BUREAU VERITAS
MARINE & OFFSHORE

2017/18 BUSINESS REVIEW

Move Forward with Confidence
Bureau Veritas is one of the world’s leading classification societies and offshore safety and verification bodies. A diverse network of engineers and technical experts are dedicated to ship and offshore safety and efficiency.

They set, measure and inspect standards for structures, materials, machinery and operations and share their expertise through advisory and support services and training.
A PIVOTAL YEAR

2017 may go down in history as the year LNG propulsion went mainstream. We at Bureau Veritas are pleased to have invested in developing expertise in LNG technology over so many years, and to see this investment rewarded in the form of new orders. "

Philippe Donche Gay, President Marine & Offshore Division

However prices across both marine and offshore markets remain low. Owners and operators demand flexible solutions and efficiency from yards and suppliers, including Bureau Veritas. They are also looking for strong technical expertise. A characteristic of the market in recent years is that a period of extreme economic stress has also been marked by rapid technical innovation.

LNG GOES MAINSTREAM

One of the main developments is the growth in demand for LNG as fuel. Indeed, 2017 may go down in history as the year LNG propulsion went mainstream, with the order of nine 22,000 TEU vessels by CMA CGM. It is the first time one of the industry giants has chosen LNG both for the performance it offers and for its environmental benefits. At Bureau Veritas we have invested in developing expertise in LNG technology over many years, and we are pleased to see this investment rewarded in the form of new orders, around a third of LNG-fuelled vessels now on order across the world are being built to BV class. While the CMA CGM order is a breakthrough, we recognize that the long-term success of LNG depends on reliable global supply chains. That is why you also find Bureau Veritas upstream, classing innovative FPSOs and FSRUs, as well as gas carriers and bunkering vessels.

LNG as fuel is also a key dimension for the development of cruise, given the environmental constraints and public sensitivity to environmental issues for ships operating close to coastlines. This is true of both large cruise ships and expedition vessels, two segments in which Bureau Veritas has built real expertise. We are classing some of the most prestigious projects to be delivered in the next 5 years, from MSC’s megaships to Ponant’s new icebreaker. Cruise ships are both extremely complex and high profile. The strong reputation we enjoy in this segment comes not only from our expertise in naval architecture, but also our obsession with safety.

ALL EYES ON CHINA

2017 stood out as the year China scooped its first cruise ship order from US owner Carnival Cruise Line for four polar class vessels to be built by China Merchants Heavy Industry. More widely, it was the year that China overtook South Korea as the world’s number one shipbuilding country, catering in part to the fast-growing domestic shipping market.

If 2017 belonged to one country, then, it belonged to China. For Bureau Veritas Group, China is our second largest country, with 10,000 employees. It is also a major focus of our 2020 strategic plan and central to our Marine & Offshore business. Indeed, it is steadily becoming a second headquarters in terms of marine expertise for Bureau Veritas. Throughout the downturn we have been able to protect our investment in China, and notably in our Advanced Technical Research Center in Shanghai. This has enabled us to work on Approvals in Principle of innovative designs for marine and offshore projects.

PART OF A SOLID, DIVERSIFIED GROUP

Being part of such a diversified group brings us major advantages. It acts as a guarantor of stability in volatile markets, smoothing the downturns. It enables us to benefit from the Group’s investment in digital transformation and new technology. And it allows us to continue to enhance our portfolio and invest in new services even in a downturn. We are sharing knowledge and learning from the companies we have acquired in recent years. Two examples worth mentioning are Matthews Consulting, which this year launched a drone-assisted live loss adjusting service and TMC Marine, which achieved the hugely complex feat of lifting the Sewol ferry in a single piece from a depth of 48m.

The synergies we enjoy as part of a large group work both ways. Our Marine & Offshore business is leading digital transformation through such projects as digital certificates, our Veristar AM™ solution transforming asset integrity management, and a groundbreaking 3D certification project with our long-term client and partner Naval Group. At the same time, we can offer the full depth and breadth of Group services to maritime and offshore clients, from fuel testing – a service we are now extending to LNG – to oil condition monitoring to identify problems within machinery components before they escalate into catastrophic failures. These synergies improve our clients’ performance. They also strengthen our ability to do what we have strived to do every day for the past 190 years: make sure they return home at the end of every voyage.
China rising

2017, the Year of the Rooster, may just become known as the year in which perceptions of Chinese shipbuilding changed for good. China has long enjoyed a strong position as a construction center for bulk carriers, oil and chemical tankers and containerships. However, two particularly important orders really made the industry sit up and hear the red dragon roar.

The first was an order for nine 22,000-TEU liquefied natural gas-fueled containerships by CMA CGM (page 20). This innovative project requires specific technical expertise: the ships’ bunker capacity, feeding the most powerful dual-fuel engine ever built, will be nearly 18,000 cubic meters. The second was from US operator Sunstone Ships (page 26) for the first cruise ships ever to be built in China. These 104-meter vessels will accommodate up to 160 passengers and require expertise that Chinese yards are keen to develop.

In the future, we expect to see more of these types of deals. The Chinese government has earmarked cruise shipbuilding as a major objective in its “Made in China 2025” program. Chinese financing is active, creating work for Chinese yards, and many emerging trends are a natural fit with today’s China. For example, the development of alternative propulsion vessels sits well with the country’s increasing focus on environmental protection. So does the development of marine renewable energy technologies: in 2017, Bureau Veritas issued an Approval in Principle for the country’s first Wave Energy Converter. Plus, the country’s growing middle class is accelerating the development of the Chinese cruise industry.

China, already a force in world shipbuilding, is clearly now expanding and deepening its capabilities.

### BUREAU VERITAS IN CHINA

Bureau Veritas returned to the Chinese market in 1993 and now has offices throughout the country. Our 350-strong team has excellent technical capabilities both in drawing appraisals, construction supervision and surveys (production): our staff also have the advantage of years of experience working with Chinese shipyards. Bureau Veritas is particularly pleased to be able to offer advanced services in this key country thanks to our Advanced Technology and Research Center located in Shanghai.

### N°1 FOR NEW ORDERS, ORDERBOOK AND DELIVERIES

In 2017, China maintained its leading position in all three shipbuilding key indicators. It also secured 39% of deliveries.

Source: Clarksons 2018

### N°3 FOR OWNERS

The China-owned fleet has expanded rapidly in the past decade, reaching 151.5 m GT in 2017, or 11% of the world’s total.

Source: Clarksons 2018

### CHINA RISING

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Increasing environmental regulation in the US, Europe, and China makes LNG a natural choice as both a power source and marine fuel. But widespread adoption depends on an efficient, secure LNG supply chain and infrastructure. Bureau Veritas is playing a key role at each stage of the LNG value chain, ensuring the viability and safety of projects, and helping bring together offshore operators, port authorities, shipowners and terminal operators to address challenges.

**PRODUCTION**

Operators are increasingly looking to floating LNG production solutions to commercialize previously stranded resources. Bureau Veritas supported Shell on quality assurance and control for the construction of Prelude, the world’s largest FLNG, and subsidiary MatthewsDaniel is the project’s nominated sole Loss Adjuster.

**TRANSPORTATION**

Today’s LNG megaprojects require new solutions to transport gas from production sites to customers around the world. Two such projects are Yamal LNG in Russia’s far North, and Ichthys offshore Australia. Bureau Veritas is classing innovative carriers for both projects. Three of a total of 15 (bunker) carriers serving Yamal LNG were delivered in 2017. For Ichthys LNG the challenge is one of scale; at 106,000m³, the vessel’s Maersk-type cargo tank capacity is the largest of any LNG carrier worldwide.

**LNG BUNKERING**

Ship-to-ship bunkering is crucial for a global adoption of LNG as fuel. The first newbuilding LNG bunkering vessels entered service in April 2017 in Northern Europe. Bureau Veritas classed the first ever LNG bunker vessel, ENGIE Zeelant, along with the Coralius, the world’s largest LNG bunker vessel to enter service. In Japan, Singapore and Canada, Bureau Veritas is a key partner in several new projects, sharing its know-how, technologies and safety methodologies for LNG bunkering in safe commercial operations.

**LNG FUELED SHIPS**

The benefits of LNG as fuel in terms of environmental compliance and competitive advantage recently boosted the number of new orders for vessels with high-capacity LNG tanks and large DF propulsion systems. While such vessels were initially used only for short sea shipping, a tipping point was reached in 2017, when the proportion of new orders for LNG-fueled ships within the total vessel order market reached 11%. This major change is symbolized by the “order of the century”: nine 22,000-TEU container carriers each able to carry 18,600m³ of LNG as fuel, and an innovative 20,000m³ bunker vessel owned and operated by MOL and chartered by Total.

**STORAGE AND REGASIFICATION**

Floating import terminals are providing importers with flexibility, enabling them to take in new volumes faster and more cheaply than by adding land-based infrastructure. In 2017, two BV-classed FSRUs were delivered: Exmar’s 25,000m³ FSRU, and the MOL/FSRU Challenger, the largest FSRU to date at 263,000m³. Bureau Veritas also published dedicated Rules for FSRUs.

