



2013  
2014

## MARINE & OFFSHORE BUSINESS REVIEW



*Move Forward with Confidence*

**BUREAU  
VERITAS**



# FOREWORD

**BUREAU VERITAS IS A GLOBAL LEADER IN TESTING, INSPECTION AND CERTIFICATION, RECOGNIZED AND ACCREDITED BY MAJOR NATIONAL AND INTERNATIONAL ORGANIZATIONS.**

It is by far the largest and most global Group involved in ship classification and offshore verification and certification in the world. The Marine & Offshore division of Bureau Veritas is an important part of the Group. Its global network is at the heart of Bureau Veritas' local presence in every country on earth and its expertise is shared across the Group.

Bureau Veritas delivers high quality services to help clients meet the growing challenges of quality, safety, environmental protection and social responsibility.

As a trusted partner, Bureau Veritas offers innovative solutions, that go beyond simple compliance with regulations and standards, reducing risk, improving performance and promoting sustainable development.

Through its eight global businesses, Bureau Veritas has developed the industry's widest array of world-class services to clients, wherever they operate.

Bureau Veritas has close to 62,000 employees in around 1,330 offices and laboratories located in 140 countries. In 2013, it reported revenue of 3.9 billion euros.

**For more information:** [www.bureauveritas.com](http://www.bureauveritas.com)





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The trust our customers placed in us before the economic crisis has been renewed with vigor as we begin this new cycle of growth.

**PHILIPPE DONCHE-GAY**  
EXECUTIVE VICE PRESIDENT  
MARINE & OFFSHORE DIVISION



↑ The 173,400 cu m LNG-RV *Experience* built to BV class for Excelerate Energy by Korea's DSME.



↑ The Petrobras P55 (180,000 bpd) production unit construction under Bureau Veritas class, concluded in October 2013, is the largest production unit ever built in Brazil.

## INSPIRING CONFIDENCE

**2013** was a pivotal year for the shipping industry. An upturn in the global economy brought renewed confidence, and a surge in new orders and projects. Add to this ongoing confidence in the offshore market, and the sector as a whole is looking healthier than it has at any point in the last five years.

Bureau Veritas saw the results of this renewed optimism. Once again, our classed fleet grew, to over 10,500 ships. New ship orders almost doubled, to 8.6m gt, with a very substantial number of containerships, bulk carriers and tankers. But this is not just about a

rising market. It's about our customers' loyalty: the trust they placed in us before the economic crisis, renewed with vigor as we begin this new cycle of growth. That's why our number one priority for 2014 is to continue to bring quality of service to our customers, many of which remained loyal to us during the downturn, and trusted us with their new projects as soon as economic conditions improved.

### ➔ QUALITY, SPEED AND EFFICIENCY

For new constructions, timing is crucial: projects must be delivered

on time, and on budget, but without compromising on safety or quality.

To cope with the surge of new construction orders, we have resumed recruitment of expert surveyors in the shipyards. We are also focusing on improving the speed of delivery for plan approval activities. For this purpose, we are introducing lean management methodologies, widely used in other industries. In a pilot project, a detailed review of each step of the design review process has shown that the turnaround time could be reduced by 40%. The lessons from that are being rolled out across the network.

We have also aimed to constantly improve the speed and quality of support we provide to our classed fleet. This focus on quality has yielded dividends: over 60 per cent of the growth in our classed fleet in 2013 came from ships in service being transferred to BV class, mostly by existing customers.

Finally, as part of our commitment to quality of service, we have been expanding our capabilities, recognizing that our customers turn to us to improve performance, safety and energy efficiency. For example, our ability to offer Computational Fluid Dynamics analysis has been key to attracting a large number of orders for new ships to be built to BV class. We have also played an instrumental role in helping shipowners improve the energy efficiency of their fleets.

### ➔ OFFSHORE: INNOVATING ALONGSIDE THE INDUSTRY

Our second key priority for 2014 is to continue to invest in high growth markets linked to meeting the global energy challenge. In this, we have the support of a global Group, with close to 62,000 employees in 140 countries. The Group offers expertise across all industrial sectors, and covering all stages of the energy

industry. With shared expertise, client relationships and synergies across the Group, our Marine and Offshore division is well positioned to expand its reach.

Bureau Veritas is firmly established as one of the top three class societies to deliver offshore services globally. Our position was reinforced in 2013 by new contracts for FPSOs, FPU's, FLNGs, and supply vessels of increasing sophistication. During 2014, we aim to expand our offshore offer through acquisitions bringing additional skills, particularly in areas such as subsea.

### ➔ LEADING THE WORLD IN GAS TRANSPORTATION

LNG represents one of the most dynamic areas of the shipping industry, as shipowners and yards seek to meet a boom in transportation demand. Bureau Veritas is a longstanding partner to the sector and in 2013, over 17 per cent

of new orders worldwide were to BV class. These orders included the world's largest regasification LNG carrier, to be built for MOL.

Shipowners and yards rely on us to provide innovative solutions, at every stage of a project. For example, we are helping Brittany Ferries switch its fleet to gas power, classing the high Arctic Yamal LNG carriers, providing services to numerous FLNG projects and certifying the world's largest bilobe tanks for smaller scale LNG transport.

In summary, Bureau Veritas is ready to partner the shipping industry in its next growth cycle, driving innovation and enhancing performance. What unites our projects is a simple aim: to inspire confidence, by ensuring our clients' projects are delivered quickly, safely and efficiently.





We invest to understand the most advanced technology and make it simple for our clients to use.

**JEAN-FRANÇOIS SEGRETAIN**  
VICE PRESIDENT, MARINE TECHNICAL DIRECTOR  
MARINE & OFFSHORE DIVISION



↑ The CMA CGM Jules Verne is the third containership of 16,000 teu delivered by DSME to CMA CGM.



↑ Major investment in ice research and tools helped Bureau Veritas to win the contract to class the innovative 170,000 cu m LNG carriers which will service the Arctic Yamal project.

## LEVERAGING TECHNOLOGY

↓ Bureau Veritas is working closely with engine and equipment manufacturers in order to propose industrial solutions to improve energy efficiency and reduce emissions.



Right at the heart of everything Bureau Veritas does is the concept of leveraging technology to help make our clients' businesses and projects more efficient, safer and cleaner. What that means in practice is investing in research and development, both alone and in partnership with industry and key institutions. The aim: to understand the most advanced technology and make it simple for our clients to use.

This impacts both ships classification and Marine services in general: BV reorganized its teams on 1<sup>st</sup> January 2014 to create a service department

which brings together all our technology and tools. Its objective is to meet client needs by deploying the right solution for each specific task.

### ➔ RISK MANAGEMENT FOR COMPLEX PROBLEMS

An example is the application of risk analysis. BV is a world leader in risk analysis, and uses it across a variety of services to help owners and offshore operators decide the best way to tackle complex problems. For example, North European ferry major Brittany Ferries turned to BV for assistance with how to comply with new air emission rules. BV was able to apply its risk and engineering simulation tools to evaluate not only proposed technical solutions to enable ferries to comply with the new emission rules, but also a complete gas fuelled solution, including the bunkering and logistics needed to make the switch to gas fuel economically feasible.

All eyes were on containership safety during 2013. An analysis of IACS class services showed that BV was the only classification body to mandate whipping and springing analysis into class for ULCSs. BV's deep understanding of the phenomena and their effect on fatigue was incorporated into its HOMER software. That helped Korean and Chinese yards, and international owners developing the world's largest containerships, design safe structures which will last a full service life. An example is the series of 16,000 teu vessels to be built in China for CMA CGM. Work is also proceeding on effective container lashing, using real-time data on ship loading condition to develop easy-to-use systems which put safety first above over-simplified route-based systems.

### ➔ ICE RESEARCH BACKS NEW DEVELOPMENTS

Major investment in ice research and tools including the IceSTAR ice

load calculation software helped BV win the contract to class the innovative 170,000 cu m LNG carriers which will be built in Korea to service the Arctic Yamal project. BV's experience, both in ice loading and in LNG containment system behavior, proved crucial when working with yards and project teams for these unique vessels which will have pod propulsion and be able to transport LNG in ice over 2 m thick.

Helping shipyards work more efficiently was a crucial part of BV's strategy during 2013. Major Korean and Chinese shipyards used BV's VeriSTAR suite for structural analysis, even for other class rules. BV's LILAS software was used for noise, vibration and shaft alignment studies for very high powered ships.

In the offshore sector, BV's Ariane software was crucial to analyzing the mooring and riser systems

of a number of major new floating offshore units. A fully-coupled version will be developed next year, providing a clear technological lead over any other mooring and riser analysis tool.

### ➔ SUPPORTING INNOVATION IN EQUIPMENT MANUFACTURING

A major focus for 2014 is to work more closely with equipment manufacturers. Engine and equipment manufacturers in the marine and offshore sectors are leading innovators, offering industrial solutions to improve energy efficiency and reduce emissions for all types of vessel and unit. Equipment packages form an increasing part of the value of new vessels. BV is using its technological lead and analytical tools to help ensure those packages deliver safe and effective performance.



## MARINE & OFFSHORE NETWORK

Modern communications have improved the way the industry works, but there is no substitute for being close to the people you need, when you need them. Businesses work more efficiently when they can access technical support face-to-face and in their own language. That's why Bureau Veritas continues to invest in its decentralized network. In 2013, our hubs for marine and offshore services around the world were

further strengthened. The emphasis everywhere is on creating a local structure that delivers world class and consistent services, support and standards quickly. Each centre is organized in a different way to suit local cultures and requirements, but they are globally consistent in the way they put customer service first and facilitate the flow of expert support to where it is needed.



**JAN SMIT**  
SENIOR VICE PRESIDENT,  
NORTH & CENTRAL EUROPE  
AND NORTH AMERICA ZONE

Marine equipment manufacturing is important in North Europe and the sector saw an upturn as orders for new ships in Asian yards picked up. The offshore business in upstream oil and gas is developing well. Investments in extensions to existing fields and development of new fields continues at a high pace. We gained market share in a very competitive environment in Aberdeen, Stavanger and Houston.

The priority for the coming year is to enhance the high level of support we deliver, focusing on availability, accessibility, competence and timely delivery. We are implementing customer support services and technical centers at our main offices. Customer support centers are focused on ships in service and technical centers are focused on studies and drawing approval and on stability, safety and statutory issues. This structure helps sharpen service delivery, as will the extra resources we are putting into the specialized sectors of offshore service vessels, mobile units, tugs, workboats, high speed craft and dredgers and for propulsion plants and gas carriers. \*



**DIDIER BOUTTIER**  
SENIOR VICE PRESIDENT,  
SOUTH EUROPE, MIDDLE EAST  
AND AFRICA ZONE

In 2013, we moved swiftly to support owners who responded to the improved market with confidence, ordering new tonnage. We were there when they needed it and we saw our market share grow in all sectors. That will continue to happen in 2014 as the market stabilizes and both owners and yards value our ability to react quickly.

Looking forward, my priority is to address two challenges. We have to make sure owners can access all of BV's services easily. Energy optimization, fuel saving and other efficiency gains are all available if we succeed in bringing our services to owners locally. And in the offshore field, we have a big challenge: to increase the local content of projects significantly. The oil majors and host countries want more done locally and we are gearing up to make sure that this can be done safely and efficiently, without any effect on production, time scale or quality. \*



**CLAUDE MAILLOT**  
SENIOR VICE PRESIDENT,  
NORTH ASIA ZONE

Yards right across Asia saw a strong pick-up in new orders as owners around the world demand bigger and more cost-effective ships. Offshore activity was also strong and Korean and Chinese yards are moving into the drill ship sector. Our priority is to support the shipowners, designers and shipyards in their projects from the basic design stage. This will be the main task of the new Advanced Technology and Research Center in Shanghai, where we are combining local expertise and specialists from head office, and signing cooperation and scientific agreements with key universities and partners.

We are leaders in FPSOs, mooring systems and OSVs: as such, the Shanghai Advanced Technology and Research Centre will include a reinforced offshore competency pole. This will provide expertise on floating gas terminals, offshore and subsea technologies, soil engineering and drilling technologies. We will also aim at building local teams to support operators on risk control, asset integrity management, risk-based inspection, and condition assessment. \*



**MATTHIEU DE TUGNY**  
VICE PRESIDENT,  
SOUTH ASIA ZONE

The shipping industry in South Asia is growing quickly. Many large shipowners, shipmanagers and offshore energy players have their headquarters in this area and there is a strong cluster effect. BV is part of this cluster, and as a further sign of our commitment to regional growth, we set up our new Deepwater Technology and Research Center in October with the support of the Maritime and Port Authorities of Singapore. The Center provides high level technical expertise to Asia Pacific builders and contractors, academic support to universities and software support to regional users. It will deliver all our services that go beyond classification.

