Belgium**	**Ashland/matrix resin**	Mechelen Be	Olli Piiroinen	Johansson Magnus		Material laboratory of Brest	3 weeks
	in association with Ashland Finland Oy	Damage tolerance of marine structures, the effect of matrix resin		opiiroinen@ashland.com	mjohansson@ashland.c	*The effect of resin chemistry to be studied more in details for selected resins. Sample preparation for mechanical tests and evaluation of resulsts will be performed.*		
17	**Hunstmann Europe**	**ultradeep insulation**	Athens	Dimitri Leroy			Material laboratory of Brest	1 week
	Hunstman Europe Polyurethane	Long term behaviour of nex thermal insulation material for ultradeep sea application		chatzi@naval.ntua.gr		*Huntsmann Europe is developping a new syntatic foam dedicated to insulation material for deep sea application. Two type of test: instrumented hydrostatic compression and long term ageing in deep sea environment are proposed.*		6 months for ageing

The project of Huntsman was rejected because non eligible (size of the company.). The decision concerning the proposal of Ashland was postponed awaiting for clarification about the proponent (eligibility as regards SME). The two other projects (NTUA and Cranfield U) were accepted.

A detailed report showing all presentations , discussions and conclusion was prepared to be sent to the participants of the commission.

1.5. Transnational Access activity

During the period of the present Annual report (from March 2007 up to February 2008), 7 projects were performed at the research facilities of Ifremer. One in the material laboratory of Brest (TTI), three in the wave basin of Brest (Ecofys, NTUA and TTI) and four in the water circulation basin of Boulogne/mer (Cormarent, Verderg and UniSoton).
A brief description of each project is given here under (see also database).

[Give an overview of the supported user-projects[1] and users in the reporting period indicating their number, their scientific fields and other relevant information.

In addition you must provide:

Ecofys (performed in the wave basin of Brest June and August 2007) - **WAVE ROTOR** - Experimental testing of the a combined Wells-Darrieus rotor in waves and currents - Project Nr **1**

Since 2000 Ecofys has been developing the Wave Rotor concept to harness both wave and tidal current using a single rotor. The Wave Rotor is unique in being able to convert both wave and tidal energy directly into rotation. In collaboration with the TU Delft who will bring in modelling and hydrodynamic expertise, Ecofys users liked to continue their research to optimise the hydrodynamic behaviour and test new configurations.
The purpose is to optimise geometry and survivability through iterative testing.
Why tank testing? Due to the complex nature of the device, numerical methods and CFD tools are not adequate to describe the behaviour of the Wave Rotor. Experimental testing is the only way to make real improvements in the design and detailed engineering.

Main results and conclusions:

Generally, power outputs up to 100Watts are recorded with speeds up to 30 rpm. All set-ups are self starting, also the Wells and Darrieus only rotor set ups.

The motoring tests in still water give an interesting insights in the % drag losses of the device.

Clearly the angled blades give better performance over non-angled blades (90 degrees rotor). Also it is demonstrated that small currents additional to waves give better power output. More details can be disclosed early August 2007 when data processing has completed.

The test facilities at IFREMER offered a unique opportunity to test a new model of the Wave Rotor, which is both larger and more flexible than the previous model. In the tank both tides and waves were tested in combination. This clearly resulted in higher power outputs, irrespective of the direction of the flow.

A large variation of set-ups was tested, different blade angles and rotors independently (only Wells and only Darrieus). Although there are clear indications of trends and improvements, at the time the data has not yet been processed. The data monitored in August can offer a more complete picture of the results including graphs and computational validation results of the new set-up.

Cormarent (performed in the current flume of Boulogne/mer July 2007) - Proof of concept tests on Cormarent **tidal stream energy device** - Project Nr **7**

Tidal Stream energy is an undeveloped energy resource that offers the EU potential to access significant amounts of low CO2, long life, secure and commercially viable power supplies.

This project is Phase 1 of a three phase programme. The overall aim of this first phase is to prove the concept of, and to establish fundamental performance data for a novel and radical tidal stream turbine concept. Then based on the results obtained in physical experiments, to assess the concepts technical and economic viability. Physical testing as well as analytical modelling studies will be performed to demonstrate the performance of the concept. Initial tests will investigate four key design parameters. A CFD study will be developed. An economic analysis will be performed to demonstrate the concept's economic viability. The findings should allow Cormarent and the University of Plymouth to either take the design concept forward into Phase 2 or reject the technology as unsuitable. Phase 2 will complete value engineering and deploy a marine pilot plant,. Phase 3 will deploy a commercial scale prototype. If the research progresses the first commercial power arrays could be in production in 5 to 7 years.

Aim : to determine fundamental performance characteristics of Cormarent.

The design concept needs to be tested to demonstrate the performance benefits of counter rotation and the flow characterisation to validate the CFD code.

The tests which was conducted in the Boulogne-sur-Mer water circulation tunnel has already conducted on a model of 600mm height and 350mm diameter. Preliminary findings from those tests suggest an improvement of performance was obtained through the use of the counter rotating concept. The model to be tested in Boulogne-Sur-Mer was of appropriate scale to suit the circulation tunnel and the available data acquisition systems.
The objective of Cormarent trial was to validate the system and the CFD code. The original system is based on a double propeller with a common vertical axis and a "contrerotating" operating.
Two types of trials were carried out: in a first time with one propeller alone, then the complete unit. The measurements were concerning the rotation speed and the velocity of the flow inside the wake. (using the Ifremer Laser Doppler Velocimetry system – LDV) and the stork. As regards the velocity, it was noted a lake of speed upstream the rotation axis with an important disequilibria between sta board and stew board, this, due to the rotation of the impeller. This disequilibria slightly disappeared when the impeller work in a reverse way.
More detailed information was impossible to provide, as the user asked for a confidentiality agreement.

Verderg (performed in the current flume of Boulogne/mer September 2007) - Spectral Marine Energy Convertor (**SMEC**) - Project Nr **2**

The concept developed by Verderg engineering is an innovative marine current and wave energy system. It is based on Venturi principle which generates a pressure gradient used to draw water from a submerged pipe network. Combining multiple orifice flows to draw water from a single manifold source, the flow can be combined to produce a much larger single flow. By incorporating an appropriate impeller, the resulting mass flow may be converted to rotational torque to drive an electrical generator.

Modelling to support the conceptual theory has been carried out using Computational Fluid Dynamics (CFD) and mathematical simulation but requires validation to carry the concept forward to extend technical development to engineering investigations and prototype sea trials.

The aim of the tests was the validation of a first principles mathematical simulation and the calibration and the confirmation of the simulation at tank scale.
The device (2 m width by 2.2 m height) was maintained on the bottom of the tank by a specific assembly of tubes and cables to overcome any structural failure.
The flow characterization around the structure was carried out by laser velocimetry techniques and measurements of surface elevation with wave gauges. The pressure in tubes and the performance of the system are also measured. To achieve this aim, different parts of the SMEC device are instrumented with pressure transducers to measure:
the dynamic pressure at the leading edge of the central pipe
the differential pressure created by the venturi
the volume of water drawn by the device.
For the performance characterization of the system, the following test program was considered:

- trials with no orifices at different throat widths to show that the venturi tube concept works and to determine the optimum throat width over the velocity range (Fig. 15)

- once the concept of the venturi tubes is at its optimum, trials with different orifice sizes, different flow rates and different throat widths.

In order to have an idea of the characteristics of the flow to be measured, some simulations on different pipe networks have been previously carried out with the CFD software Fluent. For these simulations, the k-ω turbulence model is used. Like in the real tank, the device is placed in the middle of a 4 m width and 10 m length area. A triangular grid is carried out and the mesh is about 5 mm width close to the tubes and 50 mm width at the edges of the domain.

The first results show a relatively good comparison between numerical and experimental data of the axial velocity acquired upstream of the device. Downstream the pipes network, the comparison shows some relatively bad results, essentially due to free surface effects. These results highlight the necessity to take into account the 3D effects of the flow and particularly the free surface influence on the behaviour of the flow through the pipe network and the necessity to make 3D computation to achieve a good estimation of the performance.
In conclusion, the trials for the characterization of a more innovative concept of a shaped pipe network are not completely finished but the first results give some interesting information for the validation of the concept and the numerical simulation.

NTUA-GR (performed in the wave basin of Brest June 2007) – Dynamic Response of Vertical and Catenary Shaped **Riser**-Type Slender Structures - Project Nr **4**

The proposed project was concerning measurements of the dynamic behaviour of Catenary and vertical under pretension riser type slender structures. The dynamic behaviour will be determined by measuring all time dependent variables that influence the configuration of the structure under time varying excitation. In particular measurements for the motions both tangential and normal, tension, angle, bending moment and shear force at various points along the structure will be required.

The length of the structures shall be sufficient in order for a small portion of the material to exceed the water surface in order to be attached to the oscillator. For carrying out the experiments an oscillator will be required that will apply ay the top of the structure mainly harmonic motions of various amplitudes. It is very crucial that the oscillator will be able to perform both vertical and horizontal motions or combined motions in order to simulate excitations parallel to the tangent of the structure at the top terminal point. The latter type of excitation is of particular importance as it can produce stimulation of instabilities or compression loading at the touch down area.

Main results: The measurements concerned the dynamic behaviour of a Steel Catenary Riser (SCR). The model under scale (1:12.5) was a 36m Glass Reinforced Pipe (GRP) consisting of various sections of 3m. The assembly of the model as well as the installation of the instrumentation and the necessary calibrations were carried out by IFREMER's specialized personnel who also operated the measuring devises.

The dynamic behaviour of the SCR model was evaluated through measurements of the dynamic bending moment and the acceleration in normal direction at specific locations along the structure. To this end, 20 waterproof strain gauges were used in groups of four in five locations along the structure. In addition, three waterproof accelerometers were installed. The dynamic bending moment was measured in both the in plane and the out of plane directions. Also, the fully equipped IFREMER's infrastructure enabled the

measurement of the dynamic tension amplification at the top of the structure and in particular at the connecting point with the oscillator. The five groups of the strain gauges were installed at 19, 20, 22, 25 and 29m for the anchoring point while the accelerometers were put at 19.5, 21.5 and 23.55m from the same location.

Several trials were performed that concerned sinusoidal horizontal, vertical, axial and transverse excitation. The excitation properties which were used for the experiments are given in the following table.

Several trials were performed that concerned sinusoidal horizontal, vertical, axial and transverse excitation. The excitation properties which were used for the experiments were from 16 to 10 mm (amplitude) with an excitation period from 8.9 to 1.2 s.

For each of the specified amplitudes all excitation periods were implemented. Final, some indicated measurements were taken having the riser excited by irregular excitation using JONSWAP spectrum.

The specific project is completely free of commercialism and the results of the trials shall be used for teaching purposes and for validating the efficiency of existing and under development computer programs of numerical simulation.

TTI (performed in the material laboratory of Brest November 2007) – Tension Technology International Ltd - Project Nr **12**

Ropes are strength tested with splices and over bollards. Ropes with potted terminations be cycled 20 times and then given a number of rotations and finally their strength are measured.

Other works are carried out as indicated by the results of these tests

This study has produced a unique set of results from a series of break tests performed on 36 carefully-prepared polyester sub-rope samples. This set of results constitutes a valuable data-base, for both rope modelling and to evaluate subsequent improvements in rope performance.

Strong influence of both fibre properties and surface coating on strength. The splice type does not appear to affect strength significantly. The lay length affects the strength of certain materials.

A detailed analysis of the results has been performed, and the use of both commercial rope mechanics software and a specially developed analysis of rope element variations have enabled us to understand the differences in results.

UniSoton (performed in the current flume of Boulogne/mer February 2008) - Experimental evaluation of the performance and interactions of marine current turbines – University of Southampton - Project Nr **3**

The programme of work will be undertaken at the water circulation testing basin of Boulogne/Mer. The work was discussed with Grégory GERMAIN, Head of the flume tank. It is felt that the above IFREMER's facility offers the best possible test site for the proposed work.

Below is a summary of the work programme: The work will involve measurements of the performance of a model 800mm diameter horizontal axis marine current turbine in free stream and operating in the wake of another turbine. The test rigs and turbines have been evaluated

previously but not in circulating water channels. The test rig is instrumented to measure torque and thrust and may include measurement of moment on the blades.

In addition it is anticipated that the experiments will also involve measurements of both shaft loads and wake behind the turbine. This will be followed by measurements of the second turbine operating in the wake. If possible twin rotor test will also be needed to accomplish space dependency effects on performance.

The wide re-circulating water channel at Boulogne has a continuous current where the incident flow has a boundary layer that can be modified in a controlled way. There is also sufficient space to make comprehensive measurements of velocities and turbulence intensities in the wake of multiple rotors and simulator combinations. Appropriate measurement equipment was discussed and will be available for testing. Fabrication of the turbines and their sensors will be carried out at Southampton University.

Flow mapping of the wake flow downstream of 100mm diameter porous disks was undertaken during the week 25-29th February 2008. Similar experiments had been conducted at the University of Southampton Chilworth flume but this was shallow (0.3m depth) and therefore the circulating channel at IFREMER would allow operation in a boundless flow. This is defined as a depth where the flow field around the disks is not affected by the side walls, bed or water surface. Disks were tested at 0.7m depth, 0.3m and 0.5m. The first test was to investigate boundless conditions; the later tests were to investigate any interference from the water surface only.

An acoustic Doppler velocimeter (ADV) was supplied by University of Southampton. IFREMER supplied a 3-axis automated traverse and modified an existing clamping arrangement to mount the ADV probe in the water channel. The ADV probe was traversed downstream along the central axis of the disk from 3-diameters (D) downstream to a maximum of 20D sampling at discrete points along this distance. The ADV probe was then advanced back upstream at a different vertical position. This process continued until a centre-plane slice of sample points was acquired. Following this lateral planes of points were measured thus developing a map of the downstream flow field in 3-dimensions. Figure 2 shows the downstream flow field in the vertical plane for a disk positioned at 7-diameters from the water surface.

Chaintest (performed in the wave basin of Brest February 2008) Autonomous robotic system for the inspection of mooring chains that tether offshore oil and gas structures to the ocean floor - Project Nr **10**

The project aims to develop a crawling vehicle that travels down mooring chains while in-situ carrying cleaning and non-destructive testing systems and inspecting each link for cracks and erosion. The Brest facility is valuable as a venue for a final demonstration as it provides sufficient depth and space to allow a test chain to be suspended either vertically or at an angle and the vehicle to be readily deployed.

The trials conducted at the Ifremer deep wave basin in March 2008 for the ChainTest final system demonstration

The ChainTest project was a 2-year EC Craft project that aimed to develop an underwater crawling vehicle that inspected mooring chains, cleaning and identifying defects in them. The trials at Brest were the final trials for the purpose of demonstrating the operation of the complete integrated system.

Set-up work:

On Friday 7th March the system was delivered to the deep wave basin by TWI and Zenon and the crawling vehicle assembled and mounted in a 'dummy' (not containing test defects) 5-link mooring chain. Between 10th and 11th March the cleaning system was unpacked and assembly started. Between 12th March and 13th March the crawling vehicle was first mounted onto the test chain and then the test chain was loaded with a 2 ton weight to keep the chain straight. These and other exercise required the skill of Ifremer staff in handling heaving loads. Considerable time was also spent by project partners setting up the NDT systems (ACFM, phased array UT and optical inspection) and the set-up and integration of the cleaning system was completed.

Final Demonstration:

On Friday the 14 March the final demonstration took place. Owing to a shortage of time partners did not convene to the conference room for presentations. The set-up of the crawler on the chain was completed and video was taken of the operation of the NDT and cleaning system in air by a Brest diver. The suspended chain/crawler system was then lowered into the water and some video was taken of the cleaning system operating underwater. Data was also collected from the optical system underwater. Due to a system failure ACFM and phased array data could not be collected but data on these NDT systems has previously been acquired before integration.

1.6. Scientific output of the users at the facility

Two papers has been published following the trials at the basin of Boulogne.

The **first one** is a paper entitled Facilities for Marine Current Energy Converter characterization which has been accepted for a presentation at **EWTEC 2007**, It will be presented jointly by 3 project users: Verderg, Tidalgeneration LTD and Southampton University. It has been already mentioned in AR1 but concerns also Verderg and Unisoton (projects described in AR2)

The following abstract of the presentation is published in the EWTEC newsletter:

The utilization of marine currents for power production offers a sustainable option to augment traditional power technologies and enhance the expansion of renewables. The marine current resource is potentially large and could generate a significant part of European country's electricity requirements. Energy from marine currents is highly predictable making it an attractive option amongst other renewable technologies. Many devices are designed around underwater wind turbine, known as a marine current turbine [1], but other systems are based on more new concepts.

After the first call for METRI II proposal (a european project offering a free of charge access to IFREMER* Marine Environment Tests and Research Infrastructure), some marine energy converter systems were accepted for hydrodynamic tests in Ifremer flume tank (Figure 1). Two of them concerns marine current turbine systems, one from the University of Southampton for a "classical" pile-mounted tidal turbine concept [2], [3], the other one being envisaged by Tidal Generation Ltd for a fully submerged machine in deep water [4] (figure 2). The third concept, considered here, is an innovative marine current and wave energy

* French Research Institute for Exploitation of the Sea (http://www.ifremer.fr/metri/)

system, based on Venturi principle which generates a pressure gradient used to draw water from a submerged pipe network [5] (figure 3).
Some of those systems are in a stage of concept validation for which an evaluation of the ability to exploit tidal or marine currents is needed. This ability is dependent on turbine and/or Venturi effect performances and specific trials are necessary to evaluate the behaviour of each system. The impact on the environment is also important to evaluate because changes in water surface elevation and/or seabed modification can appear.

Experimental campaigns carried out for those projects under METRI 2 program will perform in the Ifremer free surface hydrodynamic water tunnel (during the fourth months of 2007). The flume tank is 18 m long by 4 m wide and 2 m deep with a side observation window of 8 m x 2 m (this large window placed on one side of the tunnel allows to observe the behaviour of the models during trials and to carry out video sequences). The flow turbulence is less than 5 % and the flow velocity range is 0.1 to 2.2 m/s. Some performance and flow (velocities and turbulence intensities in the wake of the system) measurements will be carried out on:

a/ a 1/30 scale model of a marine current turbine studied by Southampton University to increase the knowledge of how such devices will perform when installed in arrays of farms of several machines (measurements of hydrodynamic load on the structure and flow characterization behind the structure by laser velocimetry techniques),

b/ a 1/30 scale model of the Tidal Generation Ltd concept (measurements of hydrodynamic load on the structure, the power output and the dynamic behaviour, and flow characterization behind the structure by laser velocimetry techniques),

c/ 1/40 scale model of an array of 27 profiled tubes for VerDerg Ltd CFD validations (flow characterization around the structure by laser velocimetry techniques and measurements of surface elevation and pressure in tubes).

The exploitation of the results (which should be obtained before the end of March for b/ and c/ and before the end of June for a/) should not be finished for the final paper, but the experimental set-up and the testing programs will be presented in detail. In all the cases, the experimental results obtained during those trials will be shown at the congres.

The **second one** was published by Ecofys for the Energy conference in Porto-2007 following the tests performed at Brest.

Abstract: As part of the Marine Environment Tests and Research Infrastructure (METRI 2) Programme, Ecofys tested a 1:5 scale model of a combined Darrieus-Wells rotor (“Wave Rotor”) in regular and irregular waves and tidal currents at the test facility of IFREMER, Brest, France in June and August 2007. Under supervision of the Faculty of Aeronautical Engineering of Technical University of Delft a computational streamtube model is built for both the Darrieus and Wells rotor which is validated against the experimental test results. This paper describes construction of the model, the experimental set up and results (due in August). The theory behind the streamtube model is presented and a method for validation is discussed.

Keywords: *Computational modeling and validation, Tank testing, tidal energy, and Wave Energy.*

Energy Conference, Porto, Portugal, 2007

Other output from the performed projects under AR2 are under preparation with, mainly, further possible cooperation with users (NTUA, Verderg, University of Southampton, TTI…).

1.7. User meetings

Most part of the discussion for the preparation of the projects was held by Email or phone.

For Verderg and UniSuton (Ifremer facilities of Boulogne), two meetings were already described in AR1 but was concerning projects performed in the frame of AR2.

For Verderg Limited (5/12/06)

Were present : S. Chapman, D. Wood, P. Roberts, (Verderg)
B. Gaurier, G. Germain (Ifremer)

The objective was to present and visit the research facilities and to define in details the trial that Verderg intended to carry out.

For the 5 days planned for trial it has been agreed to focus the studies on the current flow inside a tube at a 1/40 scale model. Drawings and sketch were discussed and approved. In parallel Verderg decided to take in charge the measurements in relation with absorbed power due to Venturi effect.

A paper for EWTEC 2007 will be prepared jointly (see item 1.8).

For the University of Southampton (12/10/06)

Were present : A. Bahaj, L. Meyers, J. Chaplin (Southampton University)
B. Gaurier, G. Germain (Ifremer)

The objective was also to present and visit the research facilities and to define in details the trial asked by Southampton University.

Preliminary trials founded by DTI will allow to characterise wake effect on the model of current turbine. Consequently the trials in the frame of Metri will complete these first experiments and are planned after September 2007.

As concerns the facilities of Brest also two meetings held on concerning TTI and Chaintest.

For **TTI** (Tension tech), it was a teleconference, were present:

C. Muller (Performance Fibres)
N. O'Hear (TTI Holland)
C. Berryman, S. Banfield (TTI UK)
P. davies, N. Lacotte, J. Pichon (IFREMER Brest)

TTI was conducting a study to examine how construction and termination parameters affect polyester sub-rope strength. This conference was about the definition of the test procedure for

the break tests which will be performed at IFREMER in Brest in November. The definition of samples and methodology was done. Three materials will be tested, polyester fibre grades 855TN, 1W78 and 1W83. Two types of sample will be supplied for each, spliced samples to be loaded by 100 mm diameter pins and unspliced lengths to be tested on 300 mm diameter bollards. Overall test length will be 8 metres for both.

For **Chaintest** , a teleconference between the users (Zenon and TWT) and Ifremer was firstly held on January 12, The visit of S. Wiliam in the fIfremer Brest followed with a second teleconference with the greek partners.

Jack Pichon (Ifremer)
Xavier Bompais (Ifremer)
Stephen Williams (TWI)
Dimtris Psarros (Zenon, by Teleconference to Athens, Greece)
Nikos Fanakis (Zenon, by Teleconference to Athens, Greece)
Dimitris Korres (Zenon, by Teleconference to Athens, Greece)

The main purpose of the meeting was the visit of the deep basin facility at Brest which has been proposed as the venue for the ChainTest final demonstration. Following telephone and email correspondence this meeting was primarily organised to discuss practical aspects of staging the demonstration and to foresee any possible obstacles.

1.8. Update of the non-confidential Project information

The main scientific information coming from the progress of the projects are given in paragraph 1.6 with the abstract of the two papers which was published for EWTEC 2007 (European wave and Tidal Energy Conference, Porto, Portugal – 11-14 September 2006):

Facilities for marine current energy converter characterization

G. Germain1 , A.S. Bahaj2, C. Huxley-Reynard3, P. Roberts4

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2 Sustainable Energy Research Group, University of Southampton, UK
3 Tidal Generation Limited, Bristol, UK
4 VerdErg Engineering Limited, Surrey, UK

Wave Rotor: Combined wave and tidal tank tests at IFREMER and computational validation

P.C. Scheijgrond, B. Vosbergen, B.J.Sustronk1 E.Soons2, E.A.Rossen3, J.Pichon, M. Le Boulluec4, P.Nellissen, G.Adolphs5.

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2. Annex

The annexes are produced by completing the relevant forms in the reporting MS Access 2002 Database that each co-ordinator has received by e-mail from the ***Commission****.*
A printed copy of the forms is inserted in the paper copy of the Annual Report.

Annex 1 - Composition of the Users Selection Panel
*[See "****Selection Panel****" form in the above mentioned MS Access Database.]*

Annex 2 - List of User-Projects
*[See "****List of User-Projects****" form in the above mentioned MS Access Database.]*

Annex 3 - List of Users
*[See "****List of Users****" form in the above mentioned MS Access Database.]*

List of Panel members

Contract ID 026010 **Reporting Period** AR2

Infrastructure Short Name	Family_Name	First_Name	Gender	Nation-ality	Home Institution			Email	Additional Information
					Institution Name	Town	Country		
METRI	Bozano	Roberto	M	IT	Consiglio Nazionale delle Ricerche (CNR)	Genova	IT	boz@ge.issia.cnr.it	Instituti di studi sui Sistemi Intelligenti (ISSIA)
METRI	Cognard	Jean-Yves	M	FR	ENSIETA	Brest	FR	jean-yves.cognard@ensieta.fr	Ecole Nationale Superieure d' Ingenieurs des Techniques de l'Armement
METRI	Germain	Gregory	M	FR	IFREMER	Boulogne sur Mer	FR	gregory.germain@ifremer.fr	Service hydrodynamique et Océano météo à Boulogne
METRI	Le Boulluec	Marc	M	FR	IFREMER	Brest	FR	marc.le.boulluec@ifremer.fr	Service hydrodynamique et Océano météo
METRI	Le Menn	Marc	M	FR	Service Hydrographique et Océanographique de la Marine (SHOM)	Brest	FR	lemenn@shom.fr	Département Ingenierie des équipements scientifiques
METRI	L'Her	Joel	M	FR	CETMEF	Brest	FR	joel.lher@equipement.gouv.fr	Costal and fluvial environment Department
METRI	Marec	Claudie	F	FR	INSU (Institut National des sciences de l Univers)	Brest	FR	claudie.marec@ipev.fr	Atelier national de l'équipement océanographique
METRI	Fennel	Sheena	F	IE	Marine Institute	Galway	IE	sheena.fennell@marine.ie	Oceanographic Services
METRI	Paillard	Michel	M	FR	IFREMER	Brest	FR	michel.paillard@ifremer.fr	Département des technologies des systèmes instrumentaux
METRI	Tziavos	Christo	M	GR	National Center for Marine Research	Athens	GR	ctziav@ncmr.gr	Department of Research
METRI	Waldmann	Christoph	M	DE	University of Bremen	Bremen	DE	waldmann@marum.de	Marum
METRI	Warnier	Philippe	M	FR	IFREMER	Brest	FR	Philippe.Warnier@ifremer.fr	material testing facilities
METRI	Bompais	Xavier	M	FR	IFREMER	Brest	FR	Xavier.Bompais@ifremer.fr	Service hydrodynamique et Océano météo

List of UserProjects

UserProject Acronym

Chaintest

Title

Autonomous robotic system for the inspection of mooring chains that tether offshore oil and gas structures to the ocean floor. (Acronym: ChainTest) - Project Nr 10

Scientific Field

Main Field	Engineering & Technology
FP6 Priority or Specific discipline	Other - Engineering & Technology

Objectives

The project aims to develop a crawling vehicle that travels down mooring chains while in-situ carrying cleaning and non-destructive testing systems and inspecting each link for cracks and erosion. The Brest facility would be invaluable as a venue for our final demonstration as it would provide sufficient depth and space to allow a test chain to be suspended either vertically or at an angle and the vehicle to be readily deployed.

Achievements

The trials conducted at the Ifremer deep wave basin in March 2008 for the ChainTest final system demonstration

The ChainTest project was a 2-year EC Craft project that aimed to develop an underwater crawling vehicle that inspected mooring chains, cleaning and identifying defects in them. The trials at Brest were the final trials for the purpose of demonstrating the operation of the complete integrated system.

Set-up work:
On Friday 7th March the system was delivered to the deep wave basin by TWI and Zenon and the crawling vehicle assembled and mounted in a 'dummy' (not containing test defects) 5-link mooring chain. Between 10th and 11th March the cleaning system was unpacked and assembly started. Between 12th March and 13th March the crawling vehicle was first mounted onto the test chain and then the test chain was loaded with a 2 ton weight to keep the chain straight. These and other exercise required the skill of Ifremer staff in handling heaving loads. Considerable time was also spent by project partners setting up the NDT systems (ACFM, phased array UT and optical inspection) and the set-up and integration of the cleaning system was completed.

Final Demonstration:
On Friday the 14 March the final demonstration took place. Owing to a shortage of time partners did not convene to the conference room for presentations. The set-up of the crawler on the chain was completed and video was taken of the operation of the NDT and cleaning system in air by a Brest diver. The suspended chain/crawler system was then lowered into the water and some video was taken of the cleaning system operating underwater. Data was also collected from the optical system underwater. Due to a system failure ACFM and phased array data could not be collected but data on these NDT systems has previously been acquired before integration.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	2	WCTB	6

UserProject Acronym

CORMARENT

Title

Cormarent - Proof of concept tests on Cormarent tidal stream energy device - Project Nr 7

Scientific Field

Main Field	Engineering & Technology
FP6 Priority or Specific discipline	Other - Engineering & Technology

Objectives

Tidal Stream energy is an undeveloped energy resource that offers the EU potential to access significant amounts of low CO2, long life, secure and commercially viable power supplies.

This project is Phase 1 of a three phase programme. The overall aim of this first phase is prove the concept of, and to establish fundamental performance data for a novel and radical tidal stream turbine concept. Then based on the results obtained in phyisical experiments to assess the concepts technical and economic viability. Physical testing as well as analytical modelling studies will be performed to demonstrate the performance of the concept. Initial tests will investigate four key design parameters. A CFD study will be developed. An economic analysis will be performed to demonstrate the concept's economic viability. The findings should allow Cormarent and the University of Plymouth to either take the design concept forward into Phase 2 or reject the technology as unsuitable. Phase 2 will complete value engineering and deploy a marine pilot plant,. Phase 3 will deploy a commercial scale prototype. If the research progresses the first commercial power arrays could be in production in 5 to 7 years.

Aim :- to determine fundamental performance characteristics of Cormarent.
The design concept needs to be tested to demonstrate the performance benefits of counter rotation and the flow characterisation to validate the CFD code.

The tests will be conducted in the Boulogne-sur-Mer water circulation tunnel. Cormarent has already conducted basic tests on a model of 600mm height and 350mm diameter. Preliminary findings from those tests suggest an improvement of performance can be obtained through the use of the counter rotating concept. The model to be tested in Boulogne-Sur-Mer will be of appropriate scale to suit the circulation tunnel and the available data acquisition systems.

Achievements

The objective of Cormarent trial was to validate the system and the CFD code. The original system is based on a double propeller with a common vertical axis and a contrerotating operating.
Two types of trials were carried out: in a first time with one propeller alone, then the complete unit. The measurements were concerning the rotation speed and the velocity of the flow inside the wake. (using the Ifremer Laser Doppler Velocimetry system-LDV). As regard the velocity, it is noted that there is a lake of speed upstream the rotation axis with an important disequilibria between sta board and stew board, this due to the rotation of the impeller. This disequilibria slightly disappeared when the impeller works in a reverse way.
More detailed information was impossible to provide, as the user asks for a confidentiality agreement.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	1	DWTB	10

UserProject Acronym

ECOFYS

Title

WAVE ROTOR - Experimental testing of the a combined Wells-Darrieus rotor in waves and currents - Project Nr 1

Scientific Field

Main Field	Energy
FP6 Priority or Specific discipline	FP6 - Sustainable energy systems

Objectives

Since 2000 Ecofys has been developing the Wave Rotor concept to harness both wave and tidal current using a single rotor. The Wave Rotor is unique in being able to convert both wave and tidal energy directly into rotation. In collaboration with the TU Delft who will bring in modelling and hydrodynamic expertise, we would like to continue our research to optimise the hydrodynamic behaviour and test new configurations.

The purpose is to optimise geometry and survivability through iterative testing.
Why tank testing? Due to the complex nature of the device, numerical methods and CFD tools are cannot adequately describe the behaviour of the Wave Rotor. Experimental testing is the only way to make real improvements in the design and detailed engineering.

Achievements

The test facilities at IFREMER offered a unique opportunity to test a new model of the Wave Rotor, which is both larger and more flexible than the previous model. In the tank both tides and waves were tested in combination. This clearly resulted in higher power outputs, irrespective of the direction of the flow.
A large variation of set-ups was tested, different blade angles and rotors independently (only Wells and only Darrieus). Allthough there are clear indications of trends and improvements. Later on , after compilation of the data, a more complete picture of the results including graphs and computational validation results of the new set-up can be offered.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	2	WCTB	11

UserProject Acronym

NTUA

Title Dynamic Response of Vertical and Catenary Shaped Riser-Type Slender Structures - Project Nr 4

Scientific Field

Main Field	Engineering & Technology
FP6 Priority or Specific discipline	Other - Engineering & Technology

Objectives

The proposed project concerns measurements of the dynamic behaviour of catenary and vertical under pretension riser type slender structures. The dynamic behaviour will be determined by measuring all time dependent variables that influence the configuration of the structure under time varying excitation. In particular measurements for the motions both tangential and normal, tension, angle, bending moment and shear force at various points along the structure will be required.

Two types of structures shall be tested: completely vertical and catenary shaped under specified pretension force. The trials can be performed at the plane of the riser, that is 2D approximation, but some additional tests could be carried out using out of plane excitation. The catenary risers should have sufficient length in order to ensure that a part of the total length will lie on the bottom. It is desirable that a sufficient number of sensors to be installed at the touch down area in order to predict the soil structure interaction effects and the possible development of compression loading around this area.

The length of the structures shall be sufficient in order for a small portion of the material to exceed the water surface in order to be attached to the oscillator. For carrying out the experiments an oscillator will be required that will apply ay the top of the structure mainly harmonic motions of various amplitudes. It is very crucial that the oscillator will be able to perform both vertical and horizontal motions or combined motions in order to simulate excitations parallel to the tangent of the structure at the top terminal point. The latter type of excitation is of particular importance as it can produce stimulation of instabilities or compression loading at the touch down area.

Achievements

The measurements concerned the dynamic behaviour of a Steel Catenary Riser (SCR). The model under scale (1:12.5) was a 36m Glass Reinforced Pipe (GRP) consisting of various sections of 3m. The assembly of the model as well as the installation of the instrumentation and the necessary calibrations were carried out by IFREMER's specialized personnel who also operated the measuring devises.

