Issue 1 | January 2016

FOCUS

Beneath the waves

Exploring the challenges of working in the last great wilderness: our oceans.

Managing marine growth

Underwater mining

Offshore foundations

BMT Group

"Where will our knowledge take you?"

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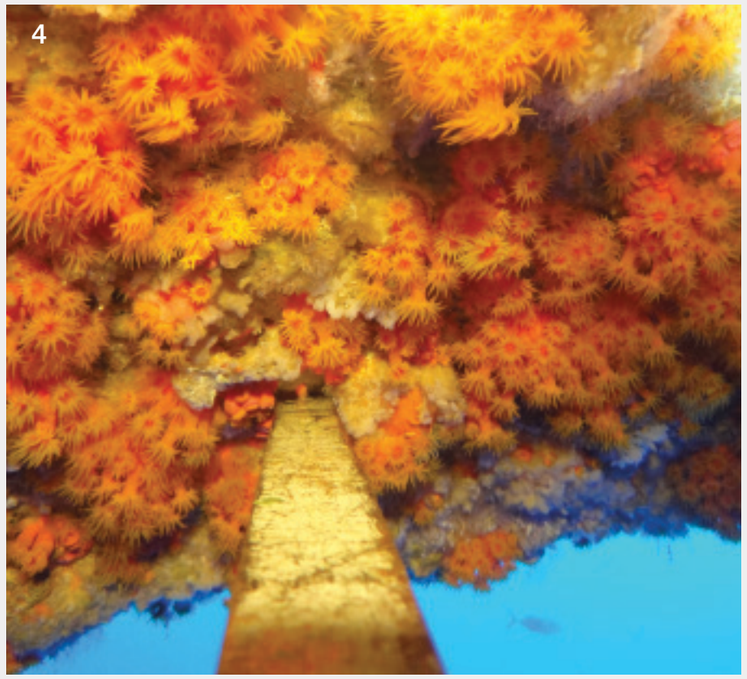

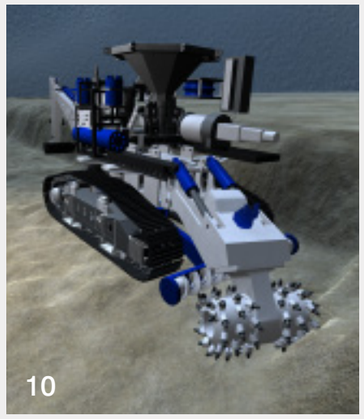

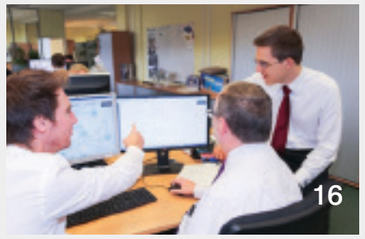

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Editorial

A warm welcome to the latest issue of Focus. The oceans of the world are often described as the last great wilderness despite mankind's attempts to conquer them. Faced with the challenges of working far away from land in extremes of cold and pressure with the added burden of maintaining often fragile ecosystems, any successful subsea enterprise demands the best of engineering and innovation.

Peter French
Chief Executive

In this issue

We look at some of the challenges involved in working beneath the waves. BMT is helping to ensure that unmanned underwater vehicles reach their potential in a safe and environmentally responsible manner. The iVAMOS! consortium is developing underwater mining equipment that could help secure up to €100 billion of unexploited European mineral resources. The Norwegian Geotechnical Institute is developing foundation technology originally used in the offshore oil and gas sector for use by the renewables industry. Dealing with offshore structures responsibly at the end of their operational life is vital and BMT Cordah is involved in ensuring that decommissioning can take place in a safe and environmentally responsible fashion. Developing people is as important as developing technology and BMT Defence Services is proactively training the next generation of submarine engineers.

I hope you enjoy this issue and would like to thank all our authors who have given their time to provide us with their views and insights. We always welcome your feedback on the magazine. If you have any thoughts on any of the subjects we have covered or would prefer to receive this publication in electronic format, please send your feedback to our editor at jwilliamson@bmtmail.com.

Dr Joe Ferris

Joe is BMT Cordah's EIA & Renewables Team Leader and as an environmental professional, Joe's work has included impact studies and environmental assessments, statutory planning, ecological field studies, implementation of the ecosystem approach, protected species studies and consultation, biodiversity planning, ecological risk assessment, and environmental support for offshore and onshore renewable energy projects.

Managing Marine Growth in Offshore Decommissioning

North Sea Installations 2030.

10,000
km of pipelines approx

5,000
wells approx

1,500
registed offshore oil and gas installations

470
UK sector offshore installations to come out of service by 2030

US$46.8bn
(£30 billion) cost of decommissioning these installations

Source: latest figures from industry body Decom North Sea.

The effective management and mitigation of potential environmental impacts and risks is key to the success of offshore oil and gas decommissioning.

With many oil and gas installations in the North Sea now reaching the end of their working lives, decommissioning within the offshore environment is rapidly becoming a focused activity for the industry. You can see some of the projected figures here. Many of these North Sea structures are over 40 years old and over the next two decades a growing number of redundant oil and gas installations will be taken out of service and decommissioned. As well as the physical removal of the component parts, decommissioning of offshore subsea structures must include the management and mitigation of any potential environmental impacts and risks. This includes the consideration of organisms that colonise submerged oil and gas structures referred to as 'marine growth'.

Why Assess Marine Growth

A marine growth assessment is a key element in the management of the decommissioning process. Correctly undertaken, it will minimise potential environmental impacts and risks. Marine growth assessments are a practical, effective and cost-saving management tool within the wider scope of environmental impact assessments (EIAs), contributing both environmental and socio-economic elements. At a minimum, these assessments can be used to provide a quantification of the weight of fouling organisms and identification of species, including those subject to protection. The weight of the structures to be decommissioned is a fundamental consideration when planning lifting, transportation and disposal operations. The additional weight of marine growth must be assessed as it can increase costs and the complexity of lifting operations.

What Influences Marine Growth?

