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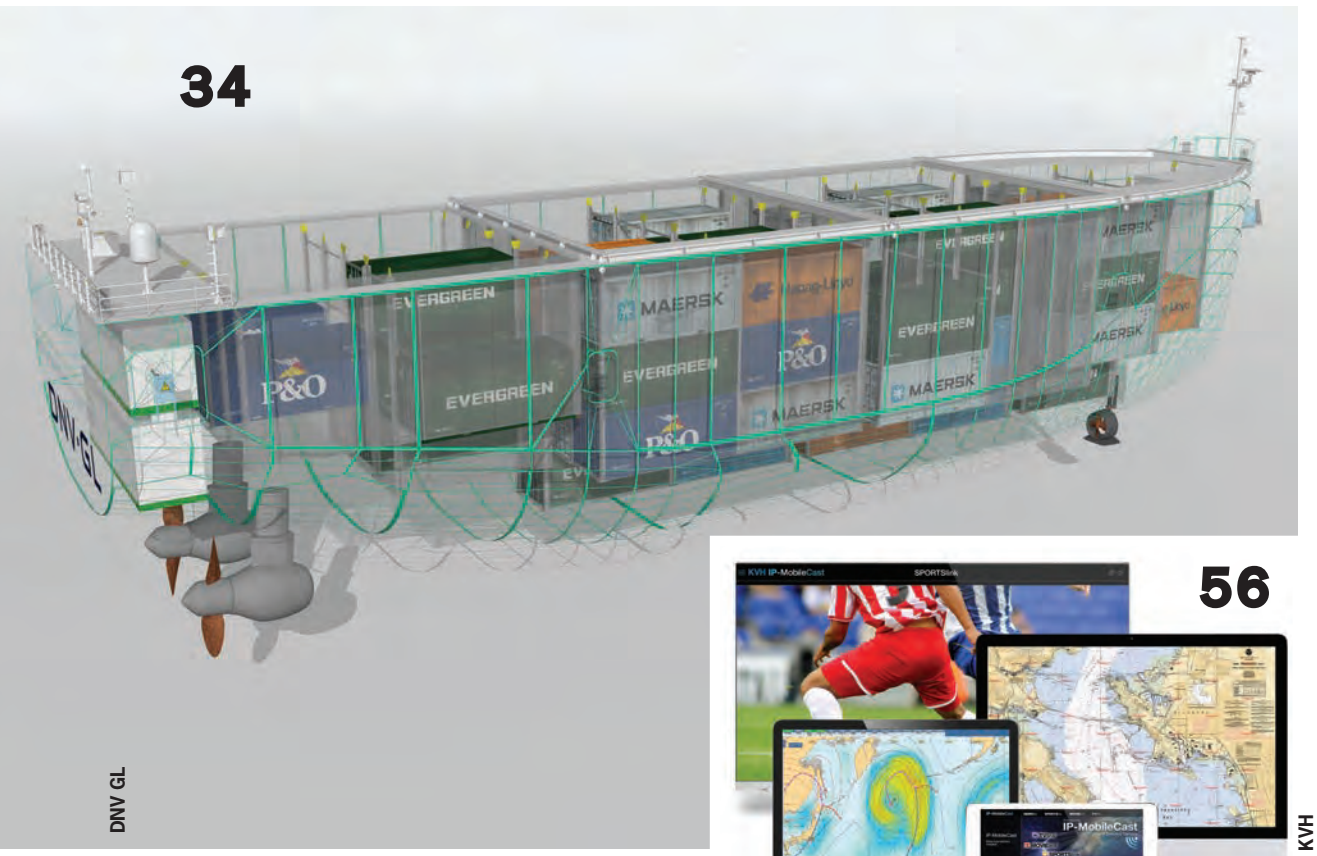

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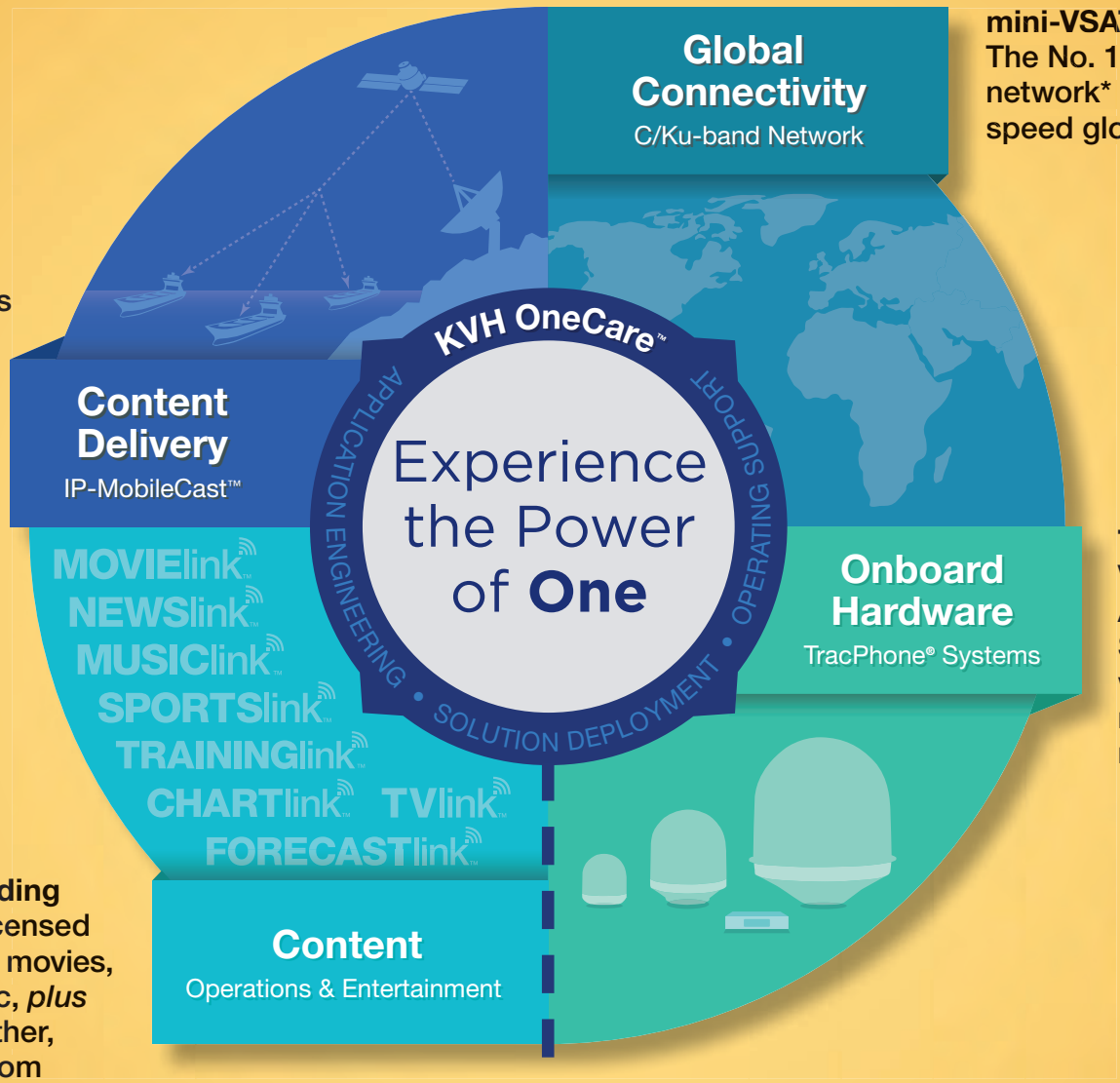

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ABS

First Class

Christopher J. Wiernicki sees Big Data and ultimately ensuring maritime Cyber Security as defining issues driving the maritime market.

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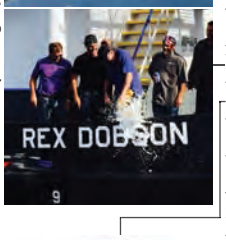
Paul Arthur Berkman



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GREG TRAUTHWEIN, EDITOR & ASSOCIATE PUBLISHER

I'll never forget the "Hinge Ship," a vessel concept that was designed to transform from a traditional deep draft hull to a flat bottom inland waterways hull courtesy of an innovative "hinge" found on the bottom of the vessel. I do forget the exact edition on which it graced the cover of MR sister-publication *Marine-News*, but I will never forget the cavalcade of comments from near and far essentially questioning my mental stability for giving the concept such prominent play. Lo and behold, the masses were indeed correct and there are not massive fleets of "Hinge Ships" sailing the globe today. However, that's not really the point.

Having sat in this chair for now more than 20 years, reporting on new marine designs, from the intuitive to the outlandish, is easily one of my favorites. Innovation is the fuel that drives this maritime market forward, and innovation comes from a variety of sources: the highest halls of academia to the the corporate R&D centers to someone's garage. Necessity is indeed the mother of invention, and in the case of maritime (and most industries) new regulation is the driver of necessity.

