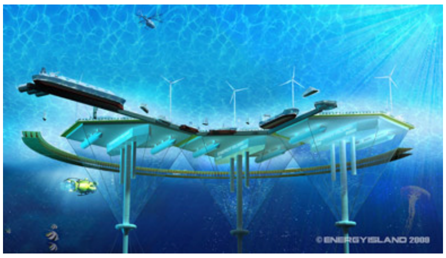
ECMAR News

The Newsletter of the European Council for Maritime Applied R&D September 2009

This issue features the activities of MARIN, the Maritime Research Institute Netherlands

Energy Island

The Energy Island concept is a platform to maximise collection and conversion of the different renewable energy sources available, such as wind, sea current, wave and solar energy. The Energy Island would bring together on a single floating structure, a variety of renewable energy conversion systems to maximise the energy production available from the diverse sources available, so that the interrelated systems can assist each other to reach greater efficiencies of conversion.
The Energy Island Group aims to commercialise Ocean Thermal Energy Conversion (OTEC), to provide large-scale renewable power and desalinated water to counties and utility companies worldwide.



Underwater view of an Energy Island facility

Our oceans are vast, untapped and renewable collectors of heat from the sun (Solar thermal energy). Ocean Thermal Energy Conversion (OTEC) works in tropical and sub-tropical seas where surface waters are over 25°C and water at 1,000m depth is at 5°C, so that there is a difference in temperature of at least 20°C throughout the year. It is this difference in temperature that powers the OTEC process.

www.energyisland.com

CIMNE joins ECMAR

CIMNE

The naval group of CIMNE, the International Centre for Numerical Methods in Engineering, has become the latest organisation to join ECMAR, and is welcomed. CIMNE is an autonomous research and development centre dedicated to promoting and fostering advances in the development and application of numerical methods and computational techniques for the solution of engineering problems, in an international context.

CIMNE organises a wide range of activities aimed at the teaching and spreading of knowledge. Additionally, the CIMNE carries out various research and development activities and has participated in a large number of technology transfer projects in cooperation with over one hundred and fifty enterprises and organisations from different countries.
www.cimne.upc.es

ECMAR's New Logo

ECMAR has a new logo, to replace the previous one. The website is also currently being upgraded and will have a new look as well; this should be up and running before the next Newsletter in November.

3rd Call: FP7-Sustainable Surface Transport (SST)-2010-RTD-1

The latest call for Sustainable Surface Transport: (SST)-2010-RTD-1, was published on 30 July 2009. It has an indicative budget distribution of EUR 20.895 million for Group of topics (GT) Nº 2: Eco-innovations in shipbuilding and waterborne transportation.

http://cordis.europa.eu/fp7/dc/idex.cfm?fuseaction=UserSiteFP7DetailsCallPage&call_id=238

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POSE^{2}IDON - Power Optimised Ship for Environment with Electric Innovative Designs ON board, is a €20 million EU FP7 funded integrated project, which began in January 2009. The project will provide a working guide on how to improve efficiency and reduce the environmental impact of the combined European commercial shipping fleet. It will also enhance the electric ship concept so that it can be applied to a wider range of vessels than is currently the case today.

The principal barrier to adoption of the electric ship concept in smaller merchant ships is the size of the generating equipment and propulsion motor. The POSE^{2}IDON consortium, consisting of 30 companies, will therefore focus on achieving size reduction through the development of new technologies across all aspects of marine electrical engineering. A key element of this will be the application of High Temperature Superconductivity (HTS) technology; this application will allow for smaller principal electrical components and an increase in efficiency. In addition, electric auxiliaries, wireless technology and fail safe power distribution will be studied.

www.poseidon-ip.eu

Strategic Energy Technology Plan (SET Plan)

In 2007 the European Commission put forward its Strategic Energy Technology Plan, also known as the SET-Plan COM(2007) 723. This set out a new energy research and innovation agenda for Europe. The European Commission is convinced that there is a large untapped potential of renewable energy in Europe. Low carbon technologies will undoubtedly play a vital role in reaching energy and climate change targets. The main goal of the SET-Plan is to accelerate the development and implementation of these technologies.