Factors influencing the distribution and occurrence of marine growth colonisation include water temperature, salinity, depth, distance from shore or from other fouled structures, exposure to wave action and predation. There can be major differences in species composition and distribution between areas of the North Sea, so each offshore facility must be considered independently. For example, the CNRI – Northern North Sea Murchison Platform was found to have approximately 2,394 tonnes of marine growth while the ConocoPhillips – Southern North Sea Satellite Platforms were found to have on average only 39 tonnes of marine growth.

Protected Species

Another issue that must be addressed is identifying the potential incidence of the two protected species that occur in the North Sea. *Lophelia pertusa*, a cold-water coral and *Sabellaria spinulosa*, a reef building polychaete worm are both listed under the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES). This listing means that a CITES certificate is required if transporting Lophelia or Sabellaria between states.

Managing Marine Growth

These colonies may form habitats from a range of species, the composition of which will differ depending on the structure's depth, geographical location and age. Marine growth introduces a wide range of issues in the context of decommissioning, including the added weight to a structure, colonisation by protected species, the potential for transfer of invasive, non-native species and the management of marine growth waste.

Colonisation of offshore structures can commence within weeks of submergence, continuing until the time of decommissioning. Throughout that period, marine growth can colonise and re-colonise, sometimes with species different to those originally found on the structure. In some cases, structures may have been in place since the late 1970s, providing opportunities for colonisation by a succession of marine species.

How Is Marine Growth Managed During Decommissioning?

Current approaches to the management of marine growth include:

(i) offshore removal of marine growth by a remotely operated vehicle (ROV) and/or divers in situ;

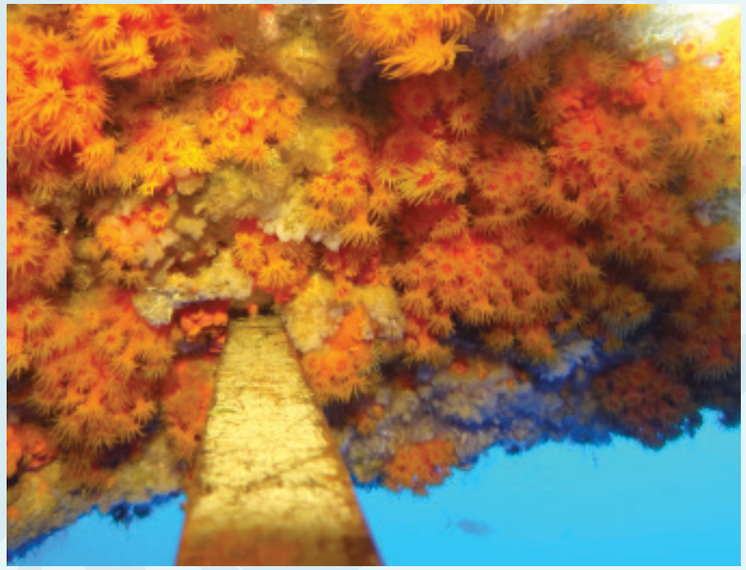
(ii) onshore removal from cut jacket sections and subsequent landfilling; and

(iii) land-spreading or composting of removed marine growth.

All these options bring with them potential environmental impacts which need to be considered. Potential seabed impact from marine growth removed in situ will also be influenced by the species' composition. The suitability of landfill or composting sites will depend on species' composition and current EU legislation, which includes an obligation for member states to reduce the amount of biodegradable waste including marine growth destined for landfill. Therefore, disposal in landfill may become a last resort for this waste.

That Smells Bad!

Furthermore, offshore structures brought to shore with marine growth still in situ have often resulted in complaints from local communities regarding the odour. If this methodology is followed then it should be planned to avoid the summer and autumn when marine growth would be expected to emit a stronger odour for longer than those removed in spring from the same location.



Managing Invasive Alien Species

With the transportation of offshore structures for disposal comes an increased potential risk to the marine environment of the introduction of invasive species. A marine growth assessment also provides information on the presence of potentially invasive alien (non-native) species (species from outside their natural range) which can threaten the diversity or abundance of native species, the ecological stability of infested waters and/or commercial, agricultural or recreational activities. Invasive species can often out-compete indigenous species, detrimentally affecting local ecosystems. A marine growth assessment can satisfy current EU and International legislation requirements for detection and management of invasive alien species.

The importance of managing marine growth cannot be underestimated in the context of offshore oil and gas decommissioning. As well as ensuring that all subsequent activities comply with current legislation, a marine growth assessment can help minimise potential environmental impacts and risks in what is, by its very nature, a high risk and expensive undertaking.

Unmanned:
A Force Multiplier

BMT Isis Is Developing Guidelines to Help Harness the Raw Potential of Unmanned Underwater Vehicles

Despite receiving less publicity than their airborne 'cousins', unmanned underwater vehicles (UUVs) have huge potential to deliver enhanced capabilities in the maritime domain. UUVs are a family of underwater vehicles including remotely operated vehicles (ROVs, tethered and untethered) and maritime autonomous systems (MAS). Operating physically independently from other assets, unlike the tethered ROVs prevalent in the offshore oil and gas industry, MAS have the potential to operate for prolonged periods over significant distances without the need for significant operator interaction.

Craig Spacey

Craig Spacey is Head of Business Development - Submarines at BMT Isis. Craig is responsible for identifying opportunities and partnerships in the delivery of services to those who build, maintain and sustain the UK's submarine capability, and is currently working on several projects, including Future Submarine, In-Service Submarines and the Submarine Dismantling project. As a Submarine Nuclear Engineer Officer in the Royal Navy, Craig gained experience managing and operating a nuclear submarine both globally and during deep maintenance activities.

In fact, the success of the unmanned aerial vehicle (UAV) is now having a positive effect on the way in which UUVs are viewed. Although much of the technology behind UUVs has been there for many years, UAVs have acted as technology and capability demonstrators in a very overt fashion to demonstrate what is possible in the unmanned field. Combined with pressure on defence budgets across the world UUVs are now looking very attractive, especially as they effectively remove the human element both in terms of exposure of humans to risk and in terms of human error as a risk during operation. This is particularly important during prolonged operations where operator fatigue would be detrimental to safe operation. The ability of UUVs to deliver repeatable and consistent performance is also desirable.