If someone would have told me 20 years ago that ships would be designed to generate and float on their own field of bubbles, I would have thought it crazy. But with new an ever-tightening emission regulation and the resultant detailed analysis of designing hulls to cut through the water more efficiently, this is a reality.

Another idea many dub 'crazy' is the notion of Unmanned Ships. While I think it safe to say it will be a long time in coming, as most everything seems to be in maritime, trust when I say that autonomy on the waterways will do nothing but grow. Autonomous vehicle use is prominent in the air and on the land, but both the rigors and the unique operating conditions of vessels at sea make marine autonomous operations a bit more challenging. But autonomy on the world's waterways is starting to pick up steam, growing in tandem with Big Data and the ability to push and pull information faster, cheaper and more reliably between ship and shore. Henrik Segercrantz presents an update on Unmanned Vessels based on the finalized joint European Research Project MUNIN starting on page 34 of this edition.

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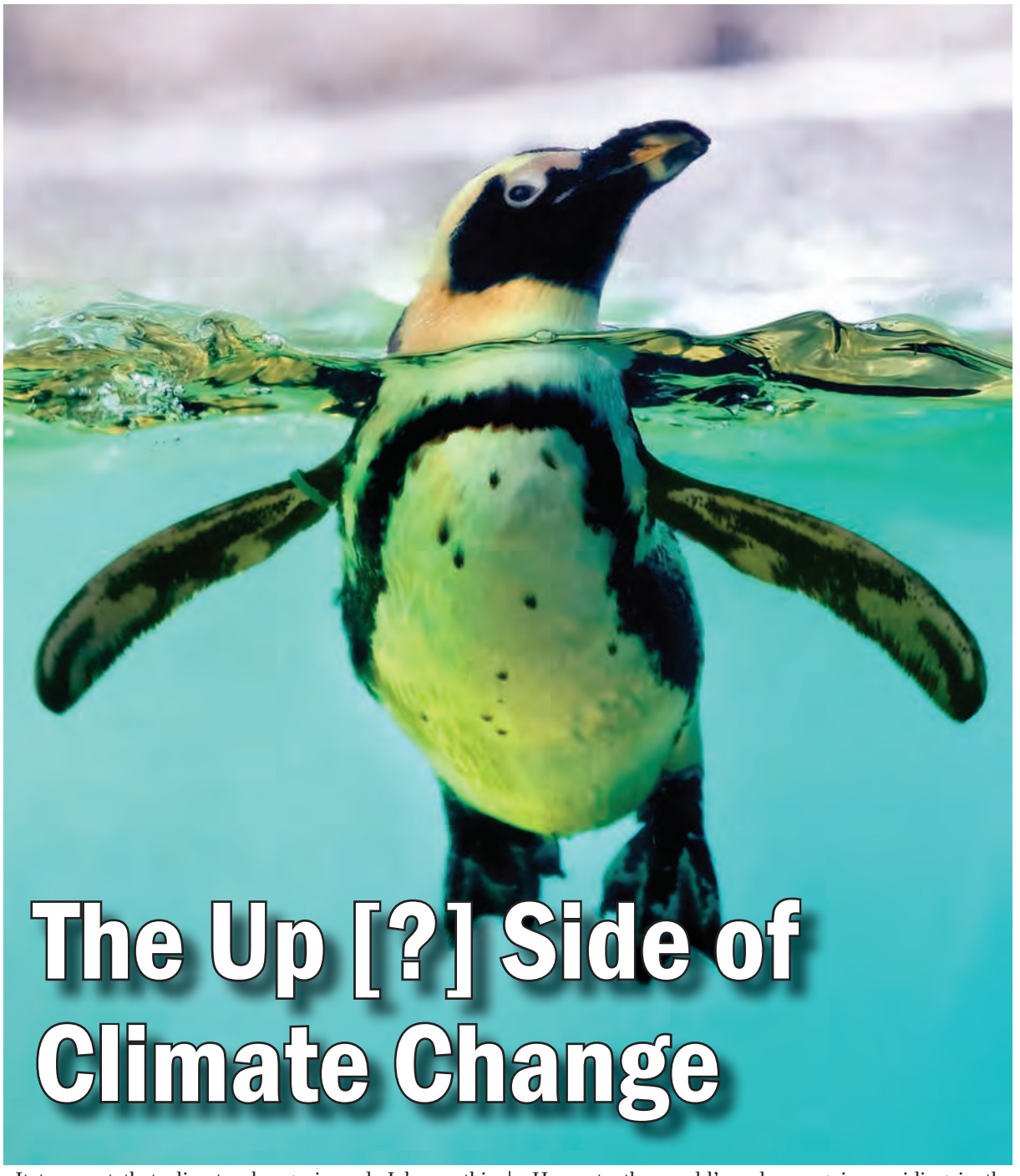

The Up [?] Side of Climate Change

Joseph Keefe is the lead commentator of MaritimeProfessional.com.

It tuns out that climate change is real. I know this because a recently reported study led by scientists at the Woods Hole Oceanographic Institute (WHOI) has offered that penguin populations in the Galapagos Islands have doubled because of it. The study, among other things, compared "sea surface temperatures with endangered Galapagos Penguin population counts and found that the penguin population doubled while waters cooled around their nesting islands." In essence, then, global warming influences and shifts winds and ocean currents, and this makes endangered Galapagos Penguins happy. Me? I have to mull this one over.

Anyone who has ever been to the Galapagos knows that the waters surrounding this UNESCO World Heritage site are extremely cold. On a 2007 family trip to the islands, the Keefe family snorkeled and swam in those waters and I can assure you that you had to double the thickness of the typical wetsuit just to be able to bear the chilling waters for even a 30 minute swim. Hearing that climate change broadened that cold pool of water that the penguins hunt for food and breed in got me to thinking about that trip.

Home to the world's only penguins residing in the Northern Hemisphere, the Galapagos Islands also hosts an ecosystem like no other. Measuring just under two-feet tall, the black and white Galapagos Penguins were put onto the endangered species list in 2000 when their numbers fell to just around 300. But, the new research infers that climate change have somehow moved the Equatorial Undercurrent to the north. This in turn, say scientists, probably increased algae and fish populations in the area. Over the same time frame – roughly 30 years – the penguin population in the Galapagos has increased to more than 1,000 birds.

Meanwhile, and back in 2007, we experienced some neat encounters with those very same penguins while snorkeling off of our miniature (50 passengers) cruise vessel. While paddling along mostly in search of the enormous sea turtles on one particular day, we were accosted and surrounded by a large group of these penguins – all spinning, diving and playing in close proximity to us. The dive master encouraged us to stay as long as we could stand the frigid waters, exclaiming, "This is a very rare event." And so it was. We had a ball with them. On another day, we got to visit some of the islands that they call home. That's another story.

Two days later, we all piled into the cruise ship's 'pangas' to motor ashore for a nature walk and scientific lecture. As we approached the first island, I wondered what kind of large rocks and boulders – all shining white – were strewn all along the shoreline. I soon found out. Stepping off the small boat onto the small island also provided a massive assault on one's olfactory system. We found out quickly that the rocks actually were not white, but instead, jet black in color. And our friends the penguins sure knew how to throw a party. Every single one of those rocks was covered with a coating of about one-half inch of – well – you know what it was. And, it was here that our guide decided to pause for a 15 minute lecture on the feeding, breeding and general social habits of the local penguins.

It may have been the longest quarter hour of my life. He began by admonishing us not to step off the path into the penguin's "sensitive ecosystem." Um, not to worry. There was absolutely no chance of that happening. I had never before – and certainly not since – smelled anything remotely that bad.

Now, I mention all of that because the new study also suggests that increases in global warming could augment the penguin's numbers even more. The WHOI press release also insists that the new study shows how large-scale changes in the climate can act locally. Michelle L'Heureux, a meteorologist with the National Oceanic and Atmospheric Administration's Climate Prediction Center in College Park, Maryland, continued, "While it is important that we focus on the big picture with climate change, it's really the small scale that matters to the animals and plants that are impacted," she said. I couldn't agree more.

On the other hand, I'm going to continue to encourage readers to embrace shortsea shipping as a means to get those trucks off the highways. And, hey, let's upgrade to Tier IV engines as fast as is humanly possible. SCR as means to control engine exhaust emissions? I'm all for it. Otherwise (and I cannot even imagine what 2X the current population of sushi-eating Galapagos penguins would smell like) we're looking at some serious aroma growth on those sacred islands, as well. And, nobody wants that.

Travel tip for those on their way to the Galapagos: bring a mask – the penguins are apparently making a serious comeback. – MarPro.

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Container Feeder Design

Deltamarin introduced a container vessel design A.Delta2300. The development work has been supported by AVIC Weihai Shipyard in terms of construction friendliness, and has been reviewed and commented on by DNV GL considering the application of the latest rules and industry practices. Deltamarin and AVIC Weihai Shipyard are both members of the AVIC Group.