The dynamic behaviour of the SCR model was evaluated through measurements of the dynamic bending moment and the acceleration in normal direction at specific locations along the structure. To this end, 20 waterproof strain gauges were used in groups of four in five locations along the structure. In addition, three waterproof accelerometers were installed. The dynamic bending moment was measured in both the in plane and the out of plane directions. Also, the fully equipped IFREMER's infrastructure enabled the measurement of the dynamic tension amplification at the top of the structure and in particular at the connecting point with the oscillator. The five groups of the strain gauges were installed at 19, 20, 22, 25 and 29m for the anchoring point while the accelerometers were put at 19.5, 21.5 and 23.55m from the same location.

Several trials were performed that concerned sinusoidal horizontal, vertical, axial and transverse excitation. The excitation properties which were used for the experiments are given in the following table.

The above concern actual values measured before the trials. The dynamic behaviour of the SCR model was evaluated through measurements of the dynamic bending moment and the acceleration in normal direction at specific locations along the structure. To this end, 20 waterproof strain gauges were used in groups of four in five locations along the structure. In addition, three waterproof accelerometers were installed. The dynamic bending moment was measured in both the in plane and the out of plane directions. Also, the fully equipped IFREMER's infrastructure enabled the measurement of the dynamic tension amplification at the top of the structure and in particular at the connecting point with the oscillator. The five groups of the strain gauges were installed at 19, 20, 22, 25 and 29m for the anchoring point while the accelerometers were put at 19.5, 21.5 and 23.55m from

the same location.

Several trials were performed that concerned sinusoidal horizontal, vertical, axial and transverse excitation. The excitation properties which were used for the experiments were from 16 to 10 mm (amplitude) with an excitation period from 8.9 to 1.2 s.

For each of the specified amplitudes all excitation periods were implemented. Final, some indicated measurements were taken having the riser excited by irregular excitation using JONSWAP spectrum.

The specific project is completely free of commercialism and the results of the trials shall be used for teaching purposes and for validating the efficiency of existing and under development computer programs of numerical simulation.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	2	WCTB	10

UserProject Acronym

TTI

Title

TTI - Optimization of Polyester Rope Strengths and Strength vs Rotation - Project Nr 12

Scientific Field

Main Field Material Sciences

FP6 Priority or Specific discipline Other - Material Sciences

Objectives

Ropes will be strength tested with splices and over bollards
Ropes with potted terminations be cycled 20 times and then given a number of rotations and finally their strength will be measured.
Other work will be carried out as indicated by the results of these tests

Achievements

This study has produced a unique set of results from a series of break tests performed on 36 carefully-prepared polyester sub-rope samples. This set of results constitutes a valuable data-base, for both rope modelling and to evaluate subsequent improvements in rope performance.

There is a strong influence of both fibre properties and surface coating on strength. The splice type does not appear to affect strength significantly. The lay length affects the strength of certain materials.

A detailed analysis of the results has been performed, and the use of both commercial rope mechanics software and a specially developed analysis of rope element variations have enabled us to understand the differences in results

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	4	MBTL	20

UserProject Acronym

UniSoton

Title

Experimental evaluation of the performance and interactions of marine current turbines - Project Nr 3

Scientific Field

Main Field	Engineering & Technology
FP6 Priority or Specific discipline	Other - Engineering & Technology

Objectives

The programme of work will be undertaken at the water circulation testing basin of Boulogne/Mer. The
work was discussed with Grégory GERMAIN, Head of the flume tank. It is felt that the above IFREMER's
facility offers the best possible test site for the proposed work.
Below is a summary of the work programme:
The work will involve measurements of the performance of a model 800mm diameter horizontal axis marine current turbine in free stream and operating in the wake of another turbine. The test rigs and turbines have been evaluated previously but not in circulating water channels. The test rig is instrumented to measure torque and thrust and may include measurement of moment on the blades. In addition it is anticipated that the experiments will also involve measurements of both shaft loads and wake behind the turbine. This will be followed by measurements of the second turbine operating in the wake. If possible twin rotor test will also be needed to accomplish space dependency effects on performance.
The wide re-circulating water channel at Boulogne has a continuous current where the incident flow has a boundary layer that can be modified in a controlled way. There is also sufficient space to make comprehensive measurements of velocities and turbulence intensities in the wake of multiple rotors and simulator combinations. Appropriate measurement equipment was discussed and will be available for testing. Fabrication of the turbines and their sensors will be carried out at Southampton University.

Achievements

Flow mapping of the wake flow downstream of 100mm diameter porous disks was undertaken during the week 25-29th February 2008. Similar experiments had been conducted at the University of Southampton Chilworth flume but this was shallow (0.3m depth) and therefore the circulating channel at IFREMER would allow operation in a boundless flow. This is defined as a depth where the flow field around the disks is not affected by the side walls, bed or water surface. Disks were tested at 0.7m depth, 0.3m and 0.5m. The first test was to investigate boundless conditions; the later tests were to investigate any interference from the water surface only.

An acoustic Doppler velocimeter (ADV) was supplied by University of Southampton. IFREMER supplied a 3-axis automated traverse and modified an existing clamping arrangement to mount the ADV probe in the water channel. The ADV probe was traversed downstream along the central axis of the disk from 3-diameters (D) downstream to a maximum of 20D sampling at discrete points along this distance. The ADV probe was then advanced back upstream at a different vertical position. This process continued until a centre-plane slice of sample points was acquired. Following this lateral planes of points were measured thus developing a map of the downstream flow field in 3-dimensions. Figure 2 shows the downstream flow field in the vertical plane for a disk positioned at 7-diameters from the water surface.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	1	DWTB	5

UserProject Acronym

VERDERG

Title

VERDERG - Spectral Marine Energy Convertor (SMEC) - Project Nr2

Scientific Field

Main Field	Energy
FP6 Priority or Specific discipline	FP6 - Sustainable energy systems

Objectives

The concept developed by Verderg engineering is an innovative marine current and wave energy system. It is based on Venturi principle which generates a pressure gradient used to draw water from a submerged pipe network.
Combining multiple orifice flows to draw water from a single manifold source, the flow can be combined to produce a much larger single flow. By incorporating an appropriate impeller, the resulting mass flow may be converted to rotational torque to drive an electrical generator.
The purpose is to calibrate and confirm the simulation at tank scale.

Achievements

Modeling to support the conceptual theory has been carried out using Computational Fluid Dynamics (CFD) and mathematical simulation but requires validation to carry the concept forward to extend technical development to engineering investigations and prototype sea trials.
The device (2 m width by 2.2 m height) was maintained on the bottom of the tank by a specific assembly of tubes and cables to overcome any structural failure.
The flow characterization around the structure was carried out by laser velocimetry techniques and measurements of surface elevation with wave gauges. The pressure in tubes and the performance of the system are also measured. To achieve this aim, different part of the SMEC device is instrumented with pressure transducers to measure:
- the dynamic pressure at the leading edge of the central pipe
- the differential pressure create by the venturi
- the volume of water drawn by the device.

For the performance characterization of the system, the following test program was considered:
- trials with no orifices at different throat widths to show that the venturi tube concept works and to determine the optimum throat width over the velocity range (Fig. 15)
- once the concept of the venturi tubes is at its optimum, trials with different orifice sizes, different flow rates and different throat widths.

In order to have an idea of the characteristics of the flow to be measured, some simulations on different pipe networks have been previously carried out with the CFD software fluent. For these simulations, the k-ω turbulence model is used. Like in the real tank, the device is placed in the center of a 4 m width and 10 m length area. A triangular grid is carried out and the mesh is about 5 mm width close to the tubes and 50 mm width at the edges of the domain.
The first results show a relatively good comparison between numerical and experimental data of the axial velocity acquired upstream of the device. Downstream the pipes network, the comparison shows some relatively bad results, essentially due to free surface effects. These results highligth the necessity to take into account the 3D effects of the flow and particularly the free surface influence on the behaviour of the flow through the pipe network and the necessity to make 3D computation to achieve a good estimation of the performance.
In conclusion, the trials for the characterization of a more innovative concept of a shaped pipe network are not completely finished but the first results give some interesting information for the validation of the concept and the numerical simulation.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	1	DWTB	5

List of Users

Contract ID 026010 **Reporting Period** AR2

UserProject Acronym	Family Name	First Name	Gender	Birth year	Nationality	Resear. status	User Background			Home Institution				User e-mail	New user	Groupl eader	Remote user	Num. of visits	Dur. of stay	T and S reimb.
							Sci. Field 1	Sci. Field 2	Sci. Field 3	Type	Name	Town	Country							
Chaintest	Chatzakos	Panagiotis	M	1976	GR	EXP	Engineering & Technology			SME	Zenon Automation Technologies	Athens	GR	pchatzak@zenon.gr	Y	Y	N	1	5	Y
Chaintest	Cramail	Max	M	1960	FR	EXP	Engineering & Technology			SME	Nuclear Engineering Services Ltd	Wolverhampton	GB	max.cramail@nes-limited.com	Y	N	N	1	4	N
Chaintest	Elcinto	Javier	M	1970	ES	EXP	Engineering & Technology			SME	Interlab	madrid	ES	jbecerra@interlab.es	Y	N	N	1	3	N
Chaintest	Hornby	David	M	1970	GB	TEC	Engineering & Technology			SME	Nuclear Engineering Services Ltd	Wolverhampton	GB	dave.hornby@nes-limited.com	Y	N	N	1	3	N
Chaintest	Longman	Peter	M	1970	GB	TEC	Engineering & Technology			SME	KMT	Wolverhampton	GB	dave.hornby@nes-limited.com	Y	N	N	1	3	N
Chaintest	Phillips	Bob	M	1960	GB	EXP	Engineering & Technology			SME	Nuclear Engineering Services Ltd	Wolverhampton	TR	bob.phillips@nes-limited.com	Y	N	N	1	3	N
Chaintest	Porta	paulo	M	1970	IT	EXP	Engineering & Technology			SME	Bytest	Volpiano	IT	paolo.porta@bytest.it	Y	N	N	1	2	N
Chaintest	Psarros	Dimiti	M	1960	DE	EXP	Engineering & Technology			SME	Zenon S A	Athens	GR	dpsarros@zenon.gr	Y	N	N	1	1	N
Chaintest	Taneja	Rajesh	M	1950	GB	EXP	Engineering & Technology			SME	NDT Consultants	Coventry	GB	rajesh@ndt-consultants.co.uk	Y	N	N	1	3	N
Chaintest	Topp	David	M	1970	GB	EXP	Engineering & Technology			SME	TSC Inspection Systems	Milton Keynes	GB	dtopp@tscinspectionsystems.com	Y	N	N	1	3	N
Chaintest	Williams	Stephen	M	1966	GB	EXP	Engineering & Technology			PRV	Welding Institute	Cambridge	GB	stephen.williams@twi.co.uk	Y	N	N	2	10	Y
CORMARENT	McSherry	David	M	1960	GB	EXP	Energy	Engineering & Technology		SME	Cormarent Ltd	Regate	GB	davidmcsherry@cormarent.co.uk	Y	Y	N	1	16	Y
CORMARENT	Stratford	Peter	M	1969	GB	TEC	Engineering & Technology			SME	BMT	Teddington	GB	pstratford@bmtrenewables.com	Y	N	N	1	16	N
CORMARENT	ZHANG	YALI	F	1977	OT	PDOC	Engineering & Technology			UNI	UNIVERSITY OF PLYMOUTH	Plymouth	GB	YALI.ZHANG@PLYMOUTH.AC.UK	Y	N	N	1	16	Y
ECOFYS	BREKEL, VAN DER	Vincent	M	1960	NL	EXP	Engineering & Technology			SME	ECOFYS Ltd	UTRECHT	NL	V.VANDENBREKEL@ECONCERN.NL	Y	N	N	1	10	N
ECOFYS	ROSSEN	Eric	M	1959	DK	EXP	Engineering & Technology			SME	Fima Rosse	Copenhagen	DK	eric@rossen.dk	Y	N	N	2	6	N

UserProject Acronym	Family Name	First Name	Gender	Birth year	Nationality	Resear. status	User Background			Home Institution				User e-mail	New user	Groupl eader	Remote user	Num. of visits	Dur. of stay	T and S reimb.
							Sci. Field 1	Sci. Field 2	Sci. Field 3	Type	Name	Town	Country							
ECOFYS	Scheijgrond	Peter	M	1972	NL	EXP	Engineering & Technology			SME	ECOFYS Ltd	UTRECHT	NL	P.SCHEIJGROND@ECOFYS.NL	Y	Y	N	1	10	Y
ECOFYS	SOONS	Ernst	M	1981	NL	PGR	Engineering & Technology			UNI	TU DELFT	DELFT	NL	E.J.Soons@student.TUDelft.NL	Y	N	N	1	10	Y
ECOFYS	Thepen	Jeffrey	M	1988	NL	UND	Engineering & Technology			UNI	University	UTRECHT	NL	none	Y	N	N	1	10	Y
ECOFYS	VOSBERGEN	Bas	M	1981	NL	PGR	Engineering & Technology			UNI	Inholland	Alkmaar	NL	B.VOSBERGEN@ECOFYS.NL	Y	N	N	1	10	Y
NTUA	Chatjigeorgiou	Yannis	M	1966	GR	EXP	Engineering & Technology			UNI	National Technical University of Athens	Arhens	GR	chatzi@naval.ntua.gr	Y	Y	N	1	7	Y
NTUA	Mazarakos	Thomas	M	1979	GR	PDOC	Engineering & Technology			UNI	National Technical University	Athens	GR	tmazarakos@naval.ntua.gr	Y	N	N	1	7	Y
NTUA	Synetos	Dionisis	M	1951	GR	TEC	Engineering & Technology			UNI	National Technical university of Athens	Athens	GR	dsinetos@naval.ntua.gr	Y	N	N	1	12	Y
TTI	Berryman	Chris	M	1960	GB	TEC	Material Sciences			SME	tension Technology International Ltd	Eastbourne	GB	berryman@tensiontech.com	Y	N	N	1	5	Y
TTI	O'Hear	Nicholas	M	1945	GB	EXP	Material Sciences			SME	Tension Technology International Ltd	Eastbourne	GB	ohear@tensiontech.com	Y	Y	N	1	3	Y
UniSoton	Giles	Jack	M	1984	TR	PGR	Energy			UNI	University of Southampton	Southampton	GB	jack.giles@soton.ac.uk	Y	Y	N	1	6	Y
UniSoton	Myers	Luke	M	1979	GB	PDOC	Energy			UNI	University of Southampton	Southampton	GB	luke@soton.ac.uk	Y	Y	N	1	6	Y
VERDERG	Bird	Paul	M	1953	GB	EXP	Engineering & Technology			SME	VeBrent Measurement Technology Ltd	Harbournefo rd	GB	pbird@brentmt.co.uk	Y	N	N	1	7	Y
VERDERG	Chapman	Sonia	F	1982	GB	PGR	Engineering & Technology			SME	Verderg Connectors Ltd	Knaphill	GB	sonia.chapman@verderg.com	Y	N	N	1	7	Y
VERDERG	Wood	Richard	M	1945	GB	EXP	Engineering & Technology			SME	Verderg Connectors Ltd	Knaphill	GB	dick.wood@verderg.com	Y	Y	N	1	7	Y

B. MANAGEMENT REPORT (FINANCIAL INFORMATION)

1. Justification of the resources deployed

- **The effort dedicated to project management tasks** in the first year of operation of Metri is estimated to 100 hours. The corresponding hourly rate is 51.79 € (figure coming from art 3.3.4 of Ifremer proposal for Metri 2 – doc. nr ERT MS 05030).

  The charged amount is then: **5179 €.**

  The spent time dedicated to the preparation and the operations for the project users is estimated to 7.4 men-month, amount which will not be charged as being include in the cost of experimental days.

  These figures comes from the data given by the accounting department of Ifremer.

- **The eligible costs claimed to the contract** during the reporting period (tabular form) are as follows:

From tables annex 1 of Metri 2 - RITA Contract Nr 026010 and CFP A3.3a

From tables annex 1 of Metri 2 - RITA Contract Nr 026010

Table of Eligible Costs - Metri Annual Report 2	Nr	Rate	Amount	Total/categories
Specific activities				***206712.03***
Transnational Access - material laboratory of Brest/days	20	2117.78	42355.60	
Transnational Access - wave basin of Brest/days	27	3407.89	92013.03	
Transnational Access - current basin of Boulogne/days	20	3617.17	72343.40	
Other activities:				***21962.25***
Expert panel travel and subsidencies	1		1151.92	
Travel and subsidencies - users	1		20810.33	
Management activities				***14069.19***
Human effort/hours	100	51.79	5179.00	
Travels, congress, Exhibitions			8890.19	
Advertising			0.00	
Total				***242743.47*** **€**

[No major deviations with respect to the planned budget.]

2. Forms C - Financial Statements

*The **Form C - Financial Statements** (**Appendix 1)** is provided in an Excel separate document (electronic form).*

*As requested an **Audit certificate** is submitted with the Forms C(separate attached document)*

Form C - Model of Financial Statement per Activity for a Specific Support Action / Transnational Access to Infrastructures

(to be completed by each contractor)

Type of instrument	Specific Support Action	Type of Action *(if necessary)*	Transnational Access to Infrastructures
Project Title (or Acronym)	Metri	Contract n°	026010
Contractors's legal name	Ifremer		
Legal Type			
Contact Person	Jack Pichon	Telephone	33 2 98 22 41 54
Telecopy	33 2 98 22 45 35	E-mail	jack.pichon@ifremer.fr
Cost model used (AC/FC or FCF) / (UF: User Fee)(*)	FC/UF	Indirect costs (Real or Flat Rate of 20% of Direct costs, except subcontracting)	Flat Rate of 20% of Direct costs, except subcontracting (**)
Period from	01/03/2007	To	29/02/2008

(*) If UF is used under "other specific activities: transnational access/connectivity", please mention the two cost models used (eg. FC/UF or FCF/UF or AC/UF)

(**) Except otherwise agreed in Article 9 [special clauses] of the contract.

1- Resources (Third party(ies))

Are there any resources made available on the basis of a prior agreement with third parties identified in Annex I of the contract? (Yes / No)				No
If Yes, please provide the following information				
Third Party 1 (Y1)	Legal name		Cost model used	
Third Party 2 (Y2)	Legal name		Cost model used	

If necessary add another Form C

2- Declaration of eligible costs (in €)

Please complete only the activity covered by the relevant instrument (and type of action) indicated above and as mentioned in Article II.25 and/or in Annexes I and III of the contract.
If you are a contractor using the additional cost model (AC):
- indicate only your additional eligible costs, except for Management of the Consortium Activity for which you may indicate your full eligible costs;
- do not declare eligible direct additional costs specifically covered by contributions from third parties as mentioned in Articles II.20 and II.23.a and b of the contract.
If you are a contractor using a full cost model (FC/FCF), indicate your full eligible costs
The costs declared should distinguish between direct and indirect costs
If necessary, adjustments to previous period(s) may be included where appropriate.

	Type of Activity													
	Research and Technological Development / Innovation (A)		Demonstration (B)		Training (C)		Management of the Consortium (D)		Other Specific Activities: Transnational Access (E)		Other Specific Activities (E)		Total (G) = (A)+(B)+(C)+(D)+(E)+(F)	
	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)
Direct costs							11724.33		172260.03		18301.88		202286.24	
Of which subcontracting									24710.45					
Indirect costs							2344.87		34452.01		3660.38		40457.25	
Adjustments to previous period(s)														
Total costs							14069.20		206712.04		21962.26		242743.47	

3- Declaration of receipts (in €)

If you are a contractor using the additional cost model (AC), indicate only receipts covered by Article II.23.c of the contract.
If you are a contractor using a full cost model (FC/FCF), indicate receipts covered by Article II.23 of the contract.

	Type of Activity													
	Research and Technological Development / Innovation (A)		Demonstration (B)		Management of the Consortium (C)		Other Specific Activities: Coordination / Networking (D)		Other Specific Activities: Transnational Access / Connectivity (E)		Other Specific Activities (E)		Total (G) = (A)+(B)+(C)+(D)+(E)+(F)	
	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)
Total receipts														

4- Declaration of interest generated by the pre-financing (in €)	
To be completed only by the coordinator.	
Did the pre-financing (advance) you received by the Commission for this period earn interest? (Yes / No)	No
If yes, please indicate the amount (in €)	

5- Request of FP6 Financial Contribution (in €)	
For this period, the FP6 Community financial contribution requested is equal to (amount in €)	242743.47

6- Audit certificates			
According to the contract, does this Financial Statement need an audit certificate (or several in case of Third party(ies)) delivered by independent auditor(s)? (Yes / No)			Yes
If Yes, does this(those) audit certificate(s) cover only this Financial Statement per Activity? (Yes / No)			Yes
If No, what are the periods covered by this(those) audit certificate(s) ?	From - to		
What is the total cost of this(those) audit certificate(s) (in €) per independent auditor(s) ?			

Audit certificate of the contractor (X)			
Legal name of the audit firm	Ifremer Accounting Agency	**Cost of the certificate**	0
Audit certificate(s) of the third party(ies) (Ys) ***(if necessary)***			
Y1 : Legal name of the audit firm		**Cost of the certificate**	
If necessary add another Form C.		**Total (Z) = (X) + (Ys)**	

Reminders:

The cost of an audit certificate is included in the costs declared under the activity "Management of the Consortium". The required audit certificate (s) is (are) attached to this Financial Statement

7- Conversion rates

Costs incurred in currencies other than EURO shall be reported in EURO.

Please mention the conversion rate used (only one choice is possible) – Please note that the same principle applies for receipts.

Contractor	
- Conversion rate of the date of incurred actual costs? (YES / NO)	
- Conversion rate of the first day of the first month following the period covered by this Financial Statement? (YES/NO)	
Third Party(ies) ***(if necessary)***	
Third Party 1 (Y1)	
- Conversion rate of the date of incurred actual costs? (YES / NO)	No
- Conversion rate of the first day of the first month following the period covered by this Financial Statement? (YES/NO)	No

If necessary add another Form C.

8- Contractor's Certificate

We certify that:

- the costs declared above are directly related to the resources used to reach the objectives of the project ;
- the receipts declared above are directly related to the resources used to reach the objectives of the project ;
- the costs declared above fall within the definition of eligible costs specified in Articles II.19, II.20, II.21, II.22 and II.25 of the contract, and, if relevant, in Annex III and Article 9 (special clauses) of the contract ;
- the receipts declared above fall within the definition of receipts specified in Article II.23 of the contract ;
- the interest generated by the pre-financing declared above falls within the definition of Article II.27 of the contract ;
- the necessary adjustments, especially to costs reported in previous Financial Statement(s) per Activity, have been incorporated in the above Statement ;
- the above information declared is complete and true ;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives.

Contractor's Stamp	**Name of the Person responsible for the work**	**Name of the duly authorised Financial Officer**
	Jack Pichon	**Yvon Le Guen**
	Date	**Date**
	14/04/2008	**14/04/2008**
	Signature	**Signature**

Ifremer

AUDIT CERTIFICATE

PROJET : METRI 2
Contrat européen RITA 026010
Date de départ du projet : 1er mars 2006
Durée : 36 mois

I Rosy Charnoé, auditor, hereby that :

- I have conducted an audit relating to the cost declared in the Financial Statement per activity attached to this certificate and presented to the Commission of the European Communities under contract 026010 (RITA) METRI II.
- The period covered by this audit is : from 01/03/07 to 29/02/08
- The amount subject to verification is : 242.743,47 Euros (two hundred forty two thousands seven hundred forty three euros and forty seven cents)

This audit certificate is providing according to art II.26 –1- of the contract.

- I may certified that the costs incurred during that period meet conditions required by the contract;
- All costs are eligible of the project en fulfil all the following conditions :

  - ✓ they are They are actual, economic and necessary for the implantation of the project ;
  - ✓ They are determined in accordance with Ifremer's accounting principles;
  - ✓ They have been incurred during the period covered by the statement
  - ✓ 242.743,47 Euros amount eligible costs of the project I costs are eligible costs
  - ✓ They are exclusive of any non-eligible costs identified below which are established in the second paragraph of article II.19 of the above mentioned contract with the Commission of the European Communities:
    - ❖ Any identifiable indirect taxes, including VAT or duties;
    - ❖ Interest owed;
    - ❖ Provisions for possible future losses or charges;
    - ❖ Exchange losses;
    - ❖ Costs declared, incurred or reimbursed in respect of another Community project;

Institut français de Recherche pour l'Exploitation de la Mer

Etablissement public à caractère industriel et commercial

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TVA FR 49 330 715 915

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tél. Accueil 33 (0)1 46 48 22 00
http://www.ifremer.fr

Ifremer

- ❖ Return on capital;
- ❖ Debt and debt service charges;
- ❖ Excessive or reckless expenditure;
- ❖ Any cost which does not meet the conditions established in Article II.19.1 of your contract with the Commission of the European Communities.

✓ They have been claimed according to the following cost reporting FC /UF model cost which the contractor is eligible to use according to article II.22 of the above mentioned contract with the Commission of the European Communities;

✓ The total amount of interest yielded by the pre-financing received from Commission of the European Communities for the periods covered by this (those) Financial Statement(s) per Activity is equal to 0.

19 MAI 2008

L'Agent Comptable Secondaire
du Centre IFREMER de BREST

Rosy CHARNOLE

3. Summary financial report

*The **Summary financial report (Appendix 2)** consolidating the costs is given in a separate excel document (electronic form).*

Report on the Distribution of the Community's contribution

Type of Instrument		Project Title	METRI	Contract N°	026010

Part I — Community's prefinancing (or payment) sent to the coordinator (1)

	Reporting Period 1 (2)		Reporting Period 2 (2)		Reporting Period 3		Reporting Period (2)		Final payment		Total Amount (I) (3)
	From	To	From	To	From	To	From	To			
	1/03/2006	28/02/2007	1/03/2007	29/02/2008							
	Date	Amount (A)	Date	Amount (B)	Date	Amount (F)	Date	Amount (G)	Date	Amount (H)	
Total (X)	25/04/2006	280 000.00	30/01/2008	91 418.74							371 418.74

Part II — Distribution of the Community's prefinancing (or payment) between contractors according to the consortium decision(s) (4)

Contractor n°	Organisation Short Name	Country Code	Reporting Period 1		Reporting Period 2		Reporting Period 3		Reporting Period		Final payment		Total Amount (I') (6)
			Date(s) (5)	Amount(s) (A') (5)	Date(s) (5)	Amount(s) (B') (5)	Date(s) (5)	Amount(s) (F') (5)	Date(s) (5)	Amount(s) (G') (5)	Date(s) (5)	Amount(s) (H') (5)	
1	IFREMER	F	15/04/2007	59 418.74	15/04/2008	242 743.47							302 162.21
			Total	59 418.74	Total	242 743.47	Total	0.00	Total	0.00	Total	0.00	302 162.21
Total (Y)			Total	59 418.74	Total	242 743.47	Total	#REF!	Total	#REF!	Total	#REF!	302 162.21

Part III — Difference between Community's prefinancing (or payment) sent to the coordinator and Total Distribution of the Community's prefinancing (or payment) between contractors according to the consortium decision(s) (4)

	Reporting Period 1	Reporting Period 2	Reporting Period 3	Reporting Period	Final payment	Total Amount
Community's prefinancing (or payment) not yet distributed between contractors (Z) (7)	220581.26	-151324.73	#REF!	#REF!	#REF!	69256.53

I certify that the information set out in this(these) form(s) is accurate and correct and agreed by all contractors

Name (8)	Surname (8)	Signature of the administrative official authorised to commit the organisation of the coordinator (8)
Yvon	Le Guen	

Explanatory notes

(1): To be filled in only by the Commission services.
(2): Established in conformity with articles 4.2 and 6 of the contract.
(3): (I) = (A) + (B) + (C) + (D) + (E) + (F) + (G) + (H)
(4): To be filled in only by the coordinator.
(5): Insert the dates (dd/mm/yyyy) and the amounts (x,xxx.xx €) transferred to a contractor (including the coordinator) for a reporting period. If there are more than one transfer to a contractor during a reporting period, identify each date and each relating transferred amount.
(6): (I') = (A') + (B') + (C') + (D') + (E') + (F') + (G') + (H')
(7): (Z) = (X) - (Y)
(8): One the following persons : authorised contact person or first or second administrative official authorised to sign the contract, as mentioned in your Contract Preparation Form (Form A2b)

3rd Annual Report

V 15/03/09

METRI 2

Marine Environments Tests and Research Infrastructure - 2

Transnational Access

implemented as

Specific Support Action

Contract number: RITA-CT-2006-026010

Project coordinator: Jack Pichon

Project website: http://www.ifremer.fr/metri/

Reporting period: from 01/03/2008 to 28/02/2009

Project funded by the European Community
under the "Structuring the European Research Area" specific programme

Research Infrastructures Action

C. REPORT ON THE DISTRIBUTION OF THE COMMUNITY FINANCIAL CONTRIBUTION

*The **Report on the distribution between contractors** made during the reporting period of the Community financial contribution **(Appendix 3)** is given on a separate Excel document (electronic form)*

Summary Financial Report

Type of Instrument	SSA-TA	Project Title (or Acronym)	METRI	Contract N°	26010
Reporting period number		From (dd/mm/yyyy)	01-mars-06	To (dd/mm/yyyy)	01-mars-09	Page	1/1

Contractor n°	Organisation Short Name	Cost model(s) used		Eligible costs (in €)	Type of activities												Total eligible costs (G)=(A)+(B)+(C)+(D)+(E)+(F)			Receipts		
		For Transnational Access	For any other activities		Research and Technological Development / Innovation (A)			Management of the consortium (D)			Other Specific Activities: Transnational Access (E)			Other Specific Activities (F)								
					Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	UF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)
26010	IFREMER	UF	FC	Direct eligible costs				31 785.38			467 607.20			119 520.00			618 912.58	0.00	0.00			
				of which direct eligible costs of subcontracting				*0.00*			*62 170.11*			*0.00*			62 170.11	0.00	0.00			
				Indirect eligible costs				6 357.07			81 087.42			23 904.00			111 348.49	0.00	0.00			
				Adjustment on previous period(s)				38 142.45			548 694.62			143 424.00			730 261.07	0.00	0.00			
				Total eligible costs				***38 142.45***	***0.00***	***0.00***	***548 694.62***	***0.00***	***0.00***	***143 424.00***	***0.00***	***0.00***	730 261.07	0.00	0.00			
Total eligible costs								38 142.45	0.00	0.00	548 694.62	0.00	0.00	143 424.00	0.00	0.00	730 261.07	0.00	0.00	#REF!	#REF!	#REF!
								38 142.45			548 694.62			143 424.00			730 261.07			#REF!		
Requested EC contribution for the reporting period (in €) without taking into account receipts								14 069.19	0.00	0.00	206 712.03	0.00	0.00	21 962.25	0.00	0.00	242 743.47					
								14 069.19			206 712.03			21 962.25								
Requested EC contribution for the reporting period (in €) taking into account receipts [=Periodic Invoice]																	242 743.47					
Amount of the financial interests generated by the prefinancing																						

Table of contents

Introduction

- **Annual Report**

The Annual report covers each successive period of 12 months from the contract start date. It is composed of the following parts:

A. an activity report

B. a management report (financial information) including:

- a justification of the resources deployed,
- the Form C Financial Statement (which may require an Audit certificate if provided for under Article 7.2 of the contract),

C. a report on the distribution of the community financial contribution,

The Annual Report was prepared according to the templates (cover page, table of contents, …) given by European Community.

This report is number 3 and covers the period from march 1st of 2008 to February 28th of 2009.

A. ACTIVITY REPORT

1. Progress report

1.1. Summary of the activities and major achievements

The project started the 1st of March 2006 as soon as the contract was signed. This third Annual report covers the period from the 1st of March 2008 up to the 28th of February 2009.

During this period the main operations were dedicated to the preparation and the performing of the selected proposals for the period with especially:

- Continuation of actions for the promotion of Metri 2
- Organization of the fourth selection meeting
- Preparation and/or realization projects selected by the expert panel (session 3 and 4)

Globally twenty-five projects was selected, they are involving the wave basin of Brest (10 projects), the water circulation of Boulogne/mer (8 projects), the material laboratory of Brest (5 projects)and the hyberbaric testing tanks of Brest (3 projects).

During the reporting period, height experimentations or tests were performed at Boulogne-sur-mer and Brest.

1.2. Management overview

During this third period the main tasks were management operations consisting especially in:

- Supervising the French company (EGIDE) which is subcontractor for the financing of user access (travel expenses, insurances, subsistences…)
- Organizing the fourth session of the commission for the study and the selection of the proposals (foreign experts, experts in and out of Ifremer)
- Promoting Metri
- Preparing and organizing the infrastructures the activities which were carried out during the period of AR3.
- Also preparing the selected activities for year 2009 and to the end of the project.

The principle of Metri is to provide free access to five different research facilities of Ifremer. In the frame of the former commissions of project selection, the basins of Boulogne and Brest were mainly concerned (hydrodynamic thematic) with 18 selected projects (12 performed). The area of behaviour of material was less represented with 8 select projects (6 performed).
For the last commission of selelection (Nr4) an effort was done to better promote the other involved facilities (hyperbaric tank, material testing and marine sensor laboratories). Eleven additional proposals were selected, studied and selected, five involving the basin of Brest, four involving the material laboratory, one involving the hyperbaric laboratory and one involving the flume of Boulogne-sur-mer.

A difficulty is often encountered in the planning of the user access because the facilities are booked by external and internal clients and require being adapted to the user demands. A continuous effort was done to schedule more precisely and more efficiently the access of each user team.
The last difficulty to be outlined was to succeed in programming the activities of all selected projects in order to achieve them before the end of the contract. An extension of time for the completion of the contract was obtained from the EC to September 2010 (previous date was February 2009). This extension will certainly permit to perform all the selected proposals and to reach a quantity of activities very close to the maximum objective of the contract.

1.3. Description of the publicity concerning the new opportunities for access

During the year 2006 and 2007, many promotion tasks were carried out for Metri 2. The continuation of these actions were performed also at the beginning 2008. Anyhow in 2008 the amount of received proposals was sufficient to fulfil the requirement of the contract.