Force Multipliers

UUVs are effective 'force multipliers': a capability that, when added to and employed by a combat force, significantly increases the combat potential of that force and thus enhances the probability of successful mission accomplishment. Whilst governments around the world have shown interest in the capabilities of UUVs, those without an in-house R&D capability have encouraged industry to do the leg-work and develop the technology. In the UK, the Ministry of Defence (MOD) and the Royal Navy have been very pragmatic in their outlook on UUVs by specifying capabilities that could be delivered by UUVs within projects such as the new Type 26 Global Combat Ship, without stipulating exactly how they should be delivered. This focus on capability has allowed industry to innovate with minimal constraints, which will undoubtedly deliver dividends in the long-term.

Command and Control

Managing unmanned vehicles in the underwater space is far more challenging than other domains. As well as working in three dimensions over large distances, there is the challenge of ensuring effective and secure command and control over an asset that is invisible to all but the most sensitive of sensing equipment.

Another key area that is currently being developed is the launch and recovery of UUVs. While UAVs can take-off and land from unmodified aircraft carriers or other surface ships in the same way as traditional aircraft or helicopters, UUVs require modification, sometimes to a significant extent, to facilitate their safe launch and recovery.

Furthermore, the launch and recovery of a UUV from a submarine is a concept that will require specialist command and control and integration. The difficulties regarding the safe interaction of underwater assets has been addressed by BMT Isis during the assessment of activities involving multiple manned and unmanned underwater assets on behalf of the UK MOD In-Service Submarine Team and rescue exercises involving the NATO Submarine

Rescue System

Before UUVs are deployed as more than just an R&D exercise, there needs to be confidence that there are adequate safeguards in place to ensure that they will not damage or harm any other ocean users that they may encounter during their deployment, or damage or harm the ocean itself.

BMT's Knowledge Base

BMT Isis is leveraging its breadth and depth of experience gained through its work on the safety assessment for the operation of manned and unmanned underwater assets, including submarine in-service support and Future Submarines programmes for the UK MOD to ensure safe and environmentally responsible UUV operations.

The benefits that UUVs can deliver are being realised on both operational and financial levels. The Royal Navy's Unmanned Warrior exercise planned for 2016 will see defence technology organisations demonstrate the deployment of combined UUVs (including MAS) concepts and will be a fascinating insight into how UUVs are developing. The ability to deploy this technology whilst keeping people out of harm's way and delivering capabilities that would cost billions of pounds using conventional forces certainly makes the UUV concept very appealing. The technology is available; the key now is to develop ways of ensuring that UUVs can interact with all the other stakeholders that use our oceans in a safe and environmentally responsible manner.

Delivering Value from Mining without the Environmental Cost

Underwater mining can deliver huge benefits by securing scarce materials without adverse environmental impacts

Many countries within the EU have a long history of mining below groundwater levels. Access to large buried mineral resources has, however, in many cases been blocked by discharge restrictions from a water quality and potential contamination perspective. While it is possible to dewater large areas to enable mining access, there are possible downsides in terms of both cost and potential environmental impact. Mining development has also often been blocked due to conflicting water resource needs for agricultural, drinking water and other commercial uses. Consequently, large attractive resources currently remain unexploited.

The Horizon 2020-funded iVAMOS! (Viable Alternative Mine Operating System) project is developing safe, clean and low impact techniques and equipment that will allow further mining activities to take place in both inland and offshore environments. This will help address some of the issues that the EU is facing in securing local supplies of critical minerals needed for downstream industries.

Currently, the European Union consumes approximately 25-30% of the world's metal production, but only extracts 3% of the world's ore production. Despite the efforts to develop recycling technologies and material science, dependency on metal imports continues to grow year on year. The EU's industry needs in metals are met by importing about 200 million tonnes of minerals each year. The rate of import dependency on metallic minerals ranges from 74% for copper ore, 80% for zinc and bauxite, and 86% for nickel, to about 100% for high-tech minerals such as rare earths, antimony, germanium, gallium, niobium, indium, beryllium, cobalt and tantalum amongst others. Because many EU countries were at the forefront of the industrial revolution in the 19th Century, much of the easily accessible raw materials have already been mined using conventional means.

Mitigating a Strategic Risk

Strategically, there is commercial vulnerability either through failure to be able to source the materials, not being able to get enough of them, or the expense of importing them. Estimates indicate that the value of unexploited European mineral resources at a depth of 500-1,000 metres is approximately 100 billion. Specialist raw materials such as tungsten and tin are strategically and economically important and potentially accessible in commercially viable underwater deposits.

Environmentally Beneficial

As well as being able to secure scarce materials, underwater mining has major benefits from an environmental perspective compared with conventional mining. There is no discharge from the mine as the groundwater remains at its natural level; there is no dewatering of aquifers; there is no blast noise or blast vibration, there is no dust because it is wet mining and there are no blast fumes. Historically, thousands of mines across Europe have been abandoned. Many of these have filled with water which has gradually become acidic. The proposed techniques will enable the re-opening of many of these generating royalties and rehabilitation bonds that can be used to cover the cost of eventual restoration.

Underwater

The gradual decline in the availability of high quality land-based resources has led to increased interest in deep sea mining and shallow offshore mining on continental shelves. Each of these has its own challenges with respect to operating conditions and minimisation of potential environmental impact. Environmental and mining permits have been granted in both arenas, but deep sea mining is currently limited to prototype activities. Shallower mining is generally limited to softer materials using dredging technology.

The research, development and innovative aspects of iVAMOS! mainly target inland submerged deposits, but also potentially enable a safe stepping stone to selective extraction of harder materials at increased depths offshore. The techniques are based on proven underwater robotics and remote control equipment technology from the oil and gas offshore sector combined with proven land-based mining and cutting equipment. Because there are a large number of partners with different technologies involved, integration is a key part of the project. The remotely controlled

Dr Stef Kapusniak

Dr Stef Kapusniak is Business Development Manager - Mining at Soil Machine Dynamics Ltd. Prior to joining SMD, Stef worked in the surface and underground mining industry, mainly in Australia. He has previously held roles in Australia as Mine Manager, Technical Services Manager, Principal Mining Engineer, Senior Mining Engineer and Senior Geotechnical Engineer for Coal and Allied Ltd in NSW, Western Collieries Ltd in WA, South Blackwater Coal and CSR in QLD. During his Australian career he received a ministerial appointment to the West Australian Coal Mines Examination Board.

www.vamos-project.eu

mining vehicle prototype will be tested at four mining sites: two in Portugal, one in Bosnia Herzegovina and one off the coast of Cornwall. The planned design is modular and can be delivered to the work site on standard, road transportation vehicles making it very flexible.