The strategic energy technology plan aims to help achieve European objectives and face up to the challenges of this sector.

In the short term this would be achieved by increasing research to reduce costs and improve performance of existing technologies, and in the longer term, by supporting development of a new generation of low carbon technologies.

Energy technology is vital if Europe's objectives for 2020 and 2050 for: combating climate change, security of energy supply, and competitiveness of European companies. In the longer term, if Europe is to decarbonise its economy, new generations of technologies will have to be developed through breakthroughs in research. The transition to a low carbon economy will take decades and affect every sector of the economy. Decisions taken over the next 10-15 years will therefore have profound consequences for energy security, for climate change, and for growth and jobs in Europe.

http://eur- lex.europa.eu/LexUriServ/

EquiMar – working to harness marine energy

EquiMar - Equitable Testing and Evaluation of Marine Energy Extraction Devices in terms of Performance, Cost and Environmental Impact is a FP7 project involving about 60 scientists, developers, engineers and conservationists from across 11 European countries. They are working together to find a way to measure and compare tidal and wave energy devices (above and below the water surface), so that governments can invest in the best ones and get marine energy on tap fast.

The aim of EquiMar is to deliver a suite of protocols for the equitable evaluation of marine energy converters (based on either tidal or wave energy). These will aim at accelerating adoption though technology matching and improved understanding of the environmental and economic impacts, associated with the deployment of arrays of devices. A series of protocols will be developed through a robust, auditable process and disseminated to the wider community. Results from the EquiMar project will establish a sound base for future marine energy standards.

www.equimar.org

Offshore renewable energy

A key socio-economic challenge for Europe is: how to deal with a climate change, while meeting rapidly increasing demand for energy and ensuring security of supply? Wind and tidal energy can be a significant part of the answer. The new frontier of the wind industry is large-scale offshore wind farms.

The high demand for green energy in Europe is likely to prevent the offshore renewable industry from heading into the downturn that has affected other maritime sectors and is likely to have an impact on the oil and gas industry in the coming year.

Europe's aspirations of reducing the amount of energy sourced from hydrocarbon imports and to decrease carbon dioxide emissions has already led to an international race to install offshore wind farms in the North Sea, Irish Sea and the Baltic. European nations are trying to outperform each another in the green energy stakes, which has led to a surge in the number of wind turbines installed.

Prospects

UK consultant Douglas-Westwood forecasts that capital expenditure on offshore wind farm construction over the next five years could go as high as $16bn, with annual spending soaring to more than $5bn in 2012. More than half of this expenditure could be on UK projects, 15% in Germany, 10% in Denmark, and the rest split between several other European countries.

This will also have an effect on the demand for vessels involved in deploying wind turbines and power cables, and the owners of such vessels can look forward to strong demand for their services. Analysts predict there will be double the number of wind turbines installed on the sea bed and a 300% increase in total power-generating capacity from these wind farms by 2011. As a consequence, analysts forecast that the market for installation vessels and cable layers will improve off Europe and that a market will emerge off the North American coast.

Prospects for other marine-based forms of renewable energy are similarly bright, after a period in which interest and investment in these technologies stalled in the 1970s. It was not revived until the late-1990s when a series of new companies sprung up to develop their ideas.

Although wave and tidal energy are still fledgling industries, they have high potential for growth and could hold opportunities for ship owners in the future. Tidal barrages were once seen as the new energy technology and an integral method of generating power from the sea. Wind turbines have taken over as the leading technique for generating power from the maritime elements, but more work is being done on developing wave power devices.

Douglas-Westwood UK consultants predict that the wave and tidal power sector will see strong growth in expenditure and the installation of generators in the next three years. Around 135 units could be installed in the next five years offshore Europe and in North America, with most of these systems deployed in 2011-2013. Combined, these systems could have the capacity to generate 86 MW of power, which is around the same size as an offshore wind farm of 40 turbines.