Shipowners are expanding into more capable LNG vessels and much more sophisticated offshore support vessels. Our dedicated local teams are in demand to deliver support to these owners. Offshore we see increased demand for asset integrity management. In both shipping and offshore, there is a huge need for specialists and for greater responsiveness – and we are structured to deliver that. \*



## MARINE & OFFSHORE NETWORK

# REGIONAL HIGHLIGHTS

BV has a global network of 180 survey stations spread over 90 countries. These include 16 local Technical Centers & Plan Approval Offices and 12 Regional Marine Centers. Each of them is linked so that the location closest to the client maintains responsibility for good service, while the location closest to the ship or shipyard delivers the service and draws on the necessary expertise. These pages highlight a few of the activities in each region during 2013.

## AMERICAS

Our **North America** network grew, particularly in Canada thanks to increased delegation from Transport Canada. Sargeant Marine ordered two new asphalt carriers; Regent Cruises chose BV for its ultra-luxury newbuilding; Unishipping, Foremost and Oak Maritime all ordered bulkers; and Excelerate ordered an LNG RV. Noteworthy projects included the first ferry in North America to use a green diesel-electric hybrid propulsion system, built in Quebec. Zodiac Hurricane Technologies in Vancouver chose BV to class two series of FPVs for the Italian and French governments, while a yard in Louisiana chose BV to class two supply vessels for the Iraqi government.

In **South and Central America**, there was an increase in work in Brazil with the classing of five FPSOs for Petrobras and the final delivery of the P55 semi- submersible. Schahin moved the drill ship Vitoria 10000 to BV class. FEED work began for two more units to be ordered by Petrobras in the near future. There was a lot of work involving flexible pipes and risers including the Type Approval Certification for the new NOV plant in Brazil. Petrobras contracted Tecnicas, a BV subsidiary dedicated to advisory services, for the review of inspection reports of in-service flexible risers and rigid pipelines. The contract also covers providing technical advice to Petrobras' new offshore FPSO projects in the pre-salt region. Technip and Techint will work with BV to provide all safety studies for the Petrobras P-76 FPSO project. This assignment covers

several studies such as HAZOP, fire, gas and explosion simulations, noise & vibrations analyses.

## EUROPE

In **France**, shipowners have placed significant orders for new vessels, notably, a series of six ULCSs, seven 9,300 teu Post Panamaxs and three 2,100 teu container feeders by CMA CGM in China and Korea, and a series of four Handysize bulk carriers by Louis Dreyfus Armateurs at Tianjin Xingang in China that will complete a large series of bulk carriers already delivered or on order. An additional Panamax bulk carrier was ordered by Setaf Saget in China, a series of two very large gas carriers and another 9,000m<sup>3</sup> LPG carrier were ordered by Geogas in Korea, a fourth luxury cruise ship for Compagnie du Ponant in Italy and several other specialized vessels. In the offshore segment, TOTAL has ordered two FPSOs in Korea, one for Egina at Samsung HI and one for Moho Nord at Hyundai HI. Bourbon has taken delivery of several highly versatile offshore support vessels built in China.

In **Norway**, local owners ordered two seismic support vessels for Vestland Offshore, five fishing vessels and a chemical tanker. Deliveries included fishing vessels, an offshore support vessel and a live fish carrier built in Turkey. Work began on the conversion of the Bergen Viking to LNG fuel. Bergshav and Frontline transferred ships to BV class.



In **Denmark, Sweden and Iceland**, Evergas A/S ordered three 25,000 cu m LEG/LNG carriers with the world's largest bilobe tanks to be built at Sinopacific in China. An environmentally-friendly electrically-driven ferry was built and delivered in Denmark to BV class. A wind farm service vessel carrier was built by Damen for NOS A/S in Denmark and a ro-pax ferry was built under BV class in Bangladesh for service under the Danish flag. Lauritzen Kosan chose BV class for a chemical tanker to be built in Turkey. Wisby Tankers in Sweden took delivery of three chemical/oil tankers from Croatia and one larger tanker from HHI in Korea. In Finland Uki Workboat delivered a ro-pax ferry for service on Lake Vättern. It was delivered in sections and assembled locally.

In the **UK and Ireland**, Norbulk ordered a Crown63 ecobulker to BV class and London-based Nigeria LNG (NLNG) ordered four 175,000 cu m LNG carriers to be built at Samsung, Korea. Ireland's Arklow Shipping took delivery of two Handysize bulkers, Andros Maritime received two 6,900 teu containerships and Mianport took two seismic support vessels built to BV class in Malaysia. Carisbrooke Shipping transferred 13 general cargo ships to BV class, Union Maritime brought four chemical tankers to BV class and NMM/Stena moved a 145,000 cu m LNG carrier to BV class. An increase in small vessel building to support wind farm development is creating new business for BV.

In **Germany**, local owners ordered eleven new vessels to BV class, including two newcastlemax bulkers for Oldendorff Carriers and two handymax plus six seahorses for Nordic Hamburg. More than 25 vessels in service moved to BV. An LNG power barge classed by BV was ordered by Becker Marine System in Hamburg. It is intended to delivery power to the AIDA cruises vessels when calling the port of Hamburg and a general cargo ship commenced conversion to gas as fuel. German owner JT Essberger took delivery of a chemical tanker built and outfitted in Turkey.

1. Bureau Veritas classes the *Vitoria 10000*, a dynamically positionable vessel owned by Schahin and equipped to operate in ultra-deep waters of up to 3,000 meters in depth.
2. Boskalis took delivery of the *Causeway*, a 4,500 m<sup>3</sup> trailing suction hopper dredger built by the Shipkits shipyard (The Netherlands).
3. The 81,120 dwt bulk carrier *Nicole* built by Japan Marine United Corporation Tsu Shipyard for Augustea Atlantica SpA (Greece).

In **Finland**, local owners ordered four vessels including an ice breaking tug and an ice-breaking ferry.

In **Russia**, FEMCO ordered six offshore support vessels to be built in China.

In **Poland**, 20 ships in the Star Reefers fleet changed class to BV.

In **the Netherlands**, Dutch shipyards were busy building vessels to BV class, including a number of offshore supply vessels, such as the 65 m DP2 SPS 2008 being built for SeaMar at De Hoop Foxhol. The vessel is the first in its kind to be built in the Netherlands. Dutch owners took delivery of 66 vessels to BV class including the 2,700 cu m vessel Bayamo built for Chemgas at Hoogezand Nieuwbouw BV at Foxhol. Van Oord took delivery of the cutter suction dredger Artemis. Royal Boskalis Westminster N.V. took delivery of the Causeway, a 4,500 cu m trailing suction hopper dredger. Focus Shipmanagement decided to change the class of 13 dry cargo vessels to BV.

In the **Hellenic and Black Sea Region**, local owners ordered 78 new vessels totaling 2.7 m gt. These include 16 bulkers for Oceanbulk Group, three bulkers for Augustea Tecnoservice, and four bulkers for Safety Management Overseas. All will be built in Asia. Local yards in Bulgaria, Romania and the Ukraine delivered 26 ships, while owners in the HBS Region took delivery of 24 ships totaling 1.2 m gt, mostly built in Asia. These included the very high ice capability LNG carrier Lena River, built for Dynagas and chartered to Gazprom. 93 ships in service were moved into BV class.

In **Italy**, two cruise ships were ordered to BV class at Fincantieri and five yachts over 30 m were contracted in Italian yards. Two major cruise ships were delivered, to Compagnie du Ponant and MSC Cruises. Ten mega yachts moved to BV class. MLC certification was provided for all Costa Crociere manning agencies all over the world and for all cruise ships belonging to Ibero Cruceros.

In **Portugal**, work began on two inland cruise vessels for Douro Azul.



In **Spain**, one dredger was delivered by Nodosa shipyard to Moroccan owner Drapor and several tuna fishing vessels were ordered to be built in Armon, Murueta, Zamakona and Balenciaga shipyards. Two passenger ferries were delivered by Armon shipyard to Portuguese owner Atlantico Line.

In **Turkey**, 66 vessels were ordered including two 70 m seismic support vessels for Vestland Offshore, Norway to be built at Cemre Shipyard and an 80 m trawler-purse seiner for HB Grandi, Iceland to be built at Celiktrans Shipyard. Turkish yards delivered 50 ships built to BV class during 2013. These included a general cargo ship for Norway's Seaworks and an asphalt tanker for Spain's Elcano. A new record was set for transfers in of class with 41 ships totaling 600,000 gt moving to BV class. These include two Capesize bulkers owned by Besiktas Shipping. Turkey was the platform for extending BV services in Azerbaijan, where statutory authorizations have now been granted, and in Turkmenistan, where they are under negotiation.

## ASIA

In **China**, 79 vessels with BV class were ordered by Chinese owners totaling 1.1 m gt. A total of 303 vessels were ordered to BV class to be built in Chinese yards, totaling over 4 m gt. Three 18,000 teu ULCSs will be built for China State Shipbuilding Corporation (CSSC) and chartered to French operator CMA CGM. These ULCSs are the biggest ever designed and built in China. In 2013 Chinese yards delivered 243 ships with BV class, totaling over 3 m gt. Investment in MLC auditing paid off with over 200 contracts. In the offshore sector, BV was selected to class the first FPSO ordered by CNOOC since 2005, now under build in DSIC. An Advanced Technology and Research Center will now be established in Shanghai to provide technical services to marine and offshore clients in China, with more engagement on pre-contract approval and more eco design ships in compliance with CSR-H Rules.

In **Korea**, 40 ships were ordered with BV class, representing a total tonnage of 2.8 m gt. Major offshore work included the Moho Nord FPU for Total, built in HHI



and the Egina FPSO also for Total, built in SHI. Noteworthy ships included four 175,000 cu m LNG carriers for Bonny Gas Transport and two 180,000 cu m LNG carriers for SK Shipping (Ichthys project) to be built in SHI. In 2013, Korean yards delivered 23 ships and one offshore unit with BV classification. These included the CLOV FPSO built in DSME for Total, the Lena River LNGC for Dynagas built in HHI and delivered in October 2013 and the 16,000 teu Jules Verne containership for CMA CGM built in DSME.

In **Japan**, international shipowners ordered to local shipyards 24 ships totaling 744,000 gt, including the world's largest Moss-type LNG carrier for K-Line. Nine ships built to BV class in Japanese yards were delivered.

In **Taiwan**, 33 ships totaling 471,000 gt were ordered to BV class by owners in Taiwan. These included four Capesize bulkers for U-Ming Marine Transport Corp, one Panamax bulker for Taiwan Navigation Co and twenty-eight 34 m fast patrol crafts for Taiwan Coast Guard to be built in Ching Fu Shipbuilding Co. Taiwanese yards delivered six ships to BV class, including two 4,680 teu containerships for Wan Hai, built by CSBC Corp and several mega yachts and fast patrol crafts. Local owners took delivery of five vessels including the FPMC B Kingdom and FPMC B Luck, both Capesize bulkers built by USC (JMU), Japan, the Corewise OL, a Handysize bulker built by Onomichi Saiiki for Shih Wei Navigation Co and two 4,680 teu containerships built by CSBC Kaohsiung for Wan Hai Lines Ltd. Yacht, fishing boat and patrol craft production is stepping up in Taiwan, and BV is playing an active role.

In **South East Asia**, local owners chose BV class for 256 new ships totaling 524,000 gt. These included six chemical tankers for the Wilmar Group and two MPPs for Pacific International Lines. Unusual projects included the conversion of the Aquarius Brasil, a ro-pax ship, into a 530-person offshore support vessel at Sembawang Shipyard. The vessel is currently deployed in the Campos Basin, Brazil, supporting Petrobras. Major gains were made with transferred-in fleets totaling 73 vessels and 750,000 gt. These included two VLCCs, one for Maersk, several Supramax bulkers and Handymax tankers. Other gains included the transfer

of two jack-ups for conversion into MOPU for operation in the Gulf of Thailand. The new DTRC (Deepwater Technology Research Center) was established with the support of the Maritime Port Authority of Singapore.

In **India, Bangladesh and Sri Lanka**, four ships were built including a ferry for a Danish owner and Danish flag built by Western Marine Shipyard Bangladesh, an OSV for Bourbon built at Bharati Shipyard India and two ships built by Chowgule Shipyard India for Garud BV. The Shipping Corporation of India took delivery of two bulkers built in China to BV class. A total of 11 small vessels switched class to BV. Transocean was a new client for a buckling study on a jack-up.

