

"Where will our knowledge take you?"

Energy Matters

Chevron Selects BMT Scientific Marine Services to Provide Big Foot EFMS

Chevron has awarded a contract to BMT Scientific Marine Services Inc (BMT) to provide an Environmental and Facilities Monitoring System (EFMS) for the Big Foot Tension Leg Platform (TLP) in the Gulf of Mexico.

The EFMS monitors, logs, and displays data in real-time on the local environment and facility motions. It archives the data for assessing the TLP's integrity over time and interfaces with the facility's other platform control systems. The EFMS is comprised of a computer console, topside and subsea remote sensor packages, BMT's proprietary data acquisition system, and custom Human Machine Interface (HMI) user display screens.



Example Metocean Subsystem Components of a Typical EFMS

The Big Foot EFMS will measure factors such as wind speed and direction, platform position, wave frequency and high frequency platform motions, air gap, surface currents and draft.

BMT Scientific Marine Services has previously provided EFMSs to five of Chevron's Gulf of Mexico Floating Production Units.

For more information on this project, please contact info@scimar.com.



BMT Fluid Mechanics wins contract to provide Tow Simulation Services to Chevron platforms. Read more on page 3.



BMT Nigel Gee designs Offshore Windfarm Support Vessels. Read more on page 8.

Message from the Sector Director Dr. Ralph Rayner

Rising demand for energy from conventional and renewable sources is a major driver of innovation. In the offshore oil and gas business the move to ever deeper and more hostile waters in the search for new reserves continuously pushes the frontiers of what is technologically possible. In the rapidly growing market for marine renewables, and especially in the development of offshore wind power, there is a pressing need to adapt existing terrestrial technologies to the unique constraints imposed by the marine environment.



In the latter case, the offshore oil and gas industry has much to teach the marine renewables business. After more than forty years of activity in designing and operating complex marine

infrastructure the oil and gas industry has learnt the hard way that operating at sea places special demands given the hostile nature of the environment and the difficulties associated with intervention. The marine renewables industry must deliberately operate in marine areas where these demands are most acute. There is little point in placing offshore wind facilities in locations where the wind climate is benign or building wave and tidal stream devices in locations with small waves or weak tidal currents!

Transitioning technologies and lessons learnt in one industry to another is not easy and demands a proactive approach to ensuring that the mistakes made in one are not repeated in the other. The offshore renewables sector still has a lot to learn from the offshore oil and gas sector, especially in the area of the interplay between reliability and the cost of intervention for maintenance and repair.

At the frontiers of offshore oil and gas exploration and production the technological challenges demand strong interfaces with cutting edge developments in many areas of science, technology and engineering. New materials, robotics and power systems are just a few examples.

BMT is proud to be playing its part in helping to foster these interfaces through sponsorship of events such as the 'Catch the Next Wave' conference aimed at connecting key research in disruptive and emergent technologies with maritime applications and through our substantial internal investment in cutting edge research and development.

In this issue of Energy Matters you will find examples of some of the things we are doing to apply our research and development efforts and our diverse knowledge of all things marine to the benefit of our many customers in the energy sector.

Upcoming Conferences for BMT Offshore Oil & Gas









Oceanology International 2012

ExCeL • London, UK March 13-15, 2012 Visit our companies at Booth #I120

Offshore Technology Conference (OTC) 2012

Reliant Center • Houston, Texas, USA April 30 - May 3, 2012 Visit our companies at Booth #2441-E in the UK Pavilion

Rio Oil & Gas 2012

Riocentro Convention Center • Rio de Janeiro, Brazil September 17-20, 2012 Visit our companies at Stand #30

Gastech Conference & Exhibition 2012

ExCeL • London, UK October 8-11, 2012 Visit our companies at Stand #E140

BMT to provide Tow Simulation Services for Chevron's Jack St. Malo and Big Foot Platforms

Heerema Marine Contractors Nederland B.V Inc. ("HMC") has awarded a contract to BMT Fluid Mechanics in partnership with BMT ARGOSS, to provide Tow Simulation Services for the inshore tow of Chevron-operated Jack St. Malo and Big Foot Production Platforms to be installed in the Gulf of Mexico.

