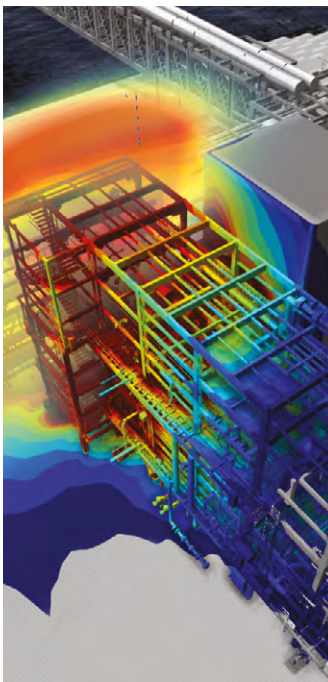




Energy

Offshore Oil and Gas



Offshore lifestages

1

Oil and gas exploration

- Metocean and downtime assessments
- Drilling criteria
- Monitoring and advisory systems

2

Feasibility

- Due diligence – exploration and field development
- Project risk and financial appraisal
- Environmental permitting and licensing

3

Design and Engineering

- Project risk and financial appraisal
- Engineering risk and safety management
- Design and verification

4

Construction and installation

- Installation planning and optimisation
- Risk and safety management

5

Operations

- Integrity monitoring and advisory
- Data Management & Data Analytics
- Vessel operations
- Client support services

6

Decommissioning

- Risk and safety management
- Monitoring
- Environmental permitting and advice



Greater control, greater safety, greater operability, greater maintainability and lower through life cost: unlocking these opportunities demands a detailed understanding of the interaction between your offshore asset and the forces affecting it. We combine our knowledge of metocean conditions, hydrology and the marine environment with structural understanding and sophisticated monitoring to help customers access these gains.

As partners, we support and supplement the technical teams within the offshore arena, working with renewable energy companies, oil and gas industry majors, independents, national oil companies and their associated engineering contractors. We are committed to building domestic sustainability by knowledge transfer.

As an international group, BMT has a presence in over 35 countries. Our data sets cover all of the world's ocean basins. We have consulted on and provided services to over 120 offshore platforms from the Gulf of Mexico and Brazil to the UK's North Sea, West Africa and South East Asia.

Managing cost and safety

Accurately matching your drilling unit to your environment is key to managing cost and safety. We combine technical ability with in-field experience to offer practical, well-grounded advice that avoids the unforeseen operational costs associated with weather downtime, whilst maintaining safe and efficient drilling operations.

During drilling, our real time remote monitoring systems provide valuable site specific data to compare with the marine forecast, assisting drillers to assess the accuracy of the forecast and maximize the efficiency of operations offshore. Integrating sensors topside and subsea provides operators with a seamless view of the performance of a drilling unit to ensure that it remains within its operational design limits.

Our combined systems and services provide warning systems and predict weather risk, enabling critical response teams to act appropriately.

Safe operational working limits for weather and sea state, and the number of working hours required for the completion of each phase of a drilling program may be provided in a short turnaround from existing data sets, thus providing valuable information to operators and drilling contractors' prior to and during the drilling operation.

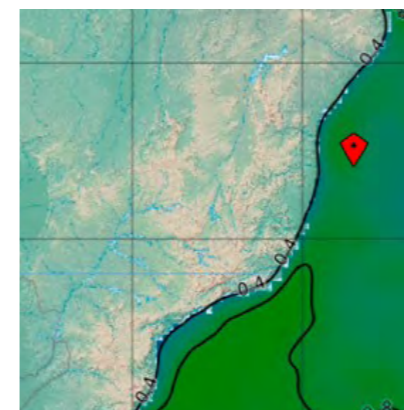
By customizing metocean services to the requirements of a customer, BMT can provide detailed information about the local climatology, determine the probability of occurrence of suitable weather windows, assess the likely hood of extreme events occurring in the area and provide an assessment of an assets, performance in the marine environment.

Where there is insufficient existing data to meet a design or operational need, BMT can support design and execution of a metocean measurement campaign to obtain additional site specific data.