In the **Middle East**, a network of nine offices was boosted with a new office in Oman. Owners in the region ordered 35 ships, including a cutter suction dredger to be built at IHC Merwede for Saudi company Huta Marine and an oil tanker for the Pakistani Navy to be built in Karachi. UAE company Gulf Craft is building a 135 ft luxury GRP yacht to BV class for a Saudi owner. Thirty-two vessels were delivered including two dredgers for Iraq, two 53 m seismic support vessels built at Grandweld Shipyard for Bourbon and two 60 m supply vessels delivered to Al Mojil Group in Kingdom of Saudi Arabia and Stanford Marine in Dubai. Several major modifications including well stimulation, dynamic positioning and various types of accommodation vessels have been performed in the region. There was an increase in work in risk engineering for offshore projects, supervision of major conversions and, in Saudi Arabia, the first phase of the King Abdullah Economic City port was certified ISPS by BV in Jeddah.

4. The Livestock carrier *Galloway Express* built by COSCO (Guangdong) Shipyard for Livestock carrier 3 PTE Limited.

5. The roll on - roll off cargo ship *Severine* built by Kyokuyo Shipyard Corporation (Japan) for Shiplux VIII S.A (The Netherlands).

6. The bulk carrier *Vishva Uday* (82,000 dwt) delivered from Jiangsu Eastern Heavy Industry Co.,Ltd. (China) to the Shipping Corporation of India.

7. The bulk carrier *FPMC B Kingdom* (206,699 dwt) delivered from USC (JMU) Japan to Formosa Plastics Marine Corp.





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↑ Bureau Veritas has issued MLC certificates for the passenger ship *MSC Divina*.

## Operational services

**T**he Bureau Veritas classed fleet grew strongly again in 2013 to 10,519 ships totaling 97.4 m gt. The significant factor underpinning this growth was a strong increase in ships already in service being transferred to BV class. Around 40 per cent of the 13 m gt added to the fleet during the year was from newbuilding deliveries, and 60 per cent from transfers-in.

Of these transfers, the majority were from large fleets where BV already classes ships. That demonstrates that the owners recognize the quality of service they receive from us.

### ➔ A SINGLE POINT OF CONTACT

This good service is not just down to good people. In recent years, a lot of effort has been put into setting and monitoring service KPIs and into improving surveyor training. A drive to automate as much of the survey work and back office work as possible and to introduce lean management techniques has resulted in a visibly sharper response time to clients.

Detention ratios improved very significantly, dropping by a further 20 per cent across all MOUs. The performance is due to increasing training for clients and surveyors

and sharpening monitoring systems to pick up problems early.

### ➔ MLC SUCCESSFULLY IMPLEMENTED

The big job that dominated the year was the implementation of the Maritime Labour Convention 2006 requirements. BV had already trained and deployed 264 MLC inspectors globally, and in the early part of 2013, we built a web-based system to help owners with large fleets of sister ships achieve certification more easily. In the end, over 6,000 MLC related jobs were performed, peaking at 1,600 during the month of August when the implementation was due.

No ship was delayed and cooperation with flag states was excellent.

Examples of ships moved to BV class include: four tankers managed by Cyprus-based Bernhard Schulte Shipmanagement; two containerships, one VLCC and one bulk carrier managed by Eastern Mediterranean of Greece; and five Kamsarmax bulkers brought to BV class by Japan's Victoria Ship Management.

One significant new flag agreement was with Central Asian state Azerbaijan. This state will increase its maritime influence as offshore energy development in the Caspian Sea increases. A dual class agreement was also struck with Indonesia's BKI.

Guidance to owners on scrubbers was produced and sixteen Ballast Water Treatment systems were type approved. Guidelines for owners on making the correct choices for BWT will be published in 2014. Energy saving projects included a fleet-wide analysis for Brittany Ferries, and specific work to save energy on reefer containers for CMA CGM, using BV's SEECAT energy use analysis tool.

### ➔ CAP IN HIGH DEMAND

Condition Assessment Programs (CAP) were in high demand, especially since BV speeded up the service last year. Fine tuning of the UTM analysis and reporting methods further cut reporting time and led to increased demand for BV CAP. During 2013, 23 gas carriers and 27 tankers were assessed for CAP ratings by BV. In January 2014 alone, 24 new CAP jobs were either completed or underway, of which 11 were gas carriers (three LNG and eight LPG) and 13 tankers.

Three major condition assessments for offshore facilities had already begun. In the offshore field the disciplines of CAP were adapted and applied to provide Condition Assessments and Life Extension Services for a number of oil majors. Studies to baseline the structural condition before and after



**BILL GALLAGHER**  
PRESIDENT, INTERNATIONAL REGISTRIES INC.

We operate the Marshall Islands Register, which we have grown as a flag for quality owners who in total operate around 100 m gt of shipping. We have been developing our worldwide network of offices so that we can provide more services,

more quickly, closer to the owners. Enhancing coordination, communication and efficiency through a major IT upgrade in all our offices worldwide is a priority which will enable us to continue to attract and retain quality owners. We work closely with Bureau Veritas, to whom we delegate the full range of international conventions including ISPS, ISM and MLC 2006 certification. BV has broad expertise and we have a good working relationship with their people. They show great responsiveness: we have noticed this in Brazil recently, where we have both been growing in the offshore sector. \*

conversion also proved popular, linked to life extension assessments. Three Condition Assessments for life extension purposes on an FPSO and two FSOs were carried out, and Condition Assessment for baselining after conversion was done for a tanker conversion into an FPSO. Two Condition Assessments for baselining prior to conversion on tankers were also completed.

Looking ahead, in 2014 BV will update and publish a BV CAP Guidance note and roll out more CAP services in South-East Asia, where demand is very strong. Condition Assessment for offshore units will be further developed, fine-tuned for the specific needs of the offshore industry.

↓ Bureau Veritas has published Guidance to owners on scrubbers.







↑ Orders for new ships to be built to BV class during 2013 totalled 8.6 m gt. Bulk carriers accounted for almost half of that tonnage.

## Newbuilding market

The global newbuilding market woke up with a start in 2013. Bureau Veritas saw its volume of new orders double during the year. The increased volume was driven by a surge in orders for Very Large and Ultra Large Containerships and by bulk carrier owners seeking competitive prices. There were speculative orders across all bulk sectors and ship sizes, with dry bulk owners seeking new designs that will result in more efficient ships at lower prices than those in the market today.

In the second half of 2013, tanker owners also began ordering again, especially MR and LR product tankers, and there were even some speculative orders for VLCCs.

Generally the pattern was big containership orders going to Korean yards and big bulk orders going to Chinese yards. The exception was a series of 16,000 teu containerships to be built to BV class in China.

### ➔ A HOT MARKET FOR GAS SHIPS

Globally, the LNG and LPG ship market continued to attract a lot of attention, particularly from Greek owners, but caution appeared to be setting in towards the year end. BV took a handsome 17 per cent of new orders, including the head of a series of super ice-capable unique LNG carriers to service the Yamal gas field in the Russian High Arctic and the largest ever regas unit to be built in Korea for MOL.

BV focused resources on helping shipyards by providing user-friendly tools such as its HOMER and VeriSTAR Hull software and by training, especially in view of the new Harmonized Common Structural Rules.

### ➔ NEW ORDERS DOUBLED IN 2013

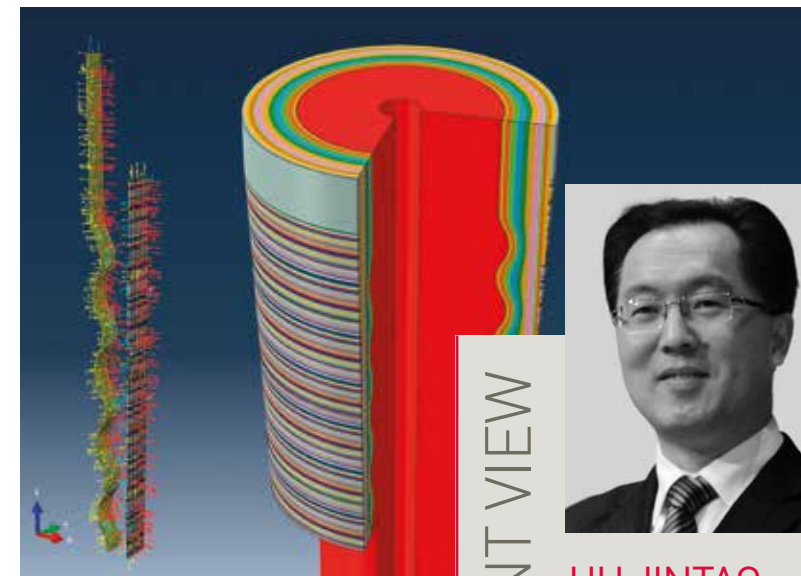
Orders for new ships to be built to BV class during 2013 totalled 8.6 m gt. Bulk carriers accounted for almost half of that tonnage. Over 1.1 m gt of containerships, and a similar tonnage of gas carriers, were ordered to BV class. Tankers made up 1.6 m gt of the new orders, with the rest a healthy mixture from every sector of offshore, cargo, passenger and specialized units.

Who was ordering this tonnage to BV class? Greek owners above all, with over 2 m gt, followed by French, Chinese, Japanese, Brazilian and Nigerian owners in the top slots. In total, owners from 31 different countries ordered to BV class.

Where were ships being built? At the end of 2013, China dominated, with over 8m gt under construction, with Korea, Brazil and Japan following in the top league. Overall, the market was strong everywhere, and BV was there to support the rebound.

## R&D shipping

↓ Detailed FEM analysis of a composite rudder stock helps determine the steel/composite interaction and reliability in service.



CLIENT VIEW

**HU JINTAO**  
PRESIDENT OF SDARI, CHINA

The challenge today is that owners want more and more cost-efficient ships with very low fuel consumption. We have to squeeze more out of our ships, but pushing optimization to the limits requires a lot of time and money. Responsive expert classification societies are a vital ally in producing the efficient designs that yards need to meet the demands of owners. We look closely at the technical expertise and capacity of each class to make sure we work with the right class from the very early stages of a new design. They can help us a lot to develop a good design, and save time and money while producing a safe and efficient ship. We worked closely with BV on the Dolphin 57 and we recommend them as class. More than four hundred have been built. Always working with good class is right at the core of the project. \*

Bureau Veritas' ground breaking research into hydrodynamics was recognized by the industry in 2013 with the award of the 2013 CEMT Award to BV's hydrodynamic research team. The award is presented by the Confederation of European Maritime Technology Societies for research which makes a significant and valuable contribution to the European maritime industry.

That fundamental knowledge of hydrodynamics was applied in several ways. BV entered a technical and commercial cooperation agreement with French hydrodynamic specialist HydrOcean. Under the agreement HydrOcean will provide advanced Computational Fluid Dynamics (CFD) services to BV's shipping and offshore clients and we will market HydrOcean's specialist services globally.

### ➔ CFD SAVES TIME AND ENERGY

HydrOcean's CFD services save massive amounts of time for ship designers and produce hull forms optimized over a wide range of loading conditions. They produce resistance savings between 10 and 20 per cent and do that five to ten times faster than an equivalent tank model testing program. Work on the structural responses of Ultra Large Containerships (ULCSs) continued. With the whipping and springing notation developed, focus switched to a new program to better predict slamming loads. That will be completed in 2014 and improve structural analysis tools. A lot of work was done on developing a transformational matrix which will make the best use of the stream of live data being collected from two ULCSs in service. Converting the accelerations and distortions measured into loads and bending

moments will produce valuable feedback for new analysis tools for the next generation of containerships.

### ➔ HYDRODYNAMIC LICENSES SOLD TO YARDS

Fundamental research into how to introduce forward speed effects into seakeeping analysis continued and the first commercial licenses for BV's HOMER hydrostructure software were sold to yards and design bureau for use in hydrodynamic/structure and fatigue analysis. As the IACS CSR-H harmonized rules for tankers and bulkers were finalized BV completed work for IACS on loads and switched some resources to computing vertical bending moment updates to unified IACS requirements. BV's advanced ability to use FEM analysis was applied to detailed analysis of a composite rudder stock, working with Becker in Germany to understand the interaction between the carbon composites and steel in the structure.





↑ The container vessel *Amoliani* built by Hyundai Samho Heavy Industries for Amoliani Maritime Corporation.

## Containerships

Size was the big story for containerships during 2013. Operators were ordering and taking delivery of bigger and bigger ships. That put the focus on safety of Ultra Large Containerships (ULCSs), especially following the break-up of the MOL Comfort.

This absolute focus on safety is not new for Bureau Veritas, which has made mandatory a full analysis of springing for containerships over 300 m length and additionally of whipping for 350 m in length and above. BV can make this

mandatory and carry out the necessary analysis quickly because of the power and speed of our HOMER hydro-structures' software. Work is underway in 2014 to develop a new slamming package for these very large ships.