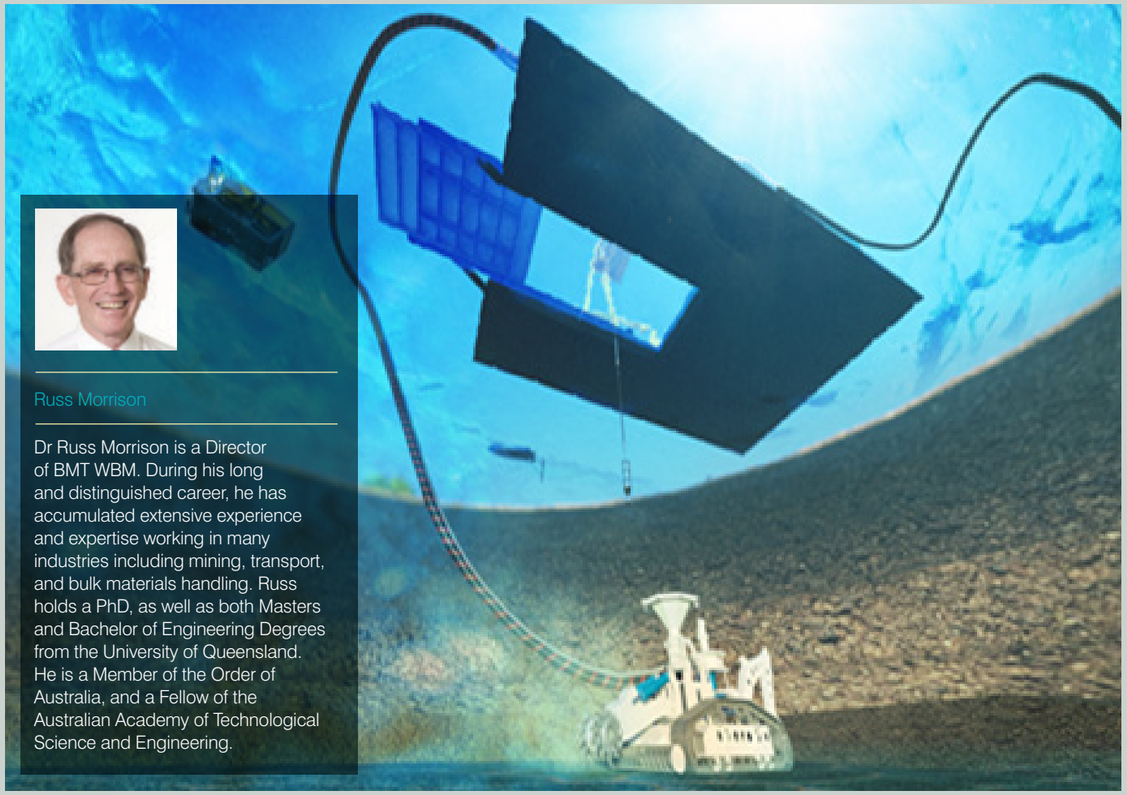
A Challenging New Environment

One of the key challenges for the project involves the accurate positioning and navigation of the remotely operated mining vehicle. The sonic techniques normally used underwater for positioning, navigation and survey will be refined to cope more effectively with the increased demands of a shallow environment with reflective side-walls and a close, surface water boundary. With limited visibility expected in both inland and offshore environments, the challenge is to fuse information from a variety of different sensory sources and deliver all the information in an accurate virtual view that an operator can easily use. BMT WBM's mining machinery group is using its experience in creating virtual environments for mining machinery and ship unloading applications to develop the prototype 3D visualisation element of the operator interface.

Additional benefits

In conventional opencut mining, depth is limited by the economic stripping ratio – the ratio of the amount of waste and overburden material requiring removal for each tonne of ore extracted. Remotely controlled mining underwater permits a steeper wall angle and increased slope stability (no wall erosion, no destabilising toe seepage). From a commercial perspective, the result is a reduced stripping ratio and lower costs per tonne of ore. There is also a lower geographical and carbon footprint per tonne of ore and from a safety perspective, there are no personnel required in the mine.

iVAMOS! provides a perfect opportunity to develop new mining techniques and test the limits of their applicability - in environments with no fauna. It is being done with a prototype sized to enable confident extrapolation to full scale production. The overarching aim of the project is to put the EU back on a level playing field in terms of cost-effective extraction of raw materials with increased safety and an improved environmental footprint – helping to secure the future of the EU's many downstream technology industries, which are highly dependent upon access to critical minerals.



Russ Morrison

Dr Russ Morrison is a Director of BMT WBM. During his long and distinguished career, he has accumulated extensive experience and expertise working in many industries including mining, transport, and bulk materials handling. Russ holds a PhD, as well as both Masters and Bachelor of Engineering Degrees from the University of Queensland. He is a Member of the Order of Australia, and a Fellow of the Australian Academy of Technological Science and Engineering.

With the operator above water and some distance from the worksite, it is essential to deliver a control and guidance system that provides the wide spread of information required to operate the mining equipment successfully. As visibility around the worksite is likely to be obscured due to silt particles in the water, visual sensors such as cameras are of limited use on their own. So acoustic sensors are additionally used with the output data fed into a 3D virtual reality model developed by BMT WBM.

Using the same technology as our successful ship-loader and stockpile management visualisation and control systems, the virtual view allows the operator to change or even fly the viewpoint through solid objects to get a better perspective at the touch of a button. A key element of ensuring the safety and success of working in the virtual world is guaranteeing that the digital models reflect their real-world counterparts in dimensional accuracy, position, and angular orientation.

Accuracy is vital as it allows control over how the cutter engages with the material that is being mined and ensures the miner cuts a suitably smooth base over which it must travel. BMT WBM has also developed a simulation tool, based on the same virtual reality modelling to allow the other partners to assess the best display options for the operational mining systems.