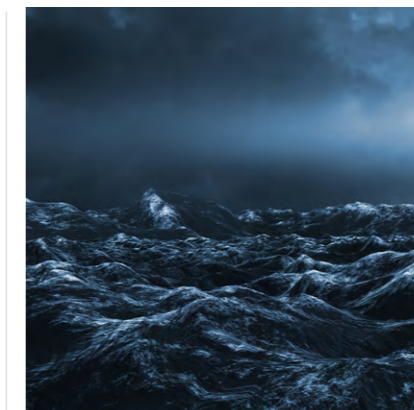
Monitoring and advisory systems

With over 20 years' experience in the design, procurement, integration and installation of monitoring systems worldwide on over 120 facilities and vessels, we are strongly positioned to provide customers in the oil and gas industry with Marine Monitoring and Advisory Services. Those services cover marine and helideck monitoring systems, independent remote monitoring and jackup advisory. We are certified in ISO 9001, ISO 14001 and ISO 18001. The data we collate helps guide early field development assessment, future engineering design and operating criteria.



Metocean site assessments

We offer analysis and prediction of the metocean conditions that can be customized according to our clients requirements. This can range from a simple statistical assessment of the sea state to support an offshore seismic survey to complex studies supporting feasibility and early survey planning for the concept design selection.



Metocean drilling criteria

We use our advanced capabilities in data collection, data management, data analysis and numerical modelling to provide comprehensive metocean information for all offshore oil and gas basins. These proprietary data sets of wind, waves and currents allow our metocean consultants to support drilling with accurate, site-specific assessments that form the basis for evaluation both at site and during transportation.



Environmental permitting and licensing

The offshore oil and gas industry faces ever increasing regulator scrutiny with environmental issues at the top of the agenda. We highlight the sensitivities and potential environmental impacts of seismic and exploration drilling activities to support licensing applications. BMT provides a comprehensive range of services in support of understanding environmental impacts and satisfying regulatory obligations.

De-risking decisions

We combine wind, wave and current data with simulation and financial assessment tools to de-risk decisions on the safety, logistics and economics of offshore projects advising on factors that can influence the viability of a successful reservoir and its future development.

Using in-house metocean and environmental consultants with data specific to your proposed location, supported by proprietary tools that determine the viability of maintaining an asset and model sea states, we help you build the business case for permitting, certification and life extensions.

Our work with regulators has given us a deep understanding of their requirements, and our reputation with them is a powerful endorsement of a submission.

Due diligence: exploration and field development

Sound financial decisions rely on gaining critical, real-world information on assets and project plans. We support these decisions by helping our customers identify investment risks and opportunities through stringent due diligence activities and the critical assessment of management, technical and operational processes.



Environmental permitting and licensing

Offshore developments in the oil and gas industry require a series of environmental permits and licenses appropriate to the operations being undertaken. From oil spill modelling and Oil Pollution Emergency Plans (OPEP) to assessing the impact on underwater noise caused by seismic surveys, installation, vessel noise, drilling and piling, BMT provides a comprehensive range of services. Together they support our understanding of environmental impacts and satisfying regulatory obligations.



Project risk and financial appraisal

Using powerful in-house RAM software we help estimate project life cycles and cost, by considering environmental conditions that may affect offshore installations prior to any capital investment made. We help customers understand the viability of maintaining an asset and unlock opportunities in design, maintenance and availability. Several major oil companies have acquired our software themselves for concept development and planning of operations in offshore oil and gas fields.