**150 SHIPS**

use LNG as fuel; more than 200 are in construction or on order worldwide

**+47%**

Increase in global LNG demand since 2000

*Source: International Energy Agency, 2017*

**25%**

of LNG-fueled ships in operation are BV-classed

**80%**

of LNG bunkering vessels in operation, under construction or on order are BV-classed
Growing demand for cruise ships

The cruise industry is booming, boosted by demographic megatrends. In Europe and the United States, ageing populations enjoy good health, disposable incomes and the time and appetite to travel. In China, a rising middle class is eager for travel and new experiences. Within the market, opportunities abound: for supersize cruises to traditional destinations; for expedition cruises that promise adventure and access to previously inaccessible experiences; and for river cruises with their increasing appeal to Millennials and Chinese domestic tourists.

Expedition cruises are one of the top cruise trends right now. The result is an avalanche of orders for high-performing vessels able to navigate icy waters. Among these projects, Ponant’s order for the world’s first icebreaker cruise ship stands out. The 140m vessel will be able to take 230 passengers to the North Pole from 2021. It features electric hybrid LNG propulsion and will accommodate two helicopters as well as Zodiac expedition dinghies. The icebreaker will be the seventh BV class expedition ship to be built by Vard for Ponant.

SEE PAGE 27

PONANT

18 SHIPS on order to Bureau Veritas Versailles class

25.5 MILLION
Cruise passengers in 2017
Source: CLIA, 2018

10% 20%
Yearly growth in domestic demand for cruise ships in China.
Source: Ponant

+30% Yearly growth in domestic demand for cruise ships in China.
Source: Ponant

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INDUSTRY MEGATRENDS

The result is steady worldwide growth in passenger numbers, and increasing demand for cruise ships. The order books of European yards with strong cruise expertise are considered full by many observers. Having delivered the MSC Meraviglia in 2017, for example, STX France’s Saint-Nazaire yard will deliver three supersize vessels to MSC Cruises alone in the next three years, with even larger projects planned to follow (SEE PAGE 26).

The tight capacity of major European yards, with their decades of experience in delivering these complex vessels, poses an issue. Two solutions to meet demand are emerging for smaller vessels. The first is European yards normally specialized in Offshore, such as VARD and Ulstein. They are building on their technical know-how in specialist OSVs to develop new expertise in expedition cruise vessels. The second is China. If China Merchants Heavy Industry is the first shipyard to gain a major cruise ship order (SEE PAGE 27), others are likely to follow. What is certain is that the industry landscape, fueled by unprecedented demand, is changing fast.

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Moving into the Smart Ship Era

Autonomous ships were the hot topic of 2017—but while full autonomy remains elusive for the vast majority of the industry, cyber-enabled ships and systems are already here. As ships increasingly incorporate the systems and sensors required to suggest, or even make, autonomous decisions, two questions arise. The first is how to take full advantage of smart technology to improve ship performance while maintaining safety. The second is how to address the need for cybersecurity.

ADRESSING CYBER RISKS

Leveraging the potential of smart ships

Autonomous... or just smart?

As vessels become connected, increasingly smart and reliant on digital systems, cyber safety and security have become a major concern for shipowners seeking to protect their data, people, assets and operations. Bureau Veritas has developed a series of classification notations and services to enable owners to comply with regulations, and safeguard their crew, vessel, and equipment against both accidents and malicious attacks.

The first notation, SW-Registry, requires owners to create and maintain a certified register of software used in the ship’s onboard systems, thereby achieving compliance with IACS UR E22.

The second notation, SYS-COM, focuses on cybersecurity: preventing malicious attacks. A voluntary notation, it covers the exchange of data between ship and shore and vice-versa for the purpose of monitoring and troubleshooting of selected systems. Bureau Veritas is currently the only classification society to offer a notation covering specifically this risk, which is identified as the principal cybersecurity threat to digital ship data and systems.

The new notations are risk-based notations and supported by risk analysis and new testing methodology services delivered by Bureau Veritas or its partners Apsys and CEA. Further tools and services are planned for 2018, including a certification scheme covering all onboard systems and equipment and a software platform allowing the owner to maintain the software register and record activity.

LEVERAGING THE POTENTIAL OF SMART SHIPS

Ship autonomy levels are categorized on a scale from 0 to 4: at zero, a conventional ship that is entirely human controlled for data acquisition and analysis, decision-making and execution; at level 4, a fully autonomous and unmanned vessel, requiring no input from humans other than in an emergency. As the level of autonomy increases, the need to have crew onboard is reduced. As of today, the most advanced seagoing ships are at level 1. Already considered “smart,” they are directed by humans, but rely on systems and sensors for support in collecting data and making decisions.

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SMART AND AUTONOMOUS SHIPS OFTEN OFFER THE POTENTIAL TO LOWER OPEX BY REDUCING CREW NUMBERS ON THE ONE HAND AND IMPROVING FUEL EFFICIENCY, MAINTENANCE AND FLEET MANAGEMENT ON THE OTHER. MANY RISKS FOR THESE SHIPS ARE SIMILAR TO CONVENTIONAL SHIPS—but these risks are transferred from humans to sensors, software and communications systems.

With a reduced crew, there comes the need to guarantee physical safety by increasing the reliability of systems. To this end, Bureau Veritas has developed Guidelines for Autonomous Ships. The document provides in-depth recommendations for risk identification and mitigation, and risk-based qualification of technology. It also defines minimal levels of functionality for autonomous systems and provides a quality assurance methodology to support system reliability.

A practical example of Bureau Veritas’ work on smart ships is with the strategic partnership agreement signed with offshore operator BOURBON to optimize the safety and reliability of vessel operations at optimum costs.

The project focuses on the collection and analysis of ship data. Ships collect large amounts of data from the dynamic positioning system. The aim of the BOURBON-Bureau Veritas project is to enable ships to transmit data to engineers onshore for analysis and troubleshooting, thereby reducing time spent onboard by engineers.

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INDUSTRY

MEGATRENDS
In a volatile economic environment, managing operational costs, improving performance and safeguarding the integrity of assets are becoming increasingly important for both shipowners and offshore operators. As part of its Group-wide focus on optimizing its clients’ OPEX, Bureau Veritas has developed a range of solutions for the Marine and Offshore industries. Increasingly, technology is leveraged alongside risk-based inspection methodologies to optimize asset integrity management.

Safer, cost-efficient inspection drones

Offshore units, structures and vessels require frequent inspections to ensure safety and integrity. But manned inspection at height or in confined spaces can be costly and dangerous and can cause disruption to operations.

Drone-assisted inspections offer a safe, cost-effective solution to the challenges posed by traditional inspection. Bureau Veritas is a pioneer in the use of drones in flare inspections and external hull inspections and outfitting, as well as for closed and global visual internal inspections. Subsidiary MatthewsDaniel has launched a drone-assisted Live Loss Adjusting™ service and Marine Warranty Service.

Potential is high, but drone-assisted inspection is still at an early stage, with challenges relating to battery life, data transmission, and compatibility with class requirements still to be overcome. To this end, Bureau Veritas is taking part in RECOMMS, a JDP to develop drones with enhanced capability to inspect steel structures in enclosed spaces.

IMPROVED ASSET INTEGRITY VERISTAR AIM™

Veristar AIM™, Bureau Veritas’ new-generation Asset Integrity Management system powered by the 3DEXPERIENCE Dassault Systèmes platform, is built on a complete 3D model of each asset. This digital twin can be used as a common base for all design checking calculations and the tracking of inspection activities and modifications. Once connected to the client’s information technology systems (ERP, CMMS, DMS), Veristar AIM™ can act as a single source of information for the user, automatically updating inspection and test data from surveys, inspections and other interventions done on board.

Following the platform’s launch in Q2 2017, Bureau Veritas was awarded two separate contracts: the Excellence Floating Storage Regasification Unit owned by Excelerate Energy and operated by EMTT, and the Pathumabaha Floating, Storage and Offloading vessel owned and operated by PTTEP. It also completed a pilot project for the Egina Floating Production Storage and Offloading vessel under the supervision of the Quantum project team at Total head office and with the support of Total Nigeria’s inspection department and the Egina project team.

Bureau Veritas continues to invest in Veristar AIM™, developing new features to help clients reduce costs without compromising safety or performance. Shipowners, technical managers, and oil and gas platform operators have all provided positive feedback on the solution, viewing it as a means of implementing their own digital transformation.

IMPROVED PERFORMANCE SOLUTIONS IN PARTNERSHIP WITH ASCENZ

Bureau Veritas is working with Singapore-based Ascenz to provide ship performance and monitoring solutions to shipowners worldwide. The agreement enables Bureau Veritas to offer Shipulse, Ascenz’s solution for real-time ship performance and monitoring. Shipulse captures critical shipboard data, including fuel consumption, bunkering activity, engine, hull and propeller performance to provide insights for better decision-making. Bureau Veritas is also able to offer complementary services and analysis based on ship modeling and data analysis across fleets.

Finally, the agreement enables Bureau Veritas to offer automated monitoring and reporting of ship CO2 emissions under EU-MRV regulation requirements. Shipulse’s CarbonComply cuts time involved in compliance by registering voyages automatically, without the need for manual calculations to break down fuel consumption or emissions on a per voyage basis.

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An evolving energy market

The world of energy is evolving. While oil and gas continue to supply 57%* of the world’s energy demand, renewable energies are steadily gaining ground, with innovation boosted by public policy and financing. The landscape is also changing in traditional oil and gas North Sea installations as they reach the end of their working life and are decommissioned.