### ELASTIC SHAFT ALIGNMENT MADE MANDATORY

Also mandatory for BV-classed Very Large Containerships (VLCs) is the new Elastic Shaft Alignment notation introduced during 2013. The ESA notation will help ensure

the integrity of the structure and shaft bearings on ULCSs. Critical attention has to be paid at the design stage to analyzing the shaft alignment and ensuring that the bearings and elastic structure match the shaft response, especially when the vessel is turning. An overall vibration analysis is also done for these large ships. Larger main line ships mean bigger and more fuel efficient feeders will be needed, so BV has been working with designer Deltamarin on the C.Delta2000, a very fuel efficient 2,000 teu containership which can be

customized for specific trades. An option for LNG is under consideration, making these ships ideal for operating in SECAs.

### ENERGY EFFICIENCY IN FOCUS

Energy efficiency of new and existing ships came into focus in 2013. BV's work with CFD specialist HydrOcean means that hull forms could be optimized over a wide range of loading conditions. The bulbous bow of an 8,500 teu ship was analyzed and modified in this way to better fit its current slow steaming profile. BV also used its SEECAT energy flow modeling software tool to explore different optimization possibilities for the cooling system of a large containership.

BV's research department is collating real time data from two instrumented ULCSs and creating a transformational matrix to make the data useful for feedback into design and approval of new vessels. The information on accelerations is also being used to inform a focus on lashing optimization. During 2014, BV will produce new rules for lashing accelerations which will enable operators to safely increase the stowage possibilities for their ships.

BV took a good share of the very large containerships delivered and ordered during 2013. Two 16,000 teu vessels,

at the time the world's largest, were delivered from Korea's DSME to CMA CGM. Other significant deliveries included two 6,700 teu vessels for Andros Maritime built at Hyundai Samho and two 4,500 teu vessels for Wan Hai built at CSBC.

### CHINA'S BIGGEST BOX SHIPS FOR BV CLASS

A significant order in 2013 was to class three ULCSs to be built for China State

Shipbuilding Corporation (CSSC). The 16,000 teu vessels will be the largest containerships built in China to date. One will be built at Shanghai Waigaoqiao Shipbuilding (SWS) yard, and the other two at Shanghai Jiangnan Changxing Heavy Industry.

The design was developed by the Marine Design and Research Institute of China (MARIC) in co-operation with BV. A hydro-elastic examination was carried out using BV's HOMER software in order to take into account extreme whipping loads due to slamming, and additional fatigue damage due to springing, factoring in the elastic structural response of the ship. BV's WhiSp2 notation has been assigned to the ships.

The vessels will be also granted BV's VeriSTAR-Hull DFL 25-year notation, which certifies various structural details, including hatch corners and coamings, for 25 years of fatigue life, following a spectral fatigue analysis with a 3D finite element analysis model. Three further 16,000 teu vessels were ordered to BV class by CMA CGM to be built at Korea's Samsung Heavy Industries yard, with similar analysis and notations.

↓ The container vessel *CMA CGM Alexander von Humboldt* (16,000 teu) delivered by DSME to CMA CGM has the possibility to connect 1,200 reefers.



### CLIENT VIEW



### ANIELLO MASTELLONE

DIRECTOR TECHNICAL DEPARTMENT,  
MEDITERRANEAN SHIPPING COMPANY

We are a privately-owned shipping company and we believe strongly in the importance of independent carriers. We operate a large fleet of containerships

and under a separate brand a modern cruise fleet. My role is to maintain and elevate the standards of the vessels we manage now and to look forward to deliver the best solutions for the vessels that will be built in the near future. A big part of that is performance monitoring and energy saving. BV classes 23 containerships for MSC and all of our cruise fleet. We have worked with BV for many years and we have found that they are a good classification society. The cooperation has been always good. With BV we feel we are with a friendly society, always ready to solve any matter, with the best professional attitude. \*





Courtesy Dynagas

↑ The 155,000 cu m LNG carrier *Lena River* built to BV class at Korea's Hyundai for Dynagas with Ice Class 1A and chartered to Gazprom.

## Gas carriers

The market for gas carriers saw rapid change during 2013 and it will change further during 2014. New sources of gas, both offshore and onshore from shale gas, and new demand in countries like India and Japan, as worries over fuel security and nuclear power grow, are radically changing the traditional gas trades. The USA will become an LNG exporter and Canada will follow soon. These changes are creating demand for flexible floating LNG facilities for export and import, and for all types and sizes of LNG carrier. Cutting edge ships are being built to transport Russian Arctic gas.

### → GREEK OWNERS GO FOR GAS

Against this rapidly moving background, BV's expertise and experience in LNG both for ships and floaters was valued right across the market. Greek owners in particular invested heavily in gas carriers.

The ability of BV to help move new LNG projects quickly and safely from concept to construction and delivery is vital to underpin investments in such a fast-moving market. That's why BV has a major share of the world LNG market and took a significant share of global

new orders for gas carriers in 2013. The FLNG under construction to BV class in Wison, China for Exmar, to be delivered in 2014 for the Pacific Rubiales terminal in Colombia, is leading the market trend. That expertise is being deployed on other planned floating LNG facilities.

### → THE WORLD'S LARGEST REGAS VESSEL FOR BV CLASS

At the year-end BV was chosen to class the world's largest ever LNG regas vessel, a 263,000 cu m Q-Max to be built at Korea's DSME for Japan's MOL and chartered to GDF Suez for use off the coast of Uruguay.

In early 2014, BV was selected to class the highly innovative 170,000 cu m Arctic ice class LNG carriers which will be built to carry gas from the Yamal project. The first vessel of the series will be built to BV and RS class for Russia's Sovcomflot at DSME. They will be capable of operating in ice over 2 m thick and will have pod propulsion which will form part of the ice breaking capability. The selection of BV along with RS for these innovative ships recognizes the large amount of investment in ice tools and research done by BV, working with Russian

LNG carrier for the same owner with full ice class and winterization will be delivered in 2014 to BV class. All together, 18 gas carriers entered service with BV class in 2013: seven existing ships transferred-in and 11 newbuildings.

### → WORLD'S LARGEST BILOBE TANKS

New orders included a series of six 27,500 cu m semi-refrigerated LNG/Ethylene carriers building for Denmark's Evergas at Sinopacific.



↑ Bureau Veritas is classing the world's largest bilobe gas tanks. The 9,686 cu m tanks were built at China's Sinopacific yard for a series of six 27,500 cu m semi-refrigerated LNG/Ethylene carriers building for Denmark's Evergas.

universities, the Russian Register of Shipping and major Korean yards.

Dynagas took delivery in 2013 of the 155,000 cu m Ice Class 1A *Lena River* built at Korea's HHI for long term charter to Russia's Gazprom. The notation COLD (H -10, E -30) has been granted to the ship for the winterization of equipment able to operate in -30 deg C. A 162,000 cu m

BV will class the world's largest bilobe tanks for these ships. Each of the IMO Type C bilobe tanks has a capacity of 9,686 cu m. Two of the tanks in each vessel will be supplemented by a third conical Type C cargo tank and a smaller LNG fuel tank on the deck of the vessels.

New contracts for 21 gas carriers were placed with BV class during 2013,

including eight LNG carriers. These included a 182,000 cu m LNG carrier for K-Line to be built at Japan's Kawasaki HI. It will be the biggest ever MOSS-type LNG carrier. Bonny Gas Transport (NLNG), Nigeria ordered four 175,000 cu m LNG vessels to be built at Korea's Samsung to BV class.



**SUNG-GEUN LEE**  
EVP, CHIEF TECHNICAL OFFICER,  
DSME, KOREA

### CLIENT VIEW

DSME is proud to have grown to be the world's top shipbuilding and offshore company.

We continually develop LNG vessels and have opened up the market for FLNG. We also have our own gas fuel system, FGSS, which is energy efficient and environmentally friendly. Now we are going to build 16 highly innovative LNG carriers to service Russia's Arctic Yamal development. This sort of innovation is part of our core strategy to be a total solution provider for any maritime venture. We have worked with Bureau Veritas on ice load analysis, hydrodynamics, ultra large containerships and many other advanced technical issues. Now BV will class the Yamal LNG carriers. BV's strength in LNG vessels and its relationship with GTT made that an easy decision. We have a long partnership with BV and mutual trust and respect. For this project BV's enthusiasm for collaboration and new challenges were the deciding factors. \*





↑ The bulk carrier *Sam Hawk* (57,200 dwt) delivered by STX Offshore & Shipbuilding for SPV SAM HAWK INC.

## Bulk carriers

**B**ureau Veritas' bulk fleet grew again in 2013 and topped over 1,000 ships for the first time, cementing our position as a class leader for bulk carriers. By the end of 2013 BV was classing 1,007 bulk carriers totaling 68 m dwt and had a further 135 bulkers totaling 9.4 m dwt on its order book. Three key trends dominated the market for new bulk ships during 2013. First and foremost, owners were hungry for new tonnage again, and the global order book tripled compared to the year before. Second, owners and yards really began to take an interest in eco ships and new sizes of ships. And third, the Harmonized Common Structural

Rules for Bulk Carriers and Oil Tankers were completed by IACS and submitted to the IMO for verification against IMO's Goal Based Standards.

### ➔ NEW BULKER ORDERS TRIPLE

These three themes meant that we saw a tripling of new orders, with almost 100 new bulkers ordered to BV class, totaling 7 m dwt. In many cases, we worked on eco systems, optimization or new designs and provided EEDI verification and assistance for preparation of the SEEMP for new and existing ships. As BV had a leading role at IACS on

CSR-H, we were able to swiftly update our ship structure analysis tools MARS and VeriSTAR Hull to the new rules. Teams from BV then trained Korean shipyards at DSME and STX and some major Chinese yards in the new rules.

### ➔ CONSEQUENCE ANALYSIS HELPS IMPLEMENT CSR-H

Consequence analyses for six bulk carrier designs were carried out for Sinopacific, SDARI, Bestway, HMD, STX and Oshima and a major program of seminars and technical committee presentations was launched to inform yards and owners about the new rules and how they would affect future designs.

### CLIENT VIEW



**PETROS PAPPAS**  
CEO, OCEANBULK MARITIME S.A.

We have been involved in the dry bulk markets for over 30 years. Today Oceanbulk Maritime is the commercial manager for Oceanbulk Shipping LLC, a joint venture between Oaktree Capital Management LP and Oceanbulk investing in the dry bulk sector. It has acquired 49 vessels, including a series of 26 eco newbuilding vessels building in Japan and China, which will command a premium due to their fuel and intake efficiency and reduced emissions. Our strategy is to continue to grow and create one of the largest dry bulk companies globally which will act as a catalyst for the consolidation of the dry bulk industry. Last year we entrusted BV with the class of 16 major new bulk carriers to be built for us in Chinese yards. Our experience with BV is outstanding. We are treated with fairness and responsiveness and BV people understand the commercial particularities of shipping without losing the safety principle and compliance with rules and regulations \*

We also offered our expertise to IMO to help tackle the problem of liquefaction of nickel ore cargoes. New tests for Transportable Moisture Limit are likely to be approved soon and BV will be able to provide these on-site.

Significant deliveries of bulk carriers to BV class during 2013 included two 206,000 dwt vessels for Polembros built at SWS, China, two 206,000 dwt vessels for TMS Bulkens, built at Jiangnan Changxing, China, two 205,000 dwt vessels for FPMC, built at Universal, Japan and three 75,200 dwt vessels delivered to Laskaridis, built by Penglai Zhongbai Jinglu in China.

### ➔ ECO-BULKER NEW ORDERS

In the eco-bulker class, 18 Crown 63 bulkers were built to BV class by Sinopacific's Yangzhou Dayang for various owners including Turkey's Ciner, France's Setaf Saget, and Germany's Oldendorff Carriers. Significant new orders included two 38,700 dwt Green Dolphin 38 eco-bulkers ordered by Atlantska Plovdiva to be built in Qingshan shipyard, China and a series of eight 63,800 dwt Dolphin 64 bulkers ordered by Wah Kwong to be built in Chengxi Shipyard.

Nordic Hamburg ordered six 37,500 dwt vessels at Nanjing Dongze and Yangzhou Guoyu, Oceanbulk ordered four Panamaxs in China and Capesizes came back into fashion, with orders for three 186,300 dwt vessels for U-Ming at SWS, two 208,000 dwt vessels for Starbulk, also at SWS, and two 210,000 dwt vessels ordered by Diana Shipping at Jiangnan. For eco-bulkers a total of 26 SDARI's Dolphin 64s were ordered in 2013, along with eight Crown 63s and two Green Dolphin 28s.