They can be considered in various categories as follows:

Metri brochure:
The pamphlet was prepared by a skilled designer for Metri 1, it shows on a 4 pages document (A4 format -strong paper) the five facilities and the access conditions for Metri. It has shown its adaptability for Metri 2 as being clear, well illustrated and suitable to be distributed in various opportunities (visitors to Ifremer, congress, mailing…).

Participation in congress, seminars or exhibitions
Many participations to various manifestations were performed in 2006 and 2007 (see previous reporting).
In 2008 it is noted:

- Paris - France (February) Nidays - exhibition of National Instruments
- London – England (March) Oceanology International O I 2008 Congress
- Toulouse – France (June) Hydralab meeting
- Hull – England (November) Hydralab meeting

Advertisements
Some advertisements were published in international professional magazines in 2007 (International Ocean Systems, Materials World):
These actions was already described in the Annual Report Nr 2.

Web site
The web site of Metri was fully renewed and updated in 2007. A continuous updating was also performed during the period.
It is closely linked to the Ifremer web site and includes a specific page which precise instructions to applicants. It also describes the progress of works with a description of the performed or selected projects

http://www.fremer.fr/metri/

1.4. Description of the selection procedure

The selection procedure to select users is conducted according to the conditions of the contract between Ifremer and the E.C.

A **pre-selection** is made at first by the project manager and his Ifremer team to identify proposals which fall out of scope for **technical feasibility**, confidentiality of results, ethic issues…

A **user group selection panel** was constituted to select the user proposals; this panel is composed with a minimum of 6 experts in the field, at least half of them are independent and external to the staff of the infrastructure.
The user group selection panel is in charge of the **evaluation of proposals** and have to rank them in order of priority taking into account the Criteria of eligibility:

- The scientific and technological merit of the intended project
- The community interest for the research project
- Technical feasibility of experimentation in regard of IFREMER facilities

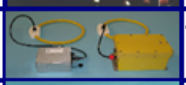
With priority given to:

- The countries where few such Infrastructures exist
- The research teams who have not previously used the Infrastructure.
- The teams integrating young researchers.

Three selection meeting were performed in 2006 and 2007 (see previous reporting), the **fourth one took place on September 25th** in Brest with the agenda as follows:

- Reminder of the role of the selection (expert) panel: Evaluation and ranking of proposals (See enclosed the list in annex 1)
- Reminder of the main lines of METRI project:
- Presentation of Ifremer facilities dedicated to METRI:
    - Deep wave pool of Brest
    - Water circulation flume tank of Boulogne/mer
    - Hyperbaric testing tanks
    - Laboratory for evaluation and calibration of marine sensor
    - Laboratory for testing of behaviour and ageing of materials
- Pre-selection and review of proposed projects regarding contract conditions
- Review of the project regarding technical and scientific matters (see table hereafter)

Metri Selection Commission - 25/09/2008
List of proposals

Nr	Name of user	Name of representative	Infrastructure	Type of test		Ifremer representative
18	TSC	David Topp (GB)	Hyperbaric lab	Deep water technology		Ph. Warnier
19	Aquaflora	J. Dolega (PL)	Basin of Brest	Insulation foam - tests in deep basin		X. Bompais
20	WFS	S. Archie (GB)	Basin of Brest	Wireless Fiber System		JF Rolin / X. Bompais
21	Cranfield-U/TEL	F. Trarieux (UK)	Boulogne	Tests for tidal energy converter		G. Germain (tel)
22	University of Porto	Lucas Da Silva	Materials lab	Behaviour of adhesively bonded joints		D. Choqueuse - P. Davies
23	Future Fibres	H. Bunyann (UK+SP)	Materials lab	Innovative fibres for marine slings		P. Davies
24	BEXCO	P. Van Der Berghe (B)	Materials lab	Rope Strenght study		P. Davies
25	MAMK-TUT	Martti Kemppinen (Fi) (U of applied sciences)	Materials lab	Injected DCPD matrix composite		D. Choqueuse - P. Davies
26	TSC - 2	David Topp (GB)	Basin of Brest	Wireless data communication		X. Bompais - JFRolin
27	Tidalstream Ltd	John Armstrong (UK)	Basin of Brest	Tests on tidal current turbine		X. Bompais
28	MARTIFER	Nuno Ferreira	Basin of Brest	Tests with waves on energetic model		M. Le Boulluec (non dispo ce jour) - X. Bompais /J. Pichon

An additional proposal (UPV) came lately with the main characteristics as follows:

29	UPV	Giuseppina Larosa	Hyperbaric laboratory	Pressure calibration	Acoustic equipment used in Antares/km3net	Ph. Warnier

- Conclusion –recommendation – ranking of the projects (see hereunder table)
- Visit of Ifremer Brest Infrastructure dedicated to METRI (laboratories, basins…)

Metri 2 Conclusions - Recommendations Selection meeting On September 25th, 2008			
Proposed projects	**Scientific & tech. Interest / Community**	**Technical feasibility**	**Comments and acceptation**
18. Inspection system	Tech Interest	Tests at low temperature to be better defined	Approved
	Link with ESONET Eu project		
TSC			
19. Insulation foam tests	Characteristics of Sme to be checked	Possibilty of plannification in November	Approved depending verification on SME conditions
Aquaflora -Poland	Test possibility also in hyperbar tank		
20. Wirelessfiber system	Interest to apply military technology to civil market	Safety conditions of operations to be checked	Approved under verification of safety conditions
WFS		Possibilities in December planning	
21. Tidal Energy Converter	Tech and scientific Interest	No difficulty for the flume of Boulogne	Approved
Cranfield University			
22. Adhesively bonded joints	Tech and scientific Interest	No difficulty	Approved
FEUP - Porto			
23. Innovatives fiber	Tech and scientific Interest	No difficulty	Approved
Future Fiber - SP			
24. Rope study	Tech Interest	No difficulty	Approved under verification of eligibilty conditions (SME) conditions
BEXCO - Belgium	Eligibility to be checked		
25. Study on matrix composite	Tech and scientific Interest	No difficulty	Approved
MAMK-TUT Fi			
26. Wireless communication	Tech Interest	Availability of Brest bassin to be checked	Approved
TSC - Nr2	Link with ESONET Eu project		
27. Tidal Current Turbine	Tech and scientific Interest	Reduced stability of the speed (Brest)	Approved under condition of solving technical difficulties
Tidalstream ltd	Ocean energy theme	Better define equipment to be supplied by the user	
		Scale to be reduced	
28. Tests on energetic model	Tech and scientific Interest	Proposal to be more defined	Approval given under condition of detailling technical aspects
MARTIFER - Pt	Ocean energy theme		
29. Pressure calibration	Tech and scientific Interest	Proposal to be more defined	Approved
UPV - valencia Spain	Antares project / km3net		
The criteria are in accordance with metri contract (annex1 item 4)			

No project was actually rejected, but the decision about five projects (Aquaflora, WFS, Bexco, Tidalstream and Martifer) was postponed awaiting for more explanation on technical or administrative details.

A detailed report showing all presentations, discussions and conclusion was drawn up and sent to the EC officer in Brussels

1.5. Transnational Access activity

During the period of the present Annual report (from March 2008 up to February 2009), 9 projects were performed at the research facilities of Ifremer:

- three in the material laboratory of Brest
  - FEUP;
  - Future Fibre;
  - Bexco
- two in the wave basin of Brest
  - Aquaflora
  - Cranfield University
- two in the water circulation basin of Boulogne/mer
  - University of Suton 2
  - VIV (Suton)
- One in the hyperbaric laboratory
  - TSC
  - UPV.

A brief description of each project is given here under (see also database).

FEUP - **Faculty of Engineering - University of Porto (Portugal).**
Innovative fibres for marine slings
Lucas Da Silva (Team leader)
performed in the material laboratory of Brest in the first week of December (30/11-5/12/08)

The purpose of the project was to investigate the behaviour of adhesively bonded joints under marine conditions, especially under the influence of hydrostatic pressure in sea water.

A test campaign using the hyperbaric material test facility at IFREMER, Figure 4, was performed in December 2008 in the presence of two researchers from the University of Porto.

Figure 4. Hyperbaric material test facility during test campaign.

Bulk adhesive specimens and two types of assembled joints (thick adherend lap shear and single lap joints) were tested at pressures up to 1000 bars. Image analysis was used to measure specimen strains inside the pressure vessel through a view-glass. Significant results concerning the influence of hydrostatic pressure on adhesive and joint strength was obtained. A second campaign is planned to complete the results, which will be presented in a joint paper at a conference in 2009.

Future Fibre – SME of Valencia Spain

Innovative fibres for marine slings

Humphrey Bunyan (Team leader)

performed in the material laboratory of Brest in November 2008

In order to characterize a series of materials for marine sling applications a preliminary test series was performed, in the presence of the material supplier. A specific load cycle, defined to represent realistic rigging load conditions, was programmed and used. However, these initial tests resulted in premature failures. Following discussions the fatigue test fixture was therefore modified, to improve end conditions. A new set of samples was then supplied. Tests are currently underway, but first results suggest that valid test data can now be obtained. In parallel a series of bend-over-pulley tests has been performed which allowed two materials to be evaluated, Figure 3.

Figure 3. Bend over sheave cyclic loading of marine sling.

Bexco - SME of Hamme - Belgium

Rope strength variability study

Karel Devos (team leader)

performed in the material laboratory of Brest in September 2008

A first series of 20 break tests was performed on polyester sub-ropes, in order to establish the variability of tensile strength values, Figure 1. Special in-house extensometry based on image analysis of targets fixed to the rope samples was used to obtain reliable strain data up to failure.

Figure 1. Unrolling sample before tensile test on polyester sub-rope, with Bexco staff.

A series of yarn-on-yarn abrasion tests was also performed, in natural sea water, as shown in Figure 2, in order to examine how the marine finish affected cyclic abrasion performance.

Figure 2. Yarn on yarn abrasion test.

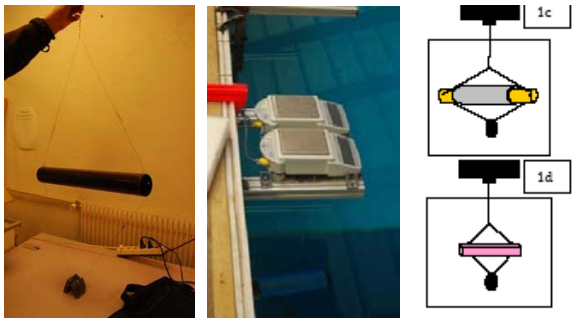
Aquaflora – SME of Wroclaw - Poland

Sea water pressure influence on cell structure of insulation foam

Agnieska Dolega (Team leader)

performed in the wave basin of Brest in November 2008 (12/11-16/1108)

The purpose of this project is to compare the resistance to underwater compression of closed-cell compressible insulations made of low density polyethylene (LDPE), polypropylene (PP) and elastomeric foam (EL). Four different products of Armacell were tested in deep wave basin of Brest/ France. These products are Tubolit S, OleCell XPP and two Armaflex products of a different recipe and wall thickness. The collapsing behaviour, buoyancy of the samples and sea water intake effect on a depth of 10 and 20 meters was investigated during one week in underwater conditions.



Testing conditions

The buoyancy of foamed material was counterbalanced with the use of weights matched separately for eachsample and each depth. Weights were fixed to inner carrying pipe made of PVC (fig. 1a) with the use of steel cables coated with Nylon to avoid their corrosion in salty water. Samples of tubes tested at the depth of 10 m have a totallength of 30 cm and at 20 m – 50 cm. Whole set was fixed to the Mettler Toledo PG-S scale (fig. 1b) and changes of sample mass were controlled during one week on both depths. Data were collected continuously every 1 s duringfirst day of test and every 30s during next six days.

Figure 1. (a) sample holder with weights counterbalancing sample's buoyancy; (b) sample fixed to scale and immersed just underthe water surface; (c-d) scheme of tube-shaped and sandwich-type samples fixing during the test.

Before the test on right depth of 10 or 20 m each sample was immersed for 1 hour close to the water surface toobserve the influence of salt water and water intake. For all tested samples no mass changes related neither to outward gas diffusion nor to water intake were noticed. During the right test foams surface and compression of cellular structure was observed with digital camera and in the 6th day of test a set of pictures was made by divers.

Main results

For all the samples surface collapsing and mass increase caused by outward air diffusion from the cells and water intake was observed. The water intake of about 0,5-1,0 wt. % was observed for polyethylene sample and for elastomeric AC tube.

All the rest samples (polypropylene and elastomeric AF) were waterproof.

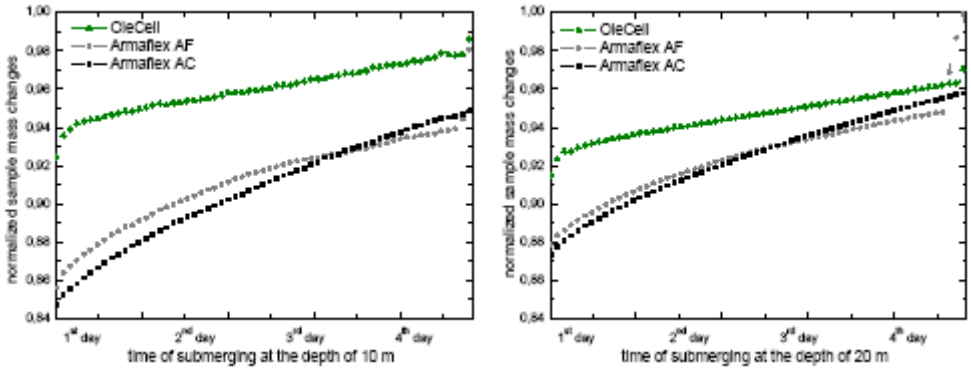


Figure 2. The mass changes of samples submerged on both depths recorded during the first four days of test (10 m on the lefthand and 20 m on the right hand).

The outward air diffusion from the pressurized cells to water was observed for all of the tested samples. The collapsing effect was fully reversible for polyolefin based samples (Tubolit and OleCell) and for both elastomeric insulations cells deformation was irreversible. The Tubolit sample is excluded from these considerations because data acquisition profile was different in this case and cannot be directly compared. The mass changes for this product are presented separately in the picture 3.

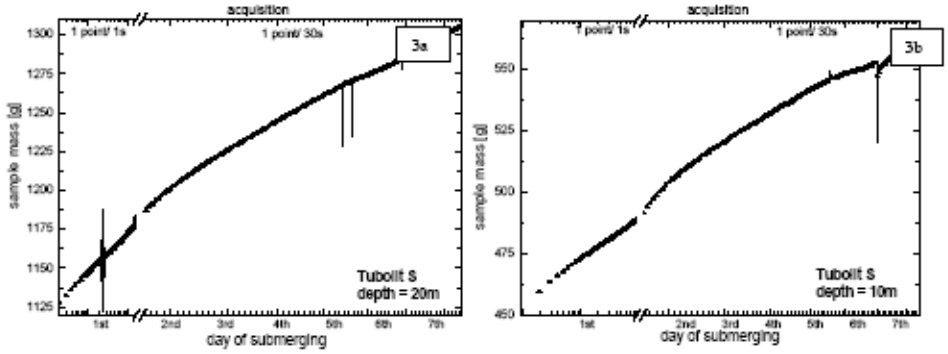


Figure 3. Tubolit S mass changes during the test at a depth of 20 m (a) and 10 m (b).

For polyolefin based samples the quickest air diffusion occurred. This is mainly resulting from higher air diffusivity value for polyethylene and polypropylene tubes comparing to elastomeric materials.

Attachments (pictures and detailed mass changes plots).

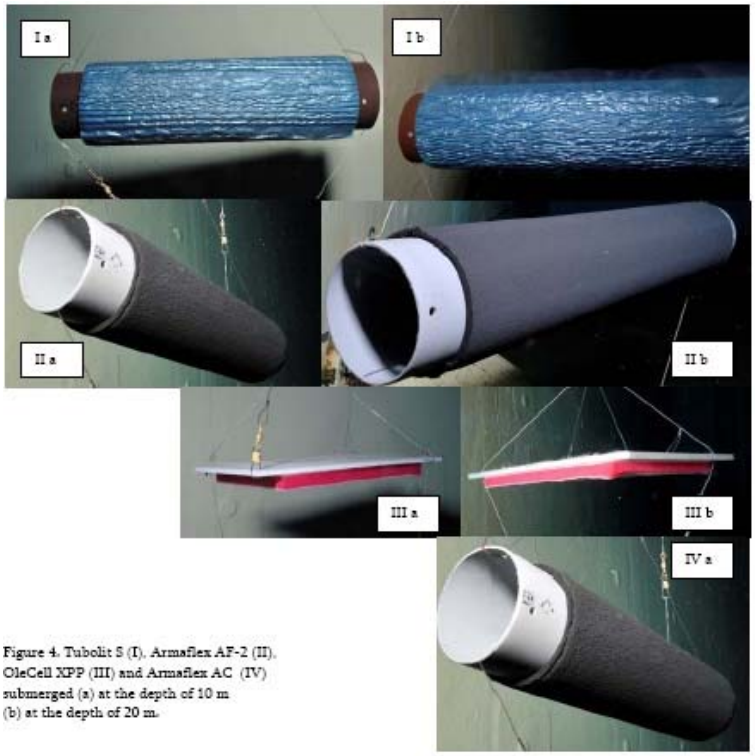


Figure 4. Tubolit S (I), Armaflex AF-2 (II), OleCell XPP (III) and Armaflex AC (IV) submerged (a) at the depth of 10 m (b) at the depth of 20 m.

Cranfield - the offshore Engineering & Naval Architecture Group of Cranfield University

Testing of a Wave Energy Device (Oscillating Water Column – OWC)

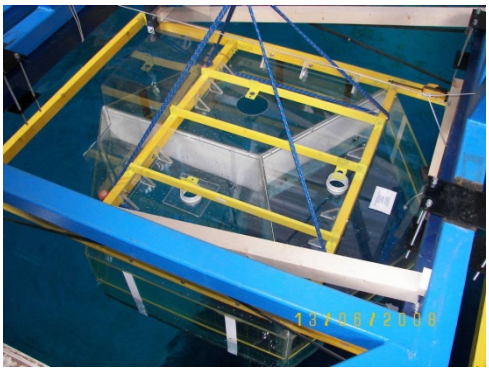
Florent Trarieux (Team leader)

Performed in the wave basin of Brest, 9-20 June 2008

The United Kingdom has one of the largest potential in Europe in marine renewable energy (Wind, Tidal and Wave), and has become one of the leading countries worldwide in the development of marine renewable energy concepts (Wind Farms, Tidal and Wave devices). Cranfield University, located in Bedfordshire (UK), is currently involved in the performance modeling, turbine design and structural design of the wave energy converter "OREcon Tension moored OWC".

The concept originated from a small company based in Plymouth, Cornwall and has now reach a stage of development where a first full scale prototype will be manufactured and commissioned in the course of 2010. The concept is based on a tensioned moored floating buoy with open bottom chambers of varying draughts. The action of a wave train on the buoy produces the compression of a volume of air entrapped in the chambers and activates a high efficiency air turbine named HydroAir designed at Cranfield University in partnership with PBL Ltd. The air turbine is then connected to an electrical generator and provides grid compliant power.

In the frame of the European Program METRI for transnational access of facilities in Ocean Engineering, Cranfield University was offered a contract to test this Wave Energy Converter in the IFREMER ocean wave tank of Brest. The test took place between Monday 9 June and Friday 20 June 2008 which included 3 days of tank calibration, 2 days set-up of the model, 4 days testing and 1 day for model and instrumentation recovery. A total of 52 tests were conducted in monochromatic and polychromatic waves on four configurations of the device which consisted in varying the diameter of the orifices and connecting all chambers in opposition to each chamber operating independently. The level of water elevation in the chambers as well as the internal chamber pressure was measured in a wide range of wave height and period to assess the optimum configuration of the orifice for the air turbine to operate efficiently. One of the main concerns was the possible water ingression in the turbine inlet and this series of test enabled to determine which configuration of the orifice is required to avoid such phenomenon as this can potentially damage the turbine and compromise the power reliability in all weather conditions. The model tested was a single draught configuration and all chambers were connected to investigate the influence of each respective chamber on the others and it was observed that all chambers tend to be synchronized above a certain wave amplitude and period. This can have important consequences on the best size and number of turbines required.



Soton 2 - Sustainable Energy Research Group, School of Civil Engineering and the Environment, University of Southampton, UK

Luke Myers (Team leader)

Flow mapping of the wake flow downstream of tidal turbine

Performed in the flume of Boulogne sur Mer in October 2008 (20 to 25/10/08)

Flow mapping of the wake flow downstream of a 0.8m diameter scale tidal turbine was undertaken during October 2008. The turbine was a 3-Bladed upstream device thought typical of first-generation full-scale devices that will be installed in future years. Work conducted over the METRI testing period was used to augment and provide additional results for a UK government funded programme of which the users were conducting experimental results and analysis. Downstream flow mapping was acquired using an acoustic Doppler Velocimeter (ADV) supplied by University of Southampton. Mapping was conducted in 3-dimensions downstream of a single turbine for two different rotor speeds.

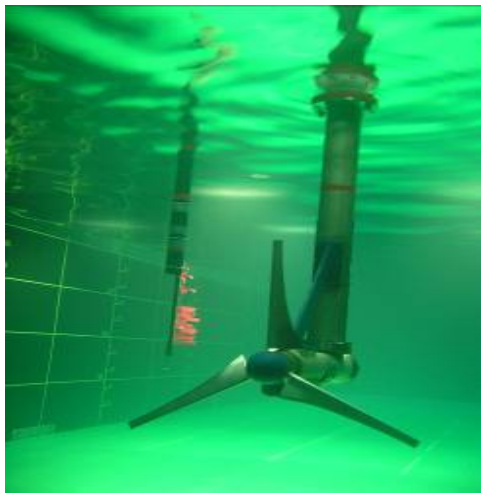


Fig 1. 0.8m-diameter tidal turbine installed in the IFREMER water channel, Boulogne sur Mer .

Further time was utilised from the METRI testing to acquire a base flow map of the Boulogne Sur Mer water channel. Most measurements were taken with a Laser Doppler Velocimeter (LDV) stationed at the facility but this was unable to measure close to the water surface so the ADV was used in this region. Data filtering enabled the ADV and LDV to give similar results in the same regions of flow. The channel showed some lateral (cross-flume) variation in flow velocity. This map was essential to calculate inflow speeds to the turbine and for determining mass flow rates either side of the device.

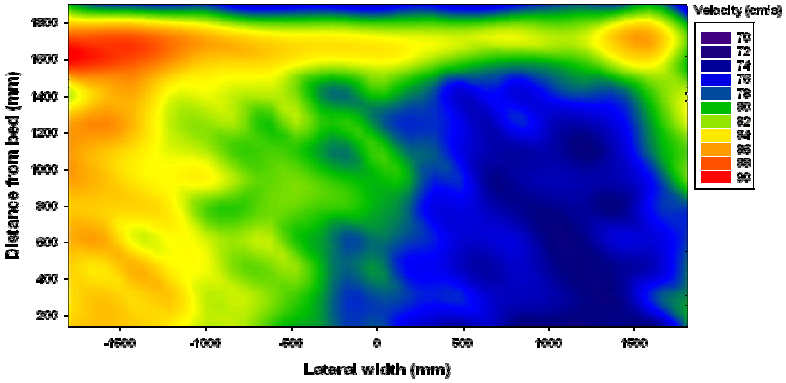


Fig 2. Lateral base flow velocity in water channel. ADV and LDV data

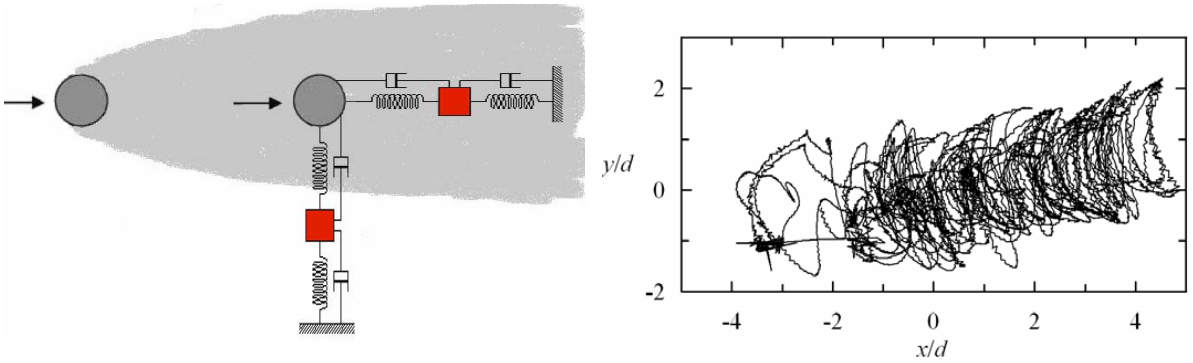
VIV (Soton) - University of Southampton – School of civil engineering

Simultaneous vortex-induced and wake-induced vibrations of a cylinder

John Chaplin (Team leader – University of Southampton) – P.W. Bearman (imperial college _ London)

Performed in the flume of Boulogne-sur-mer in November 2008 (3-7/11 and 17-28/11/08)

The flow-induced vibration of one cylinder in the wake of another is the subject of renewed interest in connection with interactions between vertical tension risers in deep water. This is one of the challenges that face the offshore oil industry as new fields are developed at water depths of well over 1000m. When exposed to ocean currents over such lengths, even weak interactions may produce large deflections in individual risers in an array, contributing to fatigue damage and increasing the probability of clashing.
Besides vortex-induced vibrations (VIV), a cylinder downstream of another one may undergo wake-induced oscillations (WIO) caused by a variety of interacting mechanisms. The experiments carried out under the Metri programme at Boulogne-sur-Mer were part of a research programme aimed at the case where both of these processes are present and are free to interact, in ways similar to those in full scale conditions at sea. Such experiments had never been conducted before under laboratory conditions.
To escape the limitations of a single frequency response (under which the motion would be dominated by either VIV or WIO), the test cylinder had to be mounted on a compound elastic system having two degrees of freedom in each of the in-line and cross-flow directions. In each direction the higher natural frequency was set so as to achieve locked-in VIV, while the lower natural frequency permitted resonance with WIO excitation. The experimental arrangement is shown schematically here. In practice the effect of the intermediate sliding masses m_1 was achieved through the inertia of masses on shafts rotating in air bearings. The design of the apparatus throughout aimed to minimize structural damping. Typical natural frequencies were 0.8Hz and 0.1Hz in both directions.



A typical set of results is shown below in the form of the trajectory of the motion of the downstream cylinder, in *x* (in-line) and *y* (cross flow) directions; *d* is the cylinder's diameter. The contributions of both VIV and WIO can be clearly identified. Analysis of the data is continuing and will shortly be submitted for publication.

TSC – Technical Software Consultants Ltd – SME

Deepwater weld inspection technology

David Topp (Team leader)

Performed in the hyperbaric laboratory of Brest in January 2009 (25-30/01/09)

Introduction

TSC have developed the ACFM technique for underwater inspection of welded structures. Inspection by diver is now routine, in depths to around 250m. Deepwater developments are now below the diving limit, and therefore require solutions suitable for deployment by ROV. The pressure tests conducted at Ifremer allowed TSC to explore the performance of several key elements necessary for deepwater weld inspection.
TSC's subsea instrument (Model U31) is rated for operation to 300m water depth. To extend this, TSC redesigned the enclosures for a rated depth of 2000m. This new deepwater instrument was tested and survived at a pressure in excess of 300bar.
TSC's standard diver probes are again rated to a working depth of 300m (never tested beyond 350m). They are a potted design and TSC were interested to explore the actual limitations. To achieve this, the probes were

attached to a prototype deepwater U31 instrument and testing to destruction was attempted. In fact the cycling at pressures in excess of 200bar was insufficient to destroy the probes, which was a very positive result.
Another phase of the test was to evaluate a brand new probe design. This was a significant departure from standard diver probes, because the design concept involved pressurising the probe internals to eliminate significant mechanical load on the housing, but of course introduces loads on the electronics. This oil filled design again proved to be suitable for deepwater operation and survived cyclic loading to 200 bar.

The figures below show some of the items tested. Section 2 contains details of the test programme.

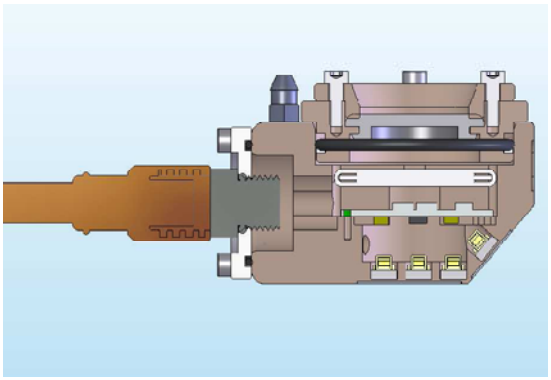


Fig 1 New deepwater pressure compensated probe design
Fig 2 Standard potted diver probe

Figure 4 Pressure chamber used at Ifremer

Test Details

TEST 1 :
Underwater standard probe type: 293 Serial number: 3585
Test settings:
- Probe connected to Standard U31
- Test procedure : 64 bar for two hours, then 5 bars for one hour
- Increases and decreases in pressure at a rate of 10 bar/min
- Temperature at 5°C

TEST 2 :
Deepwater standard probe type: 293 Serial number: 3560
Test settings:
- Probe connected to standard U31
- Test procedure : 64 bar for two hours, then 5 bars for one hour
- Increases and decreases in pressure at a rate of 10 bar/min
- Temperature at 5°C

TEST 3 :
Deepwater U 31 enclosure type: 437 Serial number: 3664
Test settings:

- U31 connected with blank plug
- Test procedure : 312,5 bar for two hours, then 5 bars for one hour
- Increases and decreases in pressure at a rate of 10 bar/min
- Temperature at 5°C

TEST 4:
Oil filled Probe type: Prototype
Test settings:
- Probe connected to standard U31
- Test procedure : 64 bar for two hours, then 5 bars for one hour
- Increases and decreases in pressure at a rate of 10 bar/min
- Temperature at 5°C

TEST 5:
Underwater standard Probe type: 293 Serial number: 3585
Test settings:
- Probe connected to Deepwater U 31, destructive test
- Test Procedure: Increases and decreases of pressure until loosing communication, at a rate of 10bar/min
    - Pressure reached 210 bar, hold for 10 minutes then released

TEST 6:
Oil filled Probe Type: Prototype
Test settings:
- Probe connected to Deepwater U 31 Unit
- Test Procedure: Increases and decreases of pressure at a rate of 12 bar/min, First step at 64 bar hold for 30 minute, then 130 bar for 30min, then 192 bar for 30 min, finally 256 bar for 60min.
- Temperature 5°C

TEST 7:
Underwater standard Probe type: 293 Serial number: 3585
Test settings:
- Probe connected to Deepwater U 31, destructive test, second attempt
- Test Procedure: Increases and decreases of pressure until loosing communication, at a rate of 12bar/min
- Pressure reached 256 bar, hold for 30 minutes then released

TEST 8:
Underwater tight access Probe type: 312 Serial number: 3371
Test settings:
- Probe connected to standard U31
- Test procedure : 64 bar for two hours, then 5 bars for one hour
- Increases and decreases in pressure at a rate of 12 bar/min
- Temperature at 5°C

Conclusions

This work proved very successful and provides TSC now with the confidence to push ahead to release their ACFM technology for commercial use during deepwater inspection programmes. The proof of their design concepts will now allow them to move forward with a new generation of hardware for deepwater use.

UPV – Universidad Politecnica de Valencia - Spain

Pressure calibration of acoustic equipment used in the project Antares/KM3Net

Larosa Giuseppina (Team leader)

Performed in the hyperbaric laboratory of Brest in 2009 (25-30/01and 22-28/02/09)

In the last week of January and in the last week of February, using the hydrophones and the velocimeter used in the context of the submarine neutrinos detectors Antares/KM3, several acoustic signals measurements have been taken at different water pressures. The aim of these measurements was to study the influence of the pressure on the sensitivity of the hydrophones and velocimeter records and therefore its implications on their calibration.

n order to change the pressure we used the tank like in the Figure1. A metallic plate has been used to avoid the interference effect between the four hydrophones FFR (Free Flooded Rings), mounted on the upper part of the tank , and the sound velocimeter with the hydrophones ANTARES mounted in the bottom part of the tank.

The signals measurements have been taken using the following pressure values: 1 – 50 – 200 – 300 – 440 – 300 – 200 – 50 – 1 bar. In this way it has been also checked the influence of the pressure on the apparatus in both conditions of rising and decreasing pressures.

For every value of pressure the amplitude variation of the received signals has been recorded.

In order to verify the right working of the transducers after long exposition at high pressure, the hydrophones and the sound velocimeter have been left at the pressure of 440 bar for a whole night.

One example of the measurements is given in the Figure 2.

Fig. 1: Configuration of the hydrophones and velocimeter.

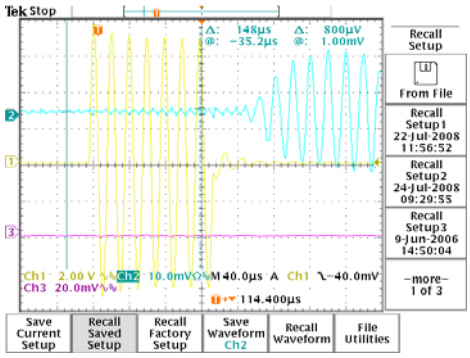


Fig.2: acoustic emission and reception signals under pressure between 2 hydrophones separated

The yellow signal represents the electric signal used as a pulse generation for the emitter hydrophone and the blue signal represents the acoustic signal on the receiver hydrophone.

During the above measurements, some signals coupling problems have been found. The problems were due to the physical housing of the cables in the same cable holder and therefore it has been solved using separated cable holders.