3 Design and engineering

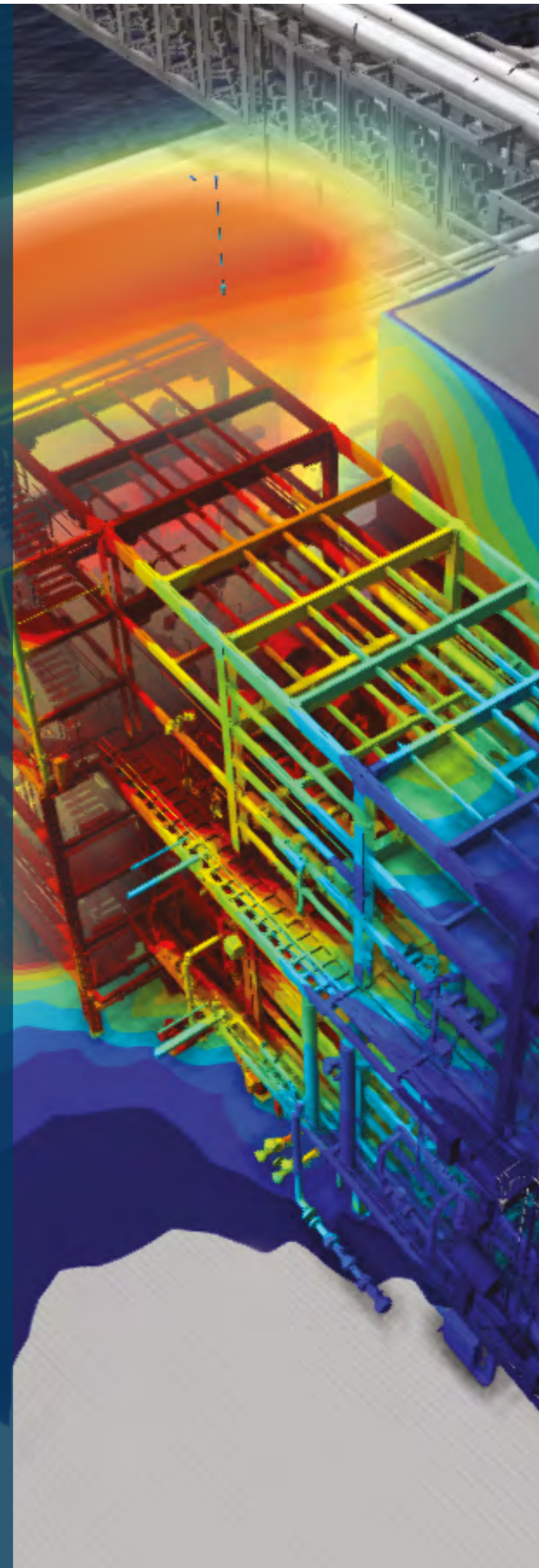
Supporting smarter decisions

We help you move beyond codes to smarter, more effective and often economical design with a clear, evidence-based view of exactly what your asset will experience.

'Design' covers not simply the asset, but the less predictable weather conditions and human factors key to the safety and success of your operation and the protection of your reputation. Our risk workshops and simulation tools are extremely valuable and capture the potential risks your operation could face.

De-risking alone does not create optimised design. We use our knowledge of operational risk to help you create a structure that will withstand its operational environment. We also look to unlock each marginal gain possible in translating concept into detailed design.

Together, such gains deliver a design that you can be confident will be safe, easy to maintain and deliver continuous production.



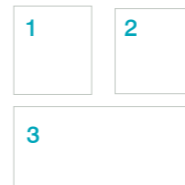
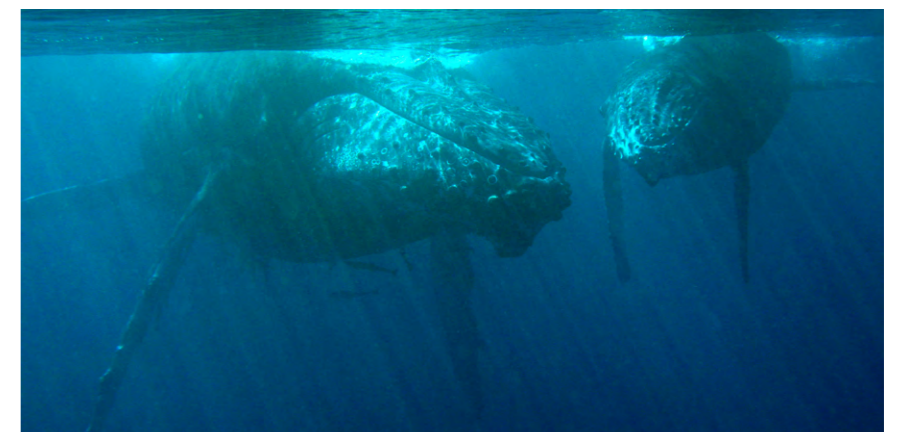
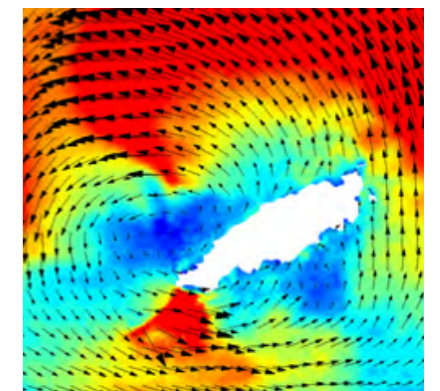
Project and environmental risk