Thomas Langford

Thomas Langford is Head of Section for Offshore Geotechnics at the Norwegian Geotechnical Institute (NGI). He has 17 years of experience in offshore and nearshore geotechnical design bridging the traditional oil and gas and renewables industries, and now leads a group of more than 20 expert professionals at NGI in Oslo, Norway.

He was instrumental in the establishment of NGI's daughter company in Perth, Western Australia, in 2014 and currently acts as chairman of the board there. His technical focus is on bringing the benefits of research and development into project application, resulting in optimised design and lower cost foundations.

Building a Foundation for Successful Offshore Operations

Innovative Foundation Design for Offshore Structures Can Deliver Multiple Benefits

With windfarms being built further away from land in deeper water, the foundations supporting the turbines, transformers and substations are starting to have more in common with those supporting offshore oil and gas platforms. This is precipitating knowledge transfer from the oil and gas industry to offshore renewables and in some cases, vice versa.

Bigger than the pitch at Wembley Stadium

Recently, the Norwegian Geotechnical Institute (NGI) has been involved in designing two very different types of innovative foundations for windfarms off the German coast. The Nordsee One, Gode Wind I and Gode Wind II windfarms in the German Bight area of the North Sea consist of 151 wind turbines located between 45km and 60km offshore. Sending the large quantities of electricity being generated back to the German grid over this distance using the alternating current (AC) harvested directly from the wind turbines could lead to unnecessary transmission losses.

To prevent this, electricity transmission system operator TenneT decided to invest in an offshore converter platform so that electricity could be transmitted more efficiently using high voltage direct current (HVDC) over the 45km to shore. In order to collect, aggregate and process electricity from between 20 and 100 individual, operational wind turbines, the platform subsequently named DolWin beta would have to support a 320-kilovolt converter station with 916 megawatt capacity, as well as living quarters for 24 people, a helipad and two cranes. To give some context, the 100.1m x 74.1m topside of the platform is bigger than the pitch at Wembley Stadium and has the power transmission capacity to provide energy for over 1,000,000 homes.

An Innovative Design

Working with Aibel AS, NGI moved away from the typical construction methodology used for smaller substations with steel piles driven into the seabed and used a Gravity Base Foundation concept that could be fabricated and fitted-out off site and then floated into position before ballasting on the seabed. Although new to offshore wind construction, GBS has a long heritage within the oil and gas industry and as with all good engineering the design rationale is elegantly simple. Faced with a very heavy 'topside' of transformers and power-conversion equipment, piled foundations would have to have been driven deeper into the seabed to support the load, with increased cost of plant and materials as well as noise related issues. However, with a GBS, only a shallow foundation on the seabed is required and the additional weight actually increases the stability of the structure which can be comfortably supported by the dense sands of the German Bight. Furthermore, the opportunity to build and fit-out the structure offsite and float it into position made installation far easier, safer and cost effective, mitigating the risk of weather delays and marine plant downtime. Looking ahead many years to the end of the platform's service life, the lack of piled foundations will make total removal considerably easier when it comes to decommissioning.

Design and Testing

Despite its simplicity, the foundation design took in excess of 5,000 engineering hours to complete, with emphasis on the cyclical loading caused by wave action which causes the soil to respond very differently to a single monotonic load. An extensive advanced laboratory testing programme was also executed in the design phase to allow the project to demonstrate compliance with the requirements of the German regulatory system, especially as DolWin beta is unique in the offshore wind sector.

The Suction Bucket Jacket Concept

Another different, but equally innovative foundation design has been installed and is operating at the Borkum Riffgrund 1 wind farm, 37km off the North West coast of Germany. Developer DONG Energy has a strong pedigree in developing new technology, undertaking small-scale trials to demonstrate the economic, as well as the technical suitability of new techniques or designs as part of a larger project, before rolling them out. Working in collaboration with the Carbon Trust Offshore Wind Accelerator programme, DONG has developed the suction bucket jacket concept to allow installation of the foundations without exceeding the strict regulatory requirements on underwater noise, designed to protect marine mammals.

Silent Installation

NGI's design relies on huge inverted steel buckets, sucked into the seabed by high capacity pumps. Once installed, the pumps are disconnected, the suction buckets are sealed and used as strong foundations for the turbine structure above. In the case of the Borkum Riffgrund 1 demonstrator, a tripod arrangement was used with 8m diameter suction buckets, each 8m high. The suction bucket jacket, including [the] transition piece and the three buckets, was lifted and lowered to the seabed in one piece weighing in at 850 tonnes.

The solution is very technically advanced and required a large amount of numerical modelling and cyclical testing. In-situ, the buckets take advantage of the very high strength of the dense sand which behaves undrained under high frequency cyclic loading.