1.6. Scientific output of the users at the facility

Two papers has been published following the trials at the basin of Boulogne:

Marine current energy converter tank testing practices
2nd International Conference on Ocean Energy (ICOE 2008 - Brest), 15th – 17th October 2008
(Grégory GERMAIN)

Hydrodynamic & Metocean Service, IFREMER

Abstract

The marine current resource is potentially large and could generate a significant part of the European Union's electricity requirements. Before the installation of marine prototypes, specific trials are necessary to evaluate the behaviour of each system and the ability to exploit tidal or marine currents.

This paper presents a feed back of Ifremer tank testing practices but not only, for marine current turbine energy converter characterization. The main objective is to investigate the potentiality of the common experimental facilities to reproduce in-situ conditions, accepting that their use will continue to reduce the financial risk to the developper.

The **second one** was published with the team of Soton

Flow boundary interaction effects for marine current energy conversion devices

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Abstract

Marine current energy conversion technology is presently at the prototype stage where single devices are deployed, or planned for installation, at isolated testing sites. The flow conditions for marine devices are distinctly different than for similar technologies such as the wind energy industry. One of the principle differences is the constrained nature of the operating fluid in the vertical plane. This is likely to introduce some interesting flow effects for Marine Current Energy Converters (MCECs) where fluid can be constrained/accelerated either above or below the region of energy capture.
MCEC's operating in shallow fast-moving flow regimes will see a difference in the downstream flow field compared devices installed in deeper water. The breakdown of vertical symmetry in the wake has been addressed in previous work by the authors [4] and appears to occur for water depth/rotor diameter ratios less than 4. Experiments to remove the effect of sea bed proximity have shown that wake recovery is not as favourable when the flow field is in effect infinitely deep beneath the rotor disk. In a symmetrical constrained flow there is acceleration around the rotor disk that reduces the length of the near wake where stronger velocity deficits exist. This faster moving flow persists into the far-wake region aiding breakdown of the wake and centreline velocity recovery. For flow depths shallower than 4-diameters the rotor disk is positioned closer to the more sheared

Concerning the activities of **the laboratory of Materials** of Brest, one paper is under preparation for the next congress of bonded materials of June in Roma

Other output from the performed projects under AR3 are under preparation with, mainly, further possible cooperation with users (Usoton, UCranfield and private activities with the suppliers of ropes –Bexco, Future fibres…).

1.7. User meetings

Most part of the discussions for the preparation of the projects was held by Email or phone. Anyhow some preparatory meeting has been held in our facilities before the completion of the trials.

Concerning**Future Fibres: meeting in Brest 12th September**
Were present : Peter Davies, Humphrey Bunyan, Bertrand Forest (part), Jack Pichon (part)

1. METRI project, slings for boats

Two preliminary tests run at Ifremer indicated premature failure in the termination designed to allow complete unloading. It is suggested that a new lower fixture be designed with an extended slot so that standard terminations can be used. (*Action: IFR to send drawing of existing fixture, FF to manufacture*).
Termination surfaces must also be well lubricated during tests.
The programme developed to perform the preliminary tests, and which also enables the machine to be controlled using values in a data file, functions correctly.

Proposed METRI programme:
1. FF to propose modified title (Innovative fibres for marine slings ?)
2. Break tests on 4 types of sling, PBO, Kevlar 49, Dyneema and impregnated carbon fibre, all designed to the same nominal break strength and with the same production parameters. FF will supply 3 of each, same dimensions as those supplied in preliminary tests (apart from diameter).It is

emphasized that these tests will provide a reference point for future studies, the samples supplied are not the optimized products.

3. Cyclic tests, "standard test" : The standard test required should run at <1Hz (the preliminary tests were run at 0.5 Hz), apply a load of 55 kN (25% nom break load) and include full unloading without global compression of the sample. The test should be run for 25000 cycles, if no failure occurs the test will then be stopped and the sample will be loaded to failure to determine residual properties. Three samples of each material will be supplied for these tests. One sample of each material will be tested initially, based on the results either two more will be tested or alternative tests will be proposed. A maximum of 12 cyclic tests of this type will be run within the METRI project.
4. Sample failures will be analyzed, additional microscopy and SEM will be performed as appropriate.
5. Other options of interest are running one test without a cover, to see if kinks develop, changing loading conditions, or changing fabrication parameters.

Administrative point: discussion with Jack on confidentiality agreement, *Action: FF to supply a modified standard contract for discussion.*

2. Offshore applications

Both Ifremer and FF are interested in the use of fibre cables for deep sea handling. There is current interest in the offshore industry, special winches are being developed (*Action Ifr to send info on ODIM project)* and if some external funding could be found FF would be very interested to participate. Some preliminary bend-over-sheave tests on an HMPE cable, to compare with results obtained at Ifremer on other materials (braided ropes) would be of interest to both parties. FF could supply samples for break tests and BOS. *Samples to be defined by Ifremer*. Initially *FF will supply short lengths of HMPE and PBO slings* for discussion with offshore companies (eg samples with nominal 60T break load, to compare with braids).
A creep test on a 65m long yarn sample will be performed at FF. Ifremer to specify load level: (I suggest 20% of the yarn break load). Temperature recording is essential during this test.

3. Additional testing

In order to evaluate possibilities for other tests FF would like Ifremer to provide:

a) a cost estimate for a 25000 cycle test on the 25T test machine
b) a cost estimate for use of the 100 ton test frame.

Also Ifremer to estimate time to run a 25000 cycle test on the large test machine.

There is considerable interest in applying measured load data from boat instrumentation directly to laboratory samples. The programme developed by Bertrand allows this to be done.

Concerning **FEUP** (university of Porto): Visit of Lucas Da Siva in Brest on 18/06/08

Were present: J. Pichon, M. Bordes, Y. Le Guen, J. Y. Cognard (ENSIETA)

Program:

- visit of Ifremer facilities
- presentation of thesis of M. Bordes about adhesive en marine environment
- Discussion on Metri program: next coming beginning December, utilisation of tank for testing under 600b, links with school of engineering (ENSIETA)

Concerning **Tidalstream**, this task was not performed during the relevant period but a preparation meeting was held in Brest in 18th November 2008.

Were present: Jack Pichon, Xavier Bompais, Marc Boulluec, Jeremy Ohana (Ifremer)
Mike Todman, John Armstrong (Tidalstream Ltd).

Purpose Discussion of testing of TidalStream Six Turbine Model in 2009.
Timing Proposed main test period 20th – 30th April inclusive. Suggested TSL come a few days early, say from 16th or 17th to set up.
Expenses Transport charges to be payable by METRI, also accommodation at the rate of 105 Euro per day. Possibility of vacation house rent that IFREMER can look into nearer the time.
Technical Items

1. Mechanical Attachment
    a. if load capacity of sidewheels looks marginal, TSL can investigate mounting support frame closer to the sidewheel side of the gantry
    b. NB salt water – review materials ref corrosion.
2. Electrical
    a. All 220v turbine motors to be protected by suitable immediate isolation key lock system
    b. No divers in water when motors energised
    c. Single motor earth connection to earth system
    d. ECLB trip advisable – nb tank mains system trips at 30mA leakage.
3. Instrumentation
    a. Typical IFREMER data logger scan rate is 100Hz
    b. TSL inputs for data logger –10 to +10 vdc, floating with screen earthed at TSL equipment end.

Actions

a. XB to send dxf file of gantry to MT
b. TSL to then send proposed design
c. Advise if acceptable

1.8 Update of the non-confidential Project information

There is no particular updating during this period

2. Annex

*The annexes are produced by completing the relevant forms in the reporting MS Access 2002 Database that each co-ordinator has received by e-mail from the **Commission**.*
A printed copy of the forms is inserted in the paper copy of the Annual Report.

Annex 1 - Composition of the Users Selection Panel
*[See "**Selection Panel**" form in the above mentioned MS Access Database.]*

Annex 2 - List of User-Projects
*[See "**List of User-Projects**" form in the above mentioned MS Access Database.]*

Annex 3 - List of Users
*[See "**List of Users**" form in the above mentioned MS Access Database.]*

Annex 4 – Database Report
*[See "**database Report**" form in the above mentioned MS Access Database.]*

List of Panel members

Contract ID 026010 **Reporting Period** AR3

Infrastructure Short Name	Family_Name	First_Name	Gender	Nation-ality	Home Institution			Email	Additional Information
					Institution Name	Town	Country		
METRI	Bozano	Roberto	M	IT	Consiglio Nazionale delle Ricerche (CNR)	Genova	IT	boz@ge.issia.cnr.it	Instituti di studi sui Sistemi Intelligenti (ISSIA)
METRI	Cognard	Jean-Yves	M	FR	ENSIETA	Brest	FR	jean-yves.cognard@ensieta.fr	Ecole Nationale Superieure d' Ingenieurs des Techniques de l'Armement
METRI	Germain	Gregory	M	FR	IFREMER	Boulogne sur Mer	FR	gregory.germain@ifremer.fr	Service hydrodynamique et Océano météo à Boulogne
METRI	Le Boulluec	Marc	M	FR	IFREMER	Brest	FR	marc.le.boulluec@ifremer.fr	Service hydrodynamique et Océano météo
METRI	Le Menn	Marc	M	FR	Service Hydrographique et Océanographique de la Marine (SHOM)	Brest	FR	lemenn@shom.fr	Département Ingenierie des équipements scientifiques
METRI	L'Her	Joel	M	FR	CETMEF	Brest	FR	joel.lher@equipement.gouv.fr	Costal and fluvial environment Department
METRI	Marec	Claudie	F	FR	INSU (Institut National des sciences de l Univers)	Brest	FR	claudie.marec@ipev.fr	Atelier national de l'équipement océanographique
METRI	Fennel	Sheena	F	IE	Marine Institute	Galway	IE	sheena.fennell@marine.ie	Oceanographic Services
METRI	Paillard	Michel	M	FR	IFREMER	Brest	FR	michel.paillard@ifremer.fr	Département des technologies des systèmes instrumentaux
METRI	Tziavos	Christo	M	GR	National Center for Marine Research	Athens	GR	ctziav@ncmr.gr	Department of Research
METRI	Waldmann	Christoph	M	DE	University of Bremen	Bremen	DE	waldmann@marum.de	Marum
METRI	Warnier	Philippe	M	FR	IFREMER	Brest	FR	Philippe.Warnier@ifremer.fr	material testing facilities
METRI	Bompais	Xavier	M	FR	IFREMER	Brest	FR	Xavier.Bompais@ifremer.fr	Service hydrodynamique et Océano météo
METRI	Davies	Peter	M	GB	IFREMER	Brest	FR	peter.davies@ifremer.fr	material behaviour laboratory

Infrastructure Short Name	Family_Name	First_Name	Gender	Nation-ality	Home Institution			Email	Additional Information
					Institution Name	Town	Country		
METRI	Chauqueuse	Bominique	M	FR	IFREMER	Brest	FR	dchauqueuse@ifremer.fr	material behaviour laboratory

List of UserProjects

UserProject Acronym

Aquaflora

Title Deep water pressure influence on cell structure and dimensional stability of insulation foam

Scientific Field

M a i n F i e l d Engineering & Technology

FP6 Priority or Specific discipline Other - Engineering & Technology

Objectives

The purpose of this project is to compare the resistance to underwater compression of closed-cell insulations made of low density polyethylene (LDPE), polypropylene (PP) and elastomeric foam (EL). In the LDPE issue two various densities resulting from different foam recipes will be considered. The selection of proper resin material has a substantial importance for obtaining assumed insulation properties in the underwater applications. Because of many interdependent factors to be considered and a lot of coexisting effects it is impossible to anticipate the properties of insulation materials exposed to temperature, pressure and sea water influence basing only on the theoretical predictions. The structural response of polymer foams strongly depends on foam density, cell structures such as cell size and shape, open or closed-cell, and solid material properties. Due to the viscoelastic nature of the solid polymer, foams often exhibit strain-rate dependent behavior. When using closed-cell polymer foams, strain rate effects are further complicated by the presence of gases within the cells. Therefore, a thorough understanding of the response of the polymer foam and the influence of gas within the cells at various external conditions is essential for effective use of these materials in some special applications, e. g. under the water surface.

The hydrostatic pressure increases with increasing depth, making the compressible insulation less effective. In closed cell foams the air is compressed as the foam deforms and a restoring force, proportional to the volume change in the gas, opposes further compression. Micromechanics modelling of closed-cell foams suggests that the two main hardening processes in hydrostatic compression tests are the elastic compression of the air trapped in the foam cells, and the non-linear viscoelasticity (or near-plasticity) of the cell wall materials [1,2]. Moreover air can diffuse through closed-cell polymer foams because the cell faces are permeable. So during underwater tests there will be a slow, inexorable permeation of air from the pressurized cells to water. Air dissolves in sea-water at given pressure to a maximum concentration determined by Henry's Law. So as a consequence of differences in air concentration in the compressed foam cells and dissolved in the sea-water net outward permeation will occur and this reduces the resistance of the foam to a creep stress and causes eventual cell collapse.

In this project we will investigate whether a pressure observed on a depth of 10 and 20 meters may cause permanent collapsing of various insulations and whether any differences in collapsing behavior are observed for tested polymer foams of the different strength and air diffusivity. We would be able to compare the relation of initial physical properties of insulations deriving from their chemical composition to their underwater compressive behaviour.

From processing point of view during foaming of LDPE and PP via direct gas injection a balance between the melt strength of the expanding polymer and the pressure of the blowing gas in the growing cells must be achieved. The most important properties of polymeric raw materials that influence foaming are melting and crystallization temperature of polymer grades and elongational viscosity (“strain hardening”) in the crystallization temperature range. Based on the experience gained by Armacell’s chemists and processing specialists all these properties may be easily modified by changing the polymer grades or using a mixture of different grades and other additives. Whereas LDPE and PP are physically foamed (as described above), elastomeric foams are typically foamed using chemical blowing agents. These are chemical compounds that react during processing and release gas or vapour that consequently foams the rubber matrix. Simultaneously the rubber matrix is crosslinked to stabilize the structure. The post-processing diffusion mechanism of the blowing agent is quite different than in the case of PP and LDPE. The chemical compounds used in elastomeric foaming are typically developed specifically for each application, where for example elasticity, cell size, compression set, density etc. may be defined quite accurately. Because of the rubber-like characteristics of the foam they behave quite differently from the rest of the polymeric foams. Before deep water testing all the samples will be characterised in the field of density, cell structure, thermal conductivity and tensile properties. To determine the best possible formulation for which the air diffusion out of the foam cells is reduced the gas permeation kinetics at ambient conditions will be measured via gas chromatography.

From theoretical point of view prediction of gas diffusion through the closed-cell foam can be accomplished via two different types of models, permeability models and diffusion models. The permeability models are based on the assumption that the permeability coefficient the cell walls can be expressed as the product of the diffusion coefficient and the solubility in the walls. This model is strictly valid only if steady state conditions are attained, the wall material is mainly amorphous, and the Henry's law is applicable. On the other hand the continuous diffusion models consider the foam as a homogeneous and isotropic medium through which air diffuses with an effective diffusion coefficient. The discrete diffusion models consider the foam layer as the repetition of unit cells characterized by their geometry (thickness, cell size and shape) as well as the diffusion coefficients of the air through the solid condensed phase and through the gas phase. Several studies showed the significant influence of the foam morphology on the diffusion process through closed-cell foams. Results of these measurements allow to assess the possibility of polyethylene insulations usage for shallow underwater pipeline insulation or any other underwater application where flexibility and/or thermal insulation properties of product play a significant role. The similar tests were carried out for different insulation materials [4]: e.g. for compressible closed cell elastomeric foam (neoprene) with a thermal conductivity range from 0,044 to 0,065 W•m−1•K−1 at atmospheric pressure, syntactic closed cell insulation consisting of a composite of a hollow glass microsphere filler (of a 25-120 μm in diameter) or for diving wetsuits applications [5-7]. The information about underwater behavior of polyethylene and polypropylene foams are very limited so the results of this project seems to be supplementary to current state-of-art in the field of underwater insulation materials.

Achievements

The buoyancy of foamed material was counterbalanced with the use of weights matched separately for each
sample and each depth. Weights were fixed to inner carrying pipe made of PVC (fig. 1a) with the use of steel cables
coated with Nylon to avoid their corrosion in salty water. Samples of tubes tested at the depth of 10 m have a total
length of 30 cm and at 20 m – 50 cm. Whole set was fixed to the Mettler Toledo PG-S scale (fig. 1b) and changes of
sample mass were controlled during one week on both depths. Data were collected continuously every 1 s during
first day of test and every 30s during next six days.

Before the test on right depth of 10 or 20 m each sample was immersed for 1 hour close to the water surface to
observe the influence of salt water and water intake. For all tested samples no mass changes related neither to
outward gas diffusion nor to water intake were noticed. During the right test foams surface and compression of
cellular structure was observed with digital camera and in the 6th day of test a set of pictures was made by divers.

For all the samples surface collapsing and mass increase caused by outward air diffusion from the cells and
water intake was observed. The water intake of about 0,5-1,0 wt. % was observed for polyethylene sample and for
elastomeric AC tube. All the rest samples (polypropylene and elastomeric AF) were waterproof.

The outward air diffusion from the pressurized cells to water was observed for all of the tested samples. The
collapsing effect was fully reversible for polyolefin based samples (Tubolit and OleCell) and for both elastomeric
insulations cells deformation was irreversible. The Tubolit sample is excluded from these considerations because
data acquisition profile was different in this case and cannot be directly compared. The mass changes for this
product are presented separately.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	1	DWTB	5

UserProject Acronym

Bexco

Title

Rope strength variability study

Scientific Field

Main Field Engineering & Technology

FP6 Priority or Specific discipline Other - Engineering & Technology

Objectives

In order to guarantee long term reliability of synthetic fibre ropes it is essential to reduce their strength variability. This requires a first characterization, in order to quantify scatter in the current product, then analysis of the various parameters (materials and manufacturing) which can introduce the variability measured, modifying these parameters (through closer control of the process) and a second series of tests to determine their influence. The work to be carried out at IFREMER includes therefore two series of tests for strength characterization of ropes of 30 to 40 ton break strength. Such ropes or cores are the building block for large marine ropes.

Achievements

A first series of 20 break tests was performed on polyester sub-ropes, in order to establish the variability of tensile strength values, Figure 1. Special in-house extensometry based on image analysis of targets fixed to the rope samples was used to obtain reliable strain data up to failure.

Figure 1. Unrolling sample before tensile test on polyester sub-rope, with Bexco staff.

A series of yarn-on-yarn abrasion tests was also performed, in natural sea water, as shown in Figure 2, in order to examine how the marine finish affected cyclic abrasion performance.

Figure 2. Yarn on yarn abrasion test.

Installation Use

Infrastructure Short Name	Installation ID	Installation Short Name	Amount of Access Delivered
METRI	4	MBTL	5

UserProject Acronym

Cranfield

Title

Reduced scale testing of the wave energy converter ORECon MRC1
in regular and irregular waves for performance evaluation and design optimisation.

Scientific Field

Main Field	Information & Communication Technologies
FP6 Priority or Specific discipline	FP6 - Future & emerging technologies

Objectives

Cranfield University is currently conducting a research program aiming at the optimization of a Wave Energy Converter (floating, tensioned moored, Oscillating Water Colum) named "ORECon MRC 1" which has been preliminary designed and patended by ORECon Ltd. An essential component of this research is to predict the performance of this Oscillating Water Column concept combined with a high efficiency air turbine as presented on Fig 1. This involves the accurate modeling of the water level inside the "chambers" which are simply open bottom tanks. The associated pressure variation and air flow rate are of then of primary importance for the air turbine design and performance predictions. A mathematical model has been developed by the Offshore Engineering Group which enables to predict the water elevation in the chamber owing to monochromatic waves. Future work is scheduled to account for irregular waves but experimental data are required to validate the model in regular waves first.

The aim of these experiments is to measure the performance and the behavior of a reduced scale version of ORECon MRC1 in regular and irregular waves. Several configurations will be tested in terms of number of chambers and draught. It is hoped that a modular design for the model will enable to modify the number of chambers and the draught without removing the whole structure from the water as well as the mooring lines in order to save cost and time. Cases where all three chambers are connected at the vent level will be undertaken to investigate the interaction between chambers. The volume of air will also be tested in two configurations; The first one will use Froude scaling and simply divide any volume by the scale to the power 3. The second configuration will use an additional air tank connected in such way that it has negligible effects on the motion of the model. The scaling for this additional air tank uses a similarity law based on the air spring force. It divides the volume of air from full scale to reduced scale by the scale to the power 2 leading to a larger volume compared to Froude scaling.

In summary, the primary aim of these tests is to check the performance of this Oscillating Water Column (OWC) concept by measuring:

- Water elevation inside each chamber
- Chamber internal air pressure
- Air mass flow rate

The second objective is to investigate the dynamic response in waves and to measure:

- RAOs in the 6 DOF: Surge – Sway - Heave – Pitch – Roll - Yaw

The final objective is to appraise the optimum number of chambers, draught of chambers and possible interaction between the chambers in terms of air flow output towards the air turbine. Time allocation permitting, the optimum chamber diameter could also be tested for three different buoy diameter.

Tests will be carried out in monochromatic, Jonswap, Pierson-Moskovitz and bimodal wave condition.

Achievements

The United Kingdom has one of the largest potential in Europe in marine renewable energy (Wind, Tidal and Wave), and has become one of the leading countries worldwide in the development of marine renewable energy concepts (Wind Farms, Tidal and Wave devices). Cranfield University, located in Bedfordshire (UK), is currently involved in the performance modeling, turbine design and structural design of the wave energy converter “OREcon Tension moored OWC”.

The concept originated from a small company based in Plymouth, Cornwall and has now reach a stage of development where a first full scale prototype will be manufactured and commissioned in the course of 2010. The concept is based on a tensioned moored floating buoy with open bottom chambers of varying draughts. The action of a wave train on the buoy produces the compression of a volume of air entrapped in the chambers and activates a high efficiency air turbine named HydroAir designed at Cranfield University in partnership with PBL Ltd. The air turbine is then connected to an electrical generator and provides grid compliant power.

In the frame of the European Program METRI for transnational access of facilities in Ocean Engineering, Cranfield University was offered a contract to test this Wave Energy Converter in the IFREMER ocean wave tank of Brest. The test took place between Monday 9 June and Friday 20 June 2008 which included 3 days of tank calibration, 2 days set-up of the model, 4 days testing and 1 day for model and instrumentation recovery. A total of 52 tests were conducted in monochromatic and polychromatic waves on four configurations of the device which consisted in varying the diameter of the orifices and connecting all chambers in opposition to each chamber operating independently. The level of water elevation in the chambers as well as the internal chamber pressure was measured in a wide range of wave height and period to assess the optimum configuration of the orifice for the air turbine to operate efficiently. One of the main concerns was the possible water ingression in the turbine inlet and this series of test enabled to determine which configuration of the orifice is required to avoid such phenomenon as this can potentially damage the turbine and compromise the power reliability in all weather conditions. The model tested was a single draught configuration and all chambers were connected to investigate the influence of each respective chamber on the others and it was observed that all chambers tend to be synchronized above a certain wave amplitude and period. This can have important consequences on the best size and number of turbines required.

Installation Use

Infrastructure Short Name	Installation ID	Installation Short Name	Amount of Access Delivered
METRI	1	DWTB	6

UserProject Acronym

FEUP

Title

Adhesively bonded assemblies in a marine environment

Scientific Field

Main Field Engineering & Technology

FP6 Priority or Specific discipline Other - Engineering & Technology

Objectives

The purpose of this proposal is to investigate the behaviour of adhesively bonded joints under marine environmental conditions. In particular two aspects will be examined, the influence of hydrostatic pressure and the influence of sea water. The former is essential, both to understand how adhesively bonded assemblies behave in deep sea structures and also to understand how hydrostatic stress affects the damage development in bonded joints. Results will be available for conference presentation and publication.

Achievements

A test campaign using the hyperbaric material test facility at IFREMER, Figure 4, was performed in December 2008 in the presence of two researchers from the University of Porto.

Bulk adhesive specimens and two types of assembled joints (thick adherend lap shear and single lap joints) were tested at pressures up to 1000 bars. Image analysis was used to measure specimen strains inside the pressure vessel through a view-glass. Significant results concerning the influence of hydrostatic pressure on adhesive and joint strength was obtained. A second campaign is planned to complete the results, which will be presented in a joint paper at a conference in 2009.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	4	MBTL	5

UserProject Acronym

Future Fibre

Title Innovative fibres for marine slings

Scientific Field

Main Field Engineering & Technology

FP6 Priority or Specific discipline Other - Engineering & Technology

Objectives

The aim of the study is to examine factors which influence the lifetime of PBO fibre cables which are exposed to severe mechanical and environmental loads at sea. These cables are finding increasing applications, both in racing yacht rigging and more recently for super-yachts. Three aspects will be studied here:
1. Cyclic loading (fixed tension-tension cycles with varying minimum load levels), followed by residual break tests.
2. Cyclic loading under more realistic conditions, by using sequences of loads recorded at sea to pilot the hydraulic piston. Particular attention will be paid to the influence of slack periods.
3. Bending limit determination. Samples will be deformed to different D/d ratios during slack fatigue testing, followed by residual strength testing.

The aim of the study is to quantify the influence of these factors in order to improve the performance and safety of PBO cables for marine applications.

Achievements

In order to characterize a series of materials for marine sling applications a preliminary test series was performed, in the presence of the material supplier. A specific load cycle, defined to represent realistic rigging load conditions, was programmed and used. However, these initial tests resulted in premature failures. Following discussions the fatigue test fixture was therefore modified, to improve end conditions. A new set of samples was then supplied. Tests are currently underway, but first results suggest that valid test data can now be obtained. In parallel a series of bend-over-pulley tests has been performed which allowed two materials to be evaluated.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	4	MBTL	5

Title

SIMULTANEOUS VORTEX-INDUCED AND WAKE-INDUCED VIBRATIONS OF A CYLINDER

Scientific Field

Main Field Engineering & Technology

FP6 Priority or Specific discipline Other - Engineering & Technology

Objectives

The flow-induced vibration of one cylinder in the wake of another is the subject of renewed interest in connection with interactions between vertical tension risers in deep water. This is one of the challenges that face the offshore oil industry as new fields are developed at water depths of well over 1000m. When exposed to ocean currents over such lengths, even weak interactions may produce large deflections in individual risers in an array, contributing to fatigue damage and increasing the probability of clashing.

Presently there is no model that can be used to predict reliably wake-induced galloping of tandem cylinders. Quasi-steady numerical models have been constructed for the prediction of wake-induced oscillations, using time-averaged force coefficients obtained experimentally for one stationary cylinder in the wake of another, e.g. Wu et al. (2002). However, this approach neglects any interaction between the response and the flow, as well as the effects of vortex shedding from either cylinder. Other groups plan, or are working on, CFD-based models for pairs of cylinders or risers. Numerical models of all kinds need measurements for purposes of validation. The work proposed at the water circulation testing basin at Boulogne/Mer is part of a programme aimed at studying simultaneous vortex- and wake-induced vibrations of cylinders in conditions that for the first time will escape the limitations of a single frequency response. Besides advancing our understanding of this flow, we plan to support the development of numerical models through the provision of high quality data, as in a previous programme on the VIV of a single riser in a non-uniform current (Chaplin et al., 2005b).

The instrumentation will be designed to monitor the kinematics and dynamics of the system, to enable us to extract both the instantaneous displacement of the cylinder and the forces on it. Besides accelerometers inside the cylinder and on the intermediate masses, strain gauges will be installed to measure the bending of the beams, and load cells to measure the extension of the side springs. Analysis of the data will focus on identifying trajectories and maximum excursions of the downstream cylinder as functions of frequency ratio, reduced velocity and cylinder separation. We shall also extract the time series of forces for the purposes of understanding the dynamics of the multi-modal process, and for making comparisons with numerical models.

Dissemination of this work will be through papers in academic journals and conference proceedings. We also plan to exploit the results by running benchmarking exercises involving blind predictions. As before (Chaplin et al., 2005b; Bearman et al., 2006, Menter et al., 2006), we expect an enthusiastic response from the growing number of numerical modellers in this field who need measurements for validation purposes but are very short of high quality data from well-documented and controlled conditions. Probable participants in such exercises include groups in the UK, Norway, France, Brazil, Australia and the USA.

Achievements

MCEC’s operating in shallow fast-moving flow regimes will see a difference in the downstream flow field compared devices installed in deeper water. The breakdown of vertical symmetry in the wake has been addressed in previous work by the authors [4] and appears to occur for water depth/rotor diameter ratios less than 4. Experiments to remove the effect of sea bed proximity have shown that wake recovery is not as favourable when the flow field is in effect infinitely deep beneath the rotor disk. In a symmetrical constrained flow there is acceleration around the rotor disk that reduces the length of the near wake where stronger velocity deficits exist. This faster moving flow persists into the far-wake region aiding breakdown of the wake and centreline velocity recovery. For flow depths shallower than 4-diameters the rotor disk is positioned closer to the more sheared section of the vertical velocity profile. This limits mass flow beneath the disk and reduces the rate of recovery on the underside of the wake. The work described in this paper provides an insight into the flow effects around MCECs operating in a constrained flow field.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	2	WCTB	10

UserProject Acronym

Soton2

Title

Experimental evaluation of the performance and interactions of marine current turbines

Scientific Field

Main Field Engineering & Technology

FP6 Priority or Specific discipline Other - Engineering & Technology

Objectives

The programme of work will be undertaken at the water circulation testing basin of Boulogne/Mer. The
work was discussed with Grégory GERMAIN, Head of the flume tank. It is felt that the above IFREMER's
facility offers the best possible test site for the proposed work.
Below is a summary of the work programme:
The work will involve measurements of the performance of a model 800mm diameter horizontal axis marine current turbine in free stream and operating in the wake of another turbine. The test rigs and turbines have been evaluated previously but not in circulating water channels. The test rig is instrumented to measure torque and thrust and may include measurement of moment on the blades. In addition it is anticipated that the experiments will also involve measurements of both shaft loads and wake behind the turbine. This will be followed by measurements of the second turbine operating in the wake. If possible twin rotor test will also be needed to accomplish space dependency effects on performance.
The wide re-circulating water channel at Boulogne has a continuous current where the incident flow has a boundary layer that can be modified in a controlled way. There is also sufficient space to make comprehensive measurements of velocities and turbulence intensities in the wake of multiple rotors and simulator combinations. Appropriate measurement equipment was discussed and will be available for testing. Fabrication of the turbines and their sensors will be carried out at Southampton University.

Achievements

Flow mapping of the wake flow downstream of 100mm diameter porous disks was undertaken during the week 25-29th February 2008. Similar experiments had been conducted at the University of Southampton Chilworth flume but this was shallow (0.3m depth) and therefore the circulating channel at IFREMER would allow operation in a boundless flow. This is defined as a depth where the flow field around the disks is not affected by the side walls, bed or water surface. Disks were tested at 0.7m depth, 0.3m and 0.5m. The first test was to investigate boundless conditions; the later tests were to investigate any interference from the water surface only.

An acoustic Doppler velocimeter (ADV) was supplied by University of Southampton. IFREMER supplied a 3-axis automated traverse and modified an existing clamping arrangement to mount the ADV probe in the water channel. The ADV probe was traversed downstream along the central axis of the disk from 3-diameters (D) downstream to a maximum of 20D sampling at discrete points along this distance. The ADV probe was then advanced back upstream at a different vertical position. This process continued until a centre-plane slice of sample points was acquired. Following this lateral planes of points were measured thus developing a map of the downstream flow field in 3-dimensions. Figure 2 shows the downstream flow field in the vertical plane for a disk positioned at 7-diameters from the water surface.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	2	WCTB	5

UserProject Acronym

TSC

Title

Wireless data communication used in mooring integrity monitoring

Scientific Field

Main Field Engineering & Technology

FP6 Priority or Specific discipline Other - Engineering & Technology

Objectives

TSC are developers of several unique technologies for use underwater. TSC's StressProbe is a novel technique for measuring the stress in steel components and is under evaluation for a number of applications in the oil and gas industry, particularly subsea. This technology is novel and unique to TSC.

The offshore industry is suffering a number of mooring failures on permanently moored structures. Measurement of the load on a mooring chain is difficult and usually involves inserting something into the mooring line load path (like a load cell). TSCs StressProbe can be retrofitted to the outside of a mooring chain without affecting the mooring in any way. Tests to date, using divers offshore, has proved the capability of this technology to measure mooring line tension variations in large offshore chain moorings. This is important for assessing mooring behaviour and indeed whether the line has actually failed.

For long term monitoring it is impractical to run cables from the mooring sensor on the chain to the vessel, so TSC are proposing the installation of an autonomous subsea system which can then communicate with the vessel via an acoustic data link. There are several problems, including the power required from the battery and the fact that the vessel rotates around the mooring and so the sensor and receiver are continuously moving relative to each other. As the vessel moves, so other moorings lines, and risers, will be positioned between the sensor and receiver.

TSC have received interest in this application from BP and plan to build a prototype acoustic data link specifically suited to this application (shallow water depth and omni directional). This project will assess different prototype sensor/receiver configurations, with simulated obstacles (mooring chains and risers) in different positions. The objective is to determine optimum positions for the sensor and receiver, in order to minimise interference from other items, and to assess data quality, integrity and range at different power settings. This will also allow detailed battery design parameters to be established.

The work will be carried out in the large seawater tank using vertical, diagonal and horizontal transmission through both the 10m and 20m sections. Sections of real mooring chain will be used to assess any signal shielding and any influences on data distortion or corruption.