↓ The bulk carrier *Rangiroa* (206,000 dwt) built by Shanghai Jiangnan Changxing Shipbuilding for OCEANSURF OWNERS (Greece).







↑ The 264-passenger *Le Soleal* is the third niche market cruise ship of the Boreal class to be built at Italy's Fincantieri Ancona to BV class for Compagnie du Ponant. It was delivered during 2013.

## Passenger ships

**D**uring 2013, confidence returned to the cruise and passenger market and ordering of new tonnage began again. Almost all the projects for new ferries and ro-pax vessels included an option to use LNG as a fuel. That in turn may reduce the number of shipyards which can quote for new ferries, as gas propulsion raises the technical bar for shipbuilders.

The move to gas put the focus on the IMO IGF Code for gas-fuelled vessels. This is still under development at IMO and there are disagreements on the size and location of the gas fuel tanks. BV is using its expertise

within IMO to speed up publication of the code, which will facilitate new project development. At the moment all new gas-fuelled projects are working to class rules and the draft IGF Code.

### ➔ POLAR CODE TO BE RETROACTIVE

Increasing interest in adventure cruising put the focus on the IMO Polar Code, which could be adopted in 2014 and become retroactive when it comes into force. Ships ordered now need to take Polar Code requirements into account. Tighter air emission regulations coming into force in 2015

focused ship operators' minds and BV worked with them on options to switch to gas as a fuel or to install exhaust gas cleaning systems. Early in 2014, BV published guidance for a new EGCS notation which will help owners installing scrubbers.

BV has also its existing notation MON-SHAFT taking into account new designs. Particularly suitable for passenger ships, it is now adapted also for water-lubricated stern bearings. It certifies that the ship monitors the shaft bearing alignment, wearing and water quality so that the vessel can operate in sensitive areas without leakage from the stern bearings.

### ➔ RISK ANALYSIS UNDERPINS SHIFT TO GAS

Major risk analysis carried out by BV together with Tecnicas impacted the decision by Brittany Ferries to switch part of its fleet to gas fuel.

A new LNG-powered ferry has been ordered to BV class at STX France. The 24.5 knot ship will be one of the largest LNG-powered ro-paxes yet with a passenger capacity of 2,475 and space for 800 cars. It will use membrane tank technology for the gas containment, making it the first vessel, other than gas carrier, to store LNG at close to atmospheric pressure instead of high pressure. It will use GTT membrane tank technology for the gas containment, allowing larger capacity and extended period between bunkering operations. Three existing ferries in the fleet will be converted to gas propulsion under BV supervision.

Another innovative project is the 74 m long LNG hybrid barge under construction with BV Class for the Port of Hamburg. This barge, fitted with five generator sets driven by Caterpillar LNG fuel with a total power of 7.5 MW, will be used to provide low emission electrical power to cruise ships while in port.

Also gas-powered is an LNG-hybrid ferry which is being developed under BV class for service in the Wadden Sea. The 75 m vessel will carry 480 passengers and will be powered by twin 630 kW electric motors. These will be fuelled by a battery pack charged overnight with electricity from wind power and by three 285 kW LNG gensets.

Another noteworthy ferry project was the first Bangladesh-built ferry for a Danish owner and operation in Danish waters. The 147-passenger Isefjord was built to BV class by Western Marine Shipyard Limited in Chittagong, Bangladesh and delivered to Danish operator Hundested Rorvig Faergefart A/S. The vessel meets all Danish Maritime Authority requirements and will fly the Danish flag.



**FRÉDÉRIC POUGET**  
GROUP MARITIME, PORT AND OPERATION  
DIRECTOR, BRITTANY FERRIES

— Each year Brittany Ferries carries 2.5 m passengers between ports in France, Great Britain, Ireland and Spain. Looking forward, Brittany Ferries plans to stimulate intermodal transport, offering the freight haulage business a real alternative to the road-only route by establishing a reliable, year-round network of motorways of the seas linking France, Great Britain, Ireland, Spain and Portugal. When we embarked on the development of a clean, safe, and 100 per cent gas-powered ferry design, we naturally approached STX France and BV – leaders in innovation and shipbuilding. PEGASIS (Power Efficient GAS Innovative Ship) is a gas-powered, clean, quick and capable vessel, reducing emissions and increasing vehicle payload. It was developed in close cooperation with BV and the French shipyard STX. With a class society it is a benefit to have long term cooperation and we have that with BV. \*

The two significant deliveries to BV class for cruise ships were the fourth in the Fantasia class for MSC Cruises, the MSC Preziosa and the third in the Boreal series of small luxury ships for Compagnie du Ponant, *Le Soleal*, built to BV class at Fincantieri Ancona.

### ➔ ULTRA-LUXURY SHIPS CHOOSE BV CLASS

Compagnie du Ponant entrusted BV with the class of a fourth sister ship to *Le Boreal*, the *Le Lyrial*, which will be built at Fincantieri for 2015 delivery.

The most important new order was for the 54,000 gt 740-passenger ultra-luxury *Seven Seas Explorer*. It will be built at Fincantieri Sestri for 2016 delivery. The key deciding factor for Regent Seven Seas in entrusting the very high end project to BV was our experience with the new Safe Return To Port requirements. BV classed the first SRTP vessel, the *Tanit*, and has worked hard to synthesize its expertise in this area for new projects.

↓ The *Pegasus* ordered by Brittany Ferries at STX France will be one of the largest LNG-powered ro-paxes yet with a passenger capacity of 2,475 and space for 800 cars.







↑ The oil tanker/chemical tanker *Med Adriatic* (8,269 dwt) built by the Turkish shipyard Usmed Gemi Insaat Sanayi A.S. for Sea Tankers 6 Ltd.

## Oil and chemical tankers

The oil and chemical tanker markets were flat for the first half of 2013, but positive sentiment began to show through in the second half of the year. That underpinned a surge of new orders. The most popular size was MR product tankers, reflecting the changing patterns of refining around the world.

Although there is so far less demand globally for eco vessels in the tanker sector compared to bulk, some owners made strong moves to save fuel. An example is the nine ship series of Suezmax tankers built to BV class at Korea's Samsung Geosje Shipyard. These ships are significant

because of the attention paid to their environmental footprint. The series was designed with the help of Stena's own design department and delivers around 15 per cent improved energy efficiency.

### ➔ ASPHALT TANKERS SPECIAL KNOWLEDGE

BV has special expertise with asphalt tankers and the high temperature cargoes involved, which create special problems for the ship structure. In 2013 BV classed the world's largest asphalt carrier, the 30,100 dwt Palanca Montevideo. The ship was built to BV class by Hyundai Mipo Dockyard,

South Korea and delivered to Sweden's Wisby Tankers AB. A sister ship Palanca Muscat was delivered in April 2014. These are highly flexible vessels able to carry a wide range of difficult cargoes. Six asphalt tankers joined the BV-classed fleet during 2013, five newbuildings and one transferred-in.

High-tech chemical tankers are a field where we have a strong position, with around 600 under BV class. Thirty-two more joined BV class during 2013, made up of 19 newbuildings and 13 ships in service transferred-in. There are currently around 70 newbuilding chemical tankers

contracted for BV class, building in China, Korea, Vietnam and Turkey. Of these, 19 were new orders during 2013: they included four 19,700 dwt vessels for Nisshin Shipping of Japan to be built at Usuki Shipyard and four 49,478 dwt vessels to be built at STX Offshore for Greece's Oceanbulk.

### ➔ CONVERTING CHEMICAL TANKERS TO GAS FUEL

Chemical tankers are often working short-sea trades and their owners need to focus on new air emission limits coming into force in 2015. Some owners want to convert existing ships to clean gas fuel.

BV is working with a group of companies in an EU project called LNG-CONV to convert the main and auxiliary engines on an existing BV class chemical tanker, Fure West. In addition, the Bergen Viking, a 4,420 dwt chemical and product tanker built in 2007 and operated along the Norwegian coast will begin conversion this year. It includes a complete Rolls-Royce package comprising two new Bergen generating engines type C26:33L6AG burning only gas, in substitution of four smaller gensets burning diesel oil and two IMO type C tanks on deck.

Product and oil tanker owners under cost pressures appreciate good service from class and that motivated a move of 48 vessels in service into BV class. A further 17 newbuildings joined the BV fleet including the two 159,000 dwt new eco Suezmax tankers Stena Sunrise and AST Sunshine. A total of 29 vessels were ordered. These included two 17,500 dwt vessels for Indonesia's PT Pertamina (Pesero).

↓ The VLCC *Hong Kong Spirit* (318,473 dwt) built by Shanghai Jiangnan Changxing Shipbuilding for Wah Kwong.



### CLIENT VIEW



#### CAPTAIN HUNG WAI LUN

GENERAL MANAGER, WAH KWONG SHIP MANAGEMENT (HK) LTD.

We provide the technical management and newbuilding supervision for the Wah Kwong fleet. It is one of the youngest fleets of modern bulk carriers and tankers and small LPG carriers in the world and we have a substantial newbuilding program. My focus is on training our staff to constantly improve management service. We have chosen BV to class two VLCCs and a series of twelve 64,000 Ultramax bulkers we are building in China. The further expansion of our group will include developing opportunities at established shipyards, utilizing our 40 years' experience in shipbuilding. Our commitment to accessing the growing cargo demand for raw materials in China will see the group expand our presence in China. We chose BV to class our new ships because we are a group with a long-term perspective and we value our long-term partnership with Bureau Veritas. \*





↑ The French Navy helicopter carrier *BPC Mistral* classed by Bureau Veritas can carry 700 troops and 16 helicopters.

## Warships

**P**olicing exclusive economic zones is creating a need for new Offshore Patrol Vessels and Littoral Combat Ships. These have to be small, capable and cost-effective. Navies recognize the value of class in delivering cost-effective ships, which is why 40 patrol vessels of different types were ordered to BV class in 2013.

The biggest new order in 2013 for Bureau Veritas in terms of number of units was for twenty-eight 34 m patrol vessels for the Taiwanese Coastguard. These 25 knot vessels will be built in Taiwan at Ching Fu Shipbuilding, with deliveries set between 2014 and 2019.

### ➔ SOPHISTICATED PATROL VESSELS FOR BV CLASS

Three sophisticated patrol vessels were also ordered in Europe to BV class. Two 53 m patrol vessels will be built by Socarenam in Boulogne-sur-Mer, for the Belgian Navy. With a speed of 21 knots, they will be delivered in September 2014 and January 2015.

The French Customs also ordered a 54 m patrol vessel from Socarenam, for delivery in 2015. Six Gowind-class Littoral Combat Ships will be built to BV class for the Royal Malaysian Navy. These are very flexible frigate style vessels of the stretched DCNS Gowind LCS design. The design is under approval by BV and the six vessels will be built in Malaysia at Boustead Naval Shipyard under a transfer of technology agreement.

### ➔ NEW RULES FOR OPVs

Next year, BV will bring out two complete new sets of rules for OPVs. One will be for civilian coastguard and customs style vessels and the other aimed at navies wanting more heavily armed OPVs. A new set of notations for amphibious vessels was also developed. Other orders for BV's warship division included a replenishment tanker for the Navy of Pakistan to be built in Karachi, three multi-mission 65 m ships for the French Navy ordered at Kership

### CLIENT VIEW



**PIERRE QUINCHON**  
INNOVATION AND TECHNICAL  
DIRECTOR, DCNS

We have been working with Bureau Veritas for 10 years now, first on the FREMM frigates, then the Mistral class force projection ships, the Adroit patrol vessel and now going forward with the Gowind corvettes for Malaysia. It has been an enriching experience for both parties, built on technical quality and the trust we have developed and reinforced together over these 10 years. DCNS designs and builds the ships and BV certifies them. Together we have learned a lot from each other. We have worked together in a way which has become indispensable and which is really appreciated by more and more naval clients, both in France and in the export market. \*

and three very high speed trimaran patrol vessels for the Mozambique Navy to be built at CMN in France.

### ➔ MAINTENING CLASS IN SERVICE

Although navies see the value of class while building new vessels they have been slow to continue to class vessels in service. That is changing and the French Navy has just renewed classification in service on the first two force projection vessels of the Mistral class and put the third unit into class. The French Navy has also put the FREMM frigate Aquitaine into classification in service. That is the first full combat unit anywhere to be built and then maintained in class.



↑ Fifteen product carriers were built to BV Inland Rules in Peru and Brazil for Perenco, Peru.