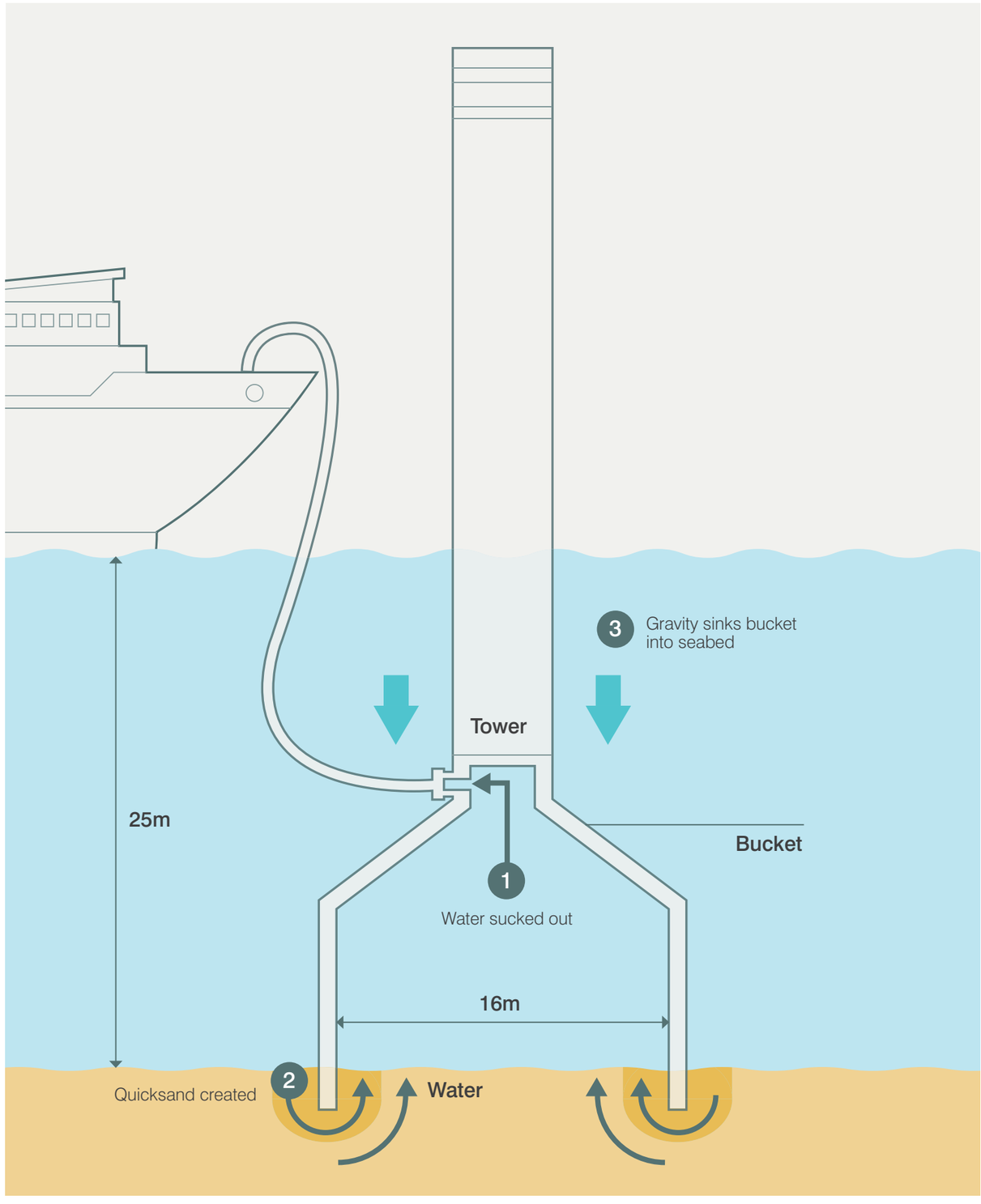
In contrast to a traditional piled foundation, the installation is silent, the steelwork doesn't have to resist the fatigue loading during pile driving and the soil response can be directly linked to advanced laboratory testing, allowing for a more optimised use of structural steel. In order to satisfy the German regulatory rules, the 'observational approach' is being applied. NGI were also involved in a separate contract with the design and installation of the instrumentation system including a large number of different sensors placed on both the foundations and on the structure itself, such as wave radar, strain gauges, accelerometers and pore pressure transducers.

A Technologically Elegant Solution

This sort of foundation solution is not new in itself, having been used in ground-breaking work for oil and gas platforms in the 1980s. However, the benefits of the design were not fully aligned with the requirements of the time and the concept lay relatively dormant. In the context of offshore wind it is a technologically elegant solution because it delivers a much more optimal design with cheaper and easier installation where more capacity can be achieved using less steel through taking greater benefit from the soil characteristics. Furthermore, the increase in capacity indicated by the design is backed up by the observational measurements from the instrumentation. It is also a very adaptable solution that can be deployed in most ground conditions, except rock.

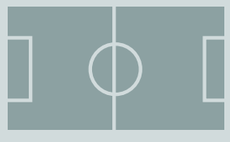
Knowledge Transfer

Although this level of innovative design would have undoubtedly developed in the offshore wind sector over time, the migration of knowledge from oil and gas in the early days certainly accelerated the process. Conversely, what we are seeing now in terms of technology development, especially for geotechnics and foundation design, is actually a migration in the other direction. The huge amounts of research and development that have taken place off the back of the boom in offshore wind are now migrating back into oil and gas, which is a very interesting evolution. It is a demonstration that robust, well thought-out, elegant design transcends sector boundaries and can deliver benefits beyond where it was originally conceived.



The DolWin beta platform: in numbers

Power transmission capacity to power 1,000,000 homes



100.1x74.1m topsiside: bigger than the pitch at Wembley Stadium.

Processing electricity from 20-100 individual wind turbines.

Training the Submarine Engineers of the Future

BMT Is Taking a Proactive Approach to Ensuring That It Has Access to Suitably Qualified and Experienced Submarine Engineers for Years to Come

BMT Is Taking a Proactive Approach to Ensuring That It Has Access to Suitably Qualified and Experienced Submarine Engineers for Years to Come

The submarine enterprise operates at a high level of technical complexity and requires a sustained pipeline of suitably qualified and experienced personnel (SQEP) to ensure the delivery and maintenance of safe, capable and available vessels. With limited numbers of submarine trained engineers on the market, it remains difficult to recruit submarine SQEP. With those leaving navies or government defence agencies also in demand from other engineering sectors including the offshore and civil nuclear industries, this presents a challenge to companies like BMT, which need access to submarine SQEP in order to successfully deliver its programmes for governments and navies around the world.

Supply and Demand

With an increasing demand for its submarine SQEP, combined with issues in recruiting, BMT wanted to try and address this problem by developing a Submarine Academy, a development, training and experiential learning programme which will help to ensure the sustainability of SQEP within the global submarine community. While previous SQEP training and development was undertaken on an individual basis to address specific needs, the Submarine Academy uses a formal structure and outcome driven approach through a dedicated investment budget.

Increasing Knowledge and Experience Knowledge transfer is a key element of the process with senior members of the submarine engineering teams sharing the depth and breadth of their considerable experience. There is also a focus on ensuring that delegates develop the right philosophy and culture. Covering the core engineering disciplines, including naval architecture, marine engineering and mission/combat systems, the Submarine Academy aims to increase knowledge and experience across submarine design and in-service support, for application both in the UK and overseas. The programme also promotes the skills required to develop concepts and assess feasibility. The scheme has been running since September 2013, with 32 engineers enrolled in the academy to date, and the first tranche of core delegates due to graduate this year.