BMT will be engineering, procuring, installing and commissioning a purpose built simulation facility to be located in Houston, Texas, for the purpose of training tug captains and other marine personnel involved with the inshore towing of the platforms from the Ingleside integration yards. The inshore tows are particularly challenging because of the extremely small hull clearances within the shipping channels leading from the yards out to the gulf. Up to five independently controlled tug boats will be effectively, rigidly coupled to the hull to perform the 15 mile wet-tows.



BMT Hull Tow Simulation

BMT's PC Rembrandt real time manoeuvring training software will be the basis of the simulator. The simulator will provide a realistic hands-on facility for tug captains to develop safe operating strategies for the tow and develop rational weather and tide operating limits.

The delivery of the project relies heavily on BMT's extensive experience with shallow water hydrodynamics, manoeuvring simulation, hydrodynamic model testing and Computational Fluid Dynamics (CFD). A comprehensive experimental and numerical study of the manoeuvring characteristics will be performed initially, followed by integration of the data into, and customisation of the PC Rembrandt simulator.

BMT has unique experience in providing valuable expert knowledge and support to the project having successfully provided towing simulation services for the inshore shallow water towing campaigns of BP's Thunderhorse and Atlantis semi-submersibles through the same channels.

For more information on this project, please contact enquiries@bmtfm.com.

Navcon Sells Stake to BMT Scientific Marine Services Ltda

Navcon Navegacao e Controle Ltda, the leading Brazilian specialist in monitoring systems for the offshore oil and gas industry is pleased to announce that it has entered into a formal partnership with BMT Scientific Marine Services Ltda. The company has an advanced R&D background and widespread experience of working offshore Brazil. Navcon's current oil and gas activities align with those of BMT and include anchorage torpedoes and riser monitoring systems, monobuoy monitoring systems as well as metocean and wave measurement buoys.

Claudio Pires and Valter Schad, Directors at Navcon commented: "We are delighted that BMT has chosen to invest in Navcon. We are confident that our cutting edge R&D and knowledge of the Brazilian market combined with BMT's innovative culture, drawn from working in the oil and gas industry in other territories, will provide added value to all our current and future customers."

Peter French, Chief Executive of BMT Group Ltd, commented: "With the BRICS countries now considered to be driving the global economy, Brazil's commercial importance has been further heightened. The new relationship with Navcon will allow BMT to enhance its technical base in-country providing skills to help further support Brazil in realising its oil and gas reserves."

BMT has been working in South America since 1998, with numerous riser tension, mooring tension, and position monitoring systems installed in the Campos and Santos basins offshore Brazil.

Oil & Gas Modeling

BMT Fluid Mechanics Super Computer Takes a Quantum Leap

Over the last 10 years, BMT Fluid Mechanics has seen a dramatic growth in its Oil & Gas modeling services supported by Computational Fluid Dynamics (CFD). CFD modeling is used for a wide variety of modeling requirements ranging from detailed high resolution explosion modeling of assets during design to minimize risk and maximize safety, hydrodynamic modeling of the world's largest TLPs, to subsea flow assurance problems involving sand erosion and multiphase flows in the world's deepest fields.

As a result of the high demand for BMT's CFD modeling services across the world, and the company's goal of providing the industry's best services to their clients, the company has recently made a major expansion to the computing facilities used to run CFD. Phase 1 of



CFD Cluster

the expansion resulted in a growth of the super computer to 200 CPUs dedicated to running high speed CFD simulations. The company also scaled up its CFD software resources of the leading edge commercial CFD packages from ANSYS and industry standard explosion modeling software FLACS to make full use of the extra computational capacity.

Phase 2 of the expansion will begin in the middle of 2012 with the installation of a high speed communications network that is used on the world's fastest super computers, and the construction of a mirror super computer at the company's Kuala Lumpur office.



CFD Application

BMT Fluid Mechanics Director, Dr. Chris Craddock, remarked the following in response to the recent expansion; "The growth of our CFD modeling services is very exciting. If I look back 5 years ago at what was possible with 5 weeks of computing time, we can now do that in 1 day. This recent upgrade puts us in a position of having a world class super computer running cutting edge CFD software all run by the world's best CFD engineers. The result is that our clients get faster turnarounds on their projects, higher quality deliverables and the best technology and personnel available to add the maximum value to their projects."