Marine Renewables: supporting commercial viability

Marine Renewables Energies (MRE) cover a range of technologies at different levels of maturity: fixed and floating offshore wind, tidal energy, and ocean thermal energy converters (OTECs). While fixed offshore wind is now a mature sector, floating wind and tidal energy are emerging; OTECs remain at an early stage.

Bureau Veritas has leveraged its expertise in marine, power and offshore to support the development of MRE, through new rules, qualification of new technologies and certification of prototypes. It is providing full project certification for two of the most important floating wind pilot projects today: EDF EN Provence Grand Large and EOLFI Groix.

See page 39

The number of oil and gas fields in the North Sea that will see installations decommissioned during 2017-25.

Source: Oil & Gas UK

10%

The proportion of the North Sea that has entered decommissioning phase.

Source: Shell

Decommissioning: rising to the challenge

Decommissioning of ageing offshore infrastructure is one of the major challenges facing the global oil and gas industry – and nowhere more so than in the North Sea. All operators are seeking solutions to achieve decommissioning safely, at a reasonable cost and within compliance. Bureau Veritas has built strong decommissioning experience, led from its Technical Center in Aberdeen and in 2017, it launched a comprehensive decommissioning offer. Acting as a complete compliance partner, Bureau Veritas is able to support operators at every phase: from portfolio planning through asset decommissioning programming to in-field delivery.

It has also published a new version of its guide: Decommissioning on the UK Continental Shelf: an overview of regulations.

Projects in 2017 included acting as Independent Verifier for one of the industry’s most complex projects: the decommissioning of Shell’s Brent Delta, which saw the lift of a 24,200-ton platform in one piece in April 2017. Bureau Veritas is also providing IVB services to Fairfield Energy for the Dunlin Platform, and subsidiary MAC is providing marine warranty and verification of engineering for the decommissioning of installations at another major North Sea field.

See page 36

Source: Decommissioning of the Brent Delta (c) M. de Zeeuw

DECOMMISSIONING: RISING TO THE CHALLENGE

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Bureau Veritas classification for marine and offshore projects was in demand in 2017 with a host of innovative orders and deliveries. Together with its subsidiaries it also provided independent verification, marine warranty and safety studies for major offshore projects.

**FRANCE**
MSC Cruises at STX France dominated both deliveries and orders and Naval Group continued its collaboration, requesting design classification for a series of midsize frigates. Louis Dreyfus Armateurs ordered an innovative BV-classed wind farm support vessel from Carrere, Turkey.

**SPAIN**
Zamakona is building an advanced BV class wind farm support vessel for Eivagut, as well as a 2-bunker supply unit for Guardiaz. Three Condén-built escort tugs for Statoil/Rederiat won the Tug of the Year award. Bureau Veritas also classed a number of tuna fishing vessels, a market it dominates in Spain, as well as a product tanker for Naviera Eicano.

**SOUTH AMERICA**
In 2017, Bureau Veritas classed tugs built at SEMAR, Sedini and TNV for PEMEX in Mexico, patrol ships in Peru under construction at SIMA and an inland patrol vessel in Colombia.

**WESTERN AFRICA**
Bureau Veritas provided classification of floating units for two major projects offshore West Africa: Kaombo and Moho Nord.

**EASTERN AFRICA**
Subsidiary Matthews Daniel is providing marine warranty services for the Coral South project in Mozambique, Africa’s first FLNG.

**SOUTH ASIA & AUSTRALIA**
Deals were struck for a project with EBC Thailand for modules certification of a P70 Tug FPSO as well as an NC supervision project for two product/chemical tankers for PT AKR Indonesia. NC contracts were also signed for seven units of various patrol boats, training vessels and landing ship tanks for the Indonesian navy. In Malaysia and Brunel, a deal was struck for the class transfer of 27 offshore support/service units (pontoons, accommodation barges) owned by Pioneer Offshore Group. The State Department of Fisheries of Kenya took delivery of a 94-meter offshore patrol vessel built at Western Marine Shipyard Ltd, and two 601-BP tugs for Bangladesh navy. Built at Khiuina Shipyard Ltd, A 49,000 DWT asphalt carrier was delivered to ASP Australia.

**NORTH SEA**
BV services were in demand under frame agreements with Total and Shell. Bureau Veritas also supported decommissioning of the Brent Delta platform.

**NORTH-WEST EUROPE**
Finland’s Moyer-Turku yard delivered the LNG-powered Megastar ferry to Tallink in Denmark. Bureau Veritas benefited from transfers of class 11 OSVs from NT Offshore and six tankers from Rederiet Simonsen. Netherlands Damen is to build 30 BV-classed harbor and terminal tugs. Flensburger in Germany, meanwhile, has been chosen by Brittany Ferries to build its new BV-classed dual fuel ro-pax.

**SOUTH KOREA**
Oil tankers and LNG projects dominated both orders and deliveries. Orders included six VLCCs for Capital Maritime and Sinokor and an FPSU for Kolín Construction. Flagship deliveries included the Christophe de Margerie LNG carrier, the MOL FSU Challenger and the ENGIE Zeeland.

**JAPAN**
Nisshin Shipping ordered 38 vessels to BV class including 36 bulk carriers and two chemical carriers, to be built at yards in China and Japan.

**CHINA**
Bureau Veritas took top position of newbuilding orders in China, both in terms of ships number and total GT. CNOOC awarded Bureau Veritas classification of the Liuhua FPSO. The modular project joins other innovative FPSO projects under construction to BV class in China. Including SBM Offshore’s Fast4Wig project. Notable deliveries included Wison’s LNGC for Exmar.

**SINGAPORE**
Singapore’s government ordered two Heavy Marine Rescue vessels, and KnE Energy ordered the first FSO for the Apsara Field in Cambodia. Notable deliveries included the hull of the first BV-classed ice-class Super 1A Saturation Diving vessel.

**SOUTH AMERICA**
In Offshore, Bureau Veritas worked on the classification of a turret system for Houston-based SOFEC, while Matthews Daniel was selected to provide marine warranty survey for the Sur del Eje Texas-Tuxpe pipeline project. Notable marine orders included two new design Post-Panamax bulk carriers by Foremost.

**FRANCE**
MSC Cruises at STX France dominated both deliveries and orders and Naval Group continued its collaboration, requesting design classification for a series of midsize frigates. Louis Dreyfus Armateurs ordered an innovative BV-classed wind farm support vessel from Carrere, Turkey.

**SPAIN**
Zamakona is building an advanced BV class wind farm support vessel for Eivagut, as well as a 2-bunker supply unit for Guardiaz. Three Condén-built escort tugs for Statoil/Rederiat won the Tug of the Year award. Bureau Veritas also classed a number of tuna fishing vessels, a market it dominates in Spain, as well as a product tanker for Naviera Eicano.

**SOUTH AMERICA**
In 2017, Bureau Veritas classed tugs built at SEMAR, Sedini and TNV for PEMEX in Mexico, patrol ships in Peru under construction at SIMA and an inland patrol vessel in Colombia.

**WESTERN AFRICA**
Bureau Veritas provided classification of floating units for two major projects offshore West Africa: Kaombo and Moho Nord.

**EASTERN AFRICA**
Subsidiary Matthews Daniel is providing marine warranty services for the Coral South project in Mozambique, Africa’s first FLNG.

**SOUTH ASIA & AUSTRALIA**
Deals were struck for a project with EBC Thailand for modules certification of a P70 Tug FPSO as well as an NC supervision project for two product/chemical tankers for PT AKR Indonesia. NC contracts were also signed for seven units of various patrol boats, training vessels and landing ship tanks for the Indonesian navy. In Malaysia and Brunel, a deal was struck for the class transfer of 27 offshore support/service units (pontoons, accommodation barges) owned by Pioneer Offshore Group. The State Department of Fisheries of Kenya took delivery of a 94-meter offshore patrol vessel built at Western Marine Shipyard Ltd, and two 601-BP tugs for Bangladesh navy. Built at Khiuina Shipyard Ltd, A 49,000 DWT asphalt carrier was delivered to ASP Australia.

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As a world-leading classification society, Bureau Veritas works to reduce risk, helping ensure its clients’ crews stay safe and their assets are sustainable. It also makes a major contribution to marine innovation. In 2017, Bureau Veritas helped the industry move forward, classing vessels using LNG and hybrid propulsion, and developing new notations to address growing risks such as cyber security.

**MARINE ACTIVITIES**

- **550** total orders
- **51** dry bulk vessels ordered in 2017
- **#1** in LNG-fueled orders
- **88** harbor and terminal tugs
In November 2017, CMA CGM chose Bureau Veritas to class their new 22,000 TEU containerships, all nine of which are to be fueled by LNG. Bureau Veritas has been involved in this project from its inception. It helped ensure that requirements for the safe use of LNG were addressed upstream and investigated the feasibility of the design in collaboration with shipbuilding group China State Shipbuilding Corporation and GTT, the containment system designer.

As the world’s first shipping company to choose LNG propulsion for its giant containerships, CMA CGM demonstrates its commitment to protecting the environment. LNG has already been adopted by certain sections of the shipping industry, notably ferries, cruise ships and tugs. But its use in container ships is a segment representing 17% of the global fleet in gross tonnage*. Constitutes a breakthrough and signals that LNG is entering the mainstream.