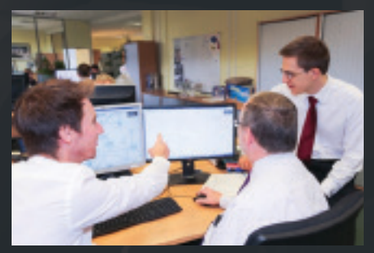
Alignment with MOD Standards

In order to make benchmarking accessible, the programme has aligned its assessments with the UK Ministry of Defence's submarine SQEP competency levels of 'Awareness', 'Practitioner' and 'Expert'. Emphasis is initially placed on achieving an 'awareness' level of understanding and, as individuals increase their knowledge and experience through greater responsibilities on project work, they have the opportunity to enhance either their submarine domain or technical discipline experience, or both. The framework has been designed to provide the best mix of internal training courses, discrete internal development modules, experiential learning opportunities, as well as waterfront placements. Delegates also attend a range of external courses including those run by University College London, the Royal Navy, and Delft University of Technology in The Netherlands.

Adding Value

The work is both interesting and challenging, be it looking at future programmes or supporting in-service submarines, and continues to increase the delegate's knowledge and understanding. The benefits of industry being pro-active in SQEP development are already evident with graduates from the Submarine Academy already embedded in clients' project teams and delivering added value.

Securing submarine SQEP is a major challenge for companies working in the underwater arena and it is vital that these skills are nurtured and safeguarded for the future. Schemes such as the Submarine Academy are essential in maintaining and developing the scarce skills that are fundamental to the UK's submarine capability.



Cat Savage

Cat Savage was promoted to Technical Director of BMT Defence Services, following her previous role of Head of Naval Architecture. Since joining BMT Defence Services in 1996, she has been integral to the development, team management and maintenance of the structures skill set for both surface ships and submarines. Her responsibilities within the business have included technical lead and project management of numerous surface ship and submarine projects. Her accreditations include a BEng in Ship Science and an MSc in Maritime Engineering Science, both from the University of Southampton. Furthermore, Cat is a Chartered Engineer and a member of the Royal Institution of Naval Architects (MRINA) and the Institute of Directors (MIoD).

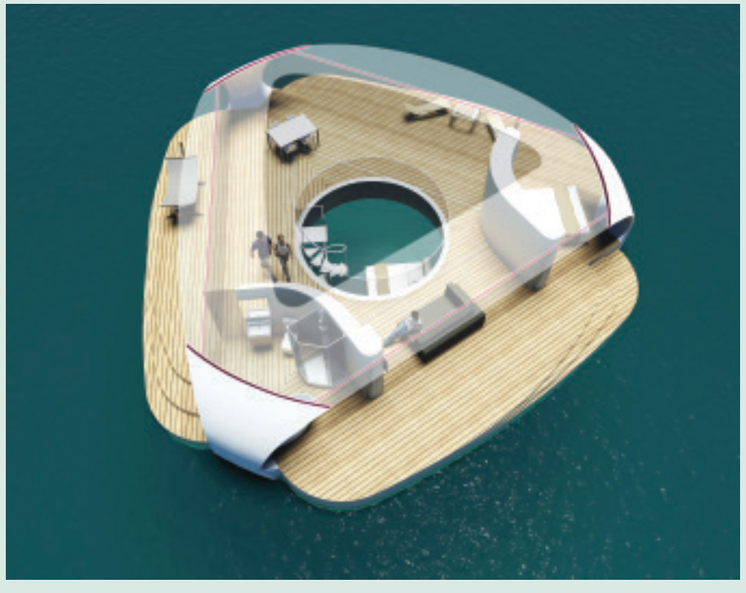
BMT news
from around the globe

Volunteering Day Sees BMT Isis Staff Transform Play Area at Beaumonds House

The team at BMT Isis has demonstrated their support to the local community by helping to enhance the outside play areas and garden at Beaumonds Short Break Service in Bath. Run by the Scottish charity, Quarriers, Beaumonds provides a short break service for children and young people with disabilities. BMT's mission was to enhance the outside play areas and garden, making them brighter, more fun and easier for the young people and their carers to use. 55 staff at BMT Isis took part in the volunteering day which has become an annual event – previous projects have included Silver Street Local Nature Reserve, Bath City Farm and the Bath Sea Cadets.

'SeaScape' Luxury Floating Villas Take You Under the Sea

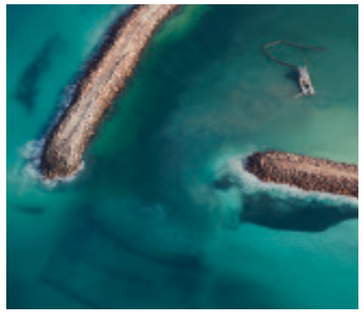
BMT Asia Pacific has unveiled SeaScape, a coastal living concept that offers style and luxury in a flexible, readily deployable design. Its modular scheme is supported by pre-fabricated parts which can readily fit into standard shipping containers and allow for simpler and more cost-effective construction. A key feature of SeaScape is the 4m diameter, cylindrical underwater bedroom formed from high-grade acrylic, allowing guests to access the mystery and wonder of the seas. Leveraging BMT's experience in naval architecture and offshore engineering, materials have been carefully chosen to ensure high quality fabrication and finish.



BMT JFA Consultants Completes Bandy Creek Boat Harbour Dredging Works

BMT JFA Consultants recently completed the project management and supervision of the 2015 Bandy Creek Boat Harbour Dredging works. This campaign was undertaken as part of the state-wide maintenance dredging program which has been managed by BMT for the Western Australian Department of Transport (DoT).

Bandy Creek Boat Harbour is a regional harbour developed in 1983 near the town of Esperance, for recreational as well as commercial use. Since the opening, the Harbour has experienced ongoing sedimentation at the entrance area, which requires regular maintenance dredging to be undertaken.



BMT Nigel Gee Showcase Expertise at Monaco Yacht Show

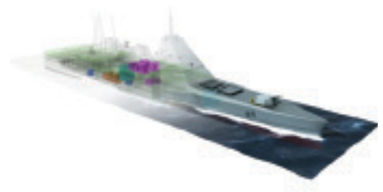
BMT Nigel Gee exhibited at the 25th Monaco Yacht Show alongside superyacht, M/Y Okto. Naval architects, structural and mechanical engineers from BMT worked with builders ISA to develop and optimise Okto's hull, culminating in a design development and testing regime more in line with the testing carried out on specialist commercial vessels.