## Inland navigation

**T**he globalization of Bureau Veritas' inland fleet grew strongly during 2013 as authorities around the world recognized the value of class for inland waterways. At the end of the year BV classed 3,104 inland vessels in service and had 302 new vessels on its order books. Outside its traditional European waterways area BV was involved with inland vessels in East Europe, Colombia, Peru, Brazil, Egypt, India and Kuwait. We also helped set up a multi-national framework for safe inland waterways vessels in the Congo River basin.

### ➔ VERISTAR-CHEM UPDATED FOR ADN

During 2013, BV published new rules for thickness measurements for inland vessels and a new UTM software package. It also adopted VeriSTAR-Chem for inland vessels and the new ADN requirements and issued new corrosion protection guidelines.

Asbestos is becoming a hot topic in the inland marine industry, with significant potential adverse implications for both health and financial loss. To help address these issues, BV has created an asbestos training center in Antwerp.

Seventy-nine new inland vessels were built and delivered to BV class during 2013, including 19 tankers, 21 special service vessels, 13 passenger vessels, nine pushers and 17 vessels of other types such as dredgers. Examples include the series of eleven Magbit

asphalt/oil barges built in Croatia for Impala Colombia and the fifteen product carriers built in Peru and Brazil for Perenco Peru. There are 62 new construction projects in progress under BV classification in South America. In 2014, these include 18 projects for the Paraguayan flag, two for Colombia, five for Argentina and 14 for Peru. This momentum continues in 2015, with 25 projects.

### ➔ INCREASED FOCUS ON THE ENVIRONMENT

Over 110 new inland vessels will be delivered to BV class in 2014, including 36 tankers and 14 passenger vessels. Increasing focus on the environment and emissions will be mirrored by BV's investment in these areas including developing specific guidelines for the safe application of LNG propulsion systems for inland vessels.

An example of BV working with innovative green craft is the delivery in 2013 of a new public transportation system using two 19 m catamarans on the Garonne waterway in Bordeaux, France. The vessels carry 45 passengers at more than 28 km/h. Designed by Orion Naval Engineering these innovative vessels are propelled by two synchronous electrical engines which can be powered by batteries, hybrid or diesel-electric. The technology provides these vessels with genuine operational flexibility, long-range autonomy and a clean means of propulsion.

### CLIENT VIEW



**PATRICK SCHMITTER**  
MANAGING DIRECTOR,  
CROISIEUROPE

We have been putting our confidence in Bureau Veritas for a long time as we develop our river and coastal cruise activities. BV has always been at our side to class our vessels and for their statutory certification, but more than that we benefit from their advice and technical assistance to facilitate the use of our vessels on the great rivers of the world. We've got two new projects underway now, luxury cruises on smaller vessels less than 38 m length and shallow water cruises such as those on the Loire, using impeller propulsion so they draw only 80 cm of water. For these two projects BV has brought us its technical and regulatory knowledge to help us build these truly original vessels and put them into service with real confidence. \*



# Tugs



↑ The 25 m 50 tonne *BP Ocean Pierre Julien* was delivered in 2013 by Canada-based Ocean Industries for operation in the port of Montreal.

**B**ureau Veritas is the world leader in the classification of tugs with over 1,650 tugs in class and 300 newbuilding tugs on its order book. That represents a 22 per cent market share of IACS-classed tugs. The global market for tugs is changing quickly as ship sizes increase. There are also more offshore operations, more escort requirements and more pressure to reduce emissions.

## NEW AND EFFICIENT TECHNOLOGIES FOR ESCORT TUGS

BV is at the forefront of these developments, helping key tug designers, yards and operators develop new solutions. One example is the Approval in Principle granted to a new Computational Fluid Dynamics (CFD)-based performance prediction methodology developed by Robert Allan Ltd as the basis for granting the service

notation Escort Tug. This approval removes the need for an expensive and time-consuming full scale trial. BV's knowledge of CFD and hydrodynamics has allowed it to perform this approval.

One of the issues facing the tug industry is a lack of clear global safety guidelines and rules. BV is taking a leading role in creating a suitable and consistent regulatory framework for tugs and has developed the Safety Guidelines for Design, Construction & Operation of Tugs in close cooperation with major industry partners.

## REDUCED EMISSIONS IN PORTS

Cutting emissions close to ports will require the use of hybrid propulsion systems and alternative fuels such as LNG and hydrogen. BV is supporting designers for gas fuelled power systems with specific consideration

## CLIENT VIEW



**ROBERT G. ALLAN**  
EXECUTIVE CHAIRMAN,  
ROBERT ALLAN LTD

Robert Allan Ltd is Canada's most senior privately-owned consulting naval architectural firm. We see that the major topic in the tug industry today is alternate energy sources for propulsion. This is often combined with the continuing major effort to improve the capability of tugs for major tanker escorting operations. We are delighted to see the progress which is being made towards harmonization of tug rules and we thank and congratulate BV for the leadership role they have taken. Uniformity in the Rules makes our job easier and more logical, and it makes life easier for our clients. Approval in principle by BV using the CFD-based escort performance prediction methodology has got very positive feedback. Our clients immediately recognize the potential benefit in having an accurate, guaranteed escort rating before the tug is delivered, and at a significantly reduced cost. All the vagaries of full-scale escort testing are eliminated. \*

for the application of regulations to tugs.

Significant new orders for tugs to be built to BV class during 2013 included: five 34 m 85 tonne BP ASD escort tugs for Smit Lamnalco, to be built at Turkey's Sanmar yard to a Robert Allan RAstar 3400 design; four 32 m 48 tonne BP Damen Shoalbuster 3209 tugs; and two 24 m 60 tonne BP OSD designed AziStern 2460 escort tugs, the latter to be built by Poet Shipbuilding and Engineering.

# Marine advisory services

**D**uring 2013, shipowners and yards increasingly turned to Bureau Veritas for services that are outside class. They want to improve efficiency and reliability and speed up projects using BV's expertise. We responded by merging its advisory arm Tecnicas into a new services department with responsibility for all advisory and outsourcing services. This will sharpen response times and ensure a coherent approach to deploying the marine and offshore team's expertise.

## CARGO HEATING SCHEDULER

One interesting spinoff was the development by Tecnicas Piraeus of a cargo heating software scheduler. Developed with Minerva Marine the software enables the ship operator or crew to optimize cargo heating for any specific voyage, delivering fuel savings of up to ten per cent.

Also in the energy-saving field, Tecnicas further developed its E2 energy saving software by building an automated version which connects to flow meters and GPS sensors to give real time energy efficiency monitoring.

A new set of requirements for Elastic Shaft Alignment on high powered ships was introduced. The ESA notation will help ensure the integrity of the structure and shaft bearings on very large vessels such as ultra-large containerships and the next generation of very large LNG carriers.

## LINE-SHAFTING EXPERIENCE IN DEMAND

BV's line shafting expertise was in high demand, especially in Chinese yards for large containerships. Line shaft analysis was carried out for a 9,200 teu series at Dalian and for an 18,000 teu design at SWS. Two 180,000 dwt bulkers and a 155,000 cu m LNG carrier also used Tecnicas for shaft alignment in Korean yards.

An ice-class passenger vessel building at Fincantieri was examined for line shafting as was an ice-class LNG carrier building in Korea. The LILAS line shafting software was further developed to include vibration and rational alignment calculations.

Tecnicas carried out a marine traffic risk study for the nuclear power plant at Gravelines, France, to take account of the new LNG terminal under construction in Dunkirk.

## PATROL VESSEL DESIGN

Tecnicas designed a new patrol vessel for the Tunisian Navy and under a framework agreement with the Saudi Arabian Navy Tecnicas was awarded

the contract for the supervision of studies, construction and installation of two floating dry docks in Jeddah. These will be used for the life extension of frigates, also under Tecnicas supervision.

In the Adriatic Sea, Tecnicas provided marine warranty services for the load out and transportation of two jacket platforms for Italy's ENI.

In Germany, Tecnicas further developed HSE services for offshore wind farms on behalf of Siemens. Tecnicas' DRIFTEC software tool was updated and used for a risk analysis on behalf of EDF for a proposed field of FOWTs off the south coast of France. The task was to evaluate the behavior of a floating turbine which had broken its moorings in heavy weather.

The considerable resources which BV had devoted to IACS to develop the Harmonized Common Structural Rules were recognized with an award from IACS.

↓ An ice-class passenger vessel building at Fincantieri and an ice-class LNG carrier building in Korea were examined for line shafting.







# OFFSHORE ACTIVITIES

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There are only three major class societies active across the range of offshore activities. Bureau Veritas is firmly one of them, with a substantial market share, particularly in offshore floaters.

**PIERRE DE LIVOIS**  
SENIOR VICE PRESIDENT, DEPUTY MANAGING DIRECTOR  
MARINE & OFFSHORE DIVISION



↑ Total's *CLOV FPSO* is the second project where Bureau Veritas has integrated certification of the topsides, risers and subsea installation with classification of the hull of the floater and one of the several floating assets where an AIMS system was developed during the build phase.

In China there is a similar pattern. BV has been chosen to both class and certify the CNOOC Enping 24-2 project, which includes an FPSO, a fixed platform and subsea pipelines. BV has classed all the new FPSOs with turret systems in the South China Sea since 2000. BV has also been chosen to class the Exmar FLNG in Wison (Nantong) Heavy Industry.

#### OBSCOLESCENCE STUDIES

Obsolescence studies were one of the new services introduced in 2013. It means checking through all the equipment on a floater and identifying anything which is out of date, going to get out of date, is no longer supported or manufactured or for which spares and repairs may become a problem. Risk-based analysis can help determine how important that obsolescence is.

## OFFSHORE FLOATING UNITS AND DRILL SHIPS

During 2013 Bureau Veritas classed or provided other services to around 1,400 mobile offshore floaters, firmly establishing it as one of the top three class societies which dominate offshore services. Recent key projects where BV delivered second and third party services have been the series of FPSOs for Total off West Africa, the P55 semi-submersible for Petrobras, the Goliat FPSO for Eni and the Prelude FLNG for Shell. Each has been different, bringing specific requirements for expertise and the way it is delivered.

#### INTEGRATED CLASSIFICATION AND CERTIFICATION

Total's *CLOV FPSO* is an example of the shift towards integrated classification, certification and lifetime asset integrity maintenance. Korea's DSME and Total entrusted structural integrity management tasks for the *CLOV FPSO* to BV's consultancy arm Technitas. This included compiling a complete record of the building showing all non-conformities and the preparation of a full FE model of the hull and topsides in its as-is condition on delivery to Total.

That model will form the basis for an on-going risk-based inspection program and an asset integrity maintenance scheme provided by BV. Powerful tools such as the VeriSTAR HLC software enables us to focus inspection on relevant structural areas, prepare inspection campaigns taking into account the means of access, assess the corrosion condition of the unit against BV's or user-defined criteria and manage data on the structure and topsides for the long term in an open format.

#### GROWTH IN LOCAL CONTENT

A major trend evident in 2013 was the growth in local content. National oil companies want to develop local expertise and local construction facilities to provide work for their own nationals. This has been undergoing for a while in Brazil where BV works closely with Petrobras and major Brazilian shipyards. BV's teams in Angola, Congo and Nigeria are being strengthened as more and more is done locally.

An example in 2013 was the contract to class the 200,000 bpd Egina FPSO, which will be built at Korea's Samsung for service off the coast of Nigeria. All the basic engineering work was done in Nigeria. In the Republic of Congo BV was chosen to class the new Moho Nord FPU. A total of 17 new wells will be tied back to a new FPU to be built to BV class at HHI in Korea. Local content is very important to this project, as is environmental impact mitigation, with no flaring and all produced water re-injected.

#### BOOM TIMES IN BRAZIL

During 2013 Petrobras' P55 Floating Production Unit (FPU), the largest semi-sub and the first of this kind entirely built in Brazil, was installed in a water depth of 1,790 m in the Roncador Field, Campos Basin. The column stabilized semi-submersible has a capacity of 180,000 bopd and 6,000,000 cu m of gas. The unit is classed by BV. Bureau Veritas Group companies

also provided a wide range of verification and support services which contributed to the success of the project. Also in Brazil BV was recently awarded the classification of five FPSOs. The P67 and P70 will be integrated by the Consortium INTEGRA (Mendes Jr. / OSX) and the P68 and P71 will be integrated by Jurong Aracruz Shipyard. All of them will be installed and operated by Petrobras, in association with BG, GALP and REPSOL, in the pre-salt fields offshore Brazil, in the area of Santos basin. The classification of the P76 FPSO was also awarded to BV along with the inspection and certification work for the integration of topsides to the converted hull, to be executed by the consortium Technip/Techint in Brazil. Building on its presence in the offshore industry in Brazil, BV has been chosen to class a series of drill ships for Schahin Petroleo. SS Vitoria 10000 is the fifth unit from Schahin Petroleo to move class to BV, following Samsung drilling ships Cerrado and Sertão and semi-submersible offshore drilling units SS Pantanal and SS Amazonia.