Achievements

TSC have developed the ACFM technique for underwater inspection of welded structures. Inspection by diver is now routine, in depths to around 250m. Deepwater developments are now below the diving limit, and therefore require solutions suitable for deployment by ROV. The pressure tests conducted at Ifremer allowed TSC to explore the performance of several key elements necessary for deepwater weld inspection.
TSC's subsea instrument (Model U31) is rated for operation to 300m water depth. To extend this, TSC redesigned the enclosures for a rated depth of 2000m. This new deepwater instrument was tested and survived at a pressure in excess of 300bar.
TSC's standard diver probes are again rated to a working depth of 300m (never tested beyond 350m). They are a potted design and TSC were interested to explore the actual limitations. To achieve this, the probes were attached to a prototype deepwater U31 instrument and testing to destruction was attempted. In fact the cycling at pressures in excess of 200bar was insufficient to destroy the probes, which was a very positive result.
Another phase of the test was to evaluate a brand new probe design. This was a significant departure from standard diver probes, because the design concept involved pressurising the probe internals to eliminate significant mechanical load on the housing, but of course introduces loads on the electronics. This oil filled design again proved to be suitable for deepwater operation and survived cyclic loading to 200 bar.
This work proved very successful and provides TSC now with the confidence to push ahead to

release their ACFM technology for commercial use during deepwater inspection programmes. The proof of their design concepts will now allow them to move forward with a new generation of hardware for deepwater use.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	3	HTTL	5

UserProject Acronym

UPV

Title

pressure calibration of acoustic equipment used in ANTARES-KM3NeT

Scientific Field

Main Field	Engineering & Technology
FP6 Priority or Specific discipline	Other - Engineering & Technology

Objectives

UPV will make two studies related to pressure calibration of acoustic equipment used in ANTARES, or being under consideration for KM3NeT. The studies corresponds to:

1 - Study on the influence of the pressure on the acoustic signal in a sound velocimeter and its implication on the sensor calibration.
2 - Evaluation of the influence of the pressure on hydrophones at 250 bars by studying the acoustic signals transmitted and received.

The aim of the first study the acoustic signals transmitted and received on the transducer of a sound specially prepared velocimeter. This study has to be done in hyperbaric tank in order to evaluate the influence of the pressure on the characteristics on the acoustic signal. This implies to have a hyperbaric tank regulated in temperature.

In the second study, we are interested in determine the behaviour of several hydrophones used in ANTARES/KM3NET under different conditions of pressure. The work is done by studying the different emission-reception configuration of the hydrophones. We will need the same facility, as in the first study, that is, the hyperbaric tank regulated in temperature and large dimension to make the acoustic study.

The measurements will be done during the last week of January and the last week of February.

Achievements

In the last week of January and in the last week of February, using the hydrophones and the velocimeter used in the context of the submarine neutrinos detectors Antares/KM3, several acoustic signals measurements have been taken at different water pressures. The aim of these measurements was to study the influence of the pressure on the sensitivity of the hydrophones and velocimeter records and therefore its implications on their calibration.
In order to change the pressure we used the tank like in the Figure1. A metallic plate has been used to avoid the interference effect between the four hydrophones FFR (Free Flooded Rings), mounted on the upper part of the tank , and the sound velocimeter with the hydrophones ANTARES mounted in the bottom part of the tank.
The signals measurements have been taken using the following pressure values: 1 – 50 – 200 – 300 – 440 – 300 – 200 – 50 – 1 bar. In this way it has been also checked the influence of the pressure on the apparatus in both conditions of rising and decreasing pressures.
For every value of pressure the amplitude variation of the received signals has been recorded.
In order to verify the right working of the transducers after long exposition at high pressure, the hydrophones and the sound velocimeter have been left at the pressure of 440 bar for a whole night.

One example of the measurements is given in an attached figure.

The yellow signal represents the electric signal used as a pulse generation for the emitter hydrophone and the blue signal represents the acoustic signal on the receiver hydrophone.

During the above measurements, some signals coupling problems have been found. The problems were due to the physical housing of the cables in the same cable holder and therefore it has been solved using separated cable holders.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	3	HTTL	10

List of Users

Contract ID 026010 **Reporting Period** AR3

UserProject Acronym	Family Name	First Name	Gender	Birth year	Nationality	Resear. status	User Background			Home Institution				User e-mail	New user	Groupl eader	Remote user	Num. of visits	Dur. of stay	T and S reimb.
							Sci. Field 1	Sci. Field 2	Sci. Field 3	Type	Name	Town	Country							
Aquaflora	Dolega	Justyna	F	1979	PL	EXP	Engineering & Technology			SME	Aquaflora/Armacell	Wroclaw	PL	justyna.dolega@armacell.com	Y	Y	N	1	5	Y
Bexco	Devos	Karel	M	1960	BE	EXP	Engineering & Technology			SME	Bexco	Hamme	BE	kdevos@bexco.be	Y	Y	N	1	5	Y
Bexco	Scheirs	Erik	F	1961	BE	EXP	Engineering & Technology			SME	Bexco	Hamme	BE	escheirs@bexco.be	Y	N	N	1	5	Y
Cranfield	Gervelas	Reynald	M	1985	FR	PDOC	Engineering & Technology	Energy		UNI	Cranfield University	Cranfield	GB	r.gervelas@cranfield.ac.uk	N	N	N	1	5	Y
Cranfield	Trarieux	Florent	M	1973	FR	PGR	Engineering & Technology	Energy		UNI	Cranfield University	Cranfield	GB	F.Trarieux@cranfield.ac.uk	Y	N	N	2	5	Y
FEUP	Da Silva	Lucas	F	1973	PT	EXP	Engineering & Technology			UNI	University of Porto	Porto	PT	lucas@fe.up.pt	Y	Y	N	2	5	Y
Future Fibre	Bunyan	Humprey	M	1964	GB	EXP	Engineering & Technology			SME	Future Fibres	Valencia	ES	humphrey@futurefibres.com	Y	Y	N	2	5	Y
Soton - VIV	Batten	William	M	1976	GB	PGR	Engineering & Technology	Energy		UNI	University of Southampton	Southampton	TR	w;batten@soton.co.uk	Y	N	N	2	10	Y
Soton - VIV	Chaplin	John	M	1946	GB	EXP	Engineering & Technology	Material Sciences		UNI	University of Southampton	southampton	GB	j.r.chaplin@soton.ac.uk	Y	Y	N	2	10	Y
Soton2	Giles	Jack	M	1984	TR	PGR	Energy	Engineering & Technology		UNI	University of Southampton	Southampton	GB	jack.giles@soton.ac.uk	Y	Y	N	1	6	Y
Soton2	Myers	Luke	M	1979	GB	PDOC	Energy	Engineering & Technology		UNI	university of southampton	Southampton	GB	luke@soton.co.uk	N	Y	N	2	10	Y
TSC	Paris	Maxence	M	1987	FR	PGR	Material Sciences	Engineering & Technology		SME	TSC	Milton Keynes	TR	maxence@tscinspectionsystems.com	Y	N	N	1	5	Y
TSC	Topp	David	M	1954	GB	EXP	Engineering & Technology	Energy		SME	TSC	Milton Keynes	GB	dtopp@tscinspectionsystems.com	N	Y	Y	0	0	N
UPV	Ardid	Miguel	M	1974	ES	EXP	Engineering & Technology			UNI	Universidad de Valencia	Valencia	ES	mardid@fis.upv.es	Y	Y	Y	0	0	N
UPV	Larosa	Giuseppina	F	1979	IT	PGR	Engineering & Technology			UNI	Universidead de valencia	Valencia	ES	giuseppina.larosa@gmail.com	Y	N	N	2	10	Y

Database Report

Contract ID 026010 **Reporting Period** AR3

Project Web site http://www.ifremer.fr/metri

Objectives

Project summary

Under this contract, access for user groups will be provided to the Infrastructure entitled Marine Environment Test and Research Infrastructure (METRI). This Infrastructure, located at Brest and Boulogne-sur-mer in France is owned and operated by IFREMER, the French Research Institute for Sustainable Sea Exploitation.
Within the Infrastructure, access will be made available to the five following installations.

- the deep wave testing basin,
- the water circulation testing basin,
- the hyperbaric testing tank laboratory,
- the material behaviour testing laboratory,
- the marine sensor evaluation laboratory.

During the contract duration, it is expected that 20 short term projects will be selected and that a minimum of 40 users will benefit from access to this Infrastructure. The total number of experimental days to be provided is 200 for the five installations.
This access will be provided free of charge to the user groups given access to the Infrastructure under this contract and will include all logistical, technical and scientific support that is normally provided to external users
of the Infrastructur

Access Modalities

How to apply to METRI2

Within METRI, the user groups consist of only one or two people and the group leader is formally identified.
The duration of the project in the Infrastructure is from 1 to 3 weeks.
Guidelines for filling in the application form

As soon as a Call for Proposals is published, European researchers who want to propose a short-term project must fill up the application form, which may be downloaded from this website.

Call for proposal Nr ...: deadline is fixed depending the call

The project proposals are selected through an independent peer review procedure.
Applicants are informed of the results of the evaluation usually within 6 weeks after the respective deadlines.
Appointed projects can usually be initiated as early as 2 months after the deadline.

The application form can also be obtained upon request from the address below:

The project proposal can be sent by e-mail to Jack.Pichon@ifremer.fr or by fax: 33 (0) 2 98 224 535

A signed copy of the proposal must also be sent to the address below:
Address
IFREMER - Mr. Jack Pichon
Centre de Brest - ERT/MS
METRI2 Project
BP 70
29280 Plouzané
France

Project Achievements

Recall :

The first session of the selection panel for selection of proposal was held on 6 October 2006. It has concluded on the selection of the nine eligible proposed projects (see AR1).

In the frame of the annual report Nr 2, 2 sessions of the commission has been held with the following resumed results:

- Session Nr 2 (19/9/2007): 4 selected project with 4 eligible:
TWI - Chaintest
Usoton - VIV
TTI
MSG

- Session 3 (14/2/2008): 4 selected projects wit 2 eligible:
NTUA2 (GR)
Cranfield University (GB)

In the frame of thepresent report (AR3), 1 sessions of the commission has been held with the following resumed results:

- Session Nr 4 (19/9/2007): 4 selected project with 4 eligible:

Nr 18 - TSC - Technical Software Consultants (UK)
Hyperbaric laboratory of Brest
tests on deep water technology equipment (weld inspection system)

Nr 19 - Aquaflora (Pl)
Wave basin of Brest
test of insulation foam in the deep basin

Nr 20 - WFS - WirelessFibreSystem(UK)
Wave basin of Brest
Underwater electromagnetic communication tests with integration of coastal monitoring system

Nr 21 - Cranfield University (UK)
Flume of Boulogne/mer
Tests for tidal energy converter

Nr 22 - FEUP - University of Porto - School of Engineering
Material laboratory of Brest
Tests concerning behaviour of bonded joints

Nr 23 - Future Fibres (Sp)
Material laboratory of Brest
Innovative fibres for marine slings

Nr 24 - Bexco - SME (Belgium)
Material laboratory of Brest
Rope strength study

Nr 25 - MAMK - University of technology - Tampere (Finland)
Material laboratory of Brest
Damage tolerance study of injected DCPD matrix composites in marine environment

Nr 26 - TSC2 - Technical Software Consultants (UK)
Wave basin of Brest
Wireless data communication used in mooring integrity monitoring

Nr 27 - Tidalstream Ltd (UK)
Wave basin of Brest
Tests on tidal current turbine

Nr 28 - MARTIFER (Portugal)
Wave basin of Brest
Tests with waves on energetic model

Nr 29 - UPV - University of Valencia (Sp)
Hyperbaric laboratory
Pressure calibration of acoustic equipment used in ANTARES/KM3Net

Six of these projects were performed during the AR3 period

Eligible Proposals	12	***Selected Proposals***	12

B. MANAGEMENT REPORT (FINANCIAL INFORMATION)

1. Justification of the resources deployed

- **The effort dedicated to project management tasks** in the first year of operation of Metri is estimated to 60 hours. The corresponding hourly rate is 51.79 € (figure coming from art 3.3.4 of Ifremer proposal for Metri 2 – doc. nr ERT MS 05030).

  The charged amount is then: **51.79 €.**

  The spent time dedicated to the preparation and the operations for the project users is estimated to 10 men-month, amount which will not be charged as being include in the cost of experimental days.

  These figures comes from the data given by the accounting department of Ifremer.

- **The eligible costs claimed to the contract** during the reporting period (tabular form) are as follows:

  From tables annex 1 of Metri 2 - RITA Contract Nr 026010 and CFP A3.3a

Table of Eligible Costs - Metri Annual Report 2	Nr	Rate	Amount	Total/categories
Specific activities				***159528.89***
1. Transnational Access - deep wave basin of Brest/days	11	3407.89	37486.79	
2. Transnational Access - water circulation basin of Boulogne/days	15	3617.17	54257.55	
3. Transnational Access - hyperbaric testing tank laboratory of Brest/days	15	2401.19	36017.85	
4. Transnational Access - material behaviour laboratory of Brest/days	15	2117.78	31766.70	
Other activities:				***13440.17***
Expert panel travel and subsidencies	1		1576.13	
Travel and subsidencies - users	1		11864.04	
Management activities				***3107.40***
Human effort/hours	60	51.79	3107.40	
Travels, congress, Exhibitions	0			
Advertising	0			
Total				***176076.46*** ***€***

[No major deviations with respect to the planned budget.]

2. Forms C - Financial Statements

*The **Form C - Financial Statement**s (**Appendix 1)** is provided in an Excel separate document (electronic form).*

*As requested an **Audit certificate** is submitted with the Forms C(separate attached document)*

Form C - Model of Financial Statement per Activity for a Specific Support Action / Transnational Access to Infrastructures

(to be completed by each contractor)

Type of instrument	Specific Support Action	Type of Action *(if necessary)*	Transnational Access to Infrastructures
Project Title (or Acronym)	Metri	Contract n°	026010
Contractors's legal name	Ifremer		
Legal Type			
Contact Person	Jack Pichon	Telephone	33 2 98 22 41 54
Telecopy	33 2 98 22 45 35	E-mail	jack.pichon@ifremer.fr
Cost model used (AC/FC or FCF) / (UF: User Fee)(*)	FC/UF	Indirect costs (Real or Flat Rate of 20% of Direct costs, except subcontracting)	Flat Rate of 20% of Direct costs, except subcontracting (**)
Period from	01/03/2008	To	28/02/2009

(*) If UF is used under "other specific activities: transnational access/connectivity", please mention the two cost models used (eg. FC/UF or FCF/UF or AC/UF)

(**) Except otherwise agreed in Article 9 [special clauses] of the contract.

1- Resources (Third party(ies))

Are there any resources made available on the basis of a prior agreement with third parties identified in Annex I of the contract? (Yes / No)				No
If Yes, please provide the following information				
Third Party 1 (Y1)	Legal name		Cost model used	
Third Party 2 (Y2)	Legal name		Cost model used	

If necessary add another Form C

2- Declaration of eligible costs (in €)

Please complete only the activity covered by the relevant instrument (and type of action) indicated above and as mentioned in Article II.25 and/or in Annexes I and III of the contract.
If you are a contractor using the additional cost model (AC):
- indicate only your additional eligible costs, except for Management of the Consortium Activity for which you may indicate your full eligible costs;
- do not declare eligible direct additional costs specifically covered by contributions from third parties as mentioned in Articles II.20 and II.23.a and b of the contract.
If you are a contractor using a full cost model (FC/FCF), indicate your full eligible costs
The costs declared should distinguish between direct and indirect costs
If necessary, adjustments to previous period(s) may be included where appropriate.

	Type of Activity													
	Research and Technological Development / Innovation (A)		Demonstration (B)		Training (C)		Management of the Consortium (D)		Other Specific Activities: Transnational Access (E)		Other Specific Activities (E)		Total (G) = (A)+(B)+(C)+(D)+(E)+(F)	
	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)
Direct costs							2589.50		132940.74		11200.14		146730.38	
Of which subcontracting									17029.34					
Indirect costs							517.90		26588.15		2240.03		29346.08	
Adjustments to previous period(s)														
Total costs							3107.40		159528.89		13440.17		176076.46	

3- Declaration of receipts (in €)

If you are a contractor using the additional cost model (AC), indicate only receipts covered by Article II.23.c of the contract.
If you are a contractor using a full cost model (FC/FCF), indicate receipts covered by Article II.23 of the contract.

	Type of Activity													
	Research and Technological Development / Innovation (A)		Demonstration (B)		Management of the Consortium (C)		Other Specific Activities: Coordination / Networking (D)		Other Specific Activities: Transnational Access / Connectivity (E)		Other Specific Activities (E)		Total (G) = (A)+(B)+(C)+(D)+(E)+(F)	
	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)
Total receipts														

4- Declaration of interest generated by the pre-financing (in €)	
To be completed only by the coordinator.	
Did the pre-financing (advance) you received by the Commission for this period earn interest? (Yes / No)	No
If yes, please indicate the amount (in €)	

5- Request of FP6 Financial Contribution (in €)	
For this period, the FP6 Community financial contribution requested is equal to (amount in €)	176076.46

6- Audit certificates			
According to the contract, does this Financial Statement need an audit certificate (or several in case of Third party(ies)) delivered by independent auditor(s)? (Yes / No)			Yes
If Yes, does this(those) audit certificate(s) cover only this Financial Statement per Activity? (Yes / No)			Yes
If No, what are the periods covered by this(those) audit certificate(s) ?	From - to		
What is the total cost of this(those) audit certificate(s) (in €) per independent auditor(s) ?			

Audit certificate of the contractor (X)			
Legal name of the audit firm	Ifremer Accounting Agency	**Cost of the certificate**	0
Audit certificate(s) of the third party(ies) (Ys) ***(if necessary)***			
Y1 : Legal name of the audit firm		**Cost of the certificate**	
If necessary add another Form C.		**Total (Z) = (X) + (Ys)**	

Reminders:

The cost of an audit certificate is included in the costs declared under the activity "Management of the Consortium". The required audit certificate (s) is (are) attached to this Financial Statement

7- Conversion rates

Costs incurred in currencies other than EURO shall be reported in EURO.

Please mention the conversion rate used (only one choice is possible) – Please note that the same principle applies for receipts.

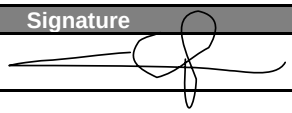
Contractor	
- Conversion rate of the date of incurred actual costs? (YES / NO)	
- Conversion rate of the first day of the first month following the period covered by this Financial Statement? (YES/NO)	
Third Party(ies) ***(if necessary)***	
Third Party 1 (Y1)	
- Conversion rate of the date of incurred actual costs? (YES / NO)	No
- Conversion rate of the first day of the first month following the period covered by this Financial Statement? (YES/NO)	No

If necessary add another Form C.

8- Contractor's Certificate

We certify that:

- the costs declared above are directly related to the resources used to reach the objectives of the project ;
- the receipts declared above are directly related to the resources used to reach the objectives of the project ;
- the costs declared above fall within the definition of eligible costs specified in Articles II.19, II.20, II.21, II.22 and II.25 of the contract, and, if relevant, in Annex III and Article 9 (special clauses) of the contract ;
- the receipts declared above fall within the definition of receipts specified in Article II.23 of the contract ;
- the interest generated by the pre-financing declared above falls within the definition of Article II.27 of the contract ;
- the necessary adjustments, especially to costs reported in previous Financial Statement(s) per Activity, have been incorporated in the above Statement ;
- the above information declared is complete and true ;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives.

Contractor's Stamp	**Name of the Person responsible for the work**	**Name of the duly authorised Financial Officer**
	Jack Pichon	**Yvon Le Guen**
	Date	**Date**
	15/04/2009	**15/04/2009**
	Signature	**Signature**
		

Ifremer

AUDIT CERTIFICATE

We Ifremer, established in Centre de Brest, Technopole de Brest-Iroise, BP 70, 29280 Plouzané, France, represented for signature of this audit certificate by Rosy Charnolé accountant public, hereby certify that :

- We have conducted an audit relating to the cost declared in the Financial Statement(s) per activity of Ifremer hereinafter referred to as contractor, to which this audit certificate is attached, and which is to be presented to the Commission of the European Communities under contract 026010 (RITA) METRI II for the following period covered bye the EC contract of 01/03/2008 at 28/02/2009.
- We confirm that our was carried out in accordance with generally accepted auditing standards respecting ethical rules and on the basis of the relevant provisions of the above-referenced contract and its annexes.

  The above mentioned Financial Statement(s) per activity were examined and all tests of the supporting documentation and accounting records deemed necessary were carried out in order to obtain reasonable assurance that, in our opinion, based on our audit :

  - The amount of total eligible cost 176.076,46 € (one hundred seventy six thousands seventy six euros and forty six cents) declared in Box 2 of the attached Financial Statement(s) per Activity is complying with the following cumulative conditions :
    - ✓ They are actual and reflect the contractor's economic environment
    - ✓ They are determined in accordance with the contractor's accounting principles
    - ✓ They have been incurred during the period covered by Financial Statement(s) per Activity concerned by this audit certificate
    - ✓ They are recorded in the accounts of the contractor at the date of the establishment of this audit certificate
    - ✓ They are exclusive of any non-eligible costs identified below which are established in the second paragraph of article II.19 of the above mentioned contract with the Commission of the European Communities :
      - ❖ Any identifiable indirect taxes, including VAT or duties;
      - ❖ Interest owed;
      - ❖ Provisions for possible future losses or charges;
      - ❖ Exchange losses;

Institut français de Recherche pour l'Exploitation de la Mer

Etablissement public à caractère industriel et commercial

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TVA FR 46 330 715 368

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- ❖ Costs declared, incurred or reimbursed in respect of another Community project;
- ❖ Return on capital;
- ❖ Debt and debt service charges;
- ❖ Excessive or reckless expenditure;
- ❖ Any cost which does not meet the conditions established in Article II.19.1 of your contract with the Commission of the European Communities.

✓ They have been claimed according to the following cost reporting FC model cost which the contractor is eligible to use according to article II.22 of the above mentioned contract with the Commission of the European Communities;

- As declared on the box 3 of the attachment Financial Statement(s) per Activity, the total amount of receipts for the periods covered by this (those) Financial Statement(s) per Activity is equal to 0 €.
- As declared on the box 4 of the attachment Financial Statement(s) per Activity, the total amount of interest yielded by the pre-financing received from Commission of the European Communities for the periods covered by this (those) Financial Statement(s) per Activity is equal to 0.

- Accounting procedures used in the recording of eligible costs and receipts respect the accounting rules of the State in which the contractor is established and permit the direct reconciliation between the costs and receipts incurred for the implementation of the project covered by the EC contract and the overall statement of accounts relating to the contractor's overall business activity;
- Our company Tresor Public is qualified to deliver this audit certificate in full compliance with the second and third paragraphs of article II.26 of the contract;
- As declared in the box 6 of attached Financial Statement(s) per Activity, the contractor paid for this audit certificate a price equal to 0 in which VAT is equal to 0.

L'Agent Comptable Secondaire
du Cente IFREMER de BREST 30.04.09
Rosy CHARNOLE

3. Summary financial report

*The **Summary financial report (Appendix 2)** consolidating the costs is given in a separate excel document (electronic form).*

Summary Financial Report

Type of Instrument	SSA-TA	Project Title (or Acronym)	METRI	Contract N°	26010
Reporting period number		From (dd/mm/yyyy)	01-mars-06	To (dd/mm/yyyy)	01-sept-10	Page	1/1

Contractor n°	Organisation Short Name	Cost model(s) used		Eligible costs (in €)	Type of activities												Total eligible costs (G)=(A)+(B)+(C)+(D)+(E)+(F)			Receipts		
					Research and Technological Development / Innovation (A)			Management of the consortium (D)			Other Specific Activities: Transnational Access (E)			Other Specific Activities (F)								
		For Transnational Access	For any other activities		Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	UF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)	Contractor	AC Third party(ies)	FC/FCF Third party(ies)
26010	IFREMER	UF	FC	Direct eligible costs				31 785.38			467 607.20			119 520.00			618 912.58	0.00	0.00			
				of which direct eligible costs of subcontracting				*0.00*			*62 170.11*			*0.00*			62 170.11	0.00	0.00			
				Indirect eligible costs				6 357.07			81 087.42			23 904.00			111 348.49	0.00	0.00			
				Adjustment on previous period(s)				38 142.45			548 694.62			143 424.00			730 261.07	0.00	0.00			
				Total eligible costs				***38 142.45***	***0.00***	***0.00***	***548 694.62***	***0.00***	***0.00***	***143 424.00***	***0.00***	***0.00***	730 261.07	0.00	0.00			
Total eligible costs								38 142.45	0.00	0.00	548 694.62	0.00	0.00	143 424.00	0.00	0.00	730 261.07	0.00	0.00	#REF!	#REF!	#REF!
								38 142.45			548 694.62			143 424.00			730 261.07			#REF!		
Requested EC contribution for the reporting period (in €) without taking into account receipts								3 107.40	0.00	0.00	159 528.89	0.00	0.00	13 440.17	0.00	0.00	176 076.46					
								3 107.40			159 528.89			13 440.17								
Requested EC contribution for the reporting period (in €) taking into account receipts [=Periodic Invoice]																	176 076.46					
Amount of the financial interests generated by the prefinancing																						

C. REPORT ON THE DISTRIBUTION OF THE COMMUNITY FINANCIAL CONTRIBUTION

*The **Report on the distribution between contractors** made during the reporting period of the Community financial contribution **(Appendix 3)** is given on a separate Excel document (electronic form)*

Report on the Distribution of the Community's contribution

Type of Instrument		Project Title	METRI	Contract N°	026010

Part I — Community's prefinancing (or payment) sent to the coordinator (1)

	Reporting Period 1 (2)		Reporting Period 2 (2)		Reporting Period 3		Reporting Period (2)		Final payment		Total Amount (I) (3)
	From	To	From	To	From	To	From	To			
	1/03/2006	28/02/2007	1/03/2007	29/02/2008	1/03/2008	28/02//2009					
	Date	Amount (A)	Date	Amount (B)	Date	Amount (F)	Date	Amount (G)	Date	Amount (H)	
Total (X)	25/04/2006	280 000.00	26/02/2008	91 418.74	24/07/2008	114 743.47					486 162.21

Part II — Distribution of the Community's prefinancing (or payment) between contractors according to the consortium decision(s) (4)

Contractor n°	Organisation Short Name	Country Code	Reporting Period 1		Reporting Period 2		Reporting Period 3		Reporting Period		Final payment		Total Amount (I') (6)
			Date(s) (5)	Amount(s) (A') (5)	Date(s) (5)	Amount(s) (B') (5)	Date(s) (5)	Amount(s) (F') (5)	Date(s) (5)	Amount(s) (G') (5)	Date(s) (5)	Amount(s) (H') (5)	
1	IFREMER	F	15/04/2007	59 418.74	15/04/2008	242 743.47	15/04/2008	176 076.46					478 238.67
			Total	59 418.74	Total	242 743.47	Total	176 076.46	Total	0.00	Total	0.00	478 238.67
Total (Y)			Total	59 418.74	Total	242 743.47	Total	176 076.46	Total	#REF!	Total	#REF!	478 238.67

Part III — Difference between Community's prefinancing (or payment) sent to the coordinator and Total Distribution of the Community's prefinancing (or payment) between contractors according to the consortium decision(s) (4)

	Reporting Period 1	Reporting Period 2	Reporting Period 3	Reporting Period	Final payment	Total Amount
Community's prefinancing (or payment) not yet distributed between contractors (Z) (7)	220581.26	-151324.73	-61332.99	#REF!	#REF!	7923.54

I certify that the information set out in this(these) form(s) is accurate and correct and agreed by all contractors.

Name (8)	Surname (8)	Signature of the administrative official authorised to commit the organisation of the coordinator (8)
Yvon	Le Guen	Yvon LE GUEN Coordinateur du Programme Infrastructures Expérimentales Moyens d'Essais

Explanatory notes

(1): To be filled in only by the Commission services.
(2): Established in conformity with articles 4.2 and 6 of the contract.
(3): (I) = (A) + (B) + (C) + (D) + (E) + (F) + (G) + (H)
(4): To be filled in only by the coordinator.
(5): Insert the dates (dd/mm/yyyy) and the amounts (x,xxx.xx €) transferred to a contractor (including the coordinator) for a reporting period. If there are more than one transfer to a contractor during a reporting period, identify each date and each relating transferred amount.
(6): (I') = (A') + (B') + (C') + (D') + (E') + (F') + (G') + (H')
(7): (Z) = (X) - (Y)
(8): One the following persons : authorised contact person or first or second administrative official authorised to sign the contract, as mentioned in your Contract Preparation Form (Form A2b)

4th Annual Report

V 15/10/2010

METRI 2

Marine Environments Tests and Research Infrastructure - 2

Transnational Access

implemented as

Specific Support Action

Contract number: RITA-CT-2006-026010

Project coordinator: Jack Pichon

Project website: http://www.ifremer.fr/metri/

Reporting period: from 01/03/2009 to 31/08/2010

Project funded by the European Community
under the "Structuring the European Research Area" specific programme

Research Infrastructures Action

Table of contents

Introduction

- **Annual Report**

  The Annual report covers each successive period of 12 months from the contract start date. It is composed of the following parts:

  A. an activity report
  B. a management report (financial information) including:
     - a justification of the resources deployed,
     - the Form C Financial Statement (which may require an Audit certificate if provided for under Article 7.2 of the contract),
  C. a report on the distribution of the community financial contribution,

  The Annual Report was prepared according to the templates (cover page, table of contents, …) given by European Community.

  This report is number 4 and covers the period from march 1st of 2009 to August 31st of 2010 (date of the end of the contract).

  .

A. ACTIVITY REPORT

1. Progress report

1.1. Summary of the activities and major achievements

The project started the 1st of March 2006 as soon as the contract was signed. This Final and fourth report covers the period from the 1st of March 2009 up to the 31st of August 2010 which is the date of the completion of the contract.

During this period the main operations were dedicated to the preparation and the performing of the selected proposals for the period with especially:

- Continuation of actions for the promotion of Metri 2
- Preparation of the remaining selected projects
- Realization of projects selected by the expert panel (session 4)

Globally twenty-nine projects was selected and finally twentyfour were actually perfomed at the end of the contract. They are involving the wave basin of Brest (9 projects), the water circulation of Boulogne/mer (7 projects), the material laboratory of Brest (5 projects)and the hyberbaric testing tanks of Brest (3 projects).

During this last reporting period, ten experimentations or tests were performed at Boulogne-sur-mer and Brest.

1.2. Management overview

During this fourth period the main tasks were management operations consisting especially in:

- Supervising the French company (EGIDE) which is subcontractor for the financing of user access (travel expenses, insurances, subsidences…)
- Still promoting Metri
- Preparing and organizing the infrastructures the activities which were carried out during this last period.

The principle of Metri is to provide free access to five different research facilities of Ifremer. In the frame of the former commissions of project selection, the basins of Boulogne and Brest were mainly concerned (hydrodynamic thematic) with 18 selected projects (14 performed in total). The area of behaviour of material was less represented with 8 select projects (5 finally performed).
During the last commission of selection (Nr4) an effort was done to better promote the other involved facilities (hyperbaric tank, material testing and marine sensor laboratories). Finally 3 projects were selected and performed with the hyperbaric laboratory but no project selected or even submitted for the metrology laboratory.
A difficulty was often encountered in the scheduling of the user access because the facilities are booked by external and internal clients and require being adapted to the user demands. A

continuous effort was done to plan more precisely and more efficiently the access of each user team.
An other point which can be outlined is that 5 proposals which has been selected and prepared were not finally performed due mainly to the lake of availability or concern from the user and despite of a lot of help and assistance from the coordination of the project.
The last difficulty to be outlined was to succeed in programming the activities of all selected projects in order to achieve them before the end of the contract. An extension of time for the completion of the contract was obtained from the EC to September 2010 (previous date was February 2009). This extension have certainly permitted to perform all the selected proposals and to reach a quantity of activities very close to the maximum objective of the contract.

1.3. Description of the publicity concerning the new opportunities for access

Mainly during the year 2007 and 2008, many promotion tasks were carried out for Metri 2. The continuation of these actions were performed also at the beginning 2009. Anyhow in 2009 the amount of received proposals was sufficient to fulfil the requirement of the contract.

They can be considered in various categories as follows:

Metri brochure:
The pamphlet was prepared by a skilled designer for Metri 1, it shows on a 4 pages document (A4 format -strong paper) the five facilities and the access conditions for Metri. It has shown its adaptability for Metri 2 as being clear, well illustrated and suitable to be distributed in various opportunities (visitors to Ifremer, congress, mailing…).

Participation in congress, seminars or exhibitions
Many participations to various manifestations were performed in 2006, 2007 and 2008 (see previous reporting).
In 2009 - 2010 it is noted:

- London – England (March) — Oceanology International O I 2010 Congress
- Barcelona – Spain (June 09) — Hydralab meeting
- Upsala - Sweden(September 2009) — Meeting EWTEC
- La Spezia – Italy (June 2009) — Sea Future exhibition (innovation connected to the sea)

Web site
The web site of Metri was updated in 2009. A continuous updating was also performed during this last period to consider the evolution of the activities.
It is remained closely linked to the Ifremer web site and includes a specific page which precise instructions to applicants. It also describes the progress of works with a description of the performed or selected projects:

http://www.fremer.fr/metri/

1.4. Description of the selection procedure

The selection procedure to select users is conducted according to the conditions of the contract between Ifremer and the E.C.

A **pre-selection** is made at first by the project manager and his Ifremer team to identify proposals which fall out of scope for **technical feasibility**, confidentiality of results, ethic issues…

A **user group selection panel** was constituted to select the user proposals; this panel is composed with a minimum of 6 experts in the field, at least half of them are independent and external to the staff of the infrastructure.
The user group selection panel is in charge of the **evaluation of proposals** and have to rank them in order of priority taking into account the Criteria of eligibility:

- The scientific and technological merit of the intended project
- The community interest for the research project
- Technical feasibility of experimentation in regard of IFREMER facilities

With priority given to:

- The countries where few such Infrastructures exist
- The research teams who have not previously used the Infrastructure.
- The teams integrating young researchers.