Unmanaged risk proves costly: to human life and the liveability of communities; to the operating time of a facility and to the business bottom line. We apply proven risk management techniques to the early phases of the project lifecycle where the knock-on effects of risk can result in serious consequences.

1: Reliability, availability and maintainability (RAM) and supply chain studies unlock opportunities in design as well as availability and maintainability. RAM guides concept design and selection by accurately estimating project life cycles and costs prior to any capital investment.

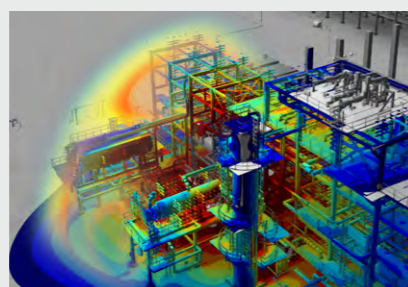
2: Metocean data and assessment uses in-house historical metocean databases, numerical modelling and analysis to inform the setting of criteria for operations, preliminary design, front end engineering design, mooring layout design and breakwater and terminal design.

3: Environmental risk assessment delivers value throughout the design phase, ensuring your proposed project will meet the exacting and changing standards required by regulators. We bring insights from the hundreds of statutory assessments we have completed as well as advising on environmental, legislative and compliance issues.



Engineering risk and safety management

Early engagement of technical safety engineering and risk management is key to the on-time delivery of oil and gas projects, establishing the Formal Safety Assessment (FSA) that allows for the development of a facility's safety case. Our independent, impartial, consultants understand the key drivers for risk and safety related studies: to ensure design achieves acceptable safety standards; to fulfil local regulatory requirements; to contribute to safety case preparation; to evaluate different design options.



1	2
3	
4	5

1: Quantified Risk Assessments (QRAs) help develop a full understanding of risk to support management and engineering decisions, with the aim to ensure risks are As Low As Reasonably Possible (ALARP).

2: Hazard identification workshops focus design teams and trigger knowledgeable and effective questioning of design to determine the frequency and severity of hazards.

For these, we also provide additional specialist support including As Low As Reasonably Possible (ALARP) studies, Maintenance and Spares Criticality and Cost/Risk Benefit Analysis.

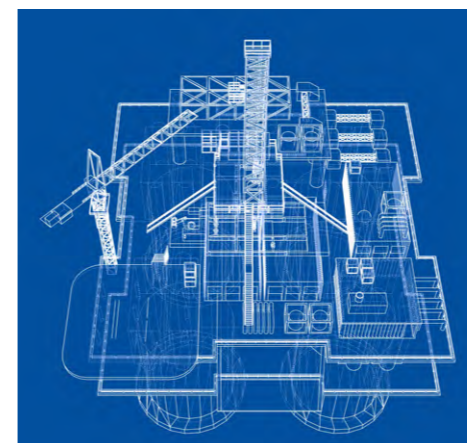
3: Human Factors Engineering (HFE) is a field in which BMT are pioneers. We specialise in designing and evaluating equipment, systems and facilities to optimise human performance and safety to reduce human error, enhance situation awareness, increase user satisfaction and reduce workload, training and maintenance requirements. Our services cover Human Systems Integration (HSI); HFE Standards; Test and Evaluation; HFE Design and Analysis and Usability Engineering.