The A.Delta2300 provides a container capacity of 2,322 TEU in five cargo holds and on deck. The increased cargo hold breadth improves stability in the fully laden condition. Together with the ballast-free approach, this results in an increased utilization rate of about 73% (1,700 TEU) of nominal container intake in the homogeneous loading condition at scantling draft carrying a 14t TEU container. In addition, intake can be optimized to a specific cargo profile and even further improved by considering route-specific loading.

Extensive effort has been focused on the A.Delta2300 hull form development to ensure low resistance combined with high propulsion efficiency. This included dozens of CFD calculations and three series of model tests at the Hamburg Ship Model Basin (HSVA). As a result, the vessel requires only low power at the design speed compared to present reference designs. The daily main engine fuel oil consumption is decreased to 42 t/day at a 19-knot service speed resulting in fuel efficiency of 0.033 t/TEU/day. A strikingly low deadweight per TEU ratio of less than 16 DWT/14t TEU is thus achieved, which is commonly gained only in larger container ships. This efficiency decreases the EEDI (Energy Efficiency Design Index) value to approximately 37% below the IMO reference line complying with Phase 3, which enters into force in 2025.

Main Particulars of A.Delta2300

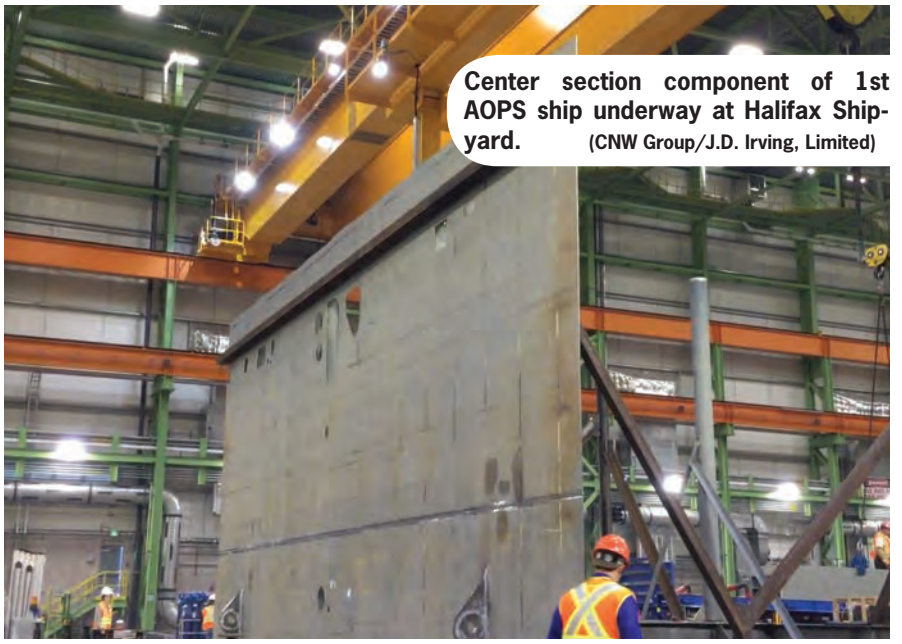
Length o.a	188.6 m
Breadth	30.95 m
Draft, design	8.75 m
Draft, scantling	10.00 m
Capacity	2,322 TEU
Capacity at 14 t/TEU	1,700 TEU
Reefer plugs	500
Deadweight at 10.0m	26,580 t
M.E. FOC	42 t/day
Service speed (15% s.m.)	19 kn

OHIO: Crowley Takes New Tanker

Crowley Maritime Corp. took delivery of Ohio, the first of four new, Jones Act, product tankers from Aker Philadelphia Shipyard, Inc. (APSI). Crowley said the delivery is significant as the product tanker has been built with consideration for the future use of LNG for propulsion. The remaining three product tankers being built by APSI for Crowley are currently under construction and have planned deliveries through 2016. The new 50,000 dwt product tankers are based on a Hyundai Mipo Dockyards (HMD) design which incorporates numerous fuel efficiency features, flexible cargo capability, and the latest regulatory requirements. The vessel is 600 feet long and is capable of carrying crude oil or refined petroleum products.

Irving Starts Arctic Offshore Patrol Ship

Hundreds of employees gathered in Irving Shipbuilding's new Assembly Hall at the Halifax Shipyard to celebrate the start of production of Canada's first Arctic Offshore Patrol ship (AOPS). Production has begun on two units for the center section of the first AOPS. Welders, pipefitters, marine fabricators and iron workers are among the trades involved in the process, using the new state-of-the-art panel line. Delivery of the first HMCS Harry DeWolf-class ship is expected in 2018. The ship is the first of up to 21 vessels that will renew Canada's combatant fleet over the next 30 years under the National Shipbuilding Procurement Strategy. The Canadian government and Irving Shipbuilding signed the $2.3b AOPS build contract earlier this year.



Center section component of 1st AOPS ship underway at Halifax Shipyard. (CNW Group/J.D. Irving, Limited)

Incat Crowther Designs 63m Ferry for Central America

Incat Crowther designed a 63-m monohull passenger ferry vessel for an operator in Central American. The main deck features a cabin with 286 first-class seats, 20 lounge seats and a children's play area. The vessel is powered by five MTU 16V400M63L, equipped with ZF-7650 gearboxes, propelled by five Hamilton HM-811 jets. Two 150ekW generator sets will provide the vessel with electricity and a 200hp bow thruster will allow for maneuverability and stationing. A service speed of 37 knots and capacity for 650 passengers will provide efficient transportation.

Image: Incat Crowther

Stena Imperial

A new 50,000 DWT MR chemical and product tanker based on the IMOIIMAX concept, Stena Imperial, was named in Savannah, Ga. Built in China by Guangzhou Shipbuilding International (GSI), Stena Imperial recently arrived in Savannah on the U.S. East Coast with a cargo of palm oil. The ship is owned by a JV of which Stena Bulk and Indonesian Golden Agri Resources (GAR) each own 50%. It is the third of 10 vessels ordered by Stena Bulk for a total of $400 million with delivery to be completed by 2017. The vessels are operated by Stena Weco and trade within the company's logistical systems, which now will include a fleet of some 60 tankers.

The IMOIIMAX concept was developed by Stena Teknik together with GSI. The tanker has 18 tanks of the same size, each with a capacity of 3,000 cubic meters, which allows for greater cargo flexibility. A large number of innovative technical solutions have been implemented, which together, when sailing at service speed, result in 10-20% lower fuel consumption compared with other vessels of the same size.

Captain Vinay Singh and godmother Kari McCormick.

Photos: Kristofer Hultén

Erik Hånell, President and CEO Stena Bulk with wife Katarina Hånell; captain Vinay Singh; godmother Kari McCormick and Doug McCormick, Commercial Regional Manager, Chevron in Houston; Kristina Hagman and Carl-Johan Hagman, CEO Stena Shipping, Drilling & Ferries

North Pole

The Latest Tourist Trap

BY DENNIS BRYANT

On August 16, 2015, the geographic North Pole was visited by a Russian surface ship for the one-hundredth time. The Russian nuclear icebreaker 50 Let Pobedy (50 Years of Victory) carried 106 tourists from 16 different countries. This was the icebreaker's seventh cruise to the Pole just this season. Each voyage takes just less than two weeks round trip, and that includes a full day of partying at the top of the world. This is all available for a starting cost of $26,995 per person for a basic two-person cabin with a standard twin bed, but does not include the $1,750 round trip air fare between Helsinki and Murmansk or the cost of getting from wherever you are to and from Helsinki.

Along the way, passengers may see polar bears, seals, walrus, and whales. But one should not expect to see animals at the North Pole, other than occasional fish and sea birds. Upon arrival at (or near, depending upon ice conditions) the North Pole, passengers may climb down onto the ice, drink champagne toasts, enjoy a barbeque, and form a circle around the Pole (or a facsimile thereof). For added fees, passengers may take helicopter rides or, weather permitting, ride in a hot-air balloon. One should not expect to see the iconic red and white diagonally striped pole – Santa Claus took it with him when he vacated the area some years ago as the locale started to attract attention.

Then, it is back onboard for a dash back to Murmansk, possibly with a short diversion for sight-seeing in Franz Josef Land. This uninhabited archipelago was discovered in 1873 by the Austro-Hungarian North Pole Expedition, who named it for their Emperor. In addition to the sea birds, polar bears, seals, walrus, and whales, Franz Josef Land also supports a population of Arctic fox.

The North Pole (or Geographic North Pole, to distinguish it from the Magnetic North Pole) is where the rotational axis of the Earth reaches the surface of the Earth in the Northern Hemisphere. While it is theoretically a fixed point, it actually moves slightly (or wobbles) because the Earth is not a perfect and uniform sphere. This wobbling is in the range of a few meters, so is only important in instances requiring very precise positioning.

The North Pole has been a quest for centuries, but was not reached by man until April 6, 1909, when Robert Peary, Matthew Henson, and four Inuit men apparently arrived by dogsled. On May 9, 1926, Richard E. Byrd and Floyd Bennett apparently overflew the Pole in a Ford Tri-Motor airplane. On May 12, 1926, the airship Norge flew over the Pole on a voyage from Svalbard to Teller, Alaska, piloted by Umberto Nobile and carrying veteran polar explorers Roald Amundsen and Lincoln Ellsworth.