CMA CGM’s choice also breaks new ground in the scale and first-time use of an innovative membrane containment system. Bureau Veritas has extensive experience working with this technology, and in the design and construction of LNG-fueled vessels. It has the largest share of any class society for new ordered vessels with LNG propulsion, and the largest share for LNG-fueled vessels in CT. The project requires its strong expertise in addressing the challenges related to the use of existing technologies to a project of this scale.

For example, the ships’ bunker capacity, feeding the most powerful dual-fuel engine ever built, will be nearly 18,600 cubic meters – a much higher volume than has previously been required in the LNG-fueled ship market. As such, the design presents particular challenges in the form of sloshing and boil-off when tanks are partially filled. Another challenge is to confirm the ships can operate in normal conditions, for example bunkering and offloading containers simultaneously while in port.

The CMA CGM order reflects tentative green shoots in the containership market, following a difficult 2016. The market for flexible container feeders under 3,000 TEU remained active, with Bureau Veritas’ current feeders orderbook standing at 19 ships.

*Clarksons WFM December 2017

SHIP TO SHIP LNG BUNKERING GATHERS PACE

Ship-to-ship bunkering is considered by the industry as crucial to adoption of LNG as a marine fuel. Reliance on fixed LNG terminals reduces the appeal of LNG projects: bunker vessels, by contrast, are not dependent on location, and can offer LNG as fuel to any receiving vessel.

The first ship-to-ship bunkering operations between two independent ocean-going vessels took place safely in 2016. As LNG propulsion looked set to go mainstream in 2017 (see opposite), the challenge is now to build worldwide capacity to meet future demand.

The first newbuilding LNG bunkering vessels entered service in 2017 with more to be delivered in 2018. Bureau Veritas is the classification society for many of these projects, having developed strong expertise in LNG propulsion: it also offers a dedicated LNG bunkering ship notation.

Bureau Veritas classed the first purpose-built LNG bunkering vessel in the world, the ENGIE Zeebrugge (see picture) delivered in February 2017 by HHIC to owners ENGIE, Mitsubishi Corporation, NYK Line, and Fluxys. With an LNG capacity of 5,100 m3, the ENGIE Zeebrugge will offer regular ship-to-ship bunkering services to all types of customers in Northern Europe.

A second important delivery was the Coralis, built by Royal Bodewes for Sinur Shipping and Anthony Veder. Chartered to Skangas, it offers 5,800 m3 of LNG capacity with bilobe type C tanks.

ENGIE Zeebrugge and Coralis share some common features to improve their environmental impact and performance: they are both equipped with dual fuel engines, and thrusters to improve manoeuvrability. Indeed, ENGIE Zeebrugge made its maiden voyage from HHIC to its new home port under LNG propulsion.

A third project currently underway is the conversion of the double-hull Oizmendi HFO/MDO bunkering and oil recovery ship into Spain’s first LNG supply vessel.

Looking ahead, the challenge is to build larger bunkering vessels able to serve the needs of mega ships. Bureau Veritas has been chosen by TOTAL and MOL as the classification society for the bunkering vessel that will service the nine LNG-fueled CMA CGM containerships ordered in 2017. At 16,600 m3, the capacity of this bunkering vessel is around three times that of any vessel delivered to date. This presents specific design challenges, as well as a major milestone for the industry.

OPTIMIZING LARGE CONTAINERSHIP PERFORMANCE

In 2016, Bureau Veritas launched its new Rules for containerships (NR 625), redesigning vessel charge and reducing acceleration rates for very large ships. The Rules are based on several years’ calculations and measurements of ships in service. Following these new Rules, Bureau Veritas launched in 2017 a new version of Veristar

Lashing that enables analysis of complex lashing configurations taking into account variables such as acceleration. The updated Rules are based on a more accurate understanding of what is possible - helping to optimize cargo capacity and provide operational flexibility.

*Deformation of full containership

© Veristar
Gas carriers are a vital link in the global LNG supply chain, transporting it from major centers of production to terminals. Bureau Veritas supports projects around the world as they forge the way for this clean fuel.

We are currently classing 15 icebreaking LNG carriers built at DSME to be used at the Yamal LNG project in Russia’s Arctic. The first 172,000m³ capacity ship was completed in 2016, with another two delivered to Dynagas in 2017. A further 12 will be delivered throughout 2018 and 2019. When fully equipped, the Yamal plant will have an annual LNG production capacity of 16.5 mtpa.

This resulted in specific design challenges: at 192,000 cubic meters, not only is the vessel the first dual-fuel diesel electric ship of its kind, it also has the biggest Moss-type cargo tank capacity of any LNG carrier in the world.

Bureau Veritas also classed SK Shipping’s SK Audace. With a cargo capacity of 180,000 cubic meters, the carrier is the first to be equipped with twin WinCDS X-DF engines, developed following an energy efficiency optimization JIP. A second ship is now under construction at SHI and will be delivered in the first half of 2018.

Finally, Bureau Veritas delivered the last two multi-purpose gas carriers for Evergas. Each with a Wartsila four stroke dual-fuel engine, these innovative vessels used in the ethane trade further extend Bureau Veritas involvement in the gas industry.

“We appreciate and value Bureau Veritas’ expertise, dedication, technical support and high end services in regard to plan approval, structural analysis, supervision and inspection during vessels construction as well as testing and certification, meeting and even exceeding quality, safety and environmental protection requirements for challenging projects.”

Manos Migadis, Newbuilding Project Manager Dynacom Tankers Management www.dynacomtm.com

When Inpex, Japan, commissioned Kawasaki Heavy Industries’ Sakaike Shipyard to build their new LNG carrier for the Ichthys Project, it chose Bureau Veritas class to guarantee its operational efficiency. Inpex’s challenge was one of scale: it has supply contracts with CPC Corporation, Taiwan, and Japanese utility companies for a combined 6.5 mtpa.

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Bureau Veritas chaired an IACS research group, steering participants from several class societies in the production of Unified Requirements for whipping calculations in relation to container ships. Bureau Veritas has built on its 10-year experience in whipping calculations to contribute to the debate in two important ways. First, it is one of the only classification societies able to use Computational Fluid Dynamics for whipping calculations. Second, it has been able to address uncertainty relating to the dynamic behavior of stiffened panels. It demonstrated that, taking into account strain rate and dynamic effects, the ultimate capacity of stiffened panels does not improve under the effects of whipping.

Bureau Veritas’ GAS-PREPARED notation was designed and fitted out for dual-fuel or LNG fuel propulsion, but which are not initially intended to use gas as a fuel. Further vessels in the series of 157,000 dwt tankers will be delivered by Now Times Shipbuilding in 2018.
In early 2018, towage and salvage specialist Multraship took delivery from Damen of the first of two highly innovative carousal rave tugs (CRT). Classed by Bureau Veritas, the 32m-long tugs feature a carousal system consisting of a base structure surrounded by a steel ring that can rotate freely through 360° in the horizontal plane. The design makes it easier, safer and more environmentally friendly to work with isagging vessels at much higher speeds than conventional tugs can safely achieve, and without the risk of capsizing under a tow-load. Delivery of the second vessel is expected in May 2018.

LNG-FUELED INNOVATION FOR TUGS AND DREDGERS

Bureau Veritas supported yards and owners in the design and delivery of innovative tug and dredger projects in 2017, cementing LNG as a fuel of choice for this type of vessels. LNG propulsion is increasingly common for new tugs and dredgers, which often operate close to centers of population. The use of cleaner fuel lowers emissions, thereby helping the vessels meet IMO Tier III emissions standards.

Designed by Robert Allan and built by Astilleros Cananéia, these LNG-fueled, 40.2 meter tugs operate within the Arctic Circle in -20°C temperatures. They are used to escort carriers exporting LNG from Statoil’s production terminal at Melkøya, Norway.

LNG was also the fuel of choice for Belgian contractor DEME, who placed an order with Dutch shipyard Royal IHC for the world’s first LNG-fueled cutter suction dredger (CSD). The 16x-meter long Spartacus will be classed by Bureau Veritas and is set to live up to the reputation of its namesake as it is the world’s most powerful self-propelled CSD. With six dual-fuel engines, Spartacus will have 44 MW installed power and the ability to cut harder soils at higher speeds than any other vessel, while working in waters up to 45m deep. Royal IHC also delivered DEME’s 7.96 cubic meter dual-fuel trailing suction hopper dredger (TSHD), Scheldt River. Only the second TSHD to use the IHC-patented two-speed propulsion drive, which creates fuel savings when at lower speeds, the vessel also features a newly developed wing shaped bow thruster tunnel.

Other innovative BV-classed projects undertaken in 2017 include the self-propelled mega-cutter suction dredger Helios, designed and built by Boskalis. With a total installed power of 23,700 kW and a pump ashore capacity of 15,600 kW, it is equipped for dredging trenches, navigation channels and harbors and can accommodate 45 people.

MARINE FUEL TESTING SERVICES LEVERAGE GLOBAL LAB NETWORK

Through laboratories and inspectors in the world’s major bunker hubs, Bureau Veritas offers an extensive range of marine fuel testing services to ensure ocean-going vessels meet quality specifications and environmental regulations.