4: Safety cases form part of the integrated safety management plan and are crucial to ensure risk controls are effectively and consistently applied as part of a safety culture. We contribute to every stage of preparation and approval of safety cases as well as periodic updates should changes be made to the facility.

5: Consequence assessments are carried out after Major Accident Events (MAEs) are identified, to quantify the frequency and severity of these events.

Design and verification

By building insight into design, we address problems before they happen and help support end products that will be reliable, safe and perform to expectation in all circumstances.



Helideck operations and design guidance: accurately measuring and modelling weather conditions during landing and take-off and analysing the impact from turbulence, hot emissions and unburnt hydrocarbons on helicopter operations, to optimise design and improve safety, and comply with CAP 437 and NORSOK C-004., to optimise design and improve safety.

Vessel simulation studies for offloading operations: evaluating design of anchor, mooring lines and terminal configurations in simulated metocean conditions with REMBRANDT.

Vessel and mooring selection: evaluating offshore floating production system, ship-to-ship and ship-to-structure operations with advice and dynamic analysis.

Ship collision analysis: in-house vessel simulation software tool REMBRANDT supporting in-depth collision analysis to address problems early in the design stage.

Pipeline design: informing optimised design and solutions for modification and maintenance.



4

Construction and Installation

Safety and efficiency from an accurate, site-specific view

We help you identify safe operational windows for construction and installation. Our advice helps maintain installation schedules and ensure safety during transit and installation. From training pilots through the simulation of complex tow-outs to understanding the metocean environment, our role is to give you an accurate, site-specific view on which to base your operations.



Installation planning and optimisation

From vessel simulation to training of crew and assessment of environmental risks, our propriety software, hydrodynamic modelling expertise and knowledge of the regulatory weather downtime and environmental risks can assist you during the planning stage of any major development and scheduled construction offshore.



Vessel simulation for complex installation programmes combine our naval architecture and offshore engineering knowledge with our hydraulic modelling expertise and metocean capabilities. Our vessel simulator Rembrandt further provides a real-time, flexible tool to identify risks and avoid costly problems.

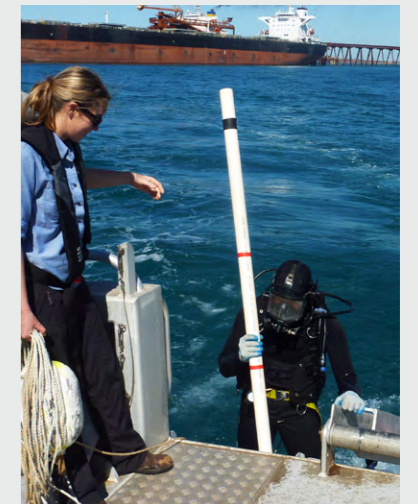
- Assessment of conditions for safe arrival and departure of vessels

- Establishment of mooring and berthing loads
- Workability for loading and unloading operations
- Evaluation of the motion responses of FPSO, Tanker and LNG carriers during offloading
- Forensic investigation of marine incidents
- Detailed vessel manoeuvring simulation to validate and exercise critical operations

Risk and safety management workshops

Construction and installation offshore create inherent risk from potential risk to life to operational overrun costs.

Our experienced facilitators can guide you through the operational risks and hazards in a customised Hazard Identification (HAZID) workshop at your premises.



Environmental and marine risk

Assessments are informed by our team's comprehensive understanding of all relevant environmental regulations, directives and international agreements. Whether identifying and mitigating potential environmental risks or meeting the needs of regulators and licencing authorities, we have the knowledge and experience to support your projects during construction and installation.

Underwater noise assessments and modelling

Our experts can help you assess the magnitude, frequency and potential impacts of the underwater noise generated by proposed offshore operations to help you protect marine life and meet regulatory obligations.