The nuclear submarine USS Nautilus (SSN 571) became the first watercraft to reach the North Pole when it surfaced through the ice on August 3 1958. Various other nuclear submarines of several navies have made similar surfacings since then.

The first surface vessel to reach the North Pole was the Soviet icebreaker Arktika on 17 August 1977. There have been five visits to the North Pole by non-nuclear Russian surface ships: one by the diesel-electric icebreaker Kaptain Dranitsyn and four by the research vessel Akademik Fedorov, including its 2007 trip (Arktika 2007) when, escorted by the nuclear icebreaker Rossiya, it used a manned submersible to place a titanium tube containing a Russian flag on the seafloor at the North Pole.

Russian (and Soviet) nuclear icebreakers have now visited the North Pole ninety-five times. The vast majority of those visits have been with paying passengers on board. The first such North Pole cruise was by the icebreaker Rossiya on August 8, 1990. The nuclear icebreaker Yamal has made 48 such voyages, the most by any individual surface ship, while 50 Let Pobedy has been to the Pole 33 times, and counting.

According to various sources, surface ships from other nations have traveled to the North Pole a total of 19 times. Swedish vessels have made eight trips. German vessels have made four trips. Canadian vessels have made three trips. U.S. vessels have made four trips. The icebreakers Oden (Sweden) and Polarstern (Germany) were the first non-nuclear ships to reach the North Pole, doing so on September 7, 1991. The USCGC Polar Sea and CCGS Louis S. St-Laurent reached the North Pole on August 22, 1994 and were joined the next day by the Russian nuclear icebreaker Yamal for the first three-ship rendezvous. The USCGC Healy and the Polarstern reached the North Pole together on September 6,

(Photo courtesy of Paul Arthur Berkman)

2001. The Russian nuclear icebreaker Sovietskiy Soyuz and the Swedish icebreakers Oden and Vidar Viking stopped at the North Pole on September 6-7, 2004 during the Integrated Arctic Ocean Drilling Program. The Canadian Coast Guard Ships Louis S. St-Laurent and Terry Fox jointly reached the North Pole on August 27, 2014. Most recently, USCGC Healy reached the North Pole on September 5, 2015 while researching the western Arctic Ocean and its seafloor, where it was met on September7 by the German icebreaker Polarstern researching the eastern Arctic Ocean and its seafloor.

Over the years, small groups have found more innovative manners of reaching the North Pole. On April 23, 1948, three Soviet aircraft landed at the North Pole. The 24 individuals established a temporary camp and conducted two days of scientific observations before flying back to the Soviet Union. On May 3, 1952, two U.S. Air Force pilots and a scientist landed at the Pole, made some brief observations, and departed. On April 19, 1968, four U.S. and Canadian adventurers completed a 48-day over-ice journey from Ellesmere Island to the North Pole on snow-mobiles. In 1969, four British nationals with the British Trans-Arctic Expedition hiked, with the aid of dog sleds and airdrops from Barrow, Alaska to Svalbard via the North Pole. Two individuals from the Transglobe Expedition 1979-1982 reached the North Pole via foot and snowmobile on August 4, 1982, becoming the first individuals to complete a circumnavigation of Earth by surface travel. On April 6, 1985, a ski-equipped twin-engine Otter aircraft flew Neil Armstrong, Sir Edmund Hillary, Steve Fossett, and Patrick Morrow from Ellesmere Island to the North Pole for a quick glass of champagne. This list goes on.

All of this going to and fro at the North Pole does not include the increasing shipping activity in the Arctic Ocean generally. Cruise ships, cargo ships, and the occasional recreational vessels transit the Northern Sea Route across the top of Eurasia and the Northwest Passage across the top of North America. Fishing vessels are increasingly venturing into Arctic waters. Natural resource extraction in the Arctic is growing apace – and it is not limited to oil and gas. It is getting so busy that a whale can hardly think.

Several years ago, I published a manifesto written by my good friend the Arctic fox. In that document, he encouraged all Arctic animals to take action to deter and deflect outsiders (i.e., all humans other than local natives) from further incursions into the Arctic. That effort has had limited success. Natural resource extraction efforts in the Arctic have slowed from their previous rapid pace, but still continue. Use of the Northern Sea Route this navigation season is significantly less that in recent years. But other activities, such as excursion cruises to the North Pole continue apace.

For eons, the North Pole was a mythical and mysterious place, often referred to as Thule. Now, it is just another location like Machu Picchu or Angkor Wat where people go, have their picture taken (often a selfie), and then brag to their friends.

The North Pole deserves more respect.

The Author

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Making Sense and Taking Risks

Human Behavior in the Shipping Industry

BY MATTI BARGEFRIED

The guide helps to identify countermeasures to avoid human errors and bad decisions. Discover how to manage the human element on all levels – from the engine room, to the bridge, to the shore.

From our summary of "The Human Element – A Guide to Human Behavior in the Shipping Industry," we examine the chapters "Making Sense of Things" and "Risk Taking," breaking down the most relevant information. Dirk Gregory and Paul Shanahan of the UK Maritime and Coastguard Agency developed the original guide.

Making Sense of Things

People are surrounded by vast amounts of information and need to make sense of it all. We need that information to support our goals and plans, as they cannot withstand a changing world without adapting to the current situation. Nevertheless, before we can use information to modify our plans, we need to choose the information to process and the sense that we give to it. This process is influenced by a number of things, most importantly culture, experience, social needs and character. As in the office ashore, the manager's door might be open to welcome everyone or it might be open in order to spy on his underlings. How do you judge? It is one situation, but according to your perception of the person's character and attributes and to your experience in other companies, your judgment alters.

To share the sense that we make of information, we need empathy and communication skills; otherwise, we will not be able to transfer reason and meaning. However, even when we can transfer this successfully, we might have been betrayed by our own minds and chosen the wrong thing to transfer. Our minds are picky; they like to find evidence that supports our current assumptions and decisions. Sense-making plays a vital role in almost all shipping accidents.

On average there are 182 large vessels lost per year, according to Lloyd's Register, and between 1995 and 2007 this amounted to 160 million gt.

The guide continues with a case study for sense-making: specifically that of a U.S. Coast Guard training cutter being rammed in 1978 by a vessel four times the cutter's size. (See story below "USCGC Cuyahoga: The Last Voyage)

How did it happen? It happened when the captain of the Coast Guard vessel noticed an approaching ship. Both vessels were running at full speed and quickly closed up to each other. The captain saw only two signal lights on the vessel, and therefore assumed that it was heading in the same direction as he was. His crewmembers saw three signal lights and knew the ship was coming towards them, but did not attempt to communicate this, as it seemed obvious. Meanwhile, the captain rationalized to himself the fast-closing speed (as seen on the radar) with the simultaneous overtaking of a fishing boat. Eleven men died. The captain's sense-making was wrong as well as the communicational behavior of the crew.

The Problem with Making Sense

As we can understand from the example, the patterns and situations that create a problem primarily exist in the heads of people, hence they are unique. Regulators today tend to close the exposed gaps with stricter regulation and new technical procedures. Therefore the rule books grow bigger, creating uncertainty and greater complexity. At the same time, people become lulled into a false sense of safety provided by the technical crutches. The guide quotes: "Automation creates new human weaknesses…and amplifies existing ones," reminding us that humans need to keep pace.

Risk Taking

In the last part, we learned that people have to make sense of things (information) in order to make decisions or plans.

USCGC CUYAHOGA: The Last Voyage

At about 2100 hours on 20 October 1978, in an area about 3.5 miles northwest of Smith Point, which marks the mouth of the Potomac River as it empties in the Chesapeake Bay, catastrophe occurred.

The Argentine coal freighter Santa Cruz II, a 521-foot bulk carrier, hit the Cuyhoga on her starboard side between amidships and the stern. A consensus of accounts indicated that the cutter was dragged backwards for a minute and then fell away from the tanker, rolled on her side, and sank within a couple of minutes. The Santa Cruz rescued 18 survivors from the water and stayed on the scene until help arrived. The remaining 11 men embarked on the Cuyhoga were lost. Four days after the accident, a Marine Board of Inquiry convened in Baltimore, Maryland, at the Marine Safety Office to investigate the accident.

After some delay due to heavy seas and high winds, two massive floating cranes were used to raise the Cuyhoga, which was in 57 feet of water. After an initial inspection, the ship was placed on barges and towed 65 miles to Portsmouth for a full inspection.

The Marine Casualty Report, number USCG 16732 / 92368 and dated 31 July 1979, concluded:

The Commandant has determined that the proximate cause of the casualty was that the commanding officer of the USCGC CUYAHOGA failed to properly identify the navigation lights displayed by the M/V SANTA CRUZ II. As a result he did not comprehend that the vessels were in a meeting situation, and altered the CUYAHOGA's course to port taking his vessel into the path of the SANTA CRUZ II. The Cuyahoga was later sunk off the coast of Virginia as an artificial reef.