Bureau Veritas’ VeriFuel testing program is a comprehensive fuel monitoring program for the marine industry. It was developed by a team of industry experts to provide residual and distillate marine fuel quality assessment, advisory reports, and expert opinion to improve fuel management. Thanks to VeriFuel, clients have timely and accurate information on the quality of fuel purchased, which helps avoid engine problems and reduces maintenance costs due to fuel unsuitability. In 2018, Bureau Veritas plans to extend its fuel testing services to LNG, thereby supporting the growth in LNG propulsion projects.

In December 2017, Bureau Veritas released a new edition of the ‘Marine Fuel’ book. This updated edition takes an in-depth look at various aspects of marine fuel management, taking into account major changes in the field such as new environmental regulations that lead to new generations and fuel types, and new ISO 8217 standards.

GREEK OWNERS RETURN TO BULK IN FORCE

Greek owners were active in bulk carrier orders. Bureau Veritas is working for the first time with Aegean Bulk, classing four Kamsarmaxes bulk carriers to be built at Cosco (Zhoushan). It also received new orders from existing client Oceanbulk for four Newkemmaxes and four Kamsarmaxes, under construction at Shanghai WaigaoQiao and Changli Shipyard respectively. Chartworld has also placed new orders for seven Kamsarmaxes built at Penglai Zhongbai Yingli and Jiangsu New Yangzi which also received an order from Alpha Bulkers for the construction of four Kamsarmaxes.

Greek owners took delivery of eight BV-classed Newcastlemax bulk carriers constructed in Chinese yards. Two went to Diana Shipping, built at Jiangnan Shipyard and five to Oceanbulk, built at Shanghai Jiangnan Changxing Heavy Industry. A sixth vessel for Oceanbulk was built at Shanghai WaigaoQiao Shipbuilding.

“We have a strong relationship with Bureau Veritas in Greece and value their good service worldwide when required. A substantial proportion of our in-service fleet is BV-classed. Also we count a lot on the service they provide for our newbuildings, which is very important.”

Antonis Faraklas, Managing Director
Chartworld Shipping Corporation
http://chartworld.gr/

Giant Order for Nissin Shipping

Nisshin Shipping ordered 36 bulk carriers of various sizes to be constructed to BV class at yards in China and Japan. Eight Kamsarmaxes will be built at Jiangnan Hantong, Nantong Xingyu will build 10 Supramaxes and Jiangnan Nantong will build six Handymaxes. Oshima will build six Kamsarmaxes and six Supramaxes.

A GAME-CHANGER FOR MULTRASHIP

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DID YOU KNOW?

Bureau Veritas Group is among the largest providers of laboratory testing for the global oil industry: commodities testing makes up just under a fifth of the Group’s revenues. Its VeriFuel services are carried out from the Group’s worldwide laboratories network strategically located in key trading locations around the world.
MSC CRUISES ADDS TO SUPERSIZE FLEET

With the global cruise industry booming, supersize cruise ships over 300m in length are becoming a regular sight in ports around the world. Among the companies leading the charge is MSC Cruises, which in 2017 launched its largest vessel to date: the MSC Meraviglia.

For the MSC Meraviglia, several alternative designs were carried out, notably relating to main fire zones and lifeboats, which are each designed to accommodate over 300 people. Alternative Designs are also underway for the last two vessels in the series, which will be around 15m longer, providing capacity for an additional 150 passengers.

Looking beyond 2020, MSC Cruises will launch a new series, also to be built by STX France, the MSC World Class series. The 200,000 GT, 330m-long vessels, will feature several innovations, including LNG propulsion and a new generation waste water treatment system. The first MSC World Class vessel, to be classed by Bureau Veritas, is scheduled for delivery in 2022.

“Innovation in cruise ships offers new sensations for travelers. With expedition cruises emerging as a top travel trend, cruise companies are ordering highly advanced ships with innovative features that enable guests to enjoy a luxurious adventure experience.”

“In the growing expedition cruise market, we see a demand for high-end, highly advanced ships with innovative features that enable guests to enjoy a luxurious adventure experience.”

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Ponant placed an order with VARD at the end of 2017 for the world’s first icebreaker cruise ship (see picture on the right). The 140m BV class vessel will be able to take 230 passengers to the North Pole from 2021 thanks to its Aker Arctic-designed hull, which combines forward sailing modes through compact ice and reverse sailing in extreme ice conditions. It will carry Icebreaker 3 and POLAR CAT-A service notations and feature POLAR CLASS 2 and Safe Return to Port.

Other innovative features of the vessel present specific design challenges requiring extensive risk studies. The ship will be electric hybrid with LNG propulsion, using dual fuel engines and a LNG containment system designed to optimize operating range of the vessel. It will accommodate two helicopters as well as 16 expedition Zodiaks.

The icebreaker will be the seventh BV class expedition ship to be built by VARD for the French cruise operator, following the delivery of six 131-meter vessels named after famous explorers in 2018-2019. Le Lapérouse and Le Champlain will be delivered in 2018, followed by Le Bougainville and Le Dumont d’Urville in 2019, and finally Le Belliot and Le Surville in 2020. All six will feature a breathtaking underwater lounge, the first time one has ever been fitted on a cruise ship.

US operator SunStone is also investing heavily in the growing expedition cruise market. It has placed an order for four ships (see picture on the left) to be built at the China Merchants Heavy Industry (CMHI) Jiangsu shipyard near Shanghai, with options for a further six. The vessels will be the first cruise ships ever to be built in China. The industry is watching this project with keen interest as this type of vessel is currently the domain of European yards. CMHI is keen to develop expertise in the cruise ship market, which in China alone is seeing a growth of 7% each year.

The SunStone vessels will be 104m long, each with 80-95 passenger cabins accommodating up to 160 passengers. They will be certified as POLAR CAT-B and conform to Safe Return to Port requirements on a voluntary basis. The project brings together an exceptionally international team from the US, China and Europe, with a design by Ulstein and classification by Bureau Veritas.

“We are really looking to Bureau Veritas to be our guide and coach on this project as it’s our first cruise ship. They have a vast experience in cruise ship design and construction, and in handling large complex projects.”

Laurent Castaing, General Manager, STX France

Wallace Yao, General Manager CMHI

www.stxfrance.com

www.cmindustry.com.hk
In 2017, new apps and tools were made available to complete our digital platform and improve client experience in their fleet management. Improving the customer experience through digitalized processes is one of the key pillars of Bureau Veritas Digital Transformation for class and statutory surveys.

End-to-end digital platform

For class and statutory surveys

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Electric hybrid solutions gained momentum in 2017 as owners recognized the environmental and performance benefits of the fast-evolving technology. Bureau Veritas supported development via new rules, classification of new projects, and Approval in Principle of an innovative new design.

Bureau Veritas’ new rules are the first of their type to address the requirements of energy storage systems (ESS). They aim to encourage uptake, with specific notations available for power management (PM), power back-up (PB) and zero-emission standards (ZE).

Two ferry owners have already chosen to adopt the notations for vessels under order: Seaparan Ferries, which at the beginning of the year took delivery of two hybrid vessels (the Seaparan Swift and the Seaparan Reliant), has ordered three more ferries with increased battery power.

“Our aim is to not just reach, but go beyond current environmental standards. We value Bureau Veritas’ involvement: they have always listened to us and we appreciate the quality of their work.”
——— Mathieu Potieu, Director Newbuilding, PONANT
www.ponant.com

Luxury river cruise vessel delivered

As river cruises continue to rise in popularity, Bureau Veritas is classing new concepts and increasingly luxurious vessels.

The Crystal Bach is a new BV-classed inland passenger cruise vessel (see picture) built by the MV Werften Wismar shipyard in Germany. With a length of 135m, it will accommodate up to 110 passengers in the same level of luxury as Crystal offers on sea cruises. A new technical concept for the generation and distribution of power presented a challenge in the design and construction of the vessel, while the use of luxury material in interior design required innovative solutions to meet fire and safety requirements.

Egyptian navy takes delivery of first GOWIND®

September 2017 saw the delivery of the El Fatah GOWIND®, a compact frigate, with the flexibility to operate in a variety of roles. The Astrolabe is the first of four Bureau Veritas-classed GOWIND® vessels.

Bureau Veritas issued Approval in Principle for the Wartsila® Hy-tug, an efficient design that features strong environmental performance as a result of less installed power. While achieving maximum bollard pull thanks to power boosting from batteries, the design illustrates the performance potential of ESS, which can also be used to provide peak shaving, power smoothing and power for Dynamic Positioning.

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NEW RULES OPTIMIZE SHIP SAFETY AND PERFORMANCE

After years of research and measurement of existing vessels regarding sea pressure and loads, Bureau Veritas amended its Rules for containment ships (NR 625), redefining loads on the vessel and optimising acceleration rates for very large ships. This change is based on a more accurate understanding of what is possible – helping to optimize cargo capacity and provide operational flexibility. Following the issuance of NR 625, Bureau Veritas launched in November 2017 a new version of Veristar Lashing for containerships (Nr 625), redefining loads on the vessel and ship safety.

As an add-on service to help clients manage risks associated with the transportation of dangerous goods, Bureau Veritas also developed the VeriSTAR Dangerous Goods & Bulk web application. It optimizes cargo management for ships carrying dangerous goods, simplifies the issuance of documents, and enables simulation of the impact of modifications to ship or cargo.