At present, there are only a few small devices deployed in Europe to demonstrate how power can be commercially generated from waves and tides. The Agucadoura wave park off Povoa de Varzim, Porto in Portugal was the first larger scaledemonstrator to be opened and uses three Pelamis wave energy converters. Portugal is planning a second phase of installations involving up to 25 Pelamis devices in the next few years. There are also demonstration devices off Denmark, Scotland, Northern Ireland and Spain.

Pelamis and its mechanism, which uses high-pressure oil to spin its generators

The Pelamis mechanism was developed from an older generation of wave-power converter, known as Salter's Duck. The Duck was highly efficient, extracting most of the energy from the waves, but this was believed to make it vulnerable to high seas. Pelamis's torpedo nose is designed to let it 'dive through' the largest waves rather than flexing with them. Although this reduces its efficiency, it makes it a more robust and 'survivable' design. Pelamis is the closest wave-power device to commercialisation.

The SeaFlow proof of concept tidal tubine, which has been installed near Lynmouth in the UK, since May 2003

UK examples

Another example is the `Anaconda', invented in the UK, which is an innovative wave energy concept whose ultra-simple lightweight design means it would be cheap to manufacture and maintain. This would allow it to produce clean electricity at a lower cost than other types of wave energy converter.

The device is still at an early stage of development and its concept has only been proven at very small laboratory-scale. But plans for larger-scale testing, funded by EPSRC, are underway.

The Anaconda wave energy converter

Named after the snake of the same name because of its long thin shape, the Anaconda is closed at both ends and filled completely with water. It is designed to be anchored just below the sea's surface, with one end facing the oncoming waves. When a wave hits the anaconda it causes a 'bulge wave' to form inside the tube. This turns a turbine fitted at the far end of the device and the power produced is fed to shore via a cable.

Also in the UK, SeaGen, the world's first commercial scale tidal stream turbine, has for the first time generated at its maximum capacity of 1.2MW. The turbine was deployed in Northern Ireland's Strangford Lough earlier this year and has since undergone commissioning trials. Developed by UK tidal energy group, Marine Current Turbines, SeaGen has reportedly achieved the highest power ever produced by a tidal stream system. SeaGen works by generating power from sea currents using a pair of axial flow turbines driving generators through gearboxes.

MARIN

www.marin.nl

Reliable, independent and innovative

MARIN, the Maritime Research Institute Netherlands, has become a reliable, independent and innovative service provider for the maritime sector and a contributor to the well being of society. We take initiative to couple our own expertise to various application areas to broaden our ability to solve problems. By maintaining our leadership position in hydrodynamic and nautical research and development, we make our accumulated know-how and experience available for Concept Development, Design Support, Operations Support and Tool Development. This commitment to high-quality technological innovation enables you to meet the challenges facing your industry today.

A dual mission

We have a dual mission: to provide industry with innovative design solutions; and to carry out advanced research for the benefit of the maritime sector as a whole. In this way, we strengthen the link between academic research and market needs. It is a unique interaction that benefits all parties concerned. The driving force behind this dual mission is a team of highly motivated and experienced people. MARIN is innovative, independent and above all reliable.

Pro-active response to market needs

By feeding back the results of advanced research programmes into market projects, MARIN has created a powerful synergy with the maritime industry. This industry is being confronted with shorter cycle times and increasing global competition in challenging environmental and economic conditions. By becoming involved in projects as early as possible, MARIN can help meet these challenges. Our customers include commercial shipbuilders, fleet owners, navies, naval architects and offshore company the world over.

Facilities & tools

To fulfil its design and verification services, MARIN has an exceptional range of model testing, computer simulation, full-scale measurement and training facilities. The synergy between these activities is the basis of our problem solving capacity, aiming at a reliable prediction. We have seven tank facilities available to solve specific design and research issues.

In combination with the model basins, MARIN uses simulation software, full-scale testing and training. This strong combination is not only used to achieve a reliable prediction of the performance in the design phases but also to improve and ensure the optimal operational use of the ship or structure. For this purpose, a large number of software simulation tools, tools for conducting full-scale measurements and several bridge simulators are available at MARIN.