Three selection meeting were performed in 2006 and 2007 (see previous reporting), the **fourth and finally the last one took place on September 25th 2008** in Brest with the agenda as for the other meetings of this type:

- Reminder of the role of the selection (expert) panel: Evaluation and ranking of proposals (See enclosed the list in annex 1)
- Reminder of the main lines of METRI project:
- Presentation of Ifremer facilities dedicated to METRI:
    - Deep wave pool of Brest
    - Water circulation flume tank of Boulogne/mer
    - Hyperbaric testing tanks
    - Laboratory for evaluation and calibration of marine sensor
    - Laboratory for testing of behaviour and ageing of materials
- Pre-selection and review of proposed projects regarding contract conditions
- Review of the project regarding technical and scientific matters (see previous report)
- Conclusion – recommendation – ranking of the projects (see hereunder table)
- Visit of Ifremer Brest Infrastructure dedicated to METRI (laboratories, basins…)

A detailed report showing all presentations, discussions and conclusion was drawn up and sent to the EC officer in Brussels

1.5. Transnational Access activity

During the period of this last Annual report (from March 2009 up to September 2010), 10 projects were performed at the research facilities of Ifremer:

- Four in the wave basin of Brest
    - NTUA 2
    - TSC 2
    - Tidalstream
    - IST-Lisboa
- One in the water circulation basin of Boulogne/mer
    - Cranfield 2
- One in the hyperbaric laboratory
    - MSG

- Four in the material laboratory of Brest
  - MAMK

  With the second phase of 3 projects (1st phase already described in AR3)
  - FEUP
  - Future Fibre;
  - Bexco

A brief description of each project is given here under (see also database):

MSG –Marine Subsea Group - Norway

Measurement of Elastic buoyancy loss and water absorption of full size buoyancy module

Daniel Viklund (16-21/11/09)
Ekaterina Popova (15-21/3/09)
performed in the hyperbaric laboratory of Brest

Background

Marine Subsea Group AS delivers subsea buoyancy that are permanently installed (for the lifetime of the installation – typically 15 to 30 years) on cables and pipelines related to offshore subsea installations used for oil and gas exploration and production. Our buoyancy products are based on composite syntactic foams, where micro glass bubbles are incorporated in a petroleum wax or an epoxy base material.

Such subsea buoyancy will, through several mechanisms, have some loss of buoyancy during their life time. Excessive buoyancy losses could lead to a pipeline installation being used outside its design envelope, with as a potential consequence loss of system integrity, pipeline ruptures etc.

Avoiding excessive buoyancy losses is done by:
- choice of materials
- well-controlled manufacturing processes
- testing to demonstrate conformity to agreed specifications

Typical testing schemes could involve applying 110% of design hydrostatic pressure to as much as 5% of manufactured products for a period of 24 hours.

Such tests involve have several inconveniences:

1. Installations for full-scale (on "live size" products) hydrostatic testing are very expensive. Products are typically bulky (more than 1 cubic meter, weighing hundreds of kilograms), meaning that out-of-house testing is expensive. This implies that existing companies with hydrostatic facilities available have an significant advantage compared to a new company that seeks to enter this market.
2. In order to estimate behaviour over life time, it is common practise to plot buoyancy loss in a diagram with log(time) on the abscissa axes (long term buoyancy loss approaches a straight line in such a diagram), and extrapolate from test results taken over few days. Such long extrapolations means that the accuracy of the measurement data must be very high, and the measurement period as long as possible.
3. Longer term test (several weeks) is inconvenient and costly when test samples are full product-size.

A theoretical investigation into the loss mechanisms shows that there are two dominating effects:

1) Elastic and plastic volume loss due to the hydrostatic pressure. This is a "bulk" effect, directly function of the volume of the tested sample. This mechanism is relatively rapid, assumed stabilised within 24 hours.
2) Loss du to surface water ingression.
   On a microscopic level, the two main components of the syntactic foam (base material and micro glass bubbles) have no molecular bindings. This means that the hydrostatic water pressure is able to enter into such interfaces at the exposed area (external surface). A small fraction of the glass bubbles will inevitably be entirely or partly damaged during the manufacturing processes, they will break as the water pressure reaches them. As this mechanism slowly propagates inwards from buoy surface towards buoy centre, through microscopic glass bubble surface voids, it slows down exponentially. However, this is clearly a "surface phenomenon", the absolute loss being a direct function of the buoy surface area exposed to the hydrostatic pressure.

Effect 1) here above is a volume effect and 2) is a surface effect. Compared to a full-scale buoy, a downsized test sample (some litres) can be shown to have a significantly larger surface-to-volume ratio. Based on this, it can be shown theoretically that hydrostatic testing on such a down-sized sample buoy constitutes a conservative way of estimating long-term hydrostatic losses, and at a fraction of the cost.

The objective of our project proposed for METRI is to perform practical tests that demonstrate these effects, with the objective of being used as documentation justifying towards our customers that testing of down-scaled samples is technically at least as good as a full-scale test – and at a fraction of the cost.

Proposed test program

Part 1.

A method to estimate analytically the elastic buoyancy loss under hydrostatic pressure of a buoyant core is to calculate the relative volume diminution given by P/K (where P is the hyperbaric pressure and K the bulk modulus of the core).
The first part of the project would be to verify this expression experimentally for wax and epoxy based buoyant cores.

Part 2

The surface of any syntactic foam float is covered with a multitude of cracks which gradually absorb water when exposed to hydrostatic pressure. The weight gain is primary a surface phenomenon and consequently the water absorption rate is influenced by the area-to-volume ratio of the buoy. The second part of the project would be to evaluate, for both wax and epoxy based foams, the area-to-volume influence by testing simultaneously a full scale and a down-sized float during two weeks.

Performed test

The tests was implemented in order to increase our knowledge about:

1. Syntactic foam matrix elasticity properties
2. Syntactic foam matrix long-term water buoyancy loss
3. Get experimental confirmation that the test for down-scale testing will return buoys provides conservative results compared to full-scale testing (which we are not equipped)

Test samples:

Two materials were tested:

1. Epoxy syntactic matrix for 1000 msw
2. Wax syntactic matrix for 500 msw

For each material was made large and small sample, total four samples:

1. Epoxy big sample
2. Epoxy small sample
3. Wax big sample
   Wax small sample

Investigations:

Wax

- Test - duration 100 / 120 hours
- Large sample have less buoyancy loss than small sample
- Buoyancy loss is very large at the end of the test:
  - Big sample 7,5%
  - Small sample 9,5%
- Buoyancy loss of samples increase with the pressure increase, test shown large losses already at small pressure - particularly for the small sample:
  - Small sample 2% loss at 1 bar
    6% loss at 10 bar
  - Big sample ca 0.4% loss at 8 bar
    ca 0,7% loss at 20 bar

Epoxy

- Test duration ca 24 timer
- Big sample has large buoyancy loss than small sample (not expected)
- Measurements of small sample given strange results:
  - Measuring curve given general positive slope towards the end of the measurements
  - Large buoyancy improvement about an hour before the test ends - taps measurements jumps from about -2% to about -1%
  - The measurements are given compatible results with known physical effects of the buoyancy element

Conclusion:

- Measuring the results of the wax-based buoyancy elements is so bad that we must assume that there is something wrong with the samples. The error must be found, new samples are made and measurements re-taken
- Measurements of Small epoxy – based buoyancy element seems to have been subject to errors in the measurement setup. The measurements are therefore worthless. New sample must be made of the same material, and measurements must be repeated (can be done at MSG)
- Measurement of big epoxy- buoyancy element:
  - Elasticity properties of 1000 msw epoxy-based buoyancy element - is very good
  - Short-term buoyancy loss effects are stable during the less than 10 hours
  - The development of buoyancy loss shows right curve when plotted as a log (time) diagram.
  - Characteristics measured on 1000 msw syntactic material are:
    - Short – time (<24 hours) <2%
    - Long – time over 30 years <1%
    - Total buoyancy loss <3%

NTUA2 - School of Naval Architecture and Marine Engineering - Athens
Wave current interaction with vertical cylinders
Spyros Mavrakos (Team leader)
Thomas Mazarakos
Dionisos Synekos
Performed in the wave basin of Brest (11-15/5/09)

Project description and type of work to be carried out

The project aims at carrying out measurements concerning the interaction of arrays of circular cylinders in a combined waves and current field. The novelty of the project is the consideration of moderate current velocities that will correspond to relatively high Strouhal numbers, approx. ¼. The previous value is the upper limit below which most probably no flow separation occurs. This requirement is of particular importance for large volume marine structures often used in offshore installations. Nevertheless, this should be confirmed during the experiments. If no flow separation occurs, then for the theoretical formulation of the associated problem, potential theory can be employed. The members of the group have recently developed a solution method that accounts for large current velocities or equivalently for moderate forward speeds of a circular cylinder moving in an incoming wave field. The numerical predictions are very encouraging and they confirm the formation of V waves for relatively high current velocities in the area of $\tau=U\omega/g\approx 1/4$ where U, ω and g respectively stand for the current velocity, the wave frequency of encounter and the acceleration due to gravity. What it is missing is the confirmation that no flow separation occurs. The method is based on potential theory and accounts for higher order components of the velocity of the current. It should be noted that the problem of the interaction of a structure with waves and current is equivalent to that which assumes incoming waves and structure's forward speed. According to what is known to the members of the group who make the present proposal, there is no work reported in the literature that considers relatively high forward speeds of vertical cylinders moving in a wave field. The objectives of the project shall be:

1. The evaluation of the corrections that the higher order velocity terms $O(\tau^2)$ imply on the total hydrodynamic loading. Special attention will be given to the evaluation of the mean – second – order drift forces on the cylinders in dependence from the current and / or structure velocity.

2. The confirmation of the occurrence of V waves and the determination of the wave run-up on the structure.
3. The investigation of the conditions under which flow separation occurs.

With regard to the last objective, the non occurrence of flow separation was claimed and partly documented by the pioneers on this subject Zhao et al. (1988) and Zhao and Faltinsen (1988). The methods that have been proposed for treating the wave/current/structure interaction problem are based mainly on the calculation of Green's function which basically describes the free surface flow.

In this context, Zao and Faltinsen (1989) used a hybrid method based on matching a local solution in the inner domain to a far-filed solution in the outer domain. The work of Zao and Faltinsen (1989) was extended thereafter by Bratland (1995) who considered the case of finite water depth. Another approach consisting of using the free surface wave Green function has been developed by Huijsmans and Hermans (1985), Wu and Eatock Taylor (1990), Nossen et al. (1991), Emmerhoff and Sclavounos (1992), Bannister (1993), Malenica et al. (1995). These studies use a perturbation expansion of the Green function and of the velocity potential with respect to the Strouhal number τ. Noblesse and Chen (1995) performed an analysis of the free surface potential for general dispersive waves which yields a formal decomposition of the Fourier representation of the free surface effects into a wave component given by a simple integral along the dispersion curves and a local near filed flow component. The application of this analysis at small τ yields a simple expression for the Green function that is uniformly valid in space. This expression for Green function was used thereafter by Chen and Malenica (1996) and (1998) who estimated the interaction effects of a local steady flow on the wave diffraction-radiation at low forward speed.

Examples of studies on the same subject that treat the problem fully numerically are those due to Kim et al. (1998), Kim and Kim (1997) and Büchmann et al. (1998). Kim et al. (1998) approached the three dimensional problem numerically in a "numerical wave tank" by applying a boundary integral equation method and mixed Eulerian-Lagragian time matching scheme. Kim and Kim (1997) used a time domain higher order boundary element method to compute the spatial derivatives of velocity potentials. Finally Büchmann et al. (1998) investigated the run-up on a bottom mounted vertical circular cylinder due to waves and current. The solution they provided accounts for second-order wave effects and linear current.

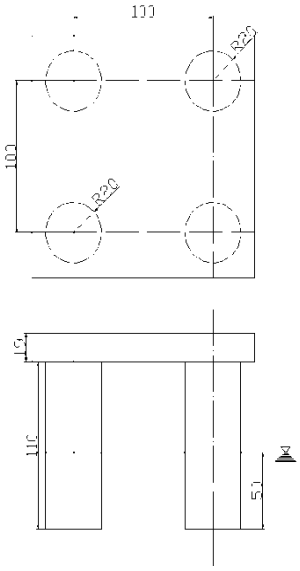
It is evident that the problem is both interesting and difficult. The members of the group have available the numerical tools for predicting the details of the specific phenomenon and they wish to validate their results by accessing a well equipped and powerful infrastructure. They propose to conduct measurements on isolated cylinders as well as on arrays of cylinders. The action of the current will be simulated by having the carriage of the basin moving relatively to the wave field. Several wave heights and wave periods will be considered while the Strouhal number will be taken in the range 0-1/4 by controlling the Froude number. The measurements during the experiments will concern the hydrodynamic loading in head and following regular seas (exciting forces and moments and drift forces), the wave run-up on the structure, and if possible the wave elevations in a reasonable distance near the structure. The formation of V waves will be inspected visually and will be recorded with a camera. With regard to the flow separation the group relies on the capabilities and the equipment of the basin.

Scope of the experimental compaign

The project aimed at carrying out measurements concerning the interaction of arrays of circular cylinders in a combined waves and current field. A four cylinder configuration has

been considered, a schematic representation of which together with its inertia characteristics is shown in Fig. 1. The water depth was 10m.

Characteristics	Design
Weight, outside the water [Kg]	160
Displacement Δ, [Kg]	257.611
Cylinder height [m]	1.10
Diameter [m]	0.40
Draught [m]	0.50



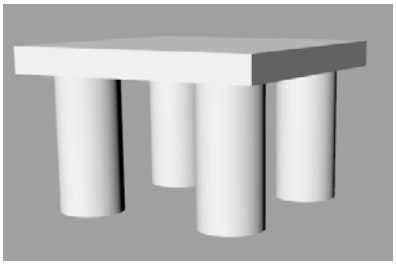


Fig. 1: Schematic and physical representation of the four cylinder configuration

In Figure 2 the IFREMER basin with the model mounded on the carriage is shown.

Fig. 2: Model mounded on the carriage in IFREMER Wave Tank.

The experimental campaign included measurements in regular waves on the restrained four cylinder configuration as well as under the combined action of regular waves and low-forward speed of the arrangement. First- and second – order wave loading (mean drift and time-dependent second – order components) was measured, together with the wave elevation at specific locations on the wetted surface of the cylinders (wave run – up) and in the gap between them. Two wave angles were considered at 0^0 and 45^0.

The matrix of the experimentally investigated wave conditions are presented in the following table:

Table 1: Matrix of the carried out experiments (please check and update accordingly)

T(s)	Hmax (m)	ω (rad/s)	ka	U<0.25g/ω (m/s)
1	0.15	6.28	1.0061	0.3903
1.5	0.35	4.188	0.4471	0.5855
2	0.55	3.14	0.2515	0.7807
2.5	0.55	2.51	0.1610	0.9758
3	0.48	2.0944	0.1118	1.1710

The experimental results were compared with numerical predictions concerning first- and mean second – order excitations at zero and the small forward speed. Two methods have been used for the numerical evaluation of the first- and the mean-second order hydrodynamic characteristics of the examined configuration. The first allows an exact analytic representation of the velocity potential around each cylinder in the array. It is based on the single cylinder hydrodynamic properties and makes use of the physical idea of multiple scattering to account for the hydrodynamic interactions among the multi – cylinder configuration (Mavrakos and Koumoutsakos, 1987; Mavrakos, 1991). The single body hydrodynamic characteristics have been obtained using the method of matched axisymmetric eigenfunction expansions (Kokkinowrachos et al., 1986). Hereby, the mean drift loads are calculated using the momentum conservation principle in properly defined control volumes surrounding each member of the multi component configuration (Mavrakos, 1988, 1995). The method has been further expanded to calculate the time – dependent quadratic transfer functions of the second-order sum – and difference – frequency wave loading on a single vertical body of revolution restrained in waves (Mavrakos and Peponis, 1992).
The second method that has been used to analyze the multi-cylinder-wave interaction is based on a panel method, according to which the wave potential around the multi-body configuration can be represented as a superposition of pulsating sink and sources uniformly distributed (low – order panel method) on panels distributed on the wetted surface of the body (Mavrakos and Bardis, 1984). A representative discretization of the wetted surface of the body through panels is show in Fig. 3. The mean drift forces are calculated using the direct integration method that account of all pressure contribution giving rise to second – order excitations.

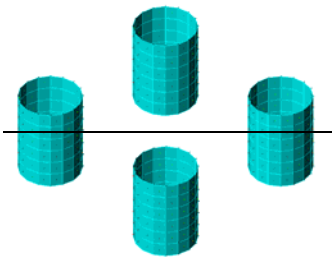


Fig.3: Panel discretization of the four cylinder configuration

Representative comparisons between numerical predictions and experimental data for the restrained four cylinder configuration are given in the following Figures 4 – 9 (Mavrakos et al., 2010). They are dealing with the first-order horizontal and vertical exciting wave forces (Figs. 4, 5), the horizontal and vertical mean drift loads in regular waves (Figs. 6, 7) and the wave elevation at a specific point on the wetted surface of the body (Figs. 8, 9).
The evaluation of the mean drift loads on the advancing model at small forward speed means from the theoretical point of view solving a low speed diffraction-radiation problem and deriving the added resistance, which, by implementing a Taylor expansion, can be written to a leading order in the forward speed U as:

$$F_d(U,w) = F_d(0,w) - B(w)\times U + 0(U^2) \qquad (1)$$

where B is the wave drift damping component. By considering Eq. (1), it is obvious that for the evaluation of the wave drift damping at low forward speed of the body, it is required its zero-speed counterpart and the evaluation of the wave drift damping component. The last is evaluated following the heuristic formula proposed by Arahna (1994) and Clark et al. (1993). According to their formulation it holds:

$$B(\omega,\beta) = -\frac{\partial F_d}{\partial U} = \frac{\omega}{g}[\omega\cos\beta\frac{\partial}{\partial\omega} - 2\sin\beta\frac{\partial}{\partial\beta} + 4\cos\beta]\cdot F_d\ (\omega,\beta) \qquad (2)$$

Where $F_d(\omega,\beta)$ is the zero-speed wave drift force. Figure 10 shows comparisons between numerical predictions and experimental data concerning the mean drift loads on the four cylinder configuration at small forward speed. Also in this case the numerical predictions compare very well with the experimental data.

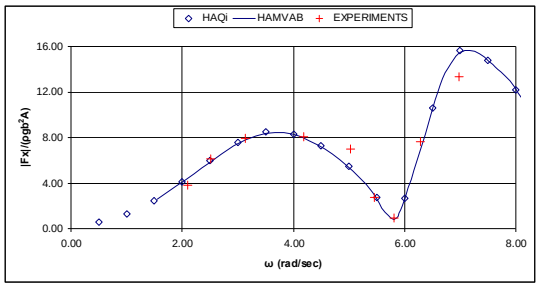


Fig. 4: Modulus of the horizontal first-order exciting wave force

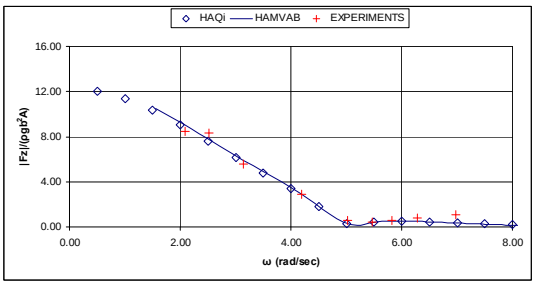


Fig. 5: Modulus of the vertical first-order exciting wave force

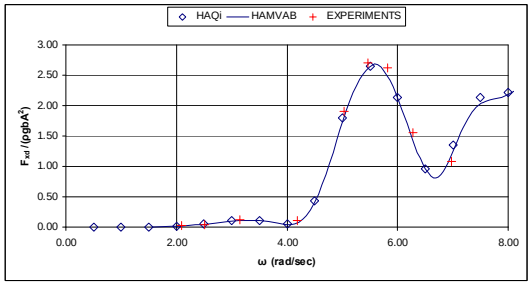


Fig. 6: Mean second -order horizontal wave drift force at zero forward speed

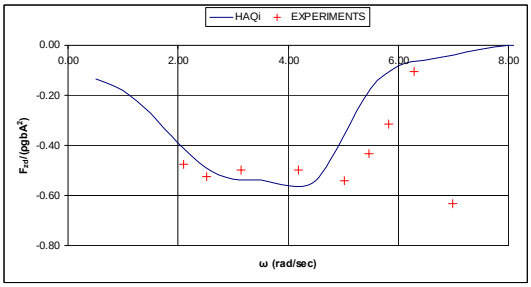


Fig. 7: Mean second – order vertical wave drift force at zero forward speed

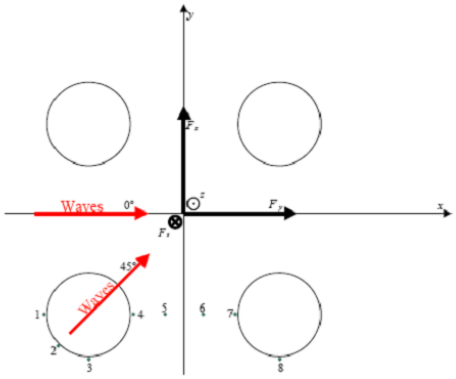


Fig.8: Schematic representation of the locations wave wave elevations were measured

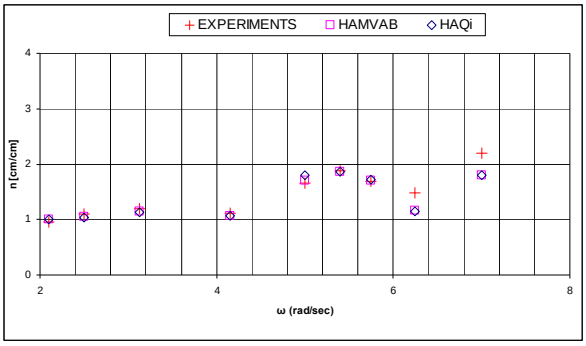


Fig.9: Wave elevation at point 1, angle of attack 0^0 deg.

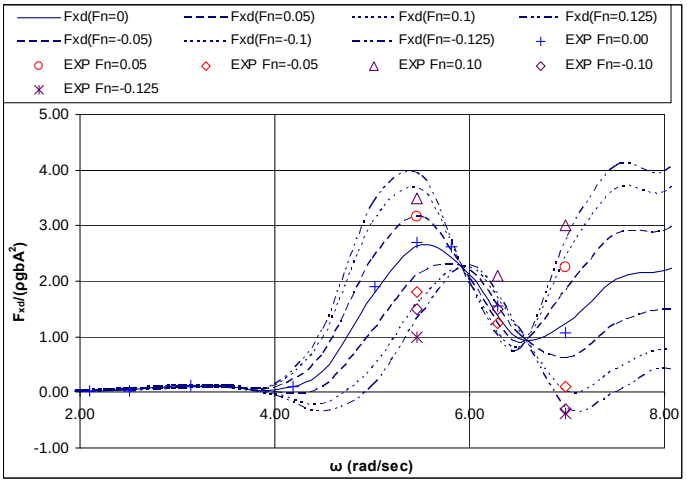


Fig.10: Mean second -order horizontal wave drift force at various forward speeds

Cranfield 2 - the offshore Engineering & Naval Architecture Group of Cranfield University

Reduced scale testing of a slow rotating turbine for performance evaluation of a Tidal EnergyConverter and visualization of flow interaction between three turbines in a Delta configuration. (Model Testing of the Tidal Energy Converter "DeltaStream")

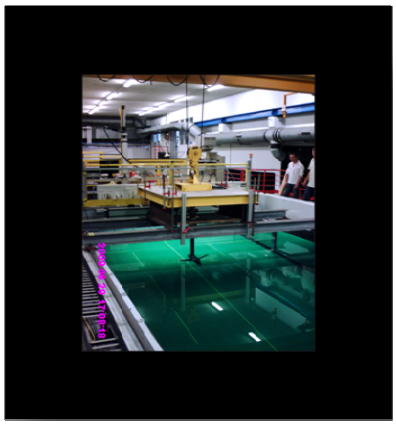
Florent Trarieux (Team leader)
Baptiste Elie

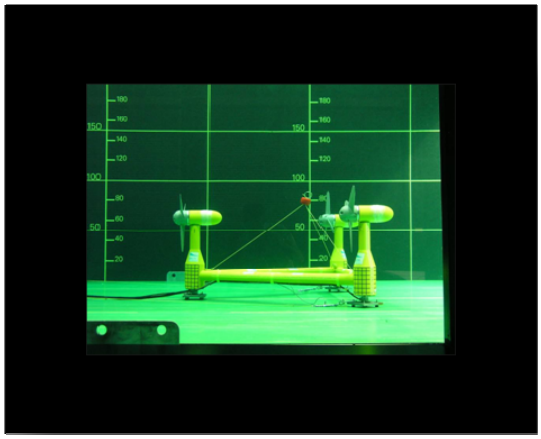
Performed in the flume of Boulogne/mer, (29/6 – 10/7/09)

The United Kingdom has one of the largest potential in Europe in marine renewable energy (Wind, Tidal and Wave), and has become one of the leading countries worldwide in the development of marine renewable energy concepts (Wind Farms, Tidal and Wave devices). Cranfield University, located in Bedfordshire, is currently involved in the performance modeling, turbine design and structural design of the tidal energy converter "DeltaStream" for Tidal Energy Ltd (TEL) based in Cardiff, Wales, UK.The DeltaStream device is a nominal 1.2MW unit which sits on the seabed without the need for a positive anchoring system, generating electricity from three separate horizontal axis turbines mounted on a common frame. The use of three turbines on a single, circa 30m wide, triangular frame produces a low centre of gravity enabling the device to satisfy its structural stability requirements including the avoidance of overturning and sliding.

In the frame of the European Program "METRI" for trans-national access of facilities in Ocean Engineering, Cranfield University was offered a contract to test this Tidal Energy Converter in the IFREMER Water Circulation Channel of Boulogne-sur-mer. A total of 257

tests were carried out between Monday 29 June and Friday 10 July 2009 on a 1/20th single turbine model and on a 1/30th device model. The main outcome of this testing campaign has been the confirmation of the behaviour of the turbine in terms of power and thrust as predicted by previous analytical and CFD work. Flow visualisation using Laser Doppler Velocimetry has shown the extent of the wake for a range of flow velocities and power off-take. It has been confirmed that no influence between turbines was happening for the range of loads applied to the generator.





MAMK – University of Mikeli – Finland

Damage tolerance study of injected DCPD matrix for marine applications
Jukka Ruuskanen (19-25/7/09 and 22-28/11/09)
Tommi Berg (19-25/7/09)
Performed in the laboratory of materials of Brest in July and November 2009

Project description

The project goal is to empirically detect the damage tolerance of injected DCPD matrix composites marine structures, compare their damage resistance with classic matrix and hand-laminated reference materials, and to conclude on the reasons for differences in behaviour. The scientific background of the study lies in previous studies performed at IFREMER and reported in journal articles and in Dr. Yves Perrot's PhD work. The composite material samples used in these previous studies were hand-laminated in open moulds, while the boat industry is moving on to use closed mould vacuum infusion technologies to achieve better composite quality, healthier working environment and improved environmental safety. Therefore, it would be beneficial to expand the study scope to injected laminates and directed

woven fabric products to have relevant information of the possible different damage tolerance and behaviour of injection manufactured composites. The industrial partners for the project include Ashland Finland, Ahstrom Glassfibre and Finnish boatbuilding SMEs, so the composite materials, chemistry, sizing and manufacturing background information represent state-of-the-art knowledge.

Work and results (1st week)

Three different test methods were explored during this week. At first we practiced tensile testing with acoustic emission monitoring. We have carried out tensile testing in Finland but this acoustic emission was new technology for us. The purpose of acoustic emission is to get information about the start of internal damage of specimens during tensile tests. Secondly we studied impact tests performance. During impact testing, an instrumented mass object is being dropped on the surface ofa part and delaminated area is inspected with ultrasonic scanning. Also in addition to acoustic emission and impact tests, we carried out DCB- (Double Cantilever Beam) testing. The purpose of DCB-tests is to measure energy which is needed for crack propagation inside a test specimen which is provided with an initial interlaminar crack. In addition to tests, we studied some related theory issues on composite structures and result analysis.

Work and results (2nd week)

For the second visit at Ifremer and during the week, the project team continued the studies we started in July 2009.

During the week, tests were carried out both with acoustic emission monitoring and impact testing. We prepared some new composite test specimens in Finland with new reinforcement structures and we studied the effect of reinforcement structure for damage tolerance as measured with these testing methods. In July, the main objective was to get familiar with the testing. Now we made some iterations and in addition to material properties, we obtained information about the reliability of the testing system. Ifremer has lot of experience about the material testing of composite structures which are used in Marine industry. It was natural to continue this project with Ifremer in order that we can exploit their knowledge in our boat industry research projects in Finland.

We started our week with a brief look at our objectives with the study. The first test we carried out was tensile test with acoustic emission monitoring. We had seven test series with three different kinds of reinforcement structures and with five different kinds of resins. The impact testing was carried out by the aid of Ifremer's laboratory staff and it took much time with necessary ultrasonic scanning before and after the test. For the impact test, we had six series to be tested with three different kinds of reinforcement structures and with five different kinds of resins.

Picture. Adjustment of the impact test device.

In addition to the testing, we had time to take a look about the results together. It was rewarding to get some advice for analyzing the results. It helped to make the right conclusions.

TSC 2 – Technical Software Consultants Ltd – SME

Deepwater weld inspection technology
David Topp (Team leader)
Sylvain Cornu
Performed in the wave basin of Brest in January 2009 (25-30/01/09)

TSC are developers of several unique technologies for use underwater. TSC's StressProbe is a novel technique for measuring the stress in steel components and is under evaluation for a number of applications in the oil and gas industry, particularly subsea. This technology is novel and unique to TSC.
The offshore industry is suffering a number of mooring failures on permanently moored structures. Measurement of the load on a mooring chain is difficult and usually involves inserting something into the mooring line load path (like a load cell). TSCs StressProbe can be retrofitted to the outside of a mooring chain without affecting the mooring in any way. Tests to date, using divers offshore, has proved the capability of this technology to measure mooring line tension variations in large offshore chain moorings. This is important for assessing mooring behaviour and indeed whether the line has actually failed.
For long term monitoring it is impractical to run cables from the mooring sensor on the chain to the vessel, so TSC are proposing the installation of an autonomous subsea system which can then communicate with the vessel via an acoustic data link. There are several problems, including the power required from the battery and the fact that the vessel rotates around the mooring and so the sensor and receiver are continuously moving relative to each other. As the vessel moves, so other moorings lines, and risers, will be positioned between the sensor and receiver.
TSC have received interest in this application from BP and plan to build a prototype acoustic data link specifically suited to this application (shallow water depth and omni directional). This project will assess different prototype sensor/receiver configurations, with simulated obstacles (mooring chains and risers) in different positions. The objective is to determine optimum positions for the sensor and receiver, in order to minimise interference from other items, and to assess data quality, integrity and range at different power settings. This will also allow detailed battery design parameters to be established.
The work has been carried out in the large seawater tank using vertical, diagonal and horizontal transmission through both the 10m and 20m sections. Sections of real mooring

chain will be used to assess any signal shielding and any influences on data distortion or corruption.

TIDALSTREAM – Feldon Ltd – SME (UK)

Stability of a Free-Floating Six Rotor Tidal Current Turbine

John Armstrong
Mike Todman

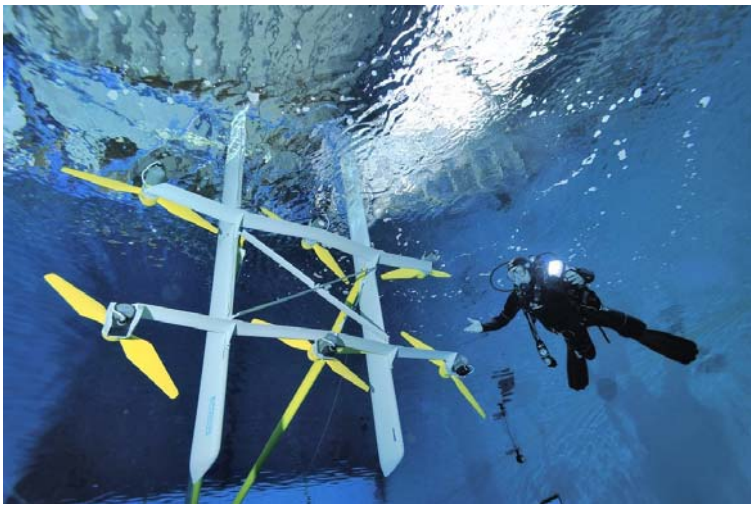
Performed in the wave basin of Brest (10/5-1/5/09)

Project description

The Project is aimed at gaining a deeper understanding of a new method for extracting tidal energy in a very cost effective and efficient way. The best tidal resources around Europe are at depths varying between 30 and 100 metres, with most at 60m deep or more. The TSP TidalStream system is specifically designed for these depths and can be towed to a site, deployed, operated, maintained, and retrieved without specialist crane-ships, jack-ups or divers. It is a semi-submersible structure that can be towed on the surface like a ship, then when water-ballasted translates its orientation to a vertical operating position. It can support multiple horizontal axis turbines and is free to swing and follow the tide direction while being tethered to the seabed by a rigid articulated arm. The turbine is also free to pitch and roll under the control of its inbuilt buoyancy system.

Triton 1 / 23rd Scale Model Tow -Testing Report

Triton is a semi-submersible plat form with the capacity to carry up to 6 tidal turbines of total capacity 10MW in strong cur rent flows in up to 100m water depth.
This series of test s was conducted in April 2009 in the 50m Deep Testing Basin in Ifremer, Brest as part of a project to establish the feasibility of the TidalStream Triton 6- rotor tidal turbine concept .The main purpose of the testing was to establish the operating and sea-keeping stability of the Triton structure and turbines, and validate theoretical models built by TidalStream predicting the generating and sea- keeping performance of the Triton turbine.



Set-up

The Triton 1/ 23rd scale model was towed behind the Deep Basin gantry by a vertical dagger board hinged to the side of the gantry — see Figure 1 below — and held in place by a cable attached to the gantry via a 3-axis flexible joint and load-measuring transducer . In this view Triton is shown in it s tow-out posit ion, which also serves for maintenance. Roll, pitch and

yaw were t racked by a video-metric device using twin video cameras to derive the angular movement of the model through a 4- image frame attached to its upper part (see Figure 2 above, where Triton has been ballasted into it s operating position) .