Bureau Veritas also updated its Rules for other types of vessels. In April 2017, the Naval Ship Committee approved the new version of NR 483, dedicated Rules for the classification of naval ships. Published in June, it contains several technical updates, cybersecurity concepts, and the military OPV service notation. This was followed in July with the issuance of NR 467 Part E for the classification of Floating Storage Units (FSRUs). The Rule, which sets out requirements to address the technical and operational issues of FSRUs, was written after consultation with stakeholders. It applies a unified approach to safety and design challenges while providing clarity in terms of classification requirements by offering two new class notations.

Bureau Veritas also issued Rules NR 610 covering the classification of diving systems. The Rules set out requirements for systems ranging from surface-supplied systems for shallow-water diving to complex saturation systems for deep-sea diving.

ENVIRONMENTAL REGULATIONS INSPIRE INNOVATION

The shipping industry faces ever more stringent regulations from governments, the International Maritime Organization (IMO) and the European Union, as they reinforce their commitment to promoting cleaner seas and coasts.

Shipping produces a range of noxious air pollutants, notably around 15% and 13% of human-produced global nitrogen and sulfur oxides. To combat this, Sulphur Emission Control Areas (SECAs) are already in place around Europe and the USA, and China is steadily increasing its number of domestic emission control areas.

To support clients in achieving compliance, Bureau Veritas constantly seeks to innovate both in terms of the services we offer and how they are delivered.

OFFSHORE RULES FOR FSRU AND DIVING SYSTEMS

In 2017, Bureau Veritas also responded to the growing demand for LNG as a clean and cost-effective energy source by releasing a new Rules (NR 645) for the classification of Floating Storage and Regasification Units (FSRUs). The Rule, which sets out requirements to address the technical and operational issues of FSRUs, was written after consultation with stakeholders. It applies a unified approach to safety and design challenges while providing clarity in terms of classification requirements by offering two new class notations.

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FOUR NEW CLASS NOTATIONS HELP SHIPOWNERS AND OPERATORS REDUCE EMISSIONS

Bureau Veritas published rules in 2017 to encourage take-up of alternative propulsion solutions. Classification Rules NR 529 for gas-fueled ships help shipowner and yards understand and comply with the new IMO International Code of Safety for Ships using Gases or Other Low-Flashpoint Fuels, which came into effect in January 2017.

Another series of rules addressing the requirements of energy storage systems (ESS) includes class notations for power management, power back-up, and zero emission standards. It will support ship operators in reducing emissions and encourage wider uptake of ESS with performance, financial and environmental benefits.

In addition, to help shipowners future-proof their vessels, Bureau Veritas issued NR 644. It sets out the technical requirements for the assignment of Scrubber-Ready notation. This can be awarded to new and existing ships prepared for later installation of an Exhaust Gas Cleaning System using scrubbers.

Finally, Bureau Veritas issued its Green Passport EU notation as part of its compliance solution for EU SRR (see above).

FAST COMPLIANCE WITH BWM

Bureau Veritas introduced ‘My Ballast Water Management Plan’ (My BWMP), an e-business solution to help the shipping industry meet last September’s Ballast Water Management deadline. My BWMP provides shipowners with immediate online quotations, and allows them to pay and submit documents online.

In addition to providing a new class notation for Ballast Water Management System (BWMS) verification and certification, Bureau Veritas also offers value-add services such as assistance in selection of BWMS systems and retrofit studies.

READY FOR EU MRV AND IMO DCS

EU MRV and IMO DCS are overlapping schemes to reduce emissions. Bureau Veritas gained accreditation from UKAS to carry out assessments and verifications for compliance with the European Union’s Maritime Monitoring, Reporting and Verification (EU MRV) regulation. The regulation obliges all merchant ships of 5,000 GT or above calling at an EU port to monitor and report CO₂ emissions based on fuel consumption. Bureau Veritas has also developed tools for compliance with IMO DCS, including an app for the SEEMP appendix and reporting to be released in 2018, gap analyses and a reporting calendar.

NEW IHM SERVICES

The 2013 European Ship Recycling Regulation (EU SRR) aims to reduce the negative impacts of ship dismantling. Its main focus is on the organization and certification of an inventory of Hazardous Materials (IHM). By December 31, 2018, all EU flagged newbuildings must carry a verified IHM with IHM Certificate: by the end of 2020, the rule applies to existing EU flagged ships. Bureau Veritas has developed partnerships and services to help clients understand the regulation and achieve compliance; this covers staff training, support in preparing documentation including development of the IHM Part I, verification and certification.

It has trained specialized IHM experts with a worldwide remit who benefit from synergies with Bureau Veritas laboratories for sample testing.
Via its classification of offshore platforms and floating units, Bureau Veritas supports offshore operators and service vessel owners to improve safety. It works to extend the life of assets and optimize owners’ OPEX, via targeted maintenance programs and digitized AIM solutions. Increasingly, it is helping the industry meet the challenge of decommissioning assets safely, efficiently and in a way that minimizes environmental impact.

180
FLOATING UNITS STUDIES
REACHED IN 2017

5
MAJOR IVB CONTRACTS, INCLUDING RENEWALS WITH TOTAL AND SHELL

37%
PROPORTION OF FSUs WORLDWIDE BUILT TO BV CLASS AS OF JANUARY 2018
Bureau Veritas’ work with SBM Offshore, a market leader in floating production solutions for the offshore energy industry, started with support in the development of the company’s flagship Fast4Ward™ project (see picture).

The world’s first Multi-Purpose Floater (MPF) program Fast4Ward™ provides a generic yet modular approach to standardize the construction and delivery of FPSOs. A Fast4Ward™ FPSO costs significantly less than a standard vessel, and the process can shave 6 to 12 months off the usual three-year wait for a third-generation FPSO. Through standardization and repetition the company aims to offer greater safety, more cost efficiency and productivity, more reliability and more assured delivery deadlines.

Bureau Veritas was involved in SBM’s internal FEED and provided full Basic Design Approval for the hull. Impressed by the speed and quality of Bureau Veritas’ support, SBM Offshore extended collaboration on the Fast4Ward™ project to full classification. In doing so, it underlined its confidence in Bureau Veritas’ surveying experience in the construction of ships and complex offshore units in China: Fast4Ward™ is being constructed at the Shanghai WaiGaoQiao Shipbuilding & Offshore yard.

In parallel, Total Exploration & Production Congo started up the production of the second part (the first part was started up end 2015) of Moho Nord project in March 2017, which involved the creation of a production point able to produce 100,000 barrels of oil daily. Two floating units were delivered: the FPU Likouf – for which Bureau Veritas provided classification during 2017, Bureau Veritas reinforced its relationship with SBM Offshore, through innovative projects and a global technical and commercial frame agreement encompassing classification, second-party inspection, and design assessment studies.

“Fast4Ward™ has been a priority for the company since development on the concept began three years ago. Our solution meets the industry’s need for standardization, but remains sufficiently modular to fit client needs. Bureau Veritas understood our generic and design envelope approach; they made several recommendations that improved details of the hull structures.”

Hervé Cariou, Senior Project Manager, SBM Offshore www.sbmoffshore.com

MOORING ANALYSIS SUPPORT FOR MAJOR FPSO PROJECT

Bureau Veritas provided state-of-the-art dynamic mooring analysis to determine the risk of clashing between mooring lines and risers for an FPSO project.

The operator approached Bureau Veritas following independent structural analyses performed during construction of the FPSO. The result was a project that required close collaboration between Bureau Veritas Headquarters and its Shanghai office. The client’s satisfaction led to an additional contract for calculations on demand that will continue well into 2018.

Floater classification for two major Total-led offshore Africa projects

Bureau Veritas won new contracts with Saipem to provide classification for the operation of the two converted turret-moored FPSOs for use at Kaombo offshore Angola, a project led by Total. It is also certifying the cranes and lifting equipment on deck and will provide an Emergency Response Service. The award of contracts follows Bureau Veritas’ classification of the design and construction phases of the project, and its certification of the topsides and turret assemblies.

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“We entrusted Bureau Veritas to provide these classification services as a result of its extensive presence in Africa, combined with an excellent track record and satisfaction on previous projects.”

Pierre Jessua, President, Total Exploration & Production Congo www.total.com

Design and construction in Hyundai Samho Heavy Industries in South Korea – and an unmanned Tension Leg Platform (TLP).

It is now classing three floaters on the field, the existing FPU Alima, FPU Likouf, and the TLP under transfer.

Floaters classification offshore Angola

Bureau Veritas won new contracts with Perenco to provide classification and certification for the construction of the converted turret-moored FPSO for use at the Yombo field offshore Congo.

Installed in late 2017, this unit, with increased power generation, processing, and accommodation capacities replaces FPSO Conkouati. It will be positioned at the same location as the previous unit so as to re-use as much as possible the existing subsea facilities, risers, mooring chains and electrical cables.

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Finally, Bureau Veritas was Independent Verifier for one of the industry’s most complex projects: the decommissioning of Shell’s Brent Delta. The 24,200-tonne platform was lifted in one piece in April 2017. Bureau Veritas’ work on the management of safety and environmentally critical elements covered the period leading up to the lift, including platform engineering preparations to strengthen the underdeck and cut the legs on Delta.