Operational Analytics Your asset's lifeline

Being able to monitor your asset and its environment in real time helps ensure safe operations and highlights any fatigue issues. BMT provides a range of services from consulting and analysis through to complex integrated monitoring systems and preventive maintenance for sensors, software and computing hardware.

Our services provide valuable information for marine operational decision making in real time, whether offshore or onshore. Data may be collated and modelled to assist with field development including input into future design, engineering operating criteria, fatigue assessment, forensic analysis or post-event analysis.



Integrity monitoring and advisory

By taking a more holistic approach to monitoring the environment and the structural response, BMT integrated systems provide a complete understanding of an asset's long-term integrity and operational decision making.

Our proven solutions support you with greater safety, operability and maintainability of your offshore assets by solving the problems of data collection in the harshest of marine environments.

BMT's life-of-field products and services for the offshore industry deliver quality, high availability data and client-tailored analytics, supported by after-market service, maintenance, data management and advanced analytical tools.

Our modular systems engineering approach provides you with turn-key, highly integrated instrumentation systems that can be tailored to your specific challenges - both on the surface or subsea - without the reduction of quality or reliability.

Over 120 marine facilities worldwide rely on BMT's integrated instrumentation

systems for reporting site specific metocean and environmental conditions, as well as structural response, mooring and flowline integrity.

Data may be collated to assist with field development and is a key input to forecasting the performance of the asset using our innovative cloud-based data analytics platform, BMT Deep.

Our systems support:

- Fixed and Floating Platform Monitoring
- Riser and Pipeline Monitoring
- Mooring Monitoring
- Wellhead Monitoring

Data Management & Data Analytics

BMT Deep advanced interactive asset data platform

Leveraging the power of cloud computing to store, manage and process extremely large data sets, BMT DEEP helps reduce downtime, increase production, extend asset life and mitigates risk. BMT Deep provides an efficient virtual environment specifically designed by oil & gas professionals for oil & gas professionals to give you complete control over the management of your field data throughout an asset's life.

Data analytics and digital products

Grounded in the in-house knowledge of our naval architects, ocean engineers, marine surveyors and metocean experts, our advanced interactive data set platform, BMT Deep, delivers deeper insights for enhanced asset performance management and is the product of 30 years' practical in-field experience in offshore oil, gas and renewables. BMT Deep harnesses big data to deliver a clear picture: it can store, manage, integrate, post-process and visualise vast data sets, fast. Interactive and intuitive, it allows you to explore data from multiple sensor time series to post-processed or statistical data, from a single asset to a fleet, throughout its operational history.

We also provide specific data analyses following events that may have affected the asset performance and integrity, from fatigue assessment to forensic analysis on controlled and documented data to post hurricane analysis.

Big data are data-sets that are so voluminous and complex that traditional data-processing application software are inadequate to deal with them. Challenges include capturing data, data storage, data analysis, search, sharing, transfer, visualization, querying, updating, information privacy and data source.

BMT Deep was not born from a software house: it is the product of over 20 years' practical in-field experience in the marine and offshore environment.



Big data,
clear picture



Secure and
powerful



Interactive
and intuitive



Fully
customisable



Verified and
supported

Client support services

We provide clients with comprehensive advice and support that spans their project's or asset's life. With many of our systems being installed for over 30 years, we understand the importance of managing the reliability of instrumentation and data for safe and efficient operations.



Maintenance, upgrades and inspections provide the regular servicing of instrumentation to ensure long-term quality data is acquired, reducing potential downtime. Our service agreements cover maintenance, upgrades, consulting and training to cover preventative maintenance programmes and field engineers to repair, calibrate, maintain and improve monitoring systems, sensors and software.

We ensure that our extensive metocean data sets are used effectively to provide estimates of weather downtime and provide you with statistical reports to identify the optimal weather window. We maintain our commitment to our customers through after sale care of instrumentation packages, advice and recommendations for upgrades.