For more information on these services, please contact enquiries@bmtfm.com

BMT Offers Specialist Dredging Advice in Icthys LNG Development

INPEX Corporation (INPEX) is the proponent behind plans to export LNG, LPG and condensate from onshore facilities at Blaydin Point as part of the Ichthys LNG project. In order to accommodate the required export facilities, it was necessary to dredge a channel and turning basin which will involve the removal and transport of up 17 Mm³ to an offshore disposal site. The dredge material typically consists of unconsolidated sediments; however, a significant volume of potentially high strength rock is also located in the dredge area, at a site known at Walker Shoal.

BMT JFA Consultants was engaged by JKC Joint Venture (JKC) on behalf of INPEX to provide a range of specialist dredging consultancy services during the front-end engineering design (FEED) and Open Book Tender (OBT) phases of the project. Initially, BMT JFA's role was focused



on the provision of specialist advice regarding the suitability of various methodologies for the removal of hard rock at Walker Shoal. Aside from the technical dredging assessment, this role also included the review of the levels of underwater noise generated by the different dredging methods. Following this, BMT JFA provided assistance to JKC in the preparation of the dredging Request for Tender package. BMT JFA prepared both the dredging Specification and Scope of Work as well as providing input into the development of the Contracting strategy and Schedule of Rates.

Services provided by BMT JFA Consultants included:

- · Review of geological data to determine appropriate dredging methodologies
- Preparation of an 'Alternative Options Report' outlining methods for the dredging of high strength rock, including a
 discussion of the potential environmental impacts associated with each method as well as production and budget
 estimates
- Development of documentation required for the Tendering process including the Specification and Scope Works.

For more information on this project, please contact jfa@bmtjfa.com.au.

New Faces to the Offshore Oil & Gas Team

Norman Di Perno - BMT Cordah

BMT Cordah has announced the appointment of Norman Di Perno as its Managing Director. Dr. David Sell, who has been the company's Managing Director for the past four and a half years will take up the role of Technical Director.

With a background in environmental engineering and hydrogeology, Norman's focus for the business will be to further enhance its global reach as a multi-disciplinary environmental consultancy for the offshore oil and gas and marine renewable sectors. Norman has held both Managing Director and Director positions throughout his career and has worked within the BMT group of companies since 2000. His most recent role saw him as Director of Risk and Environment for BMT Designers & Planners Inc, based in Washington D.C.

Rafaela Fearnley - BMT Scientific Marine Services Ltda.

Rafaela Fearnley recently joined BMT Scientific Marine Services Ltda in the Rio de Janeiro office as an Administrative and Sales Support Coordinator. Rafaela speaks both Portuguese and English fluently, and has graduated in Business Studies with a major in Marketing at the Massey University of Auckland, New Zealand. A web-based technology aficionada, she also obtained a Certificate in WebDesign from the New Zealand Openpolytechnic Institute.

Rafaela comes from a wide-ranging working background and has extensive experience in administration, office management and marketing management. She will support the Rio de Janeiro team by taking care of all clerical duties, as well as supporting sales and marketing activities.





BMT Assesses Reliability of the Stingray PRM System

BMT Reliability Consultants Ltd, a subsidiary of BMT Group Ltd, the leading international maritime design, engineering and risk management consultancy, has announced its latest project with Stingray Geophysical Ltd, a TGS company. This partnership saw BMT provide critical analysis and reliability assessments during the development of the wet-end array of Stingray's innovative fibre-optic Fosar® seabed seismic sensing system.

Stingray Geophysical, a provider of reliable, cost-effective seismic Permanent Reservoir Monitoring (PRM) solutions to the global oil and gas industry, and its manufacturing partner, Atlas Elektronik UK Ltd, turned to BMT to provide a System Model and Configuration Assessment. This assessment was then used to model the impact of design option enhancements developed by Stingray and Atlas. These enhancements were designed to maximise the fault tolerance of the system architecture and assure the reliability of the installed array over prolonged periods of up to 25 years of operation.