Bureau Veritas has built strong expertise in IVB services. Its Aberdeen-based Verification Academy trains and assesses verifiers worldwide using the same basic methodology and principles to provide the same high-quality service to clients globally.

In 2017, this expertise was recognized with new contracts, renewals and extensions with oil and gas majors operating in the North Sea, the Mediterranean and the Middle East. Bureau Veritas also secured an operational IVB contract with a drilling operator with nine drilling units.

Two of the largest North Sea operators both renewed IVB based contracts for operational assets with one of these major contracts including services such as noise and vibration and management system certification. Both contracts are for three years with options to extend by a further two.

Other IVB contracts were obtained with Mellitah Oil and Gas in Libya, and with Noble Energy for its development of the Leviathan natural gas field in the Mediterranean. Work on the Leviathan project focuses on review and verification of the design and engineering, fabrication, installation and commissioning of the safety and environmentally critical elements of the project. Work for Mellitah across the same project phases includes verification, certification and marine warranty.

Bureau Veritas also worked on the qualification of optimized buoyancy modules created by a leading seabed-to-surface engineering, construction and services contractor to the offshore energy industry. This sophisticated type of system has often only been used at certain stages of a project, such as installation, and can therefore prove to be an extremely expensive line within deepwater project budgets. By reshaping the existing product using different materials and simplified production methods, Bureau Veritas’ client was able to reduce costs considerably.

FSRUS HELP SECURE GLOBAL LNG SUPPLY CHAIN

Floating Storage and Regasification Units (FSRUs) are a bright spot in the offshore market, offering an attractive combination of lower CAPEX and shorter commissioning lead times than for onshore terminals. This makes them extremely attractive for countries looking to ramp up their energy imports quickly, or improve energy security. They have extremely high potential in India, South-East Asia – in particular Malaysia – the Middle East, South America and Africa.

Bureau Veritas’ expertise in this field is particularly sought after, as it is a clear leader for the classification of FSRUs. In 2017, we responded to industry demand and issued new Rules (NR 645) for the classification of these units, detailing requirements to address their technical and operational aspects.

Several major deliveries and orders for FSRUs were made last year. Japan’s Mitsui O.S.K. Lines took delivery of the world’s largest ever FSRU, built in the Okpo shipyard of Daewoo Shipbuilding & Marine Engineering in South Korea. The BV-classed vessel is the first that MOL has built independently and will own and operate. With a storage capacity of 261,000 cubic meters along with a shipment and gas transfer capabilities, the MOL FSRU Challenger started providing storage and regasification services offshore Turkey in 2017.

Bureau Veritas also classed an FSRU with an option for a second, built at Hyundai Heavy Industries for Turkish construction companies Kolins Insaat and Kalyon Insaat. The unit has a cargo capacity of 170,000 cubic meters and could benefit from our new REGAS notation for regasification installations.

Equally, we are helping Excelerate upgrade units already in service for use at new terminals in Bangladesh. Bureau Veritas is performing heading and mooring analysis for one particular vessel that will be upgraded this year. It will be the first FSRU to operate off Bangladesh, offering the country new possibilities for LNG importation.

Finally, Bureau Veritas is involved in re-classing Excelerate’s FSRUs following relocation. Three units were moved in 2015 and 2016 and new relocations are foreseen in the future with each move. Bureau Veritas carried out analysis on the FSRUs ahead of process modifications.

“Since 2004, Bureau Veritas has worked on 10 LNG projects with us. It is important to us to have a classification society with strong technical expertise who is also uncompromising on construction quality and HSE.”

Yoshikazu Kawagoe, Managing Executive Officer, Mitsui O.S.K. Lines

www.mol.co.jp/en
A BRIGHTER ENERGY FUTURE SUPPORTED BY SMART SERVICE OPERATION VESSELS

As the renewable energy industry sees growth from strength to strength, offshore wind farms require increasingly innovative service operation vessels (SOV) in terms of performance, environmental impact, costs and, most importantly, safety.

One project that seeks to meet these requirements is the Louis Dreyfus Armateurs (LDA) newbuild (see picture), which boasts a hybrid propulsion system combining diesel engines and electric batteries and offers excellent operating efficiency. Designed by Salt Ship Design in Norway, and under construction at Cemre Shipyard in Turkey, the 85-meter vessel will provide a base to a maximum of 90 people working on four farms off the coast of Germany.

The BV-classed vessel will feature a motion-compensated gangway and crane, the latter with a lifting capacity of 1 metric ton at 23 meters. Innovations in walk-to-work access systems are being pioneered by companies like Uptime and SMIT specifically for wind farms where, not surprisingly, the probability of high winds and rough seas is particularly high. This sophisticated technology ensures first and foremost the safe transfer of personnel even in difficult conditions, while also reducing downtime for offshore operations.

Another vessel produced with the ultimate goal of reducing the cost of renewable energy is the Esbjerg Mercator SOV, also classed by Bureau Veritas. The 58.5-meter vessel features dynamic positioning technology and two safe-transfer boats. It recently entered into service supporting two wind farms off the Belgian coast, and will provide a base for 56 MHI Vestas personnel for up to two weeks at sea.

In further support of the growing offshore wind sector, Bureau Veritas also classed a crane vessel for the installation of offshore wind turbine foundations, converted by Boskalis from an F-class semi-submersible heavy transport vessel. Able to accommodate 150 people, it features a 3,000-ton offshore mast crane supplied by Huisman as well as dynamic positioning.

“Certifying floating wind energy projects requires very particular expertise: floating turbines combine a floater, which is subject to sea conditions, and a turbine, which reacts to the wind. In this respect, Bureau Veritas is uniquely positioned to support the growing floating wind energy sector and did so in 2017 by managing certifications for several innovative projects.”

Tor Henning Vestbøstad, Sales Director, Salt Ship Design

https://saltship.com

Bureau Veritas Group was a pioneer in developing the safety and commercial viability of both offshore and onshore wind projects. It issued its first guide to certification of wind farm projects over five years ago, publishing more detailed guidance in 2017.

Offshore activities

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“We need to have a quick and efficient approval process, but also technical clarification before projects materialize. We have always received a quick response and are very satisfied with the services provided by Bureau Veritas.”

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Moving towards commercially viable tidal and wave energy

Tidal and Wave are emerging as a marine renewable energy technology with significant potential. In 2017 Bureau Veritas supported several projects that brought it closer to commercial viability.

To enable technology companies to demonstrate their electricity production capacity to potential investors, Bureau Veritas has pioneered a power curve assessment certification procedure in partnership with SEENEOH estuarine test site. The procedure will allow developers to measure and compare power outputs for machines tested at the estuarine tidal site located off the coast of Bordeaux, France, as well as those subjected to real environmental conditions. With the two first tidal turbines on the SEEENOH test site, the partners are working actively on implementing the procedure to certify the power curve of the two machines by early 2019.

The world’s first Tidal Energy Converter power curve certification is currently underway in France. It is based on an IEC 62600-200 adapted procedure and related tests conducted using a tidal turbine scale model. Certification will enable the client to acquire the investment required to move to a full-scale machine, taking them one step closer to commercialisation.

Bureau Veritas is coordinating the three-year EU-funded €5 million Horizon 2020 RealTide research project aimed at improving the Levelized Cost of Energy for tidal energy, and ultimately making the industry bankable. The Bureau Veritas-led consortium will collaborate to develop a better understanding of tidal site environmental conditions and related impacts on tidal blades, and to improve the reliability of tidal energy converters.

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After delivering an Approval in Principle for the 100KW Sharp Eagle Wave Energy Converter developed by the Guangzhou Institute of Energy Conversion (GIEC), Bureau Veritas has now finalised the first certification of the full-scale machine. Following this first success, GIEC now plans to deliver two more Wave Energy Converters in the coming year.

Certifying floating wind energy projects requires very particular expertise: floating turbines combine a floater, which is subject to sea conditions, and a turbine, which reacts to the wind. In this respect, Bureau Veritas is uniquely positioned to support the growing floating wind energy sector and did so in 2017 by managing certifications for several innovative projects.

For EDF EN, Bureau Veritas is providing full project certification for Provence Grand Large which deploys three 8 MW turbines. Floaters for the project are provided by SBM Offshore, and Siemens Gamesa Renewable Energy (SGRE) is the turbine manufacturer of choice. It is also managing full project certification for the EOLFI Croix project, conducted in collaboration with floater provider Naval Energies and turbine manufacturer GE. The project has a farm of four 6 MW turbines.

Effilage Metal, in charge of the fabrication of the floater of the Goiffe du Lion’s Floating Wind project at the Leucate site, led by ENGES and EDF Renewables.

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Bureau Veritas’ value-add services complement its classification activities. Services for owners range from risk analysis and engineering services, through to numerical modeling. Subsidiaries provide services related to accident and salvage that support a range of stakeholders including insurers. As environmental regulations grow in importance, Bureau Veritas is developing new services for owners and yards.
NEW SERVICES AND SYNERGIES

Bureau Veritas Marine & Offshore Group offers tailor-made solutions to its clients worldwide, based on a unique expertise covering all types of risk and engineering. It continues to build on its 190 years of classification experience to develop this global service offer. The objective: to respond to industry needs with fresh, digitally-enabled ideas, thanks to an efficient synergy of its subsidiaries and worldwide network.