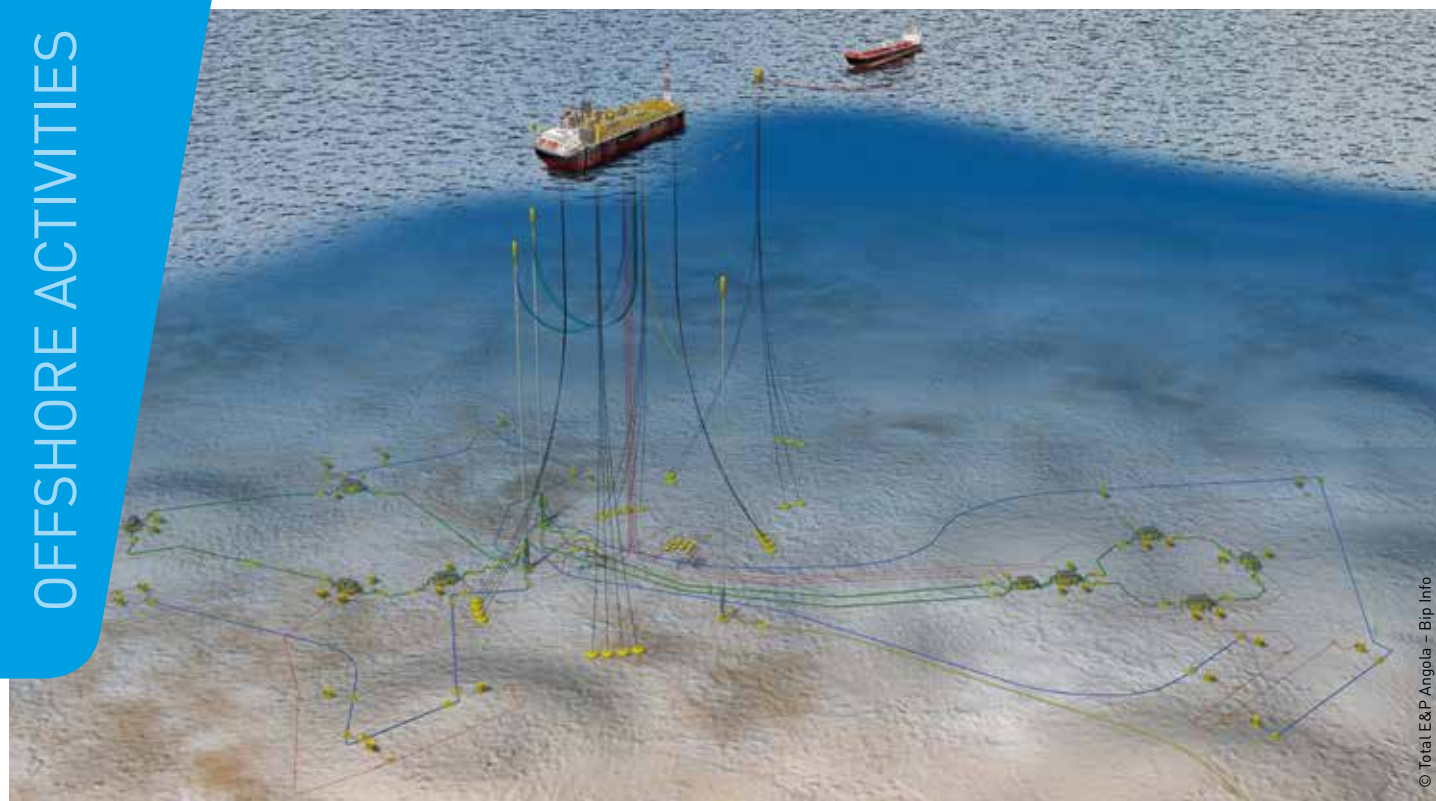
### CLIENT VIEW



**ABU FITRI ABD JALIL**  
VICE-PRESIDENT OFFSHORE BUSINESS  
UNIT, MISC BERHAD

We are recrafting our business so that we are driving solutions for customers and not waiting to bid. My focus now is on the region, helping not just Petronas but also other Malaysian and regional oil companies in Thailand and Indonesia to develop small and marginal oil fields. We want to drive down costs for a moveable facility that can exploit smaller fields economically, or develop larger reservoirs in phases. BV is classing some of our FPSOs but we also use them for Asset Integrity on our offshore structures. They have a real presence in Malaysia, they use local staff, and they understand our business. They know we need a quick response and we get that, so I have a very good experience with the BV offshore team. \*





© Total E&amp;P Angola – Bip Info

↑ CLOV SURF (Subsea Umbilical Riser Flowline), verified by Bureau Veritas.

## Subsea

**B**ureau Veritas started its verification activities for SURF (Subsea Umbilical Riser Flowline) with the certification of flexible pipelines. The first plant started production in 1974 at Le Trait (France) and BV has provided certification for more than 25 years.

Now BV offers certification for flexible Type Approval versus API standards and during project certification for all types of risers: rigid, flexible or hybrid like the riser tower.

A major subsea certification with riser tower carried out during 2013 was for Total's CLOV project. The entire SURF was certified for CLOV FPSO which is installed in deep water off the coast of Angola.

Subsea 7, the SURF contractor for Total E&P, appointed BV for the certification sub-contract.

A BV EPCI project team co-ordinated the Design and Installation Engineering review together with the necessary inspections in Europe for procurement and in Angola for onshore construction in Lobito and offshore Angola.

### INDEPENDENT DESIGN REVIEW

The certification activities performed from 2011 until 2014 include a full review of the engineering documentation in order to issue Independent Design Review Certificates (IRCs) for conformity to contractual specifications and standards. The scope of work includes the production rigid loops, the water injection and gas export flowlines, the umbilical and the riser system based on three towers (two Hybrid Riser Towers and one Single Hybrid Riser).

### RISK-BASED PROCUREMENT SUPERVISION

For procurement, BV identifies relevant intervention points for all vendor equipment based on a risk-based approach. For the construction scope, BV inspectors in Angola witnessed the fabrication and assembly of the procured items in the yard in Lobito. This includes the riser tower construction, suction piles, spools, pipe-in-pipe and double jointing activities, and various other subsea structures. Finally each installation phase was surveyed offshore by BV.

The oil offloading line, linking the FPSO to the tanker, has also been certified by BV.

BV has previously certified similar projects in Angola such as Pazflor on behalf of Technip (2008-2011) and the design of the BP Greater Plutonio SURF by Subsea 7 (2005-2008).

## Fixed platforms

**I**n the North Sea, BV provides project, capex and operation verification services for more than 15 major clients, with a wide range of platforms and floating units both under development and in operation. The experience gained there with verification to UK Safety Case regime is in demand globally as the Safety Case system is being adopted more and more in other offshore oil and gas areas. This will have increasing significance throughout Europe as EU Directive 2013/30 takes effect and verification becomes a legal requirement for all EU member states in 2016.

In 2013, we won a new contract for verification for Dana Petroleum for two FPSOs, Triton and Western Isles, and for oil services major Petrofac with ten platforms. Shell Norway turned to BV for a frame agreement to provide equipment inspections and design review resources were contracted by Conoco Phillips

from BV's Aberdeen office. Design review and initial suitability verification for the major new Laggan Tormore gas field off the Shetland Isles and the associated Shetland Gas Plant are also being carried out in Aberdeen for Total.

### INTEGRATED OPERATIONAL AND ASSET INTEGRITY ASSURANCE SERVICES

BV has been awarded a five-year contract by Petronas, the national oil company of Malaysia, to provide Integrated Operational and Asset Integrity Assurance Services for Malaysian offshore oil platforms and structures. This will cover a minimum of 72 offshore fixed platforms and 11 floating units.

The contract includes developing smart checklists to cover all asset integrity elements, conducting asset assessment, providing comprehensive reporting and driving gap closure.

Under a separate agreement BV is to provide AIMS services for all the Petronas pipelines in Sarawak using Pipeline Integrity Management Systems. During 2013 BV also began a ten-year AIMS contract covering the Bongkot field assets of Thai national company PTTEP.

Another new contract in 2013 was for the third party certification of the Sawtika fixed platform for PTTEP in Myanmar.

### VOLUNTARY ADOPTION OF SAFETY-CASE APPROACH

The UK's verification system was voluntarily adopted by Premier Oil for a fixed platform in Indonesia and verified by BV.

In the UAE BV was awarded a major contract for the Umm Lulu field which is being developed off the coast of Abu Dhabi. The field will produce 100,000 bpd and will have six new wellheads and an offshore super complex with five platforms. BV will provide review and procurement supervision and inspection and certification during construction and in service, in addition to safety and marine services, on behalf of Adma-Opco, the field developer.

Also for Adma-Opco BV will provide third party authority services for the replacement of the Zakum oil lines. The work involves laying 90 km of new pipelines and substantial subsea installations. BV tasks include design appraisal and certification, material/equipment inspection and certification, certification of quality assurance/quality control aspects of the fabrication and installation works, offshore installation certification and offshore supervision services.

↓ Bureau Veritas ensures the integrity and safety of fixed platforms throughout their life cycle.







↑ Van Oord took delivery of the second new built cutter suction dredger *Artemis* built by IHC Dredgers.

## Offshore service vessels

**T**he market for offshore service vessels saw rapid change during 2013. As offshore energy exploitation moves further offshore and into harsher climates there is increased demand for bigger and more versatile OSVs which can offer economies of scale, improved fuel consumption, lower emissions and the ability to operate in ice and cold climate.

### ➔ MORE SOPHISTICATED OSVS AND IMR VESSELS

At the same time, three factors drove demand for increasingly complex and specialized vessels. The application of risk management

techniques to almost all offshore energy developments and the continuing backlash from the Deepwater Horizon incident created a demand for more sophisticated OSVs and IMR vessels with deep water capabilities. The development of deep sea mining activities, especially for rare metals, drove demand for very complex new types of vessels able to recover minerals from great depths. And closer to the coast the rapid spread of offshore wind farms created demand for new vessels to build and service these.

Bureau Veritas was at the forefront of all these developments. It is by far the world leader in dredging and deep

sea mining vessels and in the top three class societies globally for all OSVs, with an especially strong position in support vessels. At the end of 2013 the BV classed mobile offshore fleet reached nearly 1,400 units, out of which 1,000 support vessels. Furthermore, 60 per cent of the global dredger and stone discharge fleet were classed by BV. A total of 261 new OSVs are on order to BV class, of which 215 are sophisticated support vessels.

### ➔ BV GLOBAL LEADER IN OSVS

That global leadership is reflected in the resources BV devotes to providing clients with the tools

and rules they need. At the beginning of 2014, we introduced a new AHTS notation which is the first in the world to include the latest IMO and industry developments for design and operation. It covers all support vessels which can perform anchor handling.

In 2014, BV will also publish an updated Diving Support Vessel notation, including all IMO Diving Code requirements. A new set of requirements for the classification of diving systems will be published later in 2014. The additional class notation DIVING will be applicable to integrated and modular saturation and air diving systems and equipment installed on OSVs.

BV technical experts are playing an active part in the work of IMO on offshore vessels, bringing in know-how and experience from working with owners, designers and shipyards involved with the most modern OSVs. Three issues stand out – amendments to the requirements on intact stability requirements for towing, anchor handling and heavy lift, the new OSV Chemical Code and work on rules for the carriage and transport of industrial personnel.

### ➔ SIGNIFICANT NEW ORDERS

Significant deliveries of OSVs to BV class during 2013 included the 3,500 dwt Focal 517 PSV *Tanjung Piai 1* built at Muhibbah, Malaysia for Icon and the OSD IMT952 design SSV *Bourbon Petrel* built in Dubai at Grandweld for Bourbon, the first of a series of six vessels with an energy efficient hybrid propulsion system.

Significant new orders included a series of twelve 78 m, 4,000 dwt PSVs to be built at China's Xiamen Shipyard for Nam Cheong, Pacific Radiance and Sentinel Marine to the Focal 522 PSV design and a 70 m, 2,800 dwt MPSV for Pacific Radiance to be built at Wuhu Xinlian, China to a Focal 526 RDSV design. Malaysia-based Jasa Merin chose BV class for a series of four 73 m 150 tonne BP AHTS to be built at Muhibbah, Malaysia, to an MTX design, while Sinopacific was awarded a contract for four 72 m, 150 tonne BP AHTS by Russian owner FEMCO to be built to the new SDA SPA150 design and classed by BV. Vestland Offshore of Norway selected BV class for a pair of 70 m Saltship designed SSVs to be built at Turkey's Cemre shipyard.