(Source: US Coast Guard)

Photos: U.S. Coast Guard

This sense making is heavily influenced by a number of factors, such as culture, past experience, ability to communicate, empathy and one's character.

Even we make a decision we can never be certain that we have made the right one and that we have interpreted all relevant data in the way that is favorable for a positive outcome. This is partly because we want our plan to work or our decision to be right, hence, we are tricked by our brain into selectively finding assumptions and interpretations that are good from our personal point of view.

This all involves risks and we need to accept risks, but sometimes we know that we do not have sufficient information or we feel a false sense of safety and still head for our conclusion / plan / decision.

What Affects Risk Taking?

Risks are determined by our feeling about a given situation, which of course can be easily wrong. The feeling might be influenced by an incorrect perception of control. This imagination of having control is biased by thinking positively about our skills, experience, technical equipment, hard training and a familiarity with the situation. People forget that missing knowledge and over-estimation can then lead to bad decisions.

"The Human Element – A Guide to Human Behavior in Shipping Industry" gives an example of a deckhand who was washed overboard – he only secured himself in heavy weather by wrapping an arm around the pulpit rail instead of using the harness. Therefore he took a risk, and based on his perception his decision was good enough, but it was clearly proven otherwise. This situation involved perceived familiarity, it was not the first time the deckhand had secured himself like this; therefore the situation seemed to be familiar and hence controllable. Another point of influence is perceived value – when something supports a higher goal and could bring one a big step closer to achieving it, so the more we desire it, the less risky it appears.

How Decisions are Made

To make a good decision based on the information we have we need to work through all the options, thinking about alternatives and interpreting all facts. Therefore, decision-making is a very time-consuming task and we need to decide how efficient or thorough to be, as time is a valuable and rare commodity in shipping.

That presents a problem because it means there is likely to be a tradeoff between safety (by thorough investigation) and profitability (by deciding quickly). In reality, companies need to be both at the same time. The company's culture dictates which of the qualities is more favored. Pressure from the company's demand for efficiency leads to a shift in perception where thoroughness is valued less and seamen feel the need to work as efficiently and as quickly as they can. It is difficult to consciously act against this urge and people need adequate training in order to make proper decisions that determine when it is better to be more thorough.

The Author

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Ergonomics@Sea

BY THOMAS ASK

Ergonomics is the science of designing for the human body. The goal of ergonomic design is to allow interfaces to easily connect with a human. Ergonomic design is not only easier and more comfortable to use but reduces injuries and accidents. Marine applications need special care because of vessel movement, unique hazards, multicultural crew and the extreme human machine interface environment where small controls operating enormous machinery.

The concepts behind ergonomics are rooted in a variety of disciplines such as human dimensions (anthropometry), human movement (kinesiology), user psychology and interaction design. While other elements of human comfort will not be discussed here, these include environmental issues such temperature, humidity, draftiness, air quality, noise and vibration.

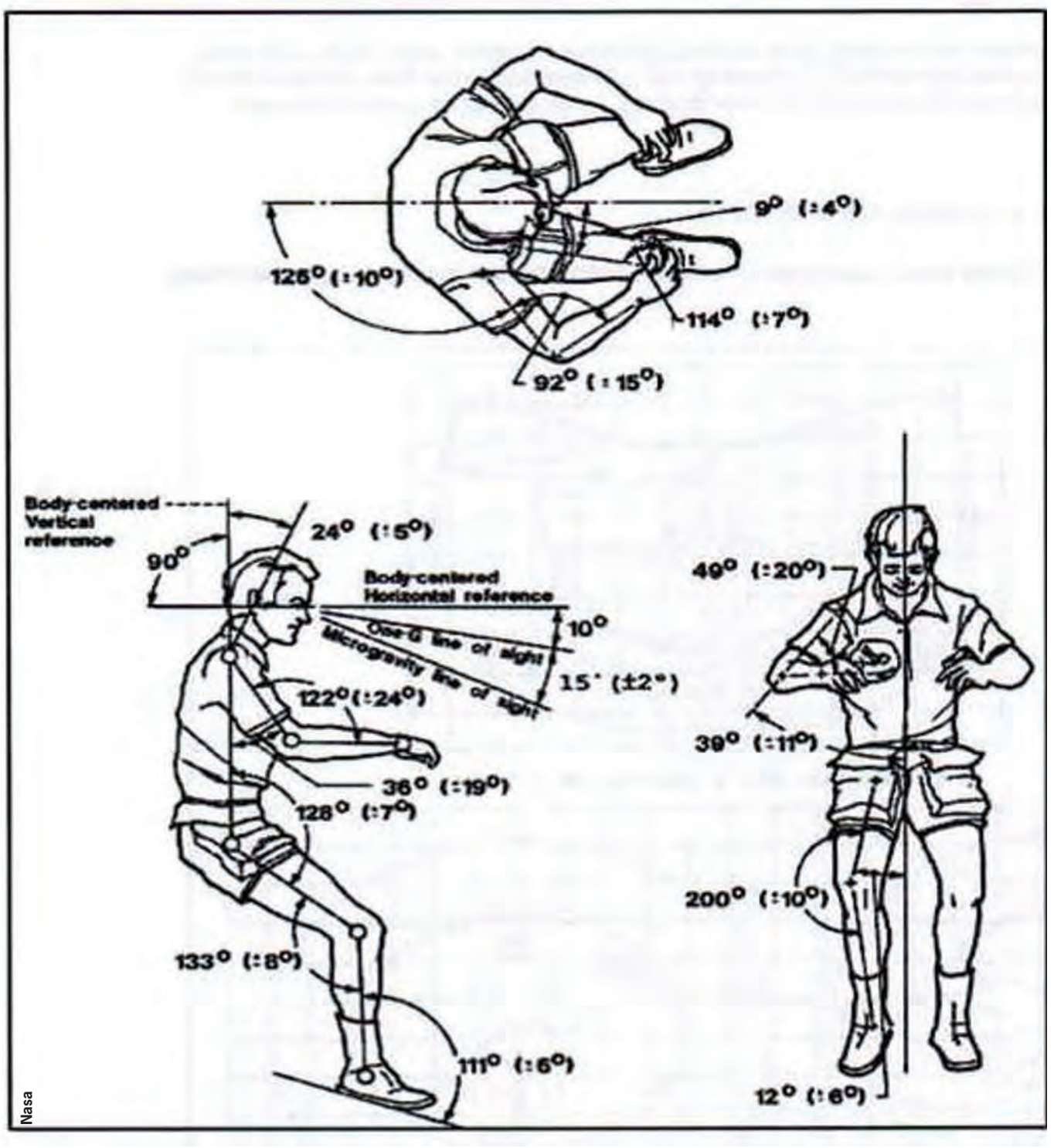
Fortunately, ergonomic design is surprisingly straight forward – simply design human interfaces that put the body in a neutral position. Injuries or discomfort increase when the hand, foot, arm, back etc. are compelled to operate outside their neutral position. The second element of design is to allow customization of user interfaces. This customization can be difficult in marine design because much of the equipment and interfaces are rigidly mounted; however, it is an important to allow adjustments where possible.

Anthropometric data are readily available for a wide array of demographics. The figure below represents neutral body posture based on NASA data (Anthropometry and Biomechanics 1995).

Ergonomic design is based on data not intuition. One must specifically avoid the mistake of designing for oneself and assuming it will be satisfactory for everyone else. Moreover, one should not assume a design for the average person is satisfactory for those at the outer ranges.

While many words and numbers are presented in connection with ergonomic design, for marine applications they break down to the following design guidance:

- Design for the neutral position and the middle of the range of motion.
- Empirically verify the effectiveness of the design.
- Allow customization where possible.
- Recognize vessel movement requires a range of angle be considered so as not to produce pinch points or more subtle ergonomic problems.



Many rules of thumb (heuristics) have been developed that guide designers, ranging from cockpit sight lines, extension to dexterity relationships and handle design.

Some correction factors that are helpful when dealing with raw anthropomorphic data include adding five percent to values to account for light clothing.

People can stretch 10 percent further than anthropometric data suggests by twisting their torso and extending their reach.

Mapping is another important interaction design concept. Mapping describes the relationship between visual cues and function, such as scissor handle movement mirroring the cutting blade action or Z-drive controller orientation indicating thrust direction. In products and systems that are vital to safety, it is critical to make the mapping as clear as possible and work with graphical language suitable for international crews.

When designs are changed, traditional mapping needs to be taken into account so that a new design is approachable by those who have experience with an old design.

Affordances and constraints should also be introduced to design to accommodate or constrain how a device is used. An example of this is scissor handle holes that are sized to handle either the fingers or thumb.