Beyond standard services such as structural strength and vibration analysis, hull form optimization, risk analysis and measurements, Bureau Veritas successfully guides clients through new challenging fields. Marine services include cyber security studies, LNG bunkering, risk and engineering analysis, propeller retrofit and composite structural analysis. For offshore oil and gas, Bureau Veritas provides asset management services such as maintenance and inspection optimization, piping and structural RBI and offshore decommissioning.

R&D FOR INNOVATIVE SERVICES

Bureau Veritas is involved in several collaborative research programs to develop innovative services with partners and clients:

- ship weather routing and global ship model (OPTIROUTES FR, Synchronet EU);
- integration of Computational Fluid Dynamics (CFD) analysis and powering and propulsion systems performance and reliability modeling in the ship design loop (HOLISHIP EU);
- numerical modeling of aircraft and helicopter ditching (SARAH EU);
- advanced simulation modeling and control of Current Tidal Turbines (REALTIDE EU);
- advanced hydrodynamic tools for marine and MRE systems (HYSMER FR);
- automatic hull form optimization cloud portal (FORTISSIMO EU).

SIL STUDIES FOR AN OFFSHORE GULF OIL FIELD

Bureau Veritas recently performed Safety Integrity Level (SIL) studies for an offshore oil field in the Gulf. The project covered drilling platforms, wellhead platforms and a process platform producing oil sent via subsea pipelines to an onshore treatment facility.

Since production began in 1997, the configuration of offshore and onshore installations has changed to optimize oil production, leading to several design upgrades. The aim of the SIL studies was therefore to ensure that the design of the Safety Instrumented Systems is safe and complies with client specifications.

The work was undertaken for each platform and onshore treatment train, with three steps. First, a SIL assignment workshop of all Safety Instrumented Functions was held to define the required SIL. Second, SIL calculations were performed, for example to determine probability of failure on demand and in terms of Programmable Logic Controllers architecture.

Finally a SIL verification of all Safety Instrumented Functions was carried out to check that each Safety Instrumented System achieves the required SIL. With the results of these SIL studies, the client identified which systems needed to be upgraded in order to reach the required SIL and targeted the Safety Instrumented System which required investment in order to increase safety.

BOOSTING THE PERFORMANCE OF SAILING YACHTS

High performance sailing yachts are among the most demanding applications in terms of accuracy, reactivity and innovation. Bureau Veritas has been involved for several years in sailing yacht design in terms of both hydrodynamic and aerodynamic performance, and even energy production onboard thanks to hydrogenerators.

Major successes achieved with design teams are: the round-the-world record in 2017 with the MACIF 100' trimaran and the Vendée Globe 2016-2017 win with Banque Populaire VIII.

In 2017, Bureau Veritas formed part of Groupama Team France in the prestigious and selective America’s Cup and contributed its unique expertise to the design of the AC50’s foils. At least 3 new sailing yachts with foils are to be released, including the Banque Populaire multihull, and Charal IMOCA for the Vendée Globe.

Such challenging and demanding projects in which 0.1% accuracy can make a great difference, push our team to be exceptionally responsive and maintain leading edge expertise.
Work is already ramping up for the MatthewsDaniel international team, with engineering review headquartered from Houston, construction supervision in Singapore, and field attendance work out of Dubai. The contract covers full scope marine warranty services, from review of all engineering drawings to feasibility studies, surveys and approvals at the FPSO and turret construction yards, as well as for the fabrication of risers and subsea flowlines.

Other stakeholders in Coral South include Portugal’s Galp Energia, South Korea’s KOGAS and Mozambique’s Empresa Nacional de Hidrocarbonetos.

Although offshore energy installations escaped widespread damage during HIM, there were a number of mooring failures on Mobile Offshore Drilling Units, leaving some units drifting off location.

The yacht market was particularly badly affected by HIM. Quantifying the damage sustained to yachts and shore based infrastructure throughout the Caribbean region is ongoing. Initial response was hampered by accessibility, with travel to a number of islands prohibited, and further complicated by destruction of survey and repair facilities. Using local surveyors, the specialist yacht team in London was able to meet the demands for immediate damage assessment and advise the London insurance market on salvage operations.

MatthewsDaniel has won the contract to provide marine warranty services to ENI for the Coral South project offshore Mozambique, the first LNG project in the country. An FLNG - the first in Africa - will be built and deployed to produce circa 3.4 mtpa of LNG and will be moored in 2,000 meters of water depth in Coral’s Area 4. The project includes drilling and development of six subsea wells, with associated sub-sea production equipment.

Drones are increasingly considered by the marine and offshore industries as an attractive alternative to traditional inspection. They are safe and cost-effective, are especially beneficial in inaccessible and hazardous areas, and the accuracy of drone-collected information can surpass traditional data gathering techniques.

With loss adjusting making up about two thirds of MatthewsDaniel’s business, potential for the technology is significant.

In the US, its surveyors and adjusters, licensed drone pilots, are now equipped with drones with a live feed capability enabling stakeholders to assess the nature and severity of damage together in real-time. The MatthewsDaniel representative onsite can instantly respond to instructions to zoom in on specific areas, capturing targeted photographic and video evidence. As an add-on to the service, MatthewsDaniel is now producing 3D models of survey locations, using the drone footage captured.

A number of further initiatives are currently being developed, including drone borne volume calculation technology, useful for deployment following incidents such as oil spills and other pollution events.

MatthewsDaniel, the loss-adjusting and risk assessment subsidiary of Bureau Veritas, launched a new service in 2017 to support its insurer clients. Live Loss Adjusting™ utilizes state-of-the-art drone technology.

Drones are increasingly considered by the marine and offshore industries as an attractive alternative to traditional inspection. They are safe and cost-effective, are especially beneficial in inaccessible and hazardous areas, and the accuracy of drone-collected information can surpass traditional data gathering techniques.
In 2017, Bureau Veritas subsidiary TMC Marine worked on the removal of South Korea’s sunken Sewol ferry, earning the company the personal thanks of the nation’s Prime Minister for its part in recovering the vessel.

The MV Sewol sank off the country’s southwest coast over the course of three hours on 16 April 2014, claiming 304 lives, almost all children. At the time of the salvage, the bodies of nine missing persons were still to be recovered, making the operation particularly sensitive.

To raise the Sewol, beams were installed by digging through the seabed underneath the ship, and two large-surface barges were positioned on either side of the 6,825-ton vessel (see picture). Some 66 cables were attached from the beams to the barges in order to wrench the wreck to the surface in one piece. After which it was placed onto a semi-submersible vessel. The complex single-piece lift from a depth of 45 meters took three years to complete and is thought to be a world record.

Throughout 2018, TMC Marine will be working to remove the containership Kea Trader, which ran aground on New Caledonia’s Durand Reef in July 2017. The ship was just four months old when it hit the reef due to a suspected navigational error. Since they started trying to refloat the ship, salvors have been hampered by bad weather and heavy swells. Brought into the project by owners, Lomar Shipping, TMC Marine is working to select a contractor to remove the wreck, as hopes of trying to repair it have now been scrapped.

MAC has been appointed to provide Marine Warranty and Third Party Verification services for a major decommissioning project in the North Sea. MAC’s contract involves the removal of topsides, jackets and other equipment.

Retiring ageing platforms is a major challenge for the oil and gas industry, particularly in the North Sea. Operators must decommission safely in line with regulations while limiting costs. As a Marine Warranty Surveyor, MAC’s involvement in the pre-operation phase of this project involves review of documentation, including calculations and procedures along with vessel suitability surveys. MAC teams will then offer support by providing Certificates of Approval for each operation to ensure that operations are properly engineered and planned in line with agreed codes and industry standards. The company will have on-site personnel to check that operations are then executed in accordance with the agreed procedures using suitable vessels and equipment.
Bureau Veritas’ Marine & Offshore business is led by an Executive Committee. Engineers and business leaders with an international background and outlook, they steer a global organization of 2,650 people. Together, they lead the development of new services, rules and tools, and are spearheading a digital transformation designed to deliver ever-better service to Bureau Veritas’ customers.

Focused on our clients, driven by society

Bureau Veritas is a Business to Business to Society company, contributing to transform the world we live in. Our mission is to reduce risk, improve our clients’ performance and help them innovate to meet society’s challenges with confidence.

A world leader in Testing, Inspection and Certification, we help clients across all industries address challenges in quality, health and safety, environmental protection (QHSE) and social responsibility.

Through our wide range of expertise, impartiality and independence, we foster confidence between companies, authorities and consumers. For 190 years, our brand has been synonymous with integrity and trust, for the benefit of business and people.

Our core services

Bureau Veritas supports clients across all industries to improve safety, quality and performance throughout the life of their assets and products, and to achieve continuous improvement in their management systems and processes.

We do this via three core services:

Testing
In a laboratory, determines a product’s or material’s characteristics.

Inspection
Verifies on site that a product, asset or system meets specified criteria.

Certification
Provides assurance by a third party that a product, service or system conforms to an agreed standard.
Front cover: CMA CGM has ordered nine 22,000 TEU containerships powered by Liquefied Natural Gas. These ships will be built at China State Shipbuilding Corporation and the first will be delivered in 2020.