Results

Power & Drag vs Flow Speed

Measures power t races for six turbines against a run time of about one minute. The measured power for the rated 0.65 m/ s tow speed was in good agreement with predicted power levels. Measured structural drag levels were also in good agreement with predicted levels.

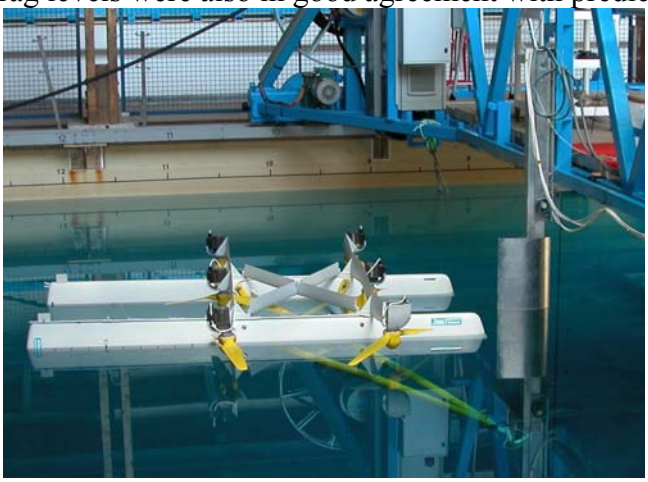


Figure 1 : Triton in Maintenance Position showing 2.3m deep tow blade connection

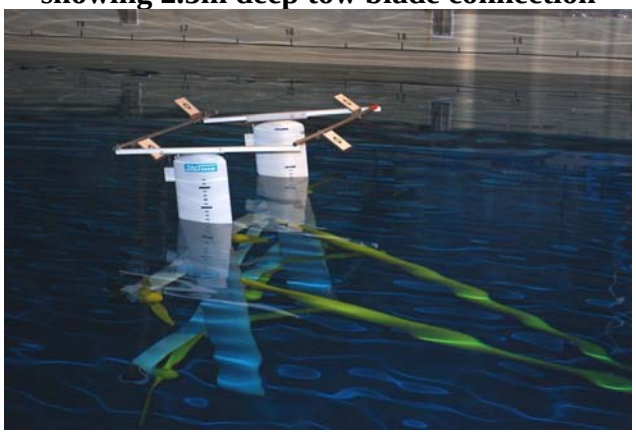
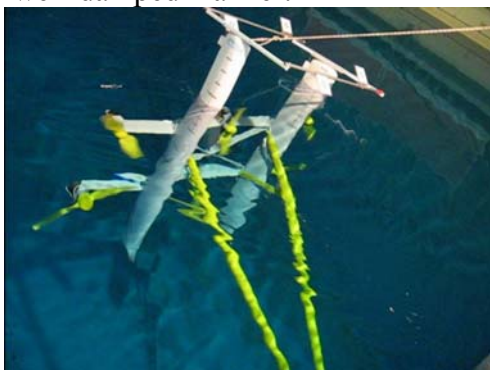


Figure 2 : Triton in operating posit ion showing frame for video position sensing

Operating position stability was established by pull-off tests; see Figures 4 & 5 below. In these test s, roll, pitch and yaw displacement s were applied manually from the tow gantry by pulling over the top of the spar buoy (see Figure) . The response of the system in this position can be seen from Figure bellow, where roll, pitch and yaw rapidly return to their neutral positions in a clearly well-damped manner.



A number of **fault cases** were tested at rated flow speed (0.65 m/ s) to ensure the stability of the turbine under various cases of single or even double fault event s. These demonstrated that Triton could be operated stably with one and even two turbines stopped, with compensating ballasting bringing the remaining rotors back into good flow alignment .
Triton also continued operating stably with the loss of one rotor blade, and under conditions of grid loss and rotor overspeed.
Performance in **waves** was observed and recorded. Figure 6 below shows the turbine generating power in 40cm waves. The response of Triton was well attenuated and damped. The response shows the expected strong variations in both thrust and power produced by the orbital flow generated by these except ional waves. I t is interesting to note that the upper row of turbines produce larger power fluctuations (0 — 200%) than the lower row (50— 150%) which see lower orbital flows from the waves. The overall thrust load is as expected in the 50 - 150% range of values. The **Maintenance Position** stability was established by towing Triton at up to 1 m/ s in waves and during pull-off test s, as for the Operating Posit ion. In Figure 8 below, the movement in even 15cm waves is small. In Figure 9, pull-off displacement s are rapidly damped.
The **transition** from Operating to Maintenance Posit ion and back is carried out by buoyancy control — by pumping ballast water out of or into the main spar chambers that form the structural

Conclusions
1. The test s of the 1/ 23rd scale TidalStream Triton model show the configuration to be highly stable in both operating and maintenance posit ions.
2. The rotor s conformed to theoretical predict ions of power and thrust .
3. Fault case simulation involving load loss, overspeed or blade loss showed the turbine to be highly adaptable in that normal operating conditions could be maintained after reballasting. Under single and even double fault conditions it would be possible to continue generating.
4. The response to extreme wave loading was excellent, with Triton pitching by typically one third of the wave peak- t rough amplitude.
5. The turbine in the maintenance position showed good stability even at high flow rate and in moderate waves.
6. Transit ions under buoyancy control from operating to maintenance posit ions and back were carried out successfully under a range of flow and wave conditions.
7. Test s with a moored scale workboat demonstrated the feasibility of maintenance position rotor-generator removal. Under wave conditions the turbine is much more stable than the workboat , and the limitation on lifting tasks will be the sea-keeping ability of the workboat and the mot ion- following capability of it s crane.

IST – Instituto Tecnico Lisboa (Pt)

Hydrodynamic assessment of a floating wave energy converter
Nuno Fonseca (team leader)
Sergio Ribeiro
Joao Pessoa
Performed in the wave basin of Brest (19/45-1/5/2010)

Objectives

The experimental program consists on testing a scaled model of a wave energy converter (WEC) in regular and irregular waves. The objectives are:

(a) **Assessment of the hydrodynamic behaviour and of the capture width as function of the** wave frequency and wave height;

(b) Assessment of the dynamic behaviour of the mooring system and its influence on the capture width;
(c) Characterize the extreme loads on the mooring system (?);
(d) Obtain experimental data to support the development of a hydrodynamic numerical model of the wave energy converter (WEC).

Testing of a WEC based on water oscillating in a U tank.
A concept of a Wave Energy Converter has been developed by IST (Instituto Superior Tecnico) based on a floating body with a U tank filled with water. The amount of water accounts for 40% of the floater displacement. The surge, heave and pitch motion of the floating body coupled to the water oscillating in the U tube induce an oscillating air flow on the upper part of the U tank from one branch to the other through a circular tube. The aim of the device is to capture the air flow energy through a turbine.

The linear dynamics of the system is represented in the frequency domain by a set of four coupled differential equations of motion (surge, heave and pitch motions of the floater, plus the motion of the water in the tank). The absorption of wave energy is proportional to the relative velocity of the water inside the tank. The wave-floater interaction problem is solved by a Green function panel method, while the motion of the water in the tank is modeled by a simplified method based on the integration of the one-dimensional Euler equation. This approximate solution is validated by full 3D potential flow calculations including the hydrodynamics of the internal tanks..

The natural period of the water in the U tank (circa 1.25 s) and of the resulting floating body natural pitch period (circa 1.9 s) were separated in such a way that the tank could not act as a stabilising device, but on the contrary could magnify the motions amplitudes.

Wave tank testing at Ifremer
Wave tank testing of a 1/16 scale model of the wave energy converter has been performed at Ifremer in the ocean engineering basin. The objectives of the experimental program consist on: (a) characterize the dynamic behaviour of the oscillating water column in the U tank, (b) obtain experimental data to validate, or improve, the hydrodynamic numerical model of the wave energy converter. The main dimensions of the model are: length = 1.25 m, width = 0.937 m, height = 0.75 m, draft = 0.3125 m.
The model was moored with four lines based on linear springs ensuring a low natural frequency in surge, sway and yaw.
The model was fitted with:

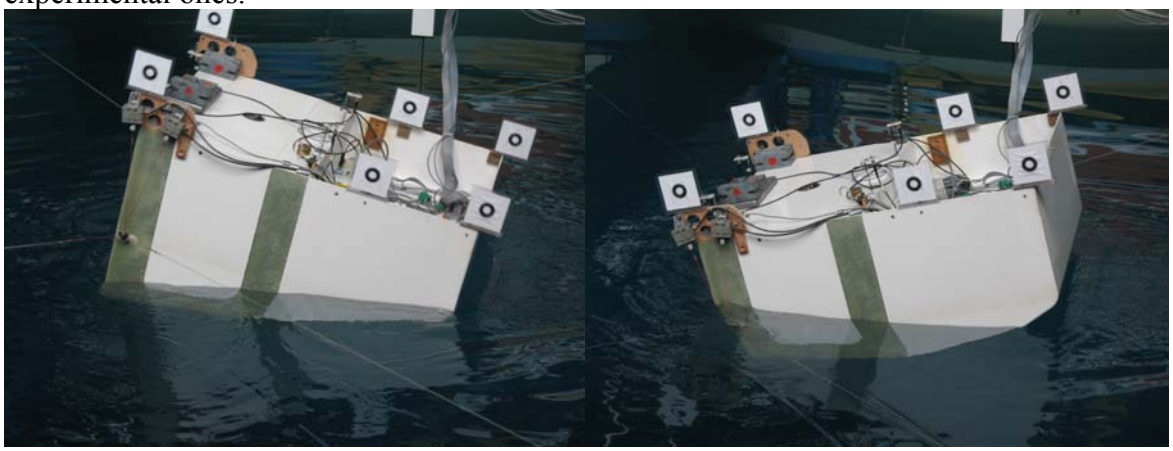
- force sensors connected to the mooring lines;
- pressure sensors, one on the top of each U tank branch;
- internal free surface sensors, two in each branch;
- targets for video tracking.

Several sensors recorded the incident and disturbed waves.
Various tests were run, namely:

- decay tests in order to evaluate the natural periods of oscillation and damping level: pitch oscillation on the ground in order to evaluate the natural frequency of the water oscillating in the U tank, surge and pitch oscillation of the coupled system in calm water;
- regular and irregular waves in order to evaluate the transfer functions on various sea states (period and height).

The power capture was simulated by a grid installed in the horizontal tube connecting the two upper parts of the U tank in order to induce a pressure loss. Three levels of pressure loss and associated damping were simulated: open tube and two different holes arrangements.
The analysis of the transfer functions show two distinct responses around the natural pitch period of the floating body and around the internal U tank water oscillation natural period.

Some preliminary conclusions confirm the four modes of motion are strongly coupled, as predicted by the numerical model, which is essential since the objective is to extract the wave energy from the different modes of motion of the floater. Oscillations of the water column in the first mode of motion of the tank were clearly identified, therefore showing the potential to absorb wave energy from this motion.
Comparisons with numerical results show that the dynamic behavior of the coupled system is qualitatively well represented by the numerical model, although the damping of the pitch motion and of the motion of the water in the tank are more damped than the potential flow predictions. At this stage, the mean wave power captured in regular waves is estimated with the numerical model by tuning the numerical motion responses amplitudes to fit well with the experimental ones.



Model in motion - The green-gray area shows the location of the U tank.

The three following activities have been initiated during the previous period (AR3). A second phase of testing or experimentation was performed during AR4 period. This concerns FEUP, Future Fibre and Bexco

FEUP - Faculty of Engineering - University of Porto (Portugal).

Characterization of adhesives under hydrostatic pressure
Lucas Da Silva (Team leader)
Fabio Texeira
performed in the material laboratory of Brest (25-28/4/2010)

The purpose of the project was to investigate the behaviour of adhesively bonded joints under marine conditions, especially under the influence of hydrostatic pressure in sea water.
A second test campaign using the hyperbaric material test facility at IFREMER, Figure 4, was performed in April in the presence of two researchers from the University of Porto.

Hyperbaric material test facility during test campaign.

The second campaign of test completed the results of 2008 where bulk adhesive specimens and two types of assembled joints (thick adherend lap shear and single lap joints) were tested at pressures up to 1000 bars. Image analysis was used to measure specimen strains inside the pressure vessel through a view-glass. Significant results concerning the influence of hydrostatic pressure on adhesive and joint strength was obtained. A joint paper was published (Journal of Adhesion Science and Technology 24 (2010) 1977–1994)

Future Fibre – **SME of Valencia Spain**

Innovative fibres for marine applications

Martin Oughton

performed in the material laboratory of Brest in October 2009 2008

In order to characterize a series of materials for marine applications a preliminary test series was performed, in the presence of the material supplier in November 2008. A specific load cycle, defined to represent realistic rigging load conditions, was programmed and used. These initial tests resulted were completed during this second phase of testing.. The fatigue test fixture was modified, to improve end conditions. A new set of samples was supplied. The results suggested that valid test data can now be obtained. In parallel a series of bend-over-pulley tests has been performed which allowed two materials to be evaluated.

Test frame for cyclic tests

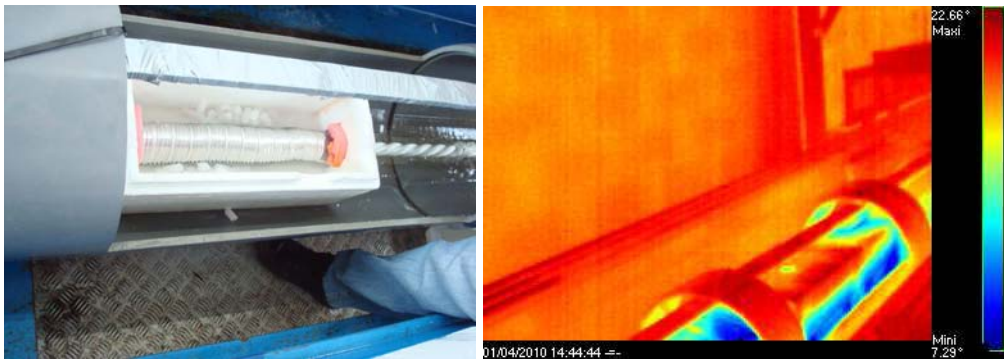
Bexco - **SME of Hamme - Belgium**

Rope strength variability study

Stijn Steyaert

performed in the material laboratory of Brest in January 2010

A first series of 20 break tests was performed in September 2008 on polyester sub-ropes, in order to establish the variability of tensile strength values.,
A series of yarn-on-yarn abrasion tests was also performed, in natural sea water.



Cooling system box - IR camera image

A series of new tests was to examine how low temperature conditions affect the resistance of a nylon rope under cyclic loading.
Based on the results the periodic freezing of the sub-rope and applications of temperatures below –50°C does not appear to affect the fatigue lifetime as evaluated by a TCLL test. However, more tests are needed to confirm this.

1.6. Scientific output of the users at the facility

Published papers:

NTUA - 9th HSTAM International Congress on Mechanics
Limassol, Cyprus, 12 – 14 July, 2010
FIRST- AND SECOND-ORDER HYDRODYNAMIC EFFECTS AND WAVE RUN-UP ON A FOUR CYLINDER CONFIGURATION AT SMALL FORWARD SPEED
Spyros A. Mavrakos1, Thomas Mazarakos2, and Dimitris Konispoliatis3
Laboratory of Floating Structures and Mooring Systems
School of Naval Architecture and Marine Engineering
National Technical University of Athens
9, Heroon Polytechniou Ave., 157 73 Zografos / Athens, Greece
1Prof. Dr.-Ing., Director, e-mail: Mavrakos@naval.ntua.gr , web page: http://www.naval.ntua.gr
2 Post-Doc Research Engineer, e-mail: tmazarakos@naval.ntua.gr
3 Doctoral Candidate, e-mail: dconisp@mail.ntua.gr
Keywords: Multiple vertical cylinders; first- and second-order wave loads; drift forces; small forward speed;
heuristic method; wave run-up; Experiments.

IST – Intituto Superior Tecnico – Lisboa
Wave Energy Converter - Paper under preparation foe an event in November
Model tests of a wave energy converter based on water oscillating in a U tank.
Nuno Fonseca *, Joao Pessoa *, Sergio Ribeiro *
Marc Le Boulluec **, Jeremy Ohana **
* Instituto Superior Tecnico, Lisboa, Portugal
** Ifremer , Centre de Brest , BP 70, 29280 Plouzané
Hydrodynamics, wave tank testing, wave energy

FEUP – Porto in collaboration with ENSIETA (Engineering school Brest France)
Cognard JY,Créac'hcadec R, Maurice J, Davies P, Peleau M, da Silva LFM

Analysis of the Influence of Hydrostatic Stress on the Behaviour of an Adhesive in a Bonded Assembly.
Journal of Adhesion Science and Technology 24 (2010) 1977–1994

Other output from the performed projects under AR4 **User meetings**

Most of the discussions for the preparation of the projects were carried out by Email or phone. Some preparatory meetings were held before performing the trials.

1.7. Scientific output of the users at the facility

No specific output of this type has been recorded during the period

1.8. User meetings

Most part of the discussions for the preparation of the projects was held by Email or phone. Anyhow some preparatory meeting has been held in our facilities before the completion of the trials.

Cranfield2 - 2/2/09 Meeting at Boulogne/mer with representatives of the university of Cranfiel and the SME TEL - visit of the infrastructure – preparation of the tests

1.8 Update of the non-confidential Project information

There is no particular updating during this period

2. Annex

The annexes are produced by completing the relevant forms in the reporting MS Access 2002 Database that each co-ordinator has received by e-mail from the ***Commission****.*
A printed copy of the forms is inserted in the paper copy of the Annual Report.

Annex 1 - Composition of the Users Selection Panel
*[See "****Selection Panel****" form in the above mentioned MS Access Database.]*

Annex 2 - List of User-Projects
*[See "****List of User-Projects****" form in the above mentioned MS Access Database.]*

Annex 3 - List of Users
*[See "****List of Users****" form in the above mentioned MS Access Database.]*

Annex 4 – Database Report
*[See "****database Report****" form in the above mentioned MS Access Database.]*

List of Panel members

Contract ID 026010 **Reporting Period** AR4

Infrastructure Short Name	Family_Name	First_Name	Gender	Nation-ality	Home Institution			Email	Additional Information
					Institution Name	Town	Country		
METRI	Bompais	Xavier	M	FR	IFREMER	Brest	FR	Xavier.Bompais@ifremer.fr	Service hydrodynamique et Océano météo
METRI	Bozano	Roberto	M	IT	Consiglio Nazionale delle Ricerche (CNR)	Genova	IT	boz@ge.issia.cnr.it	Instituti di studi sui Sistemi Intelligenti (ISSIA)
METRI	Chauqueuse	Bominique	M	FR	IFREMER	Brest	FR	dchauqueuse@ifremer.fr	material behaviour laboratory
METRI	Cognard	Jean-Yves	M	FR	ENSIETA	Brest	FR	jean-yves.cognard@ensieta.fr	Ecole Nationale Superieure d' Ingenieurs des Techniques de l'Armement
METRI	Davies	Peter	M	GB	IFREMER	Brest	FR	peter.davies@ifremer.fr	material behaviour laboratory
METRI	Fennel	Sheena	F	IE	Marine Institute	Galway	IE	sheena.fennell@marine.ie	Oceanographic Services
METRI	Germain	Gregory	M	FR	IFREMER	Boulogne sur Mer	FR	gregory.germain@ifremer.fr	Service hydrodynamique et Océano météo à Boulogne
METRI	Le Boulluec	Marc	M	FR	IFREMER	Brest	FR	marc.le.boulluec@ifremer.fr	Service hydrodynamique et Océano météo
METRI	Le Menn	Marc	M	FR	Service Hydrographique et Océanographique de la Marine (SHOM)	Brest	FR	lemenn@shom.fr	Département Ingenierie des équipements scientifiques
METRI	L'Her	Joel	M	FR	CETMEF	Brest	FR	joel.lher@equipement.gouv.fr	Costal and fluvial environment Department
METRI	Marec	Claudie	F	FR	INSU (Institut National des sciences de l Univers)	Brest	FR	claudie.marec@ipev.fr	Atelier national de l'équipement océanographique
METRI	Paillard	Michel	M	FR	IFREMER	Brest	FR	michel.paillard@ifremer.fr	Département des technologies des systèmes instrumentaux
METRI	Tziavos	Christo	M	GR	National Center for Marine Research	Athens	GR	ctziav@ncmr.gr	Department of Research
METRI	Waldmann	Christoph	M	DE	University of Bremen	Bremen	DE	waldmann@marum.de	Marum

Infrastructure Short Name	Family_Name	First_Name	Gender	Nation-ality	Home Institution			Email	Additional Information
					Institution Name	Town	Country		
METRI	Warnier	Philippe	M	FR	IFREMER	Brest	FR	Philippe.Warnier@ifremer.fr	material testing facilities

List of UserProjects

UserProject Acronym

Bexco

Title

SME of Hamme - Belgium - Rope strength variability study

Scientific Field

Main Field	Engineering & Technology
FP6 Priority or Specific discipline	Other - Engineering & Technology

Objectives

In order to guarantee long term reliability of synthetic fibre ropes it is essential to reduce their strength variability. This requires a first characterization, in order to quantify scatter in the current product, then analysis of the various parameters (materials and manufacturing) which can introduce the variability measured, modifying these parameters (through closer control of the process) and a second series of tests to determine their influence. The work to be carried out at IFREMER includes therefore two series of tests for strength characterization of ropes of 30 to 40 ton break strength. Such ropes or cores are the building block for large marine ropes.

Achievements

A series of yarn-on-yarn abrasion tests was also performed, in natural sea water.
A series of new tests was to examine how low temperature conditions affect the resistance of a nylon rope under cyclic loading.
Based on the results the periodic freezing of the sub-rope and applications of temperatures below –50°C does not appear to affect the fatigue lifetime as evaluated by a TCLL test. However, more tests are needed to confirm this.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	4	MBTL	5

UserProject Acronym

Cranfield 2

Title

Reduced scale testing of a slow rotating turbine for performance evaluation of a Tidal EnergyConverter and visualization of flow interaction between three turbines in a Delta configuration (Model Testing of the Tidal Energy Converter - Deltastream)

Scientific Field

Main Field	Engineering & Technology
FP6 Priority or Specific discipline	Other - Engineering & Technology

Objectives

The United Kingdom has one of the largest potential in Europe in marine renewable energy (Wind, Tidal and Wave), and has become one of the leading countries worldwide in the development of marine renewable energy concepts (Wind Farms, Tidal and Wave devices). Cranfield University, located in Bedfordshire, is currently involved in the performance modeling, turbine design and structural design of the tidal energy converter "DeltaStream" for Tidal Energy Ltd (TEL) based in Cardiff, Wales, UK.The DeltaStream device is a nominal 1.2MW unit which sits on the seabed without the need for a positive anchoring system, generating electricity from three separate horizontal axis turbines mounted on a common frame. The use of three turbines on a single, circa 30m wide, triangular frame produces a low centre of gravity enabling the device to satisfy its structural stability requirements including the avoidance of overturning and sliding.

Achievements

In the frame of the European Program "METRI" for trans-national access of facilities in Ocean Engineering, Cranfield University was offered a contract to test this Tidal Energy Converter in the IFREMER Water Circulation Channel of Boulogne-sur-mer. A total of 257 tests were carried out between Monday 29 June and Friday 10 July 2009 on a 1/20th single turbine model and on a 1/30th device model. The main outcome of this testing campaign has been the confirmation of the behaviour of the turbine in terms of power and thrust as predicted by previous analytical and CFD work. Flow visualisation using Laser Doppler Velocimetry has shown the extent of the wake for a range of flow velocities and power off-take. It has been confirmed that no influence between turbines was happening for the range of loads applied to the generator.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	2	WCTB	10

UserProject Acronym

FEUP

Title

Faculty of Engineering - University of Porto (Portugal).
Characterization of adhesives under hydrostatic pressure

Scientific Field

Main Field	Engineering & Technology
FP6 Priority or Specific discipline	Other - Engineering & Technology

Objectives

The purpose of this proposal is to investigate the behaviour of adhesively bonded joints under marine environmental conditions. In particular two aspects will be examined, the influence of hydrostatic pressure and the influence of sea water. The former is essential, both to understand how adhesively bonded assemblies behave in deep sea structures and also to understand how hydrostatic stress affects the damage development in bonded joints. Results will be available for conference presentation and publication.

Achievements

A test campaign using the hyperbaric material test facility at IFREMER, Figure 4, was performed in December 2008 in the presence of two researchers from the University of Porto.
A second campaign of test completed the results of 2008 where bulk adhesive specimens and two types of assembled joints (thick adherend lap shear and single lap joints) were tested at pressures up to 1000 bars. Image analysis was used to measure specimen strains inside the pressure vessel through a view-glass. Significant results concerning the influence of hydrostatic pressure on adhesive and joint strength was obtained. A joint paper was published (Journal of Adhesion Science and Technology 24 (2010) 1977-1994)

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	4	MBTL	8

UserProject Acronym

Future Fibre

Title SME of Valencia Spain - Innovative fibres for marine slings

Scientific Field

Main Field	Engineering & Technology
FP6 Priority or Specific discipline	Other - Engineering & Technology

Objectives

The aim of the study is to examine factors which influence the lifetime of PBO fibre cables which are exposed to severe mechanical and environmental loads at sea. These cables are finding increasing applications, both in racing yacht rigging and more recently for super-yachts. Three aspects will be studied here:
1. Cyclic loading (fixed tension-tension cycles with varying minimum load levels), followed by residual break tests.
2. Cyclic loading under more realistic conditions, by using sequences of loads recorded at sea to pilot the hydraulic piston. Particular attention will be paid to the influence of slack periods.
3. Bending limit determination. Samples will be deformed to different D/d ratios during slack fatigue testing, followed by residual strength testing.

The aim of the study is to quantify the influence of these factors in order to improve the performance and safety of PBO cables for marine applications.

Achievements

For the second time in the laboratory ans in order to characterize a series of materials for marine applications a preliminary test series was performed, in the presence of the material supplier in November 2008. A specific load cycle, defined to represent realistic rigging load conditions, was programmed and used. These initial tests resulted were completed during this second phase of testing.. The fatigue test fixture was modified, to improve end conditions. A new set of samples was supplied. The results suggested that valid test data can now be obtained. In parallel a series of bend-over-pulley tests has been performed which allowed two materials to be evaluated.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	4	MBTL	8

UserProject Acronym

IST

Title

Instituto Tecnico Lisboa (Pt)
Hydrodynamic assessment of a floating wave energy converter

Scientific Field

Main Field	Engineering & Technology
FP6 Priority or Specific discipline	Other - Engineering & Technology

Objectives

The experimental program consists on testing a scaled model of a wave energy converter (WEC) in regular and irregular waves. The objectives are:
(a) Assessment of the hydrodynamic behavior and of the capture width as function of the wave frequency and wave height;
(b) Assessment of the dynamic behavior of the mooring system and its influence on the capture width;
(c) Characterize the extreme loads on the mooring system (?);
(d) Obtain experimental data to support the development of a hydrodynamic numerical model of the wave energy converter (WEC).

Achievements

Some preliminary conclusions confirm the four modes of motion are strongly coupled, as predicted by the numerical model, which is essential since the objective is to extract the wave energy from the different modes of motion of the floater. Oscillations of the water column in the first mode of motion of the tank were clearly identified, therefore showing the potential to absorb wave energy from this motion.
Comparisons with numerical results show that the dynamic behavior of the coupled system is qualitatively well represented by the numerical model, although the damping of the pitch motion and of the motion of the water in the tank are more damped than the potential flow predictions. At this stage, the mean wave power captured in regular waves is estimated with the numerical model by tuning the numerical motion responses amplitudes to fit well with the experimental ones.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	1	DWTB	10

UserProject Acronym

MAMK

Title

University of Mikeli-Finland
Damage tolerance study of injected DCPD matrix for marine applications

Scientific Field

Main Field	Material Sciences
FP6 Priority or Specific discipline	Other - Material Sciences

Objectives

The project goal is to empirically detect the damage tolerance of injected DCPD matrix composites marine structures, compare their damage resistance with classic matrix and hand-laminated reference materials, and to conclude on the reasons for differences in behaviour.
The scientific background of the study lies in previous studies performed at IFREMER and reported in journal articles and in Dr. Yves Perrot's PhD work. The composite material samples used in these previous studies were hand-laminated in open moulds, while the boat industry is moving on to use closed mould vacuum infusion technologies to achieve better composite quality, healthier working environment and improved environmental safety. Therefore, it would be beneficial to expand the study scope to injected laminates and directed woven fabric products to have relevant information of the possible different damage tolerance and behaviour of injection manufactured composites. The industrial partners for the project include Ashland Finland, Ahstrom Glassfibre and Finnish boatbuilding SMEs, so the composite materials, chemistry, sizing and manufacturing background information represent state-of-the-art knowledge.

Achievements

For the second visit at Ifremer and during the week, the project team continued the studies we started in July 2009.
During the week, tests were carried out both with acoustic emission monitoring and impact testing. We prepared some new composite test specimens in Finland with new reinforcement structures and we studied the effect of reinforcement structure for damage tolerance as measured with these testing methods. In July, the main objective was to get familiar with the testing. Now we made some iterations and in addition to material properties, we obtained information about the reliability of the testing system. Ifremer has lot of experience about the material testing of composite structures which are used in Marine industry. It was natural to continue this project with Ifremer in order that we can exploit their knowledge in our boat industry research projects in Finland.
We started our week with a brief look at our objectives with the study. The first test we carried out was tensile test with acoustic emission monitoring. We had seven test series with three different kinds of reinforcement structures and with five different kinds of resins. The impact testing was carried out by the aid of Ifremer's laboratory staff and it took much time with necessary ultrasonic scanning before and after the test. For the impact test, we had six series to be tested with three different kinds of reinforcement structures and with five different kinds of resins.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	4	MBTL	8

UserProject Acronym

Marine Subsea Group

Title

MSG - SME of Norway - Measurement of Elastic buoyancy loss and water absorption of full size buoyancy module

Scientific Field

Main Field	Engineering & Technology
FP6 Priority or Specific discipline	Other - Engineering & Technology

Objectives

Marine Subsea Group AS delivers subsea buoyancy that are permanently installed (for the lifetime of the installation – typically 15 to 30 years) on cables and pipelines related to offshore subsea installations used for oil and gas exploration and production. Our buoyancy products are based on composite syntactic foams, where micro glass bubbles are incorporated in a petroleum wax or an epoxy base material.
Such subsea buoyancy will, through several mechanisms, have some loss of buoyancy during their life time. Excessive buoyancy losses could lead to a pipeline installation being used outside its design envelope, with as a potential consequence loss of system integrity, pipeline ruptures etc.

Proposed test program
Part 1.
A method to estimate analytically the elastic buoyancy loss under hydrostatic pressure of a buoyant core is to calculate the relative volume diminution given by P/K (where P is the hyperbaric pressure and K the bulk modulus of the core).
The first part of the project would be to verify this expression experimentally for wax and epoxy based buoyant cores.
Part 2
The surface of any syntactic foam float is covered with a multitude of cracks which gradually absorb water when exposed to hydrostatic pressure. The weight gain is primary a surface phenomenon and consequently the water absorption rate is influenced by the area-to-volume ratio of the buoy. The second part of the project would be to evaluate, for both wax and epoxy based foams, the area-to-volume influence by testing simultaneously a full scale and a down-sized float during two weeks.

Achievements

The buoyancy of foamed material was counterbalanced with the use of weights matched separately for each
sample and each depth. Weights were fixed to inner carrying pipe made of PVC (fig. 1a) with the use of steel cables
coated with Nylon to avoid their corrosion in salty water. Samples of tubes tested at the depth of 10 m have a total
length of 30 cm and at 20 m – 50 cm. Whole set was fixed to the Mettler Toledo PG-S scale (fig. 1b) and changes of
sample mass were controlled during one week on both depths. Data were collected continuously every 1 s during
first day of test and every 30s during next six days.

Before the test on right depth of 10 or 20 m each sample was immersed for 1 hour close to the water surface to
observe the influence of salt water and water intake. For all tested samples no mass changes related neither to
outward gas diffusion nor to water intake were noticed. During the right test foams surface and compression of
cellular structure was observed with digital camera and in the 6th day of test a set of pictures was made by divers.

For all the samples surface collapsing and mass increase caused by outward air diffusion from the cells and
water intake was observed. The water intake of about 0,5-1,0 wt. % was observed for polyethylene sample and for
elastomeric AC tube. All the rest samples (polypropylene and elastomeric AF) were waterproof.

The outward air diffusion from the pressurized cells to water was observed for all of the tested

samples. The
collapsing effect was fully reversible for polyolefin based samples (Tubolit and OleCell) and for both elastomeric
insulations cells deformation was irreversible. The Tubolit sample is excluded from these considerations because
data acquisition profile was different in this case and cannot be directly compared. The mass changes for this
product are presented separately.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	3	HTTL	10

UserProject Acronym

NTUA2

Title NTUA2 - School of Naval Architecture - Athens - Wave current interaction with vertical cylinders

Scientific Field

Main Field Engineering & Technology

FP6 Priority or Specific discipline Other - Engineering & Technology

Objectives

The project aims at carrying out measurements concerning the interaction of arrays of circular cylinders in a combined waves and current field. The novelty of the project is the consideration of moderate current velocities that will correspond to relatively high Strouhal numbers, approx. ¼. The previous value is the upper limit below which most probably no flow separation occurs. This requirement is of particular importance for large volume marine structures often used in offshore installations. Nevertheless, this should be confirmed during the experiments. If no flow separation occurs, then for the theoretical formulation of the associated problem, potential theory can be employed. The members of the group have recently developed a solution method that accounts for large current velocities or equivalently for moderate forward speeds of a circular cylinder moving in an incoming wave field. The numerical predictions are very encouraging and they confirm the formation of V waves for relatively high current velocities in the area of $\tau=U\omega/g\approx1/4$ where U, ω and g respectively stand for the current velocity, the wave frequency of encounter and the acceleration due to gravity. What it is missing is the confirmation that no flow separation occurs. The method is based on potential theory and accounts for higher order components of the velocity of the current. It should be noted that the problem of the interaction of a structure with waves and current is equivalent to that which assumes incoming waves and structure's forward speed. According to what is known to the members of the group who make the present proposal, there is no work reported in the literature that considers relatively high forward speeds of vertical cylinders moving in a wave field. The objectives of the project shall be:

1. The evaluation of the corrections that the higher order velocity terms $O(\tau2)$ imply on the total hydrodynamic loading. Special attention will be given to the evaluation of the mean – second – order drift forces on the cylinders in dependence from the current and / or structure velocity.
2. The confirmation of the occurrence of V waves and the determination of the wave run-up on the structure.
3. The investigation of the conditions under which flow separation occurs.