More extensive ergonomic design guidance includes:

- Work should be done by larges appropriate muscle groups.
- Avoid overexertion of connective tissues (muscles, tendons, tendon sheaths) in wrist.
- Avoid compression of the median nerve in the wrist's carpal tunnel and use a natural grasp angle of 60-70 degrees, limit movement to 15 degrees.
- When lifting is required avoid wrist pronation (palm down) and supination (palm up) when lifting. Also ensure that the upper arms can be close to body and elbows operating around 90-100 degrees.

Ergonomic design is straightforward and most people have an intuitive sense for what works and what is comfortable. However, primitive function often drives designs and the process of making them ergonomic can be viewed as a second phase of the design process. The health and safety of crew can be improved by moving ergonomics to the early stage of marine design.

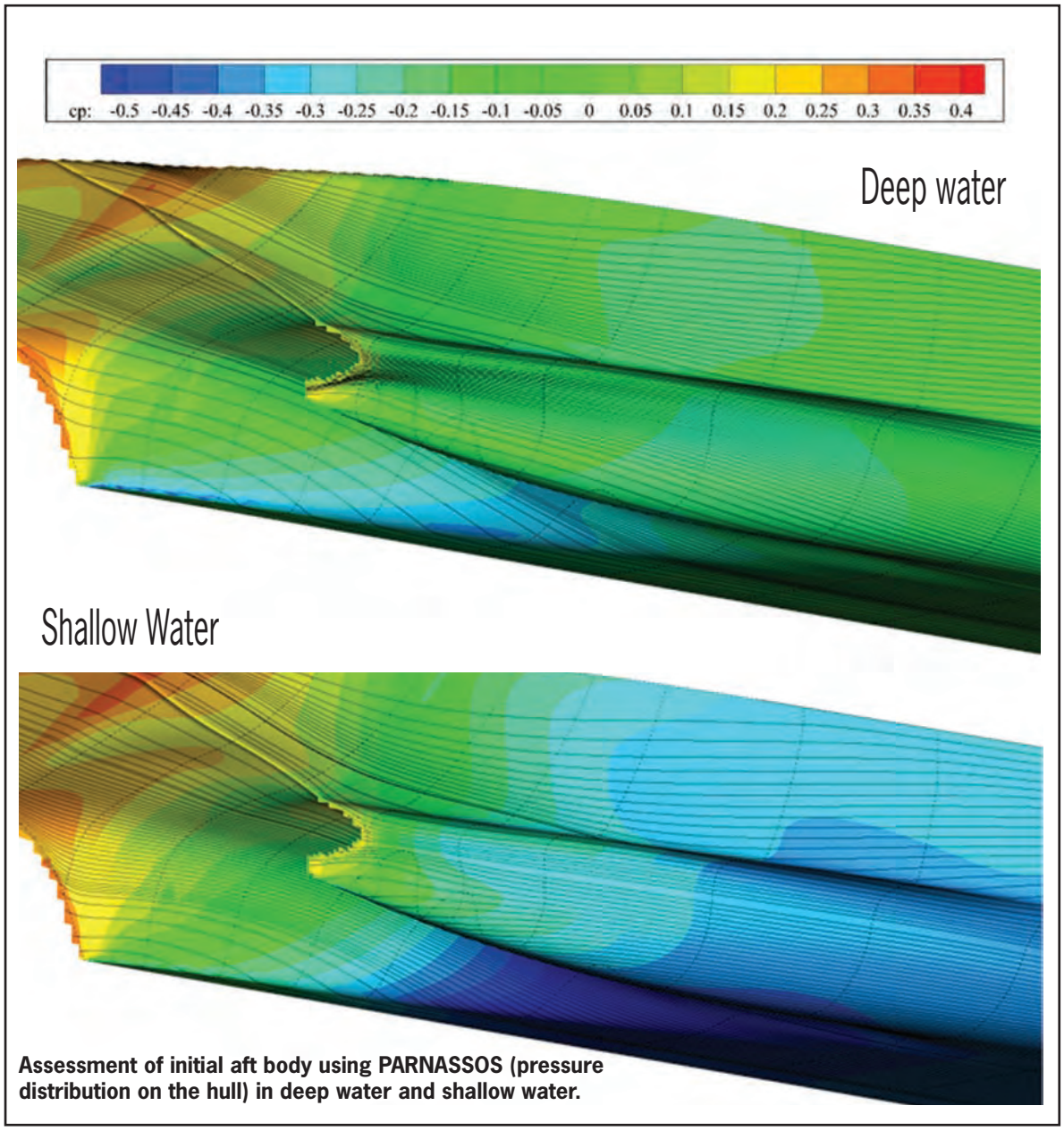
The Author

Thomas Ask is a professor of industrial and human factors design at the Pennsylvania College of Technology (USA). Ask earned a doctorate in industrial design and is a licensed Professional Engineer.

Complex Hull Shapes Require

Sophisticated Assessment

Van Oord asked MARIN to perform a full assessment of the hull lines of its new hopper dredger.



Assessment of initial aft body using PARNASSOS (pressure distribution on the hull) in deep water and shallow water.

Twin gondola aft bodies have been successfully applied to hopper dredgers for many years. This is usually combined with a tunnel head box combination above the propeller. The tunnel leads the water to the propeller, while the head box supports the nozzle and the rudder. However, this results in a very complex shape and consequently, complex flow characteristics.

On top of that the operation profile of a hopper dredger is also challenging; sailing in deep and shallow water at two completely different drafts i.e. fully laden and empty. The question arises about how to keep the flow under control in all these conditions. Full knowledge of the characteristics of the flow around the hull is crucial when designing such a ship. CFD calculations can provide this insight and are, therefore an essential part of the design process.

Operational Profile Vital

Following Van Oord's request for the assessment of the hull lines of its new hopper dredger, both wave making resistance and the viscous flow around the hull were analyzed, taking into account the aforementioned operational profile of the ship. This emphasis on the operational profile during the design process is increasingly requested by ship owners, and for good reason. Realistically, a hull design can never be 100% suited for every condition the vessel sails in. Therefore, a careful compromise, in close cooperation with the client, has to be made. This requires regular meetings, in which the results of all calculations are put on the screen, and every benefit a hull form shape provides in a certain operational condition is weighted against the possible drawbacks in other conditions. During this process operational knowledge meets hydrodynamic knowledge which results in the best compromise. The project for Van Oord is a good example of this approach.

The assessment and optimization of the hull lines has been conducted with the aid of a variety of MARIN's programs. For the optimization of the fore body the potential flow code RAPID, which has been used at MARIN for a long time, was deployed. At the bow the effects of viscosity are still limited and the effect of bow variations on wave making resistance can be quickly checked for the selected matrix of operational conditions

Optimal Bulbous Bow

After the optimum bulbous bow was found in this way, the flow along the rest of the hull was examined using the viscous flow codes PARNASSOS and ReFRESCO. The PARNASSOS solver requires a structured calculation mesh. The benefit of such a structured mesh is that the iteration process is fast. However, to enable the use of such a mesh the hull geometry should not be too complex. The PARNASSOS tool has therefore been used in the first stages of the aft body assessment, where the hull was not yet equipped with the tunnel head box combination. The flow characteristics obtained in this way, were used to align the tunnel head box combination with the flow. In the next stage, when the aligned tunnel head box combination was fitted to the hull, the hull was examined again, but now the geometry had become so complex that a viscous flow code, which is capable of solving unstructured meshes had to be used. Therefore, for this stage, MARIN's code ReFRESCO was applied. The calculated flow characteristics were examined with respect to flow separation and the generation of vortices in areas where they could negatively influence efficiency and vibrations. Similar to the aforementioned analysis, different loading and water depth conditions were examined in accordance with the selected matrix of operational conditions. The innovative hull design passed the test with very good results, in both deep and shallow water. At the time of writing this article the final validation by means of model tests was about to start. During this stage, the performance of the hull will again be investigated in deep and shallow water.

The Author

Luigi Francesco Minerva is Project Manager of the Ships Department of MARIN, the Maritime Research Institute Netherlands. MARIN offers simulation, model testing, full-scale measurements and training programmes, to the shipbuilding and offshore industry and governments.

The cost-conscious manager

DAG KRISTIAN AMLAUD

Wondering What to Trim? Look to the skies:

Billions in offshore savings may be orchestrated from the back office.

For many managers (and analysts), sales, general and administrative costs, or SG&A, are ordinary accounting lines on an offshore services company's ledger. Less ordinary — less known — is that a sizable chunk of the "A" in SG&A are travel costs that can be better managed. A recent restructuring-focused Deloitte report suggested that SG&A costs might be the wisest costs to shed without thwarting operations. For offshore suppliers, the wisest SG&A costs to shed might just be travel costs.

Examining SG&A for offshore outfits produces some interesting travel numbers, starting with the tens of thousands of people who work offshore and are shunted around the world to liaise and oversee. Whether you're thinking macro or micro — the globe or your own back office — travel costs in the offshore energy business are staggering. They're also larger than they ought to be, because most companies order travel rather than manage it.