Sharing experiences and building knowledge

In addition to providing hydrodynamic design and verification services to industry and governments, MARIN's contribution to shaping tomorrow's products also takes place through Joint Industry Project (JIPs) as one of the most important steps in the development, sharing and application of knowledge.

The cycle starts with the development of fundamental knowledge and scientific research in cooperation with universities.

The JIP promotes the transfer of theoretic knowledge to concrete applications in industry, and combines customer contact, market-driven research and the development of practical tools. Pooling resources at a pre-competitive level, all parties enjoy the cost savings of shared investment and benefit from research they could not afford alone. Joint Industry Projects form a significant part of MARIN's business.

Showcase: Pieter Schelte

Allseas asked MARIN and HSVA to carry out a model test programme for the new Pieter Schelte design in 2007. Pieter Schelte is a vessel for single-lift installation and removal of large offshore oil and gas platforms and installation of oil and gas pipelines. Pipe laying is carried out by a large stinger and it will be done using DP tracking in astern mode. The DP system is powered by 12,6 MW thrusters.

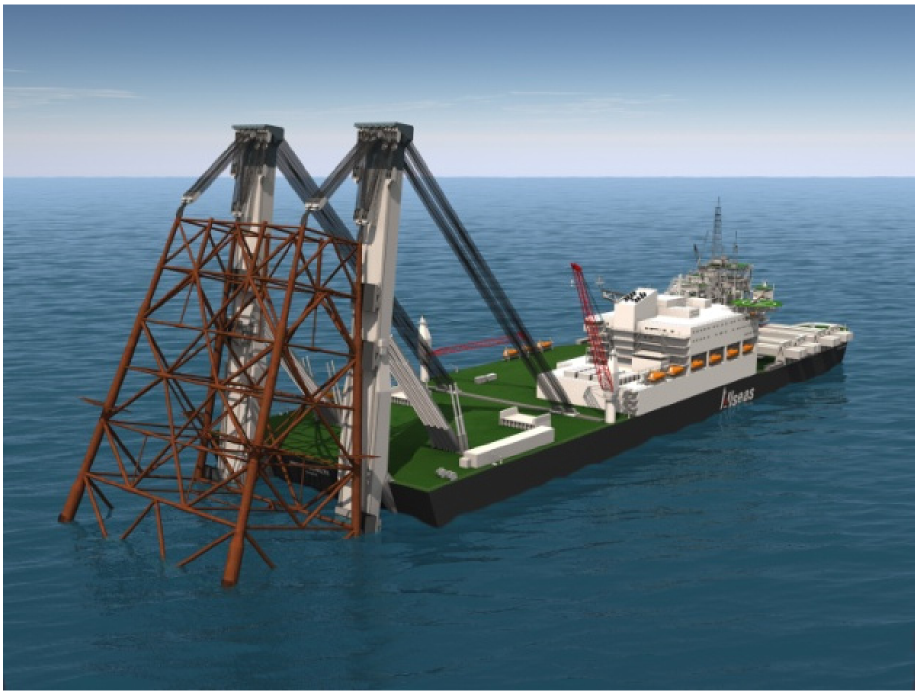
At the start of the project, the design was almost finished and the thruster equipment had been ordered but the propeller design could still be altered.

Therefore, the project focused on the performance of the vessel and its design verification. DP operability tests were carried out to determine the expected total uptime at a specific location. Speed performance, power distribution, steering methodology and ice-class verification were also tested.

MARIN's main objective was to provide Allseas with detailed information on the vessel's capabilities. This can then be used to determine the uptime and workability for different operational modes.

An extensive model test programme was carried out. The first phase of the project was to verify the design speed and optimum steering allocation of the 12 thrusters.

This was partly done in the Deep Water Towing Basin, using a regular powering model test set-up and partly using a new captive set-up. In this captive set-up, the total forces on the vessel could be measured for various drift angles and thruster settings. This resulted in a database that was used to calibrate a numerical manoeuvring model.