↑ The SSV *Bourbon Petrel*, the first of a series of six, was delivered to Bourbon by Grandweld in 2013.



**JAMES PANG**  
MANAGING DIRECTOR  
BUSINESS DEVELOPMENT,  
PACIFIC RADIANCE

### CLIENT VIEW

We are a fast-growing owner and operator of offshore vessels serving the offshore oil and gas industry. Our strategy is to penetrate protected markets through joint ventures with a local company, then scale up by building, owning and operating vessels specific to those regions. We have been successful in Indonesia and are now looking to replicate this strategy in Africa, Mexico, Brazil and other parts of Asia. We are expanding our fleet and have nine new vessels to be delivered to BV standards including four AHTS, four sophisticated PSVs and one deepwater ROV support vessel. As we build vessels that are fit for purpose to our target markets, we find BV to be a good partner that understands what our clients need. BV has a strong grasp of the rules and requirements, and is able to deliver services that are market relevant. They keep the high standards but work with the business. \*



# Marine renewable energy



↑ The TROPUS multi use platform could include a hotel, logistics park, aquaculture, wind, wave and thermal energy in one platform which uses marine power close to where it is generated.

The market for marine renewable energy is moving from research to prototype development and production. BV is moving with the market from supporting research to providing risk assessment services and certification.

During 2013 BV was involved in 12 research projects which between them cover all the marine renewable energy technologies. These include projects for floating offshore wind turbines of different types, tidal current devices, wave converters and thermal energy systems.

The already mature technology of fixed offshore wind farms created work for BV. Eight wind farm service vessels were classified according to the BV Guidelines developed during 2011

and Tecnicas Germany increased HSE services to wind farm projects.

## ➔ FOWT RISK STUDIES

For the new technology of Floating Offshore Wind Turbines (FOWT), Tecnicas delivered risk studies for turbines off the French Mediterranean coast. BV worked with Materiaal Metingen Europe, University of Liège, DN&T and Ifremer in the Eureka cluster to develop an innovative system for the structural maintenance of FOWT.

During 2013 BV carried out hydrodynamic, coupling and mooring studies for the Winflo FOWT developed by DCNS. BV also carried out calculations on the efficiency of the vertical axis Vertiwind FOWT.

## CLIENT VIEW

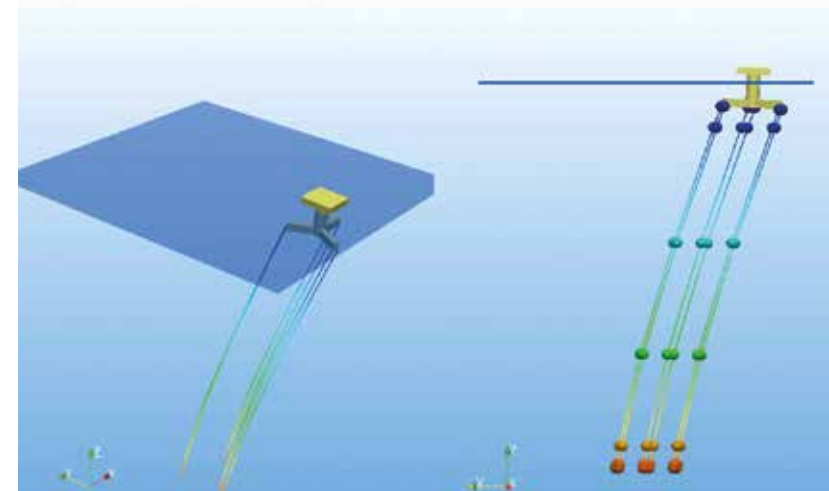


**JEAN-FRANÇOIS DAVIAU**  
CEO, SABELLA SAS

Sabella develops subsea turbines for harnessing tidal current energy. Ocean energy is a real driver of innovative industrial growth. Sabella is a growing pioneer in this field and has an exclusive partnership with a world leader energy company. We work with BV on the only collaborative project supported by the French Investissement d'Avenir program for the emerging tidal energy industry. BV backs Sabella in all the engineering studies and calculations to design and build this demonstration turbine. We chose BV because Sabella needs credibility to migrate its innovative technological drivers into industrial and competitive advantages and to provide reassurance for power operators, investors and insurance companies. Working with BV has helped develop rules and norms for this industry. We plan to pursue a strong relationship with BV for our Eussabella pilot farm project in Ushant, to be implemented in 2015-2016. \*

## ➔ NEW RULES FOR TIDE TURBINES

Requirements for current and tidal turbines were published and BV worked closely with the Sabella project to analyze the blades and help install a prototype off the coast of Brittany. BV is also involved in many projects with different technologies, such as wave energy converter (Bilboquet consortium) and multi-service platforms (TROPUS project).



↑ Bureau Veritas' offshore mooring software tool Ariane has been updated for fully-coupled effects.

# R&D Offshore

During 2013, Bureau Veritas established a Deep Water Technology Research Centre (DTRC) in Singapore, in co-operation with local universities and business partners. The DTRC reinforces the level and quality of real-time support provided by BV in the Asia-Pacific region by providing advanced technical solutions and innovations. It is a logical extension of the unique scientific leadership developed by BV in the offshore hydrodynamics and structural sectors.

Research themes for Singapore further develop those on which BV has made significant progress. They are hydrodynamics, mooring and riser systems, hydro-structure, Computational Fluid Dynamics and renewable energy. Specific projects include simulating fluid kinematics when green water occurs to find the loading on deck equipment, new formulations for bilge keels to dampen rolling and the hydrodynamic behavior of FLNGs and FSRUs, including multi-body interactions, gap resonance, and the coupling of sea-keeping and sloshing in short-crest waves and shallow water areas.

## ➔ PLANNED PROJECTS

Projects are planned on air-gap and run-up estimation for semi-submersibles and evaluation of the water column motion inside the large open moonpool in drilling ships. The motion of deep-draft semi-submersibles and Tension Leg Platforms (TLP) due to the vortex created by current passing platform columns will also be studied.

During 2013, the Ariane software for moorings has been updated for fully coupled effects and a software tool has been released for use on board offshore units while adjusting mooring spreads. Ariane is being developed as a tool for marine operations which will allow operators to calculate the responses of floating units to moorings and other floaters when planning operations.

## ➔ RESEARCH INTO SLOSHING

Research into sloshing continued, with a special focus on offshore FLNG units. Dynamic probes have been developed to detect and store impacts during the CFD sloshing simulation and that technology has specifically helped improve design of new FLNG units.

BV' HOMER hydrodynamic software was used to evaluate the fatigue and strength of a round FPSO design for the Goliat project. During 2014 HOMER will be further updated and merged with the VeriSTAR CSM software tool to deliver FE model generation, quasi static hydro structure coupling and strength assessment in one single tool.

## CLIENT VIEW

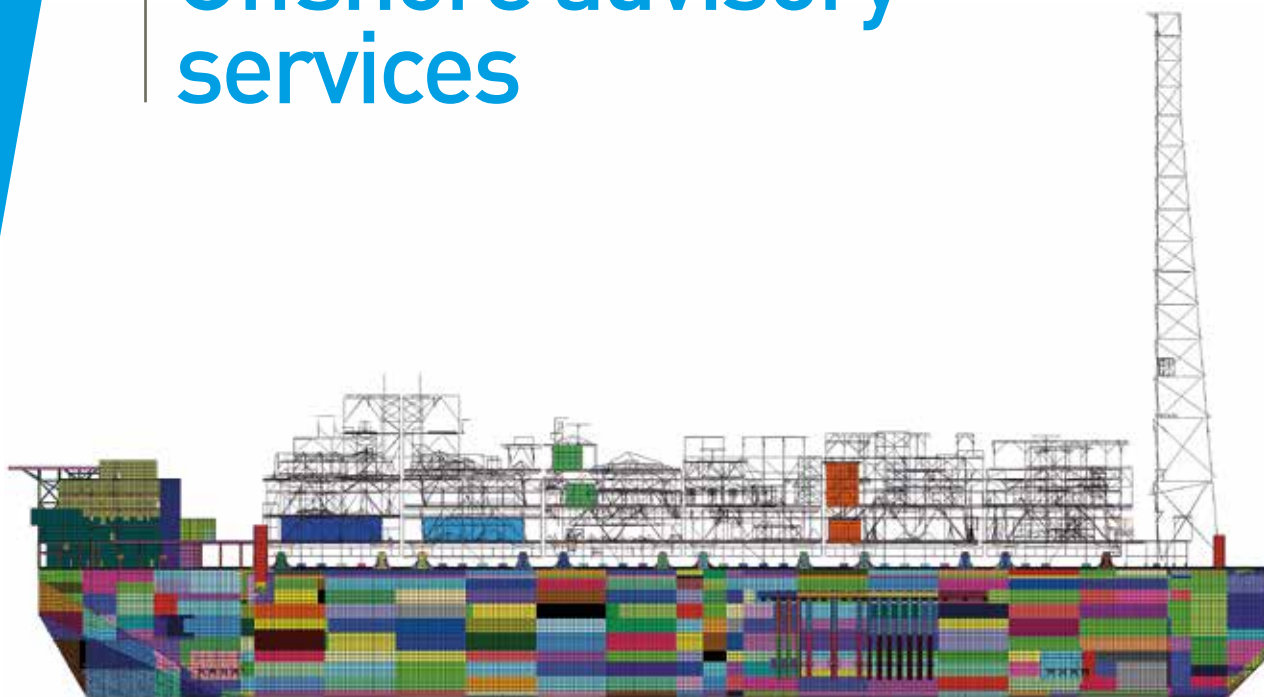


**PHILIPPE BERTEROTTIÈRE**  
PRESIDENT AND CEO, GTT

GTT's two main areas of expertise are cargo containment systems for LNG carriers and land storage of LNG. That's what we do, we do it well and we will stick to this expertise which we master. In the new area of offshore LNG, we have looked very carefully at the particular needs of operators in these environments and perhaps because of that attention to detail, all the FSRUs and large FLNGs now under development are using GTT membrane containment systems. The new very large LNG carriers for high Arctic ice will also use GTT systems. We work with different class societies but we particularly appreciate BV's deep knowledge of membrane systems and their development. BV does a lot of independent research that allows them to challenge us intelligently. We are very happy to be challenged by BV's experts because that really helps the process of innovation. \*



# Offshore advisory services



↑ The full CLOV FPSO FEM model in the as-built condition.

Expertise from Tecnitas, Bureau Veritas' advisory arm, was in high demand everywhere in the offshore field during 2013. A lot of work was connected to moorings and risers for floating units, recognising Tecnitas' technical lead in this area. One example was to project manage and renew the moorings and risers for the Total FSO Unity, off Nigeria. A large number of stress calculations were carried out on new risers for Technip, the global leader in riser fabrication and installation.

## ➔ LIFE EXTENSION STUDIES

Perenco employed Tecnitas for an onsite life extension and repair definition assessment for the MOPU platform off the Congo. Two major studies were conducted on the behavior of jack-up platforms for EMCC and one for Neptune, examining wind and wave effects. The Tecnitas-

developed EMPREINTE pipeline damage assessment tool was successfully rolled out and development continued to include corrosion effects. The tool saves pipeline operators time and money when assessing what to do about damages. Shell employed Tecnitas to provide second party inspection for its Prelude FLNG project in Australia.

## ➔ STRUCTURAL INTEGRITY PROGRAMME FOR CLOV FPSO

Korea's DSME awarded Tecnitas a contract to create a structural integrity program for Total's CLOV FPSO. Tecnitas created an as-built FEM model and a design, fabrication, installation resume which includes all non-conformities as the basis for a lifetime AIMS system. For Total's new Egina FPSO, Tecnitas was contracted by Samsung to provide assistance to design the fore and aft

parts. A major project was undertaken on the piling for the FPU Moho Nord on behalf of Doris Engineering. In Brazil BV group services to the P55 project included design review for the entire project including structure, mechanical systems, electrical and automation, process, safety, hydrodynamics and the mooring system. Independent risk and safety studies were performed during the FEED and detailed design phases, including PHA, HAZID, HAZOP, SIL/LOPA, dropped objects and collision studies, gas dispersion, fire, explosion and flare CFD 3D simulations and noise studies. Independent structural studies were performed by Tecnitas for the lifting of P55 lower hull megablocks, each up to 2,500 tonnes. Design review and second party inspections were carried out on behalf of Petrobras for the assembly and installation of the P55 Steel Catenary Risers (SCR) export lines.

Design: [www.kazoar.fr](http://www.kazoar.fr) 01 53 06 32 22

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