Andrew Cooper, Managing Director of BMT Reliability Consultants comments: "Permanent Reservoir Monitoring solutions such as Fosar enable the monitoring of production-induced changes in reservoir behaviour over time. Used as part of a reservoir management strategy, this can provide oil and gas companies with the opportunity to increase production and recoverable reserves. BMT Reliability Consultants is committed to helping the evolution of such products by delivering reliability risk assessments that form a key part of design development.

The speed at which technologies evolve in this industry means that companies like Stingray are constantly looking at enhancing their solutions. We are delighted to be continuing to work with the team and support them in their drive to provide the most technologically advanced PRM solution."

For more information on this project, please contact energy@bmtrcl.com.



A Typical Fosar® System Array Layout. Image courtesy of Stingray Geophysical Limited

BMT Cordah and add novatech Deliver Improved EEMS Reporting Software to UK Market

BMT Cordah, a subsidiary of BMT Group Ltd, the leading international maritime design, engineering and risk management consultancy, has launched the NEMS Accounter® Light reporting software to the UK market.

The software developed by environmental specialists add novatech, in conjunction with BMT Cordah builds on the success of NEMS Accounter® which has been developed in close cooperation with major oil and gas operating companies, specifically as an environmental accounting and management system. This user friendly, online tool is a key element in helping oil companies to better register and manage the vast number of emission and discharge data they need for proper environmental control and to ensure that they can report this data in compliance with the UK regulatory regime.

(Article continued on next page)

BMT Cordah Reporting Software (continued)

In order to address the comprehensive and unique UK electronic reporting requirements, BMT Cordah has utilised its experience, knowledge of environmental regulations and proximity to the UK regulator to add value throughout the development process. By utilising customer feedback to assess the current needs, add novatech and BMT Cordah have ensured that the NEMS Accounter® / NEMS Accounter® Light system is not only a bespoke system, but unique in the market.

The UK energy market is constantly evolving and NEMS Accounter® has continued to align itself with the market's progression. By deploying NEMS Accounter® as "software- as-a-service" (SaaS), new versions can be deployed continuously to ensure strict regulatory compliance.

Geir Husdal, Managing Director at add novatech comments: "Partnering with BMT Cordah provides us with a comprehensive understanding of the regulatory complexities UK energy companies face. Being experts for over 30 years, BMT has demonstrated its knowledge and expertise is second to none which comes through



the close relationship it has with the key stakeholders involved in developing the necessary environmental regulations."

For more information, please e-mail enquiries@bmtcordah.com.

BMT WBM Secures International Environmental, Safety and Quality Accreditations

BMT WBM has successfully secured both ISO 14001 Environmental Management and ISO 18001 Occupational Health and Safety certification as part of its drive to comply with the latest, international environmental and safety standards.

As well as these accreditations BMT has been awarded the Australian and New Zealand standard for Occupational Health and Safety Management Systems, AS/NZ4801 and has been recertified for the Quality standard, ISO 9001.

Tony McAlister, Managing Director of BMT WBM comments: "Achieving these accreditations is a key milestone for our business and has resulted in the implementation of a completely integrated management system which will help to simplify, streamline and standardise the operational systems that we use.

With over 40 years' consulting experience it was vital for us to ensure compliance with both Safety and Environmental laws and regulations and implement an effective Integrated Management System - being accredited to ISO 14001, ISO 18001 and ISO 9001 demonstrates our conformance."







For more information on this partnership, please contact bmtwbm@bmtwbm.com.au.

Renewables Focus

BMT Nigel Gee Wins Two Contracts to Design Offshore Windfarm Support Vessels

BMT Nigel Gee has won a contract to supply the design for the construction of eight new 20m Windfarm Support Vessels to be built by Strategic Marine, the Australian shipbuilder. The vessels are to be built for Njord Offshore Ltd., a subsidiary of Norse Management UK which has a long history in the marine industry. This contract follows the signing of the Teaming Agreement between Strategic Marine and BMT in September last year and reinforces Strategic Marine's ability to provide offshore windfarm support vessels into the European market.