Hypothetical Vessel: Real Costs

Consider the travel costs of just one drillship off the coast of Africa. Let's call that hypothetical vessel the Offshore Africa. What are its travel costs? While local crew might only need to travel by helicopter, 45 of the 210 onboard are expat tool-pushers, DP operators, subsea engineers, chief electricians, to name a few, and they would need much more than the helicopter journey offshore. The number of crew trips would quickly reach 90 for flights in and out of area and shifts two-weeks-on and two-weeks-off. The number of round trips soon hits 1,170 (see table 1.0). Remember that number.

So what are those travel costs, and how can they be cut back? We've heard operators grill the supply chain and their own staffs for skyrocketing costs, yet apart from the singling out of mushrooming and often duplicate engineering time, there's little mention of administrative costs. The lack of an efficient travel administration, or travel management, is never mentioned.

If you book online now for the Offshore Africa crew, the cheapest business class ticket round-trip and nonstop between Sidney and Luanda, the drillship's base, is $7,930. From Houston (one stop) it's $8,357, and from Aberdeen (one stop) it's $9,609. The average of those is $8,632 per round trip. Multiply by 1,170 flights and you have a budget of $10.1 million. Remember that number, too. ATPI buys travel for clients using a 100-location global-office footprint, so we pretty much demolish those fares.

There's also car service and other expenses to get expats safely from the airport to the shore base and their helicopter plus extra expenses for hotels and incidentals. We help clients cut down on those, too.

Offshore Africa

Back to that $10 million for a hypothetical, undersized drillship crew of 45. There are 856 drilling units worldwide, so that would be … $8.56 billion in travel for offshore drilling alone. But, it's not. Only about half of those rigs are actually in places as remote as Africa from Houston, Aberdeen or Stavanger. Yet, I know one drilling contractor without deep water commitments or remote operations whose travel budget is about $4.5 million.

At ATPI, we like to say that managing travel can cut travel costs by 10 percent and the administrative burden of travel

Photo: Shell

Graphic 1

crew capacity	210
minimal local crew travel, helicopter only	0
expat crew (toolpushers, DP operator, subsea engineer, chief electricians, etc.)	45
2 wks on/2 off, so it's Luanda to Sidney/Aberdeen/ Houston etc. every 2 wks	90
round-trip flights (45 crew x 13 round-trip flights x 2 (rotating crews))	1,170

Photo: Mackerel Press

by 30 percent. Consider half of that $8 billion, and the percentages suggest vast potential savings. In costs-conscious Norway — with its rising numbers of locally based worldwide energy industry suppliers — travel management is on the rise, and ATPI's new Oslo office bears testimony to the new awareness of the savings available in travel management. Customers include drilling contractors, offshore vessels owners, midstream players and a robust supply chain.

For oil independents and suppliers, travel can be 30 percent of administrative costs, or the "A" in SG&A, and for upstream businesses, that can mean up to $2 per produced barrel. This same category of costs can incur a six-percent hit of total expenses, including all expenses for key operations (see Table 2). For medium-sized suppliers, travel can reach 16 percent of SG&A costs.

Savings & Safety

So what does ATPI do to cut industry travel costs? Remember the African Drillship's "incidental" costs? We have a new partnership with worldwide port agent S5 aimed at eliminating many of those hotel stays and incidentals for travelling expats, be they managers, specialists or crew. If S5 sees that a ship or rig isn't ready for crew (late, engine trouble, testing kit, diverted to another port, etc.), then ATPI customers — using a travel-management technology interface called ATPI CrewHub — know automatically when not to book travel. Through CrewHub, they also know of expiring Visas or passports, even for multinational crews. Our Duty of Care travel standard is in-line with the industry standard for keeping crews safe (sometimes by extricating them from harm's way or diverting them out of danger).

So, travel might be the easiest part of SG&A costs to address, and the industry needs to cut costs without affecting safety, stopping innovation or curbing production. At $10 million per hypothetical drillship, there's about $4 billion in travel costs to target for drilling alone, and drill crews aren't the only offshore travelers.

Offshore shipping, for one, has similar numbers for some vessels, and they're some of our best clients. At stake for all suppliers, potentially, are day-rate losses due to absent specialists; cancelled buy paid for hotel stays, plus taxis, accidents, kidnappings, etc., which our Duty of Care and S5 partnerships address.

As for operators, well … If you save on travel, you might be able to drill some more wells or tackle some more projects.

The Author

Dag Kristian Amland is Divisional Managing Director of ATP Instone, part of an ATPI Group that earned over $1.78 billion in travel-management business in 2014. About 40 percent of ATPI's business is in oil and gas.

Black Market Refrigerants
pose a major shipping risk

BY SVENN JACOBSEN

In 2011, several refrigerated, reefer containers exploded, killing three port workers. While there has been no further tragedies since then, counterfeit refrigerants remain in circulation and still represent a safety risk.

Counterfeit refrigerant cylinders can consist of a dangerously unstable cocktail of gases, blended to roughly mimic the most common refrigerant, R-134a. These cylinders are often loaded with rogue gases such as R-40. Though similar to R-134a, R-40 reacts with aluminium to form trimethylaluminum, a highly volatile substance that, when exposed to air, can explode. At best, these fake refrigerants perform poorly, are energy-inefficient and are likely to damage hoses, seals and compressors. At worse, they are highly toxic, and in the case of the fatal accidents in Vietnam, China and Brazil in 2011, highly volatile.

According to international insurer TT Club, R-40 contamination accounts for 0.2% of the world's reefer container fleet, affecting about 2,500 reefers. However, other counterfeit refrigerant mixtures, such as those containing R-50, R-744, R-22 or R-170, are also considered unsafe, so the number of reefers affected could be far higher.

Disposables a Permanent Problem

Some operators may be unaware of the potential risk of using counterfeit refrigerants, while others may be seeking to cut costs. However, the main reason these refrigerants continue to circulate is because of the continued existence of disposable cylinders. According to Svenn Jacobsen, Technical Product Manager, Refrigeration, Wilhelmsen Ships Service, the absence of a worldwide ban has created a robust market for counterfeiters. "These cylinders are the container of choice for the counterfeiter," he says. "Cheap and untraceable, no counterfeiter is ever going to get any complaints from their customers using this type of packaging".

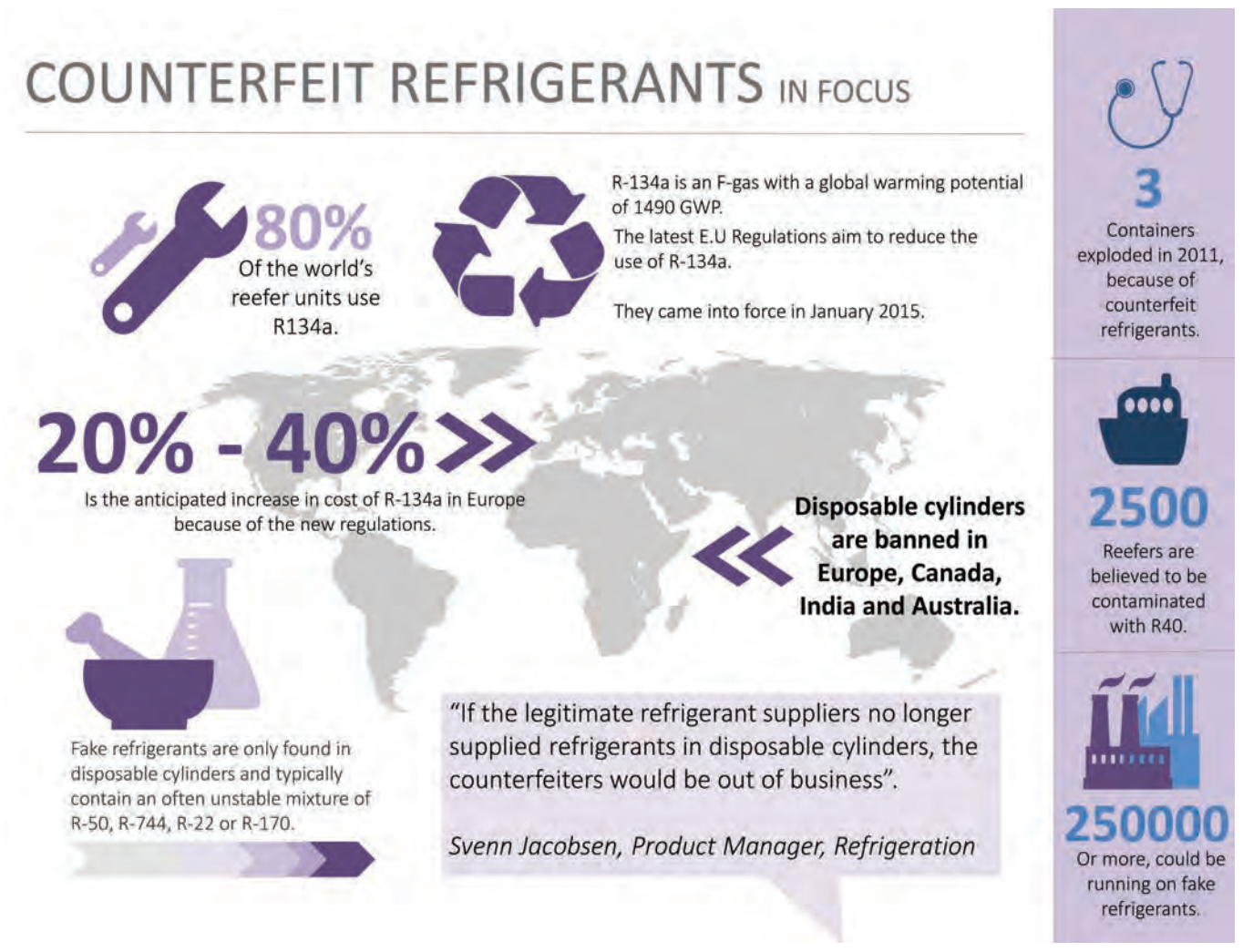
Jacobsen explains that counterfeiters offer what appear to be authentic, trademarked refrigerants. Despite the efforts of leading manufacturers such as Honeywell, Linde and Dupont, which have taken legal action to crack down on counterfeiters and changed packaging to discourage fakes, counterfeit refrigerants remain an industry menace. Even elaborate precautions, such as holographic seals or cylinder stamps, are easily copied in days rather than months. For Jacobsen, the only way to put an end to this illegal and dangerous market is to ban disposable cylinders.