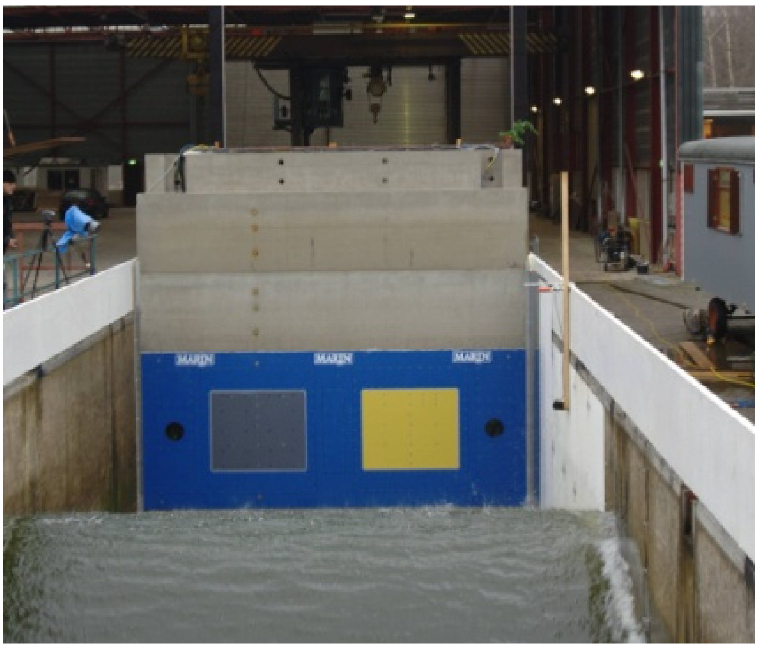
Knowing these settings, the model was transported to Hamburg where the HSVA ice basin is located.

Here, the Pieter Schelte was further tested for its resistance and manoeuvrability in sheet ice and broken ice fields.

The results of this unique model test project were very interesting and allow the designers of the Pieter Schelte to move forward with their design and to assess the operability of the vessel under different conditions.

Showcase: SlosHel – collaborative investigation into sloshing of LNG in tanks

Conventional sloshing assessments of new membrane LNG carriers traditionally follow the comparative approach that is based on small-scale model testing, numerical simulations and the excellent track record of LNG carriers. Model testing provides the maximum loads, based on statistical analysis of measured pressures. The response of the containment system to these loads is numerically simulated and checked against different limit states.



However, with the filling level limitation on the current fleet, experience is lacking to support comparative methods for partially filled cargo tanks. To move forward, the industry is developing a methodology to assess membrane systems by a direct comparison of the loads and the structural capacity. To develop such methodology, MARIN recognized the need for full-scale validation already back in 2003.

Gradually, a confidential and exclusive Joint Industry Project "Sloshel" was set up by MARIN, Gaztransport & Technigaz (GTT), Bureau Veritas and Shell. Ecole Centrale Marseille, the American Bureau of Shipping, Chevron, Lloyd's Register, Det Norske Veritas and ClassNK joined the project later on.

Following a recent decision of the project group to reveal some of the findings, a dedicated session on the Sloshel project was held during the first LNG Sloshing Dynamics Symposia at the ISOPE conference in Osaka, Japan, 2009. The scope of work includes full and small-scale tests conducted at MARIN, numerical developments carried out by Bureau Veritas and validation studies undertaken by the consortium members.

On behalf of the project group, MARIN has now carried out 110 full-scale sloshing tests in the Delta flume of Deltares. Each sloshing test consisted of one breaking wave impact, obtained by the controllable wave focusing method. The wave breaking impacts were first defined in 1:6 tests that showed that they are similar to sloshing impacts in membrane LNG tanks. The full-scale data includes shape measurements of the breaking wave before and during the impact, as well as pressure, force, strain and acceleration measurements of a real containment system and its rigid equivalent.