Developed from BMT's well-established range of Windfarm Support Vessels, the Njord Offshore vessels will be 20m in length with a beam of 7m, powered by two MTU 8V2000M72 diesel engines with fixed pitch propellers and capable of speeds in excess of 25 knots. The vessels will be built to the DNV Wind Farm Service 1 notation and will be delivered later this year.

Commenting on the significance of the order, Ed Dudson, BMT Nigel Gee's Technical Director, says: "These 20m vessels are the first in a range of Offshore Windfarm Support Vessel designs developed by BMT specifically for Strategic Marine. It confirms BMT's ability to offer cutting-edge designs for this fast growing market and demonstrates yet another success for the specialized vessel design team at BMT Nigel Gee."

BMT also announces further collaboration with Turbine Transfers, one of the leading providers of Windfarm Support Vessels (WSVs), on its latest unique development - the design of a 19m WSV utilizing the Voith Linear Jet.



Strategic Marine Njord Offshore Vessel



BMT Nigel Gee Voith Linear Jet

The Voith Linear Jet (VLJ) is an innovative propulsor unit developed by Voith that provides considerable advantages to the operator over both conventional propellers and waterjets. Voith has undertaken extensive numerical modeling and model testing of the propulsor, but this will be the first application in a vessel. The VLJ is an advanced ducted propeller with a stator positioned in the duct aft of the propeller, in a similar arrangement to that of a waterjet. For the same installed power, the VLJ is expected to provide a bollard pull approximately 50% higher than that of a waterjet and in excess of 30% higher than conventional propellers.

Bollard pull is important for the WSV operator in docking operations as a higher bollard pull could allow for personnel transfers in higher sea states. The advantage of the VLJ is that the increased bollard pull is provided without a requirement for increased installed power. Most importantly, since the VLJ has a torque curve similar to that of a waterjet, the torque limits of the engine do not impact the available bollard pull which can be the case with fixed pitch propellers. Model tests have shown that at speed, the VLJ is capable of delivering efficiencies at least equal to, if not higher than, those achieved with fixed pitch propellers.

Voith is now undertaking extensive model tests in conjunction with BMT to optimize the VLJ design and to validate performance. The production of the first VLJ9000 units is underway and construction of the vessel will start shortly at Holyhead Marine, for completion early next year.

BMT ARGOSS Expands Metocean Efforts in Southeast Asia

BMT ARGOSS, has recently been awarded a number of projects in Southeast Asia including metocean studies for Petronas Carigali Sdn Bhd and its offshore development, east of Sabah in Malaysia.

As well as operating regional wind and wave models, BMT ARGOSS can generate and provide localized hindcast data sets and has recently worked closely with sister company BMT WBM to undertake innovative, nested hydrodynamic modelling in the Makassar Strait, Indonesia. Coupled with its recent development in tropical storm modelling, BMT ARGOSS is providing the necessary support within the engineering design, planning and installation phases of offshore production facilities, including jacket and floating structures as well as the associated pipelines back to shore.

Robin Stephens, Manager of the Metocean Group at BMT ARGOSS explains: "As oil and gas companies look towards much deeper water provinces such as the Makassar Strait and areas close to Vietnam for offshore production, metocean studies become even more important due to the harsher environmental conditions. Our customers need to be able to understand and quantify the conditions that need to be withstood and we can guide them through this process."





Monthly average wind velocities across the region from BMT ARGOSS' long-term hindcast database. The top figure shows results from January while the figure underneath shows results from July.

Stephens continues: "It's all about reducing the uncertainty in the basis of design – we're working in a very erratic environment and we need to inform the design engineers of pragmatic values for extreme loadings, and that's a balance between economy and safety."

BMT ARGOSS specializes in monitoring, analysing and forecasting environmental conditions with a focus on providing innovative solutions to the offshore, coastal and harbour sectors, and urban management authorities. Consulting in the offshore and harbour sectors is supported by expertise in (moored) ship response, ship manoeuvring simulation and ship performance monitoring.

Using in-house resources and expertise on MetOcean conditions, ocean & atmospheric modelling, meteorology, remote sensing and data assimilation, the company support numerous projects and operations around the world.