"If the legitimate refrigerant suppliers no longer provided refrigerants in disposable cylinders, the counterfeiters would be out of business," he says, noting that WSS does not offer refrigerants in disposable cylinders. "We don't support their use and we believe a worldwide ban is far overdue".

Whether or not a global ban on disposable cylinders will come into force anytime soon is unclear. In 2007, the European Union (EU) banned disposable refrigerant cylinders in the EU and on EU flagged vessels. Similar bans are also in place in Canada, India and Australia. However, disposable refrigerant cylinders are still in use elsewhere in the world.

Unintended Consequences

More recently new EU legislation, introduced in January of this year, may only exacerbate the issue. The new EU regulation applies to the use of hydrofluorocarbon (HFC) R-134a. HFCs are fluorinated greenhouse gases (f-gases) with a relatively high Global Warming Potential (GWP). So while R134-a is an ozone-friendly, chlorine-free, energy-efficient, low toxicity refrigerant, its use accelerates climate change. The EU regulation (EC517/2014) calls for the total supply of HFCs across the EU to be reduced to just 63% of the 2009-2012 baseline quantity by 2018, measured as the total tonnes of carbon dioxide equivalent (CO_2e). This sustained reduction in capacity will continue until it reaches just 21% of the original baseline figure



by 2030.

While Jacobsen applauds the EU's bold move to reduce the environmental impact of R-134a refrigerants, he cautions that these regulations may inadvertently create a strong market for suppliers of counterfeit refrigerants. "It is likely that the reduction in the supply of EU HFCs will lead to shortages and a sharp spike in costs, meaning some operators will be tempted to purchase lower-price refrigerants," he says. "This regulatory change will create an ideal market for counterfeiters. Despite numerous warnings, accidents and fatalities, many operators will be more willing to take a chance on gases packaged in disposable cylinders by unregistered suppliers. We anticipate that the counterfeiters of R-134a are going to be very busy in the years ahead."

Too Good to Be True?

In the absence of a global ban, it is up to operators to use common sense, coupled with a healthy dose of scepticism. Because fake refrigerants are found exclusively in disposable cylinders, Jacobsen recommends that operators only purchase refrigerants supplied in refillable, re-usable, traceable cylinders. For operators who insist on using disposable units, they should make sure a reputable company, which has been audited and approved by a licensed manufacturer, is supplying their refrigerants.

Jon Black, Global Head of Chemicals and Refrigerants, Linde Gases, suggests that operators only source refrigerants from well-known providers or companies who distribute the products for these main manufacturers. "If a new distributor appears on the market, we recommend operators conduct a thorough audit before making a purchase," he says.

Finally, if the price quoted for gases is way below the market average, it is likely to be a counterfeit. It may be a cliché, but you really do get what you pay for. So if you want a safe, consistent, and authentic refrigerant you must be willing to pay for it.

The Author

Svenn Jacobsen is the Technical Product Manager at WSS.

R134a & Low GWP Replacements

Operators active in the EU will have to manage the new regulations that apply to apply to the use of hydrofluorocarbons (HFC). The so-called 'drop-in' replacement for R-12, R-134a is the most used refrigerant in refrigerated shipping container units accounting for approximately 80% of the market. Contributing to global warming when released to the atmosphere, R-134a has a GWP value of 1430.

With GWP calculated as:

$$GWP = \frac{\text{heat trapped per lb. of greenhouse gas}}{\text{heat trapped per lb. of } CO_2}$$

There are of course potential replacements for R-134a readily available such as R-1234yf, which has a GWP of four or R-744 (CO_2), which has a GWP of one. However, switching to such ultra-low GWP alternatives will typically require converting existing equipment or installing new equipment specifically designed to use lower-GWP refrigerants. In addition, these low GWP refrigerants also currently come with a cost premium attached.

Innovative LNG Containment Tank

Tank design reduces cost of LNG carrier 5 to 10%

The Cubic Donut Tank System (CDTS) was originally developed in 1973 and a patent was awarded in 1976. The main design principle behind the initial design concept was the construction of a near prismatic shape using 12 substantially identical cylinders that were interconnected to each other so that it would have the structural efficiency of a spherical tank and the volumetric efficiency of a membrane tank. Unfortunately, this was the time when the U.S. broke off diplomatic relations with Algeria cancelling all contracts to import LNG. Six new LNG Carriers were immediately laid up and interest in LNG containment technology in the U.S. waned ... until recently.

By Thomas Lamb and Regu Ramoo

Main Photo: Altair LNG Carrier Concept
(inset) Figure 1: Development of CDTS

In 2005, Altair Engineering, Inc. was providing advanced structural engineering analysis tools to University of Michigan and applied it to the CDTS, as a case study. This in turn developed into an interest to develop this Type 'B' tank concept further resulting in the awarding of multiple improvement patents to Altair's Product-Design team in 2013, 2014 & 2015, and Approval-in-Principle (AIP) by ABS in March 2015. Since 2005, the development has been continuous, as shown in Figure 1, with the design efforts focused on the use of CDTS for both the marine transport (LNG Carriers) and Floating LNG Processing and Storage Platforms (FLNG).

Alcoa joined this effort in 2012 providing material recommendations as well as manufacturability assessments, and Dongsung Finetec in 2014, providing insulation solutions. The details of the CDTS have been presented at the Offshore Technology Conference in 2009 and 2010 as well as LNG Conferences in London in 2009 and ICCAS 2009. Since the original concept was patented, the:

- The average LNG ship size has increased, thus increasing the need for sloshing mitigation
- Altair identified and solved functional and structural problems with the original concept, and patented the improved design
- The economics of transport costs make efficiency an even more significant economic opportunity

The marine transport of LNG is a mature technology that is almost 50 years old. In the early years of LNG Carrier designs, a number of containment systems were developed and the most successful were the Moss Rosenberg Spherical Tank and the Gas Transport Membrane Lining System. The CDTS has much better volumetric efficiency (0.85) than the Spherical Tank (0.52) and close to the membrane system (0.88). This high hold space volumetric efficiency coupled with the CDTS being of an independent tank construction and self-standing allows for higher utilization of available space above and below the main deck resulting in a significantly smaller ship length for the same cargo capacity. [Recent development of the extended Spherical Tanks has improved the Volumetric Efficiency to 0.56.]

The major benefit of the CDTS is that for the same LBP it offers 35% more capacity than Spherical and 24% more than a Membrane and IHI SPB ship, or a reduction in ship or platform length for equivalent Cargo Capacity; 12% compared to Spherical and 6% compared to Membrane ships.

The use of the CDTS results in the following additional advantages:

- Significant reduction in Gross Tonnage
- Significant reduction in the overall construction schedule compared to the membrane tank system
- Eliminates the restriction on partial filling of tanks for sloshing, allowing multiple discharge locations
- Reduced estimated cost of LNG carrier by 10% compared to Spherical and 5% Membrane
- Provides ease of construction and ease of installation in the ship,
- Offers superior structural efficiency
- Less installed power and thus fuel savings in service
- Utilizes a simple support system
- Better protection from side collision damage – 4m versus 2.5 m for Membrane Ships and 3.25m for Spherical Tank Ships
- Better protection from bottom damage – 4m versus 2.75 m for Membrane Ships
- Excellent Boil of Gas performance
- Internal Connectivity provides Natural Conductive Cool-Down Pathways – low pre-loading spray down time with low spray-in mass flow-rate

Further, the CDTS can be constructed using typical shipyard rolling and forming equipment. While the CDTS offers benefits just from the tank design, construction and installation in the ship, it also offers unique benefits in the design of the ship including significant reduction in length, providing significant reduction in longitudinal bending moment, which results in construction benefits in reduced steel weight and less work content for the same capacity ship compared