Achievements

Scope of the experimental compaign
The project aimed at carrying out measurements concerning the interaction of arrays of circular cylinders in a combined waves and current field. A four cylinder configuration has been considered, a schematic representation of which together with its inertia characteristics is shown in various figures. The experimental campaign included measurements in regular waves on the restrained four cylinder configuration as well as under the combined action of regular waves and low-forward speed of the arrangement. First- and second – order wave loading (mean drift and time-dependent second – order components) was measured, together with the wave elevation at specific locations on the wetted surface of the cylinders (wave run – up) and in the gap between them. Two wave angles were considered at 00 and 450.
The experimental results were compared with numerical predictions concerning first- and mean second – order excitations at zero and the small forward speed. Two methods have been used for the numerical evaluation of the first- and the mean-second order hydrodynamic characteristics of the examined configuration. The first allows an exact analytic representation of the velocity potential around each cylinder in the array. It is based on the single cylinder hydrodynamic properties and makes use of the physical idea of multiple scattering to account for the hydrodynamic interactions among the multi – cylinder configuration (Mavrakos and Koumoutsakos, 1987; Mavrakos, 1991). The single body hydrodynamic characteristics have been obtained using the method of matched axisymmetric eigenfunction expansions (Kokkinowrachos et al., 1986). Hereby, the mean drift loads are calculated using the momentum conservation principle in properly defined control volumes surrounding each member of the multi component configuration (Mavrakos, 1988, 1995). The method has been further expanded to calculate the time – dependent quadratic transfer functions of the second-order sum – and difference – frequency wave loading on a single vertical body of revolution restrained in waves (Mavrakos and Peponis, 1992).

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	1	DWTB	7

UserProject Acronym

Tidalstream

Title

Feldon Ltd-SME
Stability of a Free-Floating Six Rotor Tidal Current Turbine

Scientific Field

Main Field Engineering & Technology

FP6 Priority or Specific discipline Other - Engineering & Technology

Objectives

The Project is aimed at gaining a deeper understanding of a new method for extracting tidal energy in a very cost effective and efficient way. The best tidal resources around Europe are at depths varying between 30 and 100 metres, with most at 60m deep or more. The TSP TidalStream system is specifically designed for these depths and can be towed to a site, deployed, operated, maintained, and retrieved without specialist crane-ships, jack-ups or divers. It is a semi-submersible structure that can be towed on the surface like a ship, then when water-ballasted translates its orientation to a vertical operating position. It can support multiple horizontal axis turbines and is free to swing and follow the tide direction while being tethered to the seabed by a rigid articulated arm. The turbine is also free to pitch and roll under the control of its inbuilt buoyancy system.

Achievements

1. The test s of the 1/ 23rd scale TidalStream Triton model show the configuration to be highly stable in both operating and maintenance posit ions.
2. The rotor s conformed to theoretical predict ions of power and thrust .
3. Fault case simulation involving load loss, overspeed or blade loss showed the turbine to be highly adaptable in that normal operating conditions could be maintained after reballasting. Under single and even double fault conditions it would be possible to continue generating.
4. The response to extreme wave loading was excellent, with Triton pitching by typically one third of the wave peak- t rough amplitude.
5. The turbine in the maintenance position showed good stability even at high flow rate and in moderate waves.
6. Transit ions under buoyancy control from operating to maintenance posit ions and back were carried out successfully under a range of flow and wave conditions.
7. Test s with a moored scale workboat demonstrated the feasibility of maintenance position rotor-generator removal. Under wave conditions the turbine is much more stable than the workboat , and the limitation on lifting tasks will be the sea-keeping ability of the workboat and the mot ion-following capability of it s crane.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	1	DWTB	12

UserProject Acronym

TSC 2

Title

Technical Software Consultants Ltd – SME
Deepwater weld inspection technology

Scientific Field

Main Field Engineering & Technology

FP6 Priority or Specific discipline Other - Engineering & Technology

Objectives

TSC are developers of several unique technologies for use underwater. TSC's StressProbe is a novel technique for measuring the stress in steel components and is under evaluation for a number of applications in the oil and gas industry, particularly subsea. This technology is novel and unique to TSC.
The offshore industry is suffering a number of mooring failures on permanently moored structures. Measurement of the load on a mooring chain is difficult and usually involves inserting something into the mooring line load path (like a load cell). TSCs StressProbe can be retrofitted to the outside of a mooring chain without affecting the mooring in any way. Tests to date, using divers offshore, has proved the capability of this technology to measure mooring line tension variations in large offshore chain moorings. This is important for assessing mooring behaviour and indeed whether the line has actually failed.
For long term monitoring it is impractical to run cables from the mooring sensor on the chain to the vessel, so TSC are proposing the installation of an autonomous subsea system which can then communicate with the vessel via an acoustic data link. There are several problems, including the power required from the battery and the fact that the vessel rotates around the mooring and so the sensor and receiver are continuously moving relative to each other. As the vessel moves, so other moorings lines, and risers, will be positioned between the sensor and receiver.

Achievements

TSC have received interest in this application from BP and plan to build a prototype acoustic data link specifically suited to this application (shallow water depth and omni directional). This project will assess different prototype sensor/receiver configurations, with simulated obstacles (mooring chains and risers) in different positions. The objective is to determine optimum positions for the sensor and receiver, in order to minimise interference from other items, and to assess data quality, integrity and range at different power settings. This will also allow detailed battery design parameters to be established.
The work has been carried out in the large seawater tank using vertical, diagonal and horizontal transmission through both the 10m and 20m sections. Sections of real mooring chain will be used to assess any signal shielding and any influences on data distortion or corruption.

Installation Use

Infrastructure Short Name	*Installation ID*	*Installation Short Name*	*Amount of Access Delivered*
METRI	1	DWTB	5

List of Users

Contract ID 026010 **Reporting Period** AR4

UserProject Acronym	Family Name	First Name	Gender	Birth year	Nationality	Resear. status	User Background			Home Institution				User e-mail	New user	Group leader	Remote user	Num. of visits	Dur. of stay	T and S reimb.
							Sci. Field 1	Sci. Field 2	Sci. Field 3	Type	Name	Town	Country							
Bexco	Devos	Karel	M	1960	GB	EXP	Engineering & Technology			SME	Bexco	Hamme	BE	kdevos@bexco.be	Y	Y	Y	2	2	Y
Bexco	Scheirs	Erik	F	1961	BE	EXP	Engineering & Technology			SME	Bexco	Hamme	BE	escheirs@bexco.be	Y	N	Y	1	5	Y
Cranfield 2	Baptiste	Elie	M	1986	FR	PGR	Engineering & Technology			UNI	Cranfield University	Cranfield	GB	baptisteelie@hotmail.com	Y	N	N	1	5	Y
Cranfield 2	Trarieux	Florent	M	1973	FR	PGR	Engineering & Technology	Energy		UNI	Cranfield University	Cranfield	GB	F.Trarieux@cranfield.ac.uk	Y	N	N	2	10	Y
FEUP	Da Silva	Lucas	F	1973	PT	EXP	Engineering & Technology			UNI	University of Porto	Porto	PT	lucas@fe.up.pt	Y	Y	Y	2	10	Y
FEUP	Lima	Ricardo	M	1984	PT	PDOC	Engineering & Technology			UNI	FEUP	Porto	PT	lima@fe.up.pt	Y	N	Y	1	5	Y
Future Fibre	Bunyan	Humprey	M	1964	GB	EXP	Engineering & Technology			SME	Future Fibres	Valencia	ES	humphrey@futurefibres.com	Y	Y	Y	2	5	Y
Future Fibre	Oughton	Martin	M	1985	GB	EXP	Engineering & Technology			SME	Future fibres	Valencia	ES	martin.oughton@googlemail.com	Y	N	Y	1	2	Y
IST	Fonseca	Nuno	M	1966	PT	PGR	Engineering & Technology			UNI	IST	Lisbon	PT	nunofonsecaist@gmail.com	Y	Y	N	1	10	Y
IST	Pesso	Joao	M	1980	PL	PDOC	Engineering & Technology			UNI	IST	Lisbon	PT	joao.pessoa@mar.ist.utl.pt	Y	Y	N	1	10	Y
IST	Ribeiro	Sergio	M	1968	PT	EXP	Engineering & Technology			UNI	IST	Lisbon	PT	sbnrs@netcabo.pt	Y	N	N	1	10	Y
MAMK	Berg	Tommi	M	1976	FI	PDOC	Engineering & Technology			UNI	Mikkeli University	Mikkeli	EE	tommi.berg@tut.fi	Y	N	Y	1	5	Y
MAMK	Ruuskanen	Jukka	M	1981	FI	EXP	Engineering & Technology			UNI	Mikkeli University	Mikkeli	FI	jukka.ruuskanen@tut.fi	Y	N	Y	1	5	Y
Marine Subsea Group	Popova	Ekaterina	F	1980	SI	EXP	Engineering & Technology			SME	MSG	Andalsnes	NO	ekaterina.popova@msgmarine.no	Y	N	N	1	5	Y
Marine Subsea Group	Viklund	Daniel	M	1983	SE	PDOC	Engineering & Technology			SME	MSG	Andalsnes	NO	daniel.viklund@partnerplast.com	Y	N	N	1	5	Y

UserProject Acronym	Family Name	First Name	Gender	Birth year	Nationality	Resear. status	User Background			Home Institution				User e-mail	New user	Group leader	Remote user	Num. of visits	Dur. of stay	T and S reimb.
							Sci. Field 1	Sci. Field 2	Sci. Field 3	Type	Name	Town	Country							
NTUA2	Mavrakos	Spyros	M	1952	GR	PGR	Engineering & Technology			UNI	NTUA	Athens	GR	mavrakod@naval.ntua.gr	Y	Y	Y	1	10	Y
NTUA2	Mazarkos	Thomas	M	1979	GR	PDOC	Engineering & Technology			UNI	NTUA	Athens	GR	tmazarakos@naval.ntua.gr	Y	N	N	1	10	Y
NTUA2	Synetos	Dionissos	M	1951	GR	TEC	Engineering & Technology			UNI	NTUA	Athens	GR	chatzi@naval.ntua.gr	Y	N	N	1	10	Y
Tidalstream	Armstrong	John	M	1945	GB	EXP	Engineering & Technology	Energy		SME	Feldon ltd	Southam	GB	johnarmstrong@tidalstream.co.uk	Y	Y	N	2	12	Y
Tidalstream	Robertson	Alex	M	1970	GB	EXP	Engineering & Technology			SME	Feldon ltd	Southam	GB	johnarmstrong1@blueyonder.co.uk	Y	N	N	1	5	Y
Tidalstream	Todman	Michael	M	1952	TR	PDOC	Engineering & Technology	Energy		SME	Feldon ltd	Southam	GB	miketodman@tidalstream.co.uk	Y	N	N	2	12	Y
TSC 2	Lugg	Martin	M	1956	GB	EXP	Engineering & Technology			SME	TSC	Milton Keynes	GB	martin@tscinspectionsystems.com	Y	N	N	1	5	Y
TSC 2	Topp	David	M	1954	GB	EXP	Engineering & Technology	Energy		SME	TSC	Milton Keynes	GB	dtopp@tscinspectionsystems.com	N	Y	N	1	5	Y

Database Report

Contract ID 026010 **Reporting Period** AR4

Project Web site http://www.ifremer.fr/metri

Objectives

Project summary

Under this contract, access for user groups will be provided to the Infrastructure entitled Marine Environment Test and Research Infrastructure (METRI). This Infrastructure, located at Brest and Boulogne-sur-mer in France is owned and operated by IFREMER, the French Research Institute for Sustainable Sea Exploitation.
Within the Infrastructure, access will be made available to the five following installations.

-□the deep wave testing basin,
-□the water circulation testing basin,
-□the hyperbaric testing tank laboratory,
-□the material behaviour testing laboratory,
-□the marine sensor evaluation laboratory.

During the contract duration, it is expected that 20 short term projects will be selected and that a minimum of 40 users will benefit from access to this Infrastructure. The total number of experimental days to be provided is 200 for the five installations.
This access will be provided free of charge to the user groups given access to the Infrastructure under this contract and will include all logistical, technical and scientific support that is normally provided to external users
of the Infrastructure

Access Modalities

How to apply to METRI2

Within METRI, the user groups consist of only one or two people and the group leader is formally identified.
The duration of the project in the Infrastructure is from 1 to 3 weeks.
Guidelines for filling in the application form

As soon as a Call for Proposals is published, European researchers who want to propose a short-term project must fill up the application form, which may be downloaded from this website.

Call for proposal Nr ...: deadline is fixed depending the call

The project proposals are selected through an independent peer review procedure.
Applicants are informed of the results of the evaluation usually within 6 weeks after the respective deadlines.
Appointed projects can usually be initiated as early as 2 months after the deadline.

The application form can also be obtained upon request from the address below:

The project proposal can be sent by e-mail to Jack.Pichon@ifremer.fr or by fax: 33 (0) 2 98 224 535

A signed copy of the proposal must also be sent to the address below:
Address
□IFREMER - Mr. Jack Pichon
Centre de Brest - ERT/MS
METRI2 Project
BP 70
29280 Plouzané
France

Project Achievements

Recall :

The first session of the selection panel for selection of proposal was held on 6 October 2006. It has concluded on the selection of the nine eligible proposed projects (see AR1).

In the frame of the annual report Nr 2, 2 sessions of the commission has been held with the following resumed results:

- Session Nr 2 (19/9/2007): 4 selected project with 4 eligible:
TWI - Chaintest
Usoton - VIV
TTI
MSG

- Session 3 (14/2/2008): 4 selected projects wit 2 eligible:
NTUA2 (GR)
Cranfield University (GB)

In the frame of thepresent report (AR3), 1 sessions of the commission has been held with the following resumed results:

- Session Nr 4 (19/9/2007): 4 selected project with 4 eligible:

Nr 18 - TSC - Technical Software Consultants (UK)
Hyperbaric laboratory of Brest
tests on deep water technology equipment (weld inspection system)

Nr 19 - Aquaflora (Pl)
Wave basin of Brest
test of insulation foam in the deep basin

Nr 20 - WFS - WirelessFibreSystem(UK)
Wave basin of Brest
Underwater electromagnetic communication tests with integration of coastal monitoring system

Nr 21 - Cranfield University (UK)
Flume of Boulogne/mer
Tests for tidal energy converter

Nr 22 - FEUP - University of Porto - School of Engineering
Material laboratory of Brest
Tests concerning behaviour of bonded joints

Nr 23 - Future Fibres (Sp)
Material laboratory of Brest
Innovative fibres for marine slings

Nr 24 - Bexco - SME (Belgium)
Material laboratory of Brest
Rope strength study

Nr 25 - MAMK - University of technology - Tampere (Finland)
Material laboratory of Brest
Damage tolerance study of injected DCPD matrix composites in marine environment

Nr 26 - TSC2 - Technical Software Consultants (UK)
Wave basin of Brest
Wireless data communication used in mooring integrity monitoring

Nr 27 - Tidalstream Ltd (UK)
Wave basin of Brest
Tests on tidal current turbine

Nr 28 - MARTIFER (Portugal)
Wave basin of Brest
Tests with waves on energetic model

Nr 29 - UPV - University of Valencia (Sp)
Hyperbaric laboratory
Pressure calibration of acoustic equipment used in ANTARES/KM3Net

Six of these projects were performed during the AR3 period.

No additionnal session of selection pannel was peformed during AR4 as the financial capacity of the whole project METRI was reached with all the selected proposals at the end of the AR 3 period.

The remaining projects were performed during the AR4 period:

MSG (NW)
NTUA2 (GR)
CRANFIELD 2 (UK)
MAMK (FI)
TSC 2 (UK)
TIDALSTREAM (UK)
IST (PT)

2nd phase of 3 projects were also performed during the last period
FEUP (PT)
Future Fibres (SP)
BEXCO (BE)

Eligible Proposals 29 ***Selected Proposals*** 24

B. MANAGEMENT REPORT (FINANCIAL INFORMATION)

1. Justification of the resources deployed

- **The effort dedicated to project management tasks** in the first year of operation of Metri is estimated to 622 hours. The corresponding hourly rate is 51.79 € (figure coming from art 3.3.4 of Ifremer proposal for Metri 2 – doc. nr ERT MS 05030).

  The charged amount is then: **51.79 €.**

  The spent time dedicated to the preparation and the operations for the project users is estimated to more than 16 men-month, amount which will not be charged as being include in the cost of experimental days.

  These figures comes from the data given by the accounting department of Ifremer.

- **The eligible costs claimed to the contract** during the reporting period (tabular form) are as follows:

From tables annex 1 of Metri 2 - RITA Contract Nr 026010

Table of Eligible Costs - Metri Annual Report 4	Nr	Rate	Amount	Total/categories
Specific activities				***237467.48***
1. Transnational Access - deep wave basin of Brest/days	34	3407.89	115868.26	
2. Transnational Access - water circulation basin of Boulogne/days	10	3617.17	36171.70	
3. Transnational Access - hyperbaric testing tank laboratory of Brest/days	10	2401.19	24011.90	
4. Transnational Access - material behaviour laboratory of Brest/days	29	2117.78	61415.62	
Other activities:				***41839.71***
Expert panel travel and subsidencies	0			
Travel and subsidencies - users	1		41839.71	
Management activities				***32213.38***
Human effort/hours	622	51.79	32213.38	
Travels, congress, Exhibitions	0			
Advertising	0			
Total				***311520.57*** **€**

[No major deviations with respect to the planned budget.]

2. Forms C - Financial Statements

*The **Form C - Financial Statements** (**Appendix 1)** is provided in an Excel separate document (electronic form).*

*As requested an **Audit certificate** is submitted with the Forms C(separate attached document)*

Form C - Model of Financial Statement per Activity for a Specific Support Action / Transnational Access to Infrastructures

(to be completed by each contractor)

Type of instrument	Specific Support Action	Type of Action *(if necessary)*	Transnational Access to Infrastructures
Project Title (or Acronym)	Metri	Contract n°	026010
Contractors's legal name	Ifremer		
Legal Type			
Contact Person	Jack Pichon	Telephone	33 2 98 22 41 54
Telecopy	33 2 98 22 45 35	E-mail	jack.pichon@ifremer.fr
Cost model used (AC/FC or FCF) / (UF: User Fee)(*)	FC/UF	Indirect costs (Real or Flat Rate of 20% of Direct costs, except subcontracting)	Flat Rate of 20% of Direct costs, except subcontracting (**)
Period from	01/03/2009	To	31/08/2010

(*) If UF is used under "other specific activities: transnational access/connectivity", please mention the two cost models used (eg. FC/UF or FCF/UF or AC/UF)
(**) Except otherwise agreed in Article 9 [special clauses] of the contract.

1- Resources (Third party(ies))

Are there any resources made available on the basis of a prior agreement with third parties identified in Annex I of the contract? (Yes / No)				No
If Yes, please provide the following information				
Third Party 1 (Y1)	Legal name		Cost model used	
Third Party 2 (Y2)	Legal name		Cost model used	

If necessary add another Form C

2- Declaration of eligible costs (in €)

Please complete only the activity covered by the relevant instrument (and type of action) indicated above and as mentioned in Article II.25 and/or in Annexes I and III of the contract.
If you are a contractor using the additional cost model (AC):
- indicate only your additional eligible costs, except for Management of the Consortium Activity for which you may indicate your full eligible costs;
- do not declare eligible direct additional costs specifically covered by contributions from third parties as mentioned in Articles II.20 and II.23.a and b of the contract.
If you are a contractor using a full cost model (FC/FCF), indicate your full eligible costs
The costs declared should distinguish between direct and indirect costs
If necessary, adjustments to previous period(s) may be included where appropriate.

	Type of Activity													
	Research and Technological Development / Innovation (A)		Demonstration (B)		Training (C)		Management of the Consortium (D)		Other Specific Activities: Transnational Access (E)		Other Specific Activities (E)		Total (G) = (A)+(B)+(C)+(D)+(E)+(F)	
	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)
Direct costs							26844.48		197889.57		34866.43		259600.48	
Of which subcontracting									28579.67					
Indirect costs							5368.90		39577.91		6973.29		51920.10	
Adjustments to previous period(s)														
Total costs							32213.38		237467.48		41839.71		311520.57	

3- Declaration of receipts (in €)

If you are a contractor using the additional cost model (AC), indicate only receipts covered by Article II.23.c of the contract.
If you are a contractor using a full cost model (FC/FCF), indicate receipts covered by Article II.23 of the contract.

	Type of Activity													
	Research and Technological Development / Innovation (A)		Demonstration (B)		Management of the Consortium (C)		Other Specific Activities: Coordination / Networking (D)		Other Specific Activities: Transnational Access / Connectivity (E)		Other Specific Activities (E)		Total (G) = (A)+(B)+(C)+(D)+(E)+(F)	
	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)	Contractor	Third Party(ies)
Total receipts														

4- Declaration of interest generated by the pre-financing (in €)	
To be completed only by the coordinator.	
Did the pre-financing (advance) you received by the Commission for this period earn interest? (Yes / No)	No
If yes, please indicate the amount (in €)	

5- Request of FP6 Financial Contribution (in €)	
For this period, the FP6 Community financial contribution requested is equal to (amount in €)	*311520.57*

6- Audit certificates			
According to the contract, does this Financial Statement need an audit certificate (or several in case of Third party(ies)) delivered by independent auditor(s)? (Yes / No)			Yes
If Yes, does this(those) audit certificate(s) cover only this Financial Statement per Activity? (Yes / No)			Yes
If No, what are the periods covered by this(those) audit certificate(s) ?	From - to		
What is the total cost of this(those) audit certificate(s) (in €) per independent auditor(s) ?			

Audit certificate of the contractor (X)			
Legal name of the audit firm	Ifremer Accounting Agency	**Cost of the certificate**	0
Audit certificate(s) of the third party(ies) (Ys) ***(if necessary)***			
Y1 : Legal name of the audit firm		**Cost of the certificate**	
If necessary add another Form C.		**Total (Z) = (X) + (Ys)**	

Reminders:

The cost of an audit certificate is included in the costs declared under the activity "Management of the Consortium". The required audit certificate (s) is (are) attached to this Financial Statement

7- Conversion rates

Costs incurred in currencies other than EURO shall be reported in EURO.

Please mention the conversion rate used (only one choice is possible) – Please note that the same principle applies for receipts.

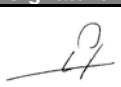
Contractor	
- Conversion rate of the date of incurred actual costs? (YES / NO)	
- Conversion rate of the first day of the first month following the period covered by this Financial Statement? (YES/NO)	
Third Party(ies) ***(if necessary)***	
Third Party 1 (Y1)	
- Conversion rate of the date of incurred actual costs? (YES / NO)	No
- Conversion rate of the first day of the first month following the period covered by this Financial Statement? (YES/NO)	No

If necessary add another Form C.

8- Contractor's Certificate

We certify that:

- the costs declared above are directly related to the resources used to reach the objectives of the project ;
- the receipts declared above are directly related to the resources used to reach the objectives of the project ;
- the costs declared above fall within the definition of eligible costs specified in Articles II.19, II.20, II.21, II.22 and II.25 of the contract, and, if relevant, in Annex III and Article 9 (special clauses) of the contract ;
- the receipts declared above fall within the definition of receipts specified in Article II.23 of the contract ;
- the interest generated by the pre-financing declared above falls within the definition of Article II.27 of the contract ;
- the necessary adjustments, especially to costs reported in previous Financial Statement(s) per Activity, have been incorporated in the above Statement ;
- the above information declared is complete and true ;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the Commission and in the event of an audit by the Commission and/or by the Court of Auditors and/or their authorised representatives.

Contractor's Stamp	**Name of the Person responsible for the work**	**Name of the duly authorised Financial Officer**
Yvon LE GUEN Coordinateur du Programme Infrastructures Expérimentales Moyens d'Essais	**Jack Pichon**	**Yvon Le Guen**
	Date	**Date**
	15/10/2010	**15/10/2010**
	Signature	**Signature**
		

Ifremer

AUDIT CERTIFICATE

We Ifremer, established in Centre de Brest, Technopole de Brest-Iroise, BP 70, 29280 Plouzané, France, represented for signature of this audit certificate by THOMAS Valerie accountant public, hereby certify that:

- We have conducted an audit relating to the cost declared in the Financial Statement(s) per activity of Ifremer hereinafter referred to as contractor, to which this audit certificate is attached, and which is to be presented to the Commission of the European Communities under **contract 026010 (RITA) METRI II** for the following period covered by the EC contract from **01/03/09 to 31/08/10**.
- We confirm that our was carried out in accordance with generally accepted auditing standards respecting ethical rules and on the basis of the relevant provisions of the above-referenced contract and its annexes.

  The above mentioned Financial Statement(s) per activity were examined and all tests of the supporting documentation and accounting records deemed necessary were carried out in order to obtain reasonable assurance that, in our opinion, based on our audit :

  - The amount of total eligible cost **311 520,57 € (three hundred and eleven thousand five hundred and twenty euros and fifty seven cents)** declared in Box 2 of the attached Financial Statement(s) per Activity is complying with the following cumulative conditions :
    - ✓ They are actual and reflect the contractor's economic environment
    - ✓ They are determined in accordance with the contractor's accounting principles
    - ✓ They have been incurred during the period covered by Financial Statement(s) per Activity concerned by this audit certificate
    - ✓ They are recorded in the accounts of the contractor at the date of the establishment of this audit certificate
    - ✓ They are exclusive of any non-eligible costs identified below which are established in the second paragraph of article II.19 of the above mentioned contract with the Commission of the European Communities :
      - ❖ Any identifiable indirect taxes, including VAT or duties;
      - ❖ Interest owed;
      - ❖ Provisions for possible future losses or charges;
      - ❖ Exchange losses;
      - ❖ Costs declared, incurred or reimbursed in respect of another Community project;
      - ❖ Return on capital;
      - ❖ Debt and debt service charges;
      - ❖ Excessive or reckless expenditure;
      - ❖ Any cost which does not meet the conditions established in Article II.19.1 of your contract with the Commission of the European Communities.
    - ✓ They have been claimed according to the following cost reporting FC/UF model cost which the contractor is eligible to use according to article II.22 of the above mentioned contract with the Commission of the European Communities;
  - As declared on the box 3 of the attachment Financial Statement(s) per Activity, the total amount of receipts for the periods covered by this (those) Financial Statement(s) per Activity is equal to 0 €.

Institut français de Recherche pour l'Exploitation de la Mer

Etablissement public à caractère industriel et commercial

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TVA FR 46 330 715 368

téléphone 33 (0)1 46 48 21 00
télécopie 33 (0)1 46 48 22 96
http://www.ifremer.fr

- As declared on the box 4 of the attachment Financial Statement(s) per Activity, the total amount of interest yielded by the pre-financing received from Commission of the European Communities for the periods covered by this (those) Financial Statement(s) per Activity is equal to 0.

- Accounting procedures used in the recording of eligible costs and receipts respect the accounting rules of the State in which the contractor is established and permit the direct reconciliation between the costs and receipts incurred for the implementation of the project covered by the EC contract and the overall statement of accounts relating to the contractor's overall business activity;
- Our company Tresor Public is qualified to deliver this audit certificate in full compliance with the second and third paragraphs of article II.26 of the contract;
- As declared in the box 6 of attached Financial Statement(s) per Activity, the contractor paid for this audit certificate a price equal to 0 in which VAT is equal to 0.

DATE , SIGNATURE et CACHET DE L'ACS

Brest le 8/12/10

L'Agent Comptable Secondaire
du Centre IFREMER de BREST
Valérie THOMAS

3. Summary financial report

*The **Summary financial report (Appendix 2)** consolidating the costs is given in a separate excel document (electronic form).*

Summary Financial Report

Type of Instrument	SSA-TA	Project Title (or Acronym)	METRI	Contract N°	26010
Reporting period number		From (dd/mm/yyyy)	01-mars-06	To (dd/mm/yyyy)	31-août-10	Page	1/1

Contractor n°	Organisation Short Name	Cost model(s) used: For Transnational Access	Cost model(s) used: For any other activities	Eligible costs (in €)	Type of activities: Research and Technological Development / Innovation (A) – Contractor	(A) – AC Third party(ies)	(A) – FC/FCF Third party(ies)	Management of the consortium (D) – Contractor	(D) – AC Third party(ies)	(D) – FC/FCF Third party(ies)	Other Specific Activities: Transnational Access (E) – Contractor	(E) – AC Third party(ies)	(E) – UF Third party(ies)	Other Specific Activities (F) – Contractor	(F) – AC Third party(ies)	(F) – FC/FCF Third party(ies)	Total eligible costs (G)=(A)+(B)+(C)+(D)+(E)+(F) – Contractor	Total – AC Third party(ies)	Total – FC/FCF Third party(ies)	Receipts – Contractor	Receipts – AC Third party(ies)	Receipts – FC/FCF Third party(ies)
26010	IFREMER	UF	FC	Direct eligible costs				31 785.38			467 607.20			119 520.00			618 912.58	0.00	0.00			
				of which direct eligible costs of subcontracting				*0.00*			*62 170.11*			*0.00*			62 170.11	0.00	0.00			
				Indirect eligible costs				6 357.07			81 087.42			23 904.00			111 348.49	0.00	0.00			
				Adjustment on previous period(s)				38 142.45			548 694.62			143 424.00			730 261.07	0.00	0.00			
				Total eligible costs				***38 142.45***	***0.00***	***0.00***	***548 694.62***	***0.00***	***0.00***	***143 424.00***	***0.00***	***0.00***	730 261.07	0.00	0.00			
				Total eligible costs				38 142.45	0.00	0.00	548 694.62	0.00	0.00	143 424.00	0.00	0.00	730 261.07	0.00	0.00	#REF!	#REF!	#REF!
								38 142.45			548 694.62			143 424.00			730 261.07			#REF!		
				Requested EC contribution for the reporting period (in €) without taking into account receipts				32 213.38	0.00	0.00	237 467.48	0.00	0.00	41 839.71	0.00	0.00	311 520.57					
								32 213.38			237 467.48			41 839.71								
				Requested EC contribution for the reporting period (in €) taking into account receipts [=Periodic Invoice]													311 520.57					
				Amount of the financial interests generated by the prefinancing																		

C. REPORT ON THE DISTRIBUTION OF THE COMMUNITY FINANCIAL CONTRIBUTION

*The **Report on the distribution between contractors** made during the reporting period of the Community financial contribution **(Appendix 3)** is given on a separate Excel document (electronic form)*

Report on the Distribution of the Community's contribution

Type of Instrument		Project Title	METRI	Contract N°	026010

Part I — Community's prefinancing (or payment) sent to the coordinator (1)

	Reporting Period 1		Reporting Period 2		Reporting Period 3		Reporting Period 4		Final payment		Total Amount (I) (3)
	From	To	From	To	From	To	From	To			
	1/03/2006	28/02/2007	1/03/2007	29/02/2008	1/03/2008	28/02/2009	1/03/209	31/08/2010			
	Date	Amount (A)	Date	Amount (B)	Date	Amount (F)	Date	Amount (G)	Date	Amount (H)	
Total (X)	25/04/2006	280 000.00	26/02/2008	91 418.74	24/07/2008	114 743.47	24/07/2009	135 276.46			621 438.67

Part II — Distribution of the Community's prefinancing (or payment) between contractors according to the consortium decision(s) (4)

Contractor n°	Organisation Short Name	Country Code	Reporting Period 1		Reporting Period 2		Reporting Period 3		Reporting Period 4		Final payment		Total Amount (I') (6)
			Date(s) (5)	Amount(s) (A') (5)	Date(s) (5)	Amount(s) (B') (5)	Date(s) (5)	Amount(s) (F') (5)	Date(s) (5)	Amount(s) (G') (5)	Date(s) (5)	Amount(s) (H') (5)	
1	IFREMER	F	15/04/2007	59 418.74	15/04/2008	242 743.47	15/04/2008	176 076.46	15/09/2010	311 520.57			789 759.24
			Total	59 418.74	Total	242 743.47	Total	176 076.46	Total	311 520.57	Total		789 759.24
Total (Y)			Total	59 418.74	Total	242 743.47	Total	176 076.46	Total	311 520.57	Total		789 759.24

Part III — Difference between Community's prefinancing (or payment) sent to the coordinator and Total Distribution of the Community's prefinancing (or payment) between contractors according to the consortium decision(s) (4)

	Reporting Period 1	Reporting Period 2	Reporting Period 3	Reporting Period	Final payment	Total Amount
Community's prefinancing (or payment) not yet distributed between contractors (Z) (7)	220581.26	-151324.73	-61332.99	-176244.11		-168320.57

I certify that the information set out in this(these) form(s) is accurate and correct and agreed by all contractors.

Name (8)	Surname (8)	Signature of the administrative official authorised to commit the organisation of the coordinator (8)
Yvon	Le Guen	

Explanatory notes

(1): To be filled in only by the Commission services.
(2): Established in conformity with articles 4.2 and 6 of the contract.
(3): (I) = (A) + (B) + (C) + (D) + (E) + (F) + (G) + (H)
(4): To be filled in only by the coordinator.
(5): Insert the dates (dd/mm/yyyy) and the amounts (x,xxx.xx €) transferred to a contractor (including the coordinator) for a reporting period.
(6): (I') = (A') + (B') + (C') + (D') + (E') + (F') + (G') + (H')
(7): (Z) = (X) - (Y)
(8): One the following persons : authorised contact person or first or second administrative official authorised to sign the contract, as mentioned in your Contract Preparation Form (Form A2b)