For more information, please contact info@bmtargoss.com.

Technology Qualification

Maximizing the Benefit of Technology

BMT Reliability Consultant's Mike Sillett will be presenting a paper at Offshore Technology Conference 2012 entiled "Maximising the Benefit of Technology by Evaluation Qualification from Early R&D and Concept Stages of Development".

Technology Evaluation Qualification is a systematic process for reducing uncertainty associated with new technology. Although frequently applied to drive the technology readiness level of the subject technology from the result of a prototype onwards, there is a proven benefit to applying the discipline of Technology Evaluation Qualification from the earlier stages of R&D, Concept and Proof of Concept. The paper will discuss the tailored application of the methodology to these earlier stages of technology development.

This tailored application of Technology Evaluation Qualification is applicable to all aspects of technology, but is especially valuable in the offshore area where today risks, costs and development time are very high. The importance of improving the reduction of risk and uncertainties in an effective fashion has been highly emphasized in the last year, and is requiring a wider collaborative effort by an increased number of parties, as complexity and difficulty of interfaces intensify.

The primary benefit from this process driving towards an early application of Technology Evaluation Qualification is the improvement in reduction in risks and uncertainties in the first application of a new technology. By identifying the risks earlier in the development cycle, more timely and cost effective mitigation actions can be invoked.



For more information, please contact energy@bmtrcl.com.

BMT JFA Consultants Assists in Design of Onshore MOF in Western Australia

BMT JFA Consultants has recently been engaged on a significant contract in the burgeoning Oil and Gas sector in Western Australia. The engagement is with one of the Design and Construct (D&C) contractors involved in construction of an onshore material offload facilities (MOF) in very shallow coastal waters exposed to cyclonic wave attack. This work builds on significant assistance on dredging, coastal structures, port planning and design and inshore metocean and wave loading advice to the resources sector.

Assistance was given to the design team to interpret the client supplied information and basis of design for the site, and to develop facility specific design wave criteria including: wave transformation modelling and shallow water wave form interpretation; design loadings for exposed vertical face berth caissons and piled mooring structures; physical model verification of structure wave loadings; and technical inputs to mooring analyses and designs. Design challenges were presented in providing typical port quay and mooring infrastructure at a site fully exposed to cyclonic extreme event loadings. BMT JFA Consultants were able to use their knowledge and insight of coastal wave conditions, current design methods for current vertical coastal structures and port planning/design development to assist the contractor in meeting these challenges and provide technical support and input in a rigorous client JV EPCM project management environment.

Typical aspects of BMT JFA Consultants capabilities employed in providing services to the Oil and Gas and Resources sectors include: general port and harbour planning and engineering; coastal dynamics; and coastal and maritime structures.



Boussinesq Modeling



Physical Model Testing

For more information, please contact jfa@bmtjfa.com.au.

BMT Moves to New Office in Houston

BMT Group is pleased to announce the opening of its new offices in Houston, Texas. BMT Scientific Marine Services have had operations in Houston since 1996. Their expanding business has necessitated their move to larger and more suitable facilities. BMT SMS also serves as a Houston base for BMT Fluid Mechanics and BMT Reliability Consultants, the new location at 11505 West Little York, Houston, TX 77041 is approximately 8 miles from the previous location on Whithorn Drive and in close proximity to the intersection of Highway 290 and Beltway 8.

The new building provides 60% more useable space which will be fundamental to BMT Scientific Marine Services' future plans.

Jeffrey Lewis, Vice President of Operations for BMT Scientific Marine Services commented, "Our Instrumentation Systems (IS) Group uses the Houston office to build Integrated Marine Monitoring Systems (IMMS) and Independent Remote Monitoring Systems (IRMS). The expanded lab area will increase our capacity by allowing us to build multiple IS projects simultaneously." Lewis added, "Our Service Group also operates out of this office, and with the increased space, we are able to better organize equipment and spares to more efficiently service our clients. In the future, we plan to add inventory of common components to help provide quicker service response times."





Goodrich House 1 Waldegrave Road Teddington, TW11 8LZ United Kingdom

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