BMT Nigel Gee to Support Ben Ainslie Racing's America's Cup Challenge

BMT Nigel Gee has been announced as a supporting technical partner to Ben Ainslie Racing (BAR) and the founding member of the BAR Technical Innovation Group. BMT Nigel Gee will provide world-class technology and innovation support to Ben Ainslie Racing's America's Cup campaign through the qualifying series and leading up to the Challenger Playoffs, which will be held in Bermuda in 2017. The TIG will complement and support the existing design team at Ben Ainslie Racing with an external, world-class, multidisciplinary research and development capability, allowing the team to develop, prove and rapidly put new technologies into the field.

BMT Design & Technology Delivers Unique Whole Life Warship Capability Management Course

BMT Design & Technology has delivered the first Whole Life Warship Capability Management course in Canberra, Australia, to a full enrolment of defence, government and industry participants. The four day course presented delegates with the knowledge to plan for and manage the capability definition, acquisition and sustainment phases of warship ownership. The course is the only one of its kind in Australia and has been developed to assist with the challenge of sustaining the existing RAN fleet, whilst preparing for major acquisition programs including offshore patrol vessels, frigates, replenishment ships and submarines.

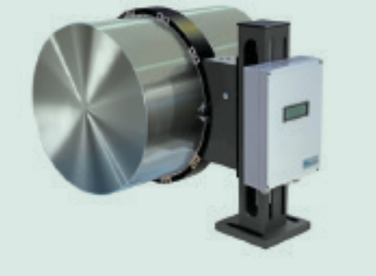


BMT WBM Picks Up National Award for Planning Excellence

BMT WBM has been recognised at the Planning Institute of Australia (PIA) National Awards for Planning Excellence. Working with its partners and client, BMT won the 'best planning ideas – small project' award category for its outstanding work in the Climate Change Adaptation Plan for Choiseul Bay Township, Solomon Islands. BMT has previously won awards for the same project in the PIA Queensland state awards, resulting in an automatic nomination for the national awards. BMT worked with The Australian Government Department of the Environment, Buckley Vann Town Planning Consultants and the School of Civil Engineering at the University of Queensland on this project.

BMT SMART Launches SMART^{POWER} Torque Meter

BMT SMART has launched its new, highly accurate and cost-effective SMART^{POWER} torque meter, as part of its fleet and vessel performance management (FVPM) suite of products. BMT's SMART^{POWER} torque meter is a dedicated measurement tool specifically designed for the maritime sector, to provide a highly accurate digital output for torque, speed, power, running hours and total energy. In addition, the system can provide Thrust and Dynamic data, which BMT SMART software can utilise to analyse the condition of the main engine, propeller and the gearbox. The system has been developed in partnership with Datum Electronics Ltd, a torque and shaft power measurement specialist with over 25 years of experience working across different industries, including navies, in the development of torsion measurement equipment.



BMT Asia Pacific Secures Contract with Endeavour Energy for Africa's First Ever LNG Import Terminal

BMT Asia Pacific has been appointed Owner's Engineer and lead design consultant by Endeavour Energy for the development of the LNG storage and regasification facility, a part of the Ghana 1000 Gas to Power Project and Africa's first LNG import terminal. Through its LNG industry experts and marine engineers, BMT will be working closely with Endeavour and Excelerate Energy in conducting front end engineering design level studies which include operability assessments, infrastructure design and optimisation studies for the supply of gas from the offshore moored floating storage and regasification unit via subsea infrastructure to the onshore gas turbines at Aboadze, Ghana. The five-year project is expected to boost Ghana's power generation capacity by 50% from the current 2000MW installed capacity.

BMT Signs Memorandum of Understanding with DSME

DSME (Daewoo Shipbuilding and Marine Engineering) has signed a Memorandum of Understanding (MoU) with BMT and other local partners including BAE Systems Australia Limited, L-3 Communications and SAAB. The MoU, signed at the Pacific 2015 International Maritime Exposition in Sydney reinforces DSME's commitment to local participation in its tender response to the SEA1654 Maritime Operational Support Capability Program which is based around a bespoke version of BMT's Aegir® family of vessel designs.

Movers and shakers

Sir John Hood

Sir John Hood KNZM has been appointed Chairman of BMT Group with effect from 1 October 2015, following the retirement of Dr Neil Cross at the end of BMT's financial year on 30 September. Sir John is a non-executive Director of BG Group plc and WPP plc. With a Bachelor of Engineering and a PhD in Civil Engineering from the University of Auckland, Sir John was awarded a Rhodes Scholarship to study at the University of Oxford where he read for an MPhil in Management Studies. He was appointed a Knight Companion to the New Zealand Order of Merit in 2014.

Andrew Glass

Andrew Glass has joined BMT Cordah as Managing Director. With a wealth of experience in Environment Health and Safety as a Director at the RSK Group, Andrew spent several years in the UAE developing new service lines and helping to bring the business back to profitability, achieving financial targets and delivering business benefits for clients. Andrew has a degree in Industrial and Operations Management and is a member of the: Chartered Management Institute and Institute of Management Consultancy.

Kai Skavaria

Kai Skvarla has been promoted to President at BMT Designers & Planners [on the retirement of Charlie Behrle]. Formerly Vice President of Strategic Planning with BMT for the past five years, Kai will now concentrate on developing new commercial markets to generate sustained growth, whilst ensuring the company continues to provide an extensive range of specialist services to its local and international defence customers. Kai has a Masters Degree in Business Administration, a Bachelor of Science in Naval Architecture and Marine Engineering as well as Aerospace Engineering, and is a Licensed Professional Engineer.

Professor Christopher Hodge

Professor Christopher Hodge has been appointed an Officer of the Order of the British Empire in the Queen's Birthday Honours for services to Royal Navy engineering. Making his mark as an engineer in nuclear and conventional submarines in the Royal Navy, Chris went on to pursue a career in the world-class companies of Rolls-Royce and now BMT Defence Services. Chris, a Fellow of the Royal Academy of Engineering and the current Chairman of the Board of Trustees of the Institute of Marine Engineering, Science and Technology, is recognised as an outstanding engineer.