Vessel operations

Safe and efficient vessel operations are a key component to a successful offshore operation. Optimising how vessels perform, training crew and ensuring that safety measures are in place are all critical to operational safety and performance within operating budgets.



Metocean operability and downtime assessments set safe operational working limits for weather and sea state. We can provide these in short turnaround from existing data sets. These databases are based on over 25-year hindcast modelling, calibrated with satellite observations and coupled with in-house knowledge to derive site-specific information.

Vessel simulation and training helps you model and manage your operations. Alongside our powerful Rembrandt simulator, we bring together naval architecture and offshore engineering knowledge with hydraulic expertise and metocean capabilities to inform the most complex operations.

Investigation and forensics and the design of preventative measures can be extremely complex, requiring an objective assessment by a multidisciplinary team. From naval architects to metocean specialists, we evaluate accidents by applying our in-depth knowledge of physics, hydraulics, metocean conditions and ship response behaviours. Our Rembrandt ship simulation software provides insight into the processes and conditions behind an incident and how these could have resulted in damage, injury or loss.

Search and rescue using SARIS (the BMT Search and Rescue Information Systems) provides a search planning tool designed by coastguards for coastguards. As well as saving lives, it can help achieve rapid response, support the continuation of operational capabilities and minimise damage to property.



6 Decommissioning

Navigating difficult decisions with confidence

As thinking on decommissioning strategies evolves, we help operators assess their options and spell out the environment consequences. We run comparative assessment workshops to help you navigate these complex decisions.

The ability to accurately monitor the performance and environmental impact of abandoned or deteriorating deepwater facilities is particularly important during decommissioning. Here, our expertise in remote monitoring and capabilities in metocean data mean we can help you make safe and cost-effective decisions that satisfy regulators.



1: Risk and safety management

BMT's expertise can be utilised for independent facilitation of decommissioning procedure hazard identification (HAZID) workshops.

We fully understand that well-structured risk identification and management workshops facilitated by an independent and impartial party can allow participants to share and contribute experiences in a neutral environment resulting in the identification and ranking of key risks.

2: Monitoring

The ability to accurately monitor the performance and environmental impact of abandoned or deteriorating deepwater facilities is particularly important during decommissioning.

Our expertise in remote monitoring and capabilities in metocean data mean we can help you make safe and cost-effective decisions that satisfy regulators. Our independent remote monitoring system (IRMS) enables operators to maintain communication with their asset during abandonment and receive the real-time environmental and performance data they need to make key decisions and satisfy regulators.



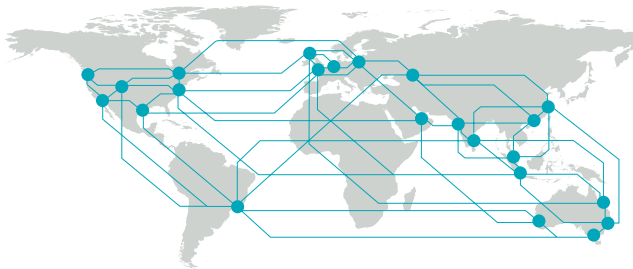
3: Environmental permitting and advice

The oil and gas industry faces ever-increasingly regulatory scrutiny with environmental issues at the top of the agenda, particularly at decommissioning.

A decommissioning project typically begins several years before projected cessation of production and our multidisciplinary teams have the experience to help you at every stage. We combine our experience of coastal and marine environments, knowledge of regulatory requirements and project management expertise to support your objectives. Our decommissioning services include:

- Environmental support/secondment to decommissioning projects
- Seabed environmental survey design
- EIA Scoping Reports

- EIA and Comparative EIA
- Comparative Assessment
- Decommissioning Programme
- Consultation advice and support
- Energy use and gaseous emissions
- Advice and support with regulatory compliance
- Environmental permits, licences and consents
- Waste management strategy and planning
- Management of cutting piles



BMT applies engineering, science and technology to help customers design, manage, maintain and improve their assets. Founded on a century's heritage in the marine environment and with a worldwide network of offices, BMT is an independent organisation held in trust for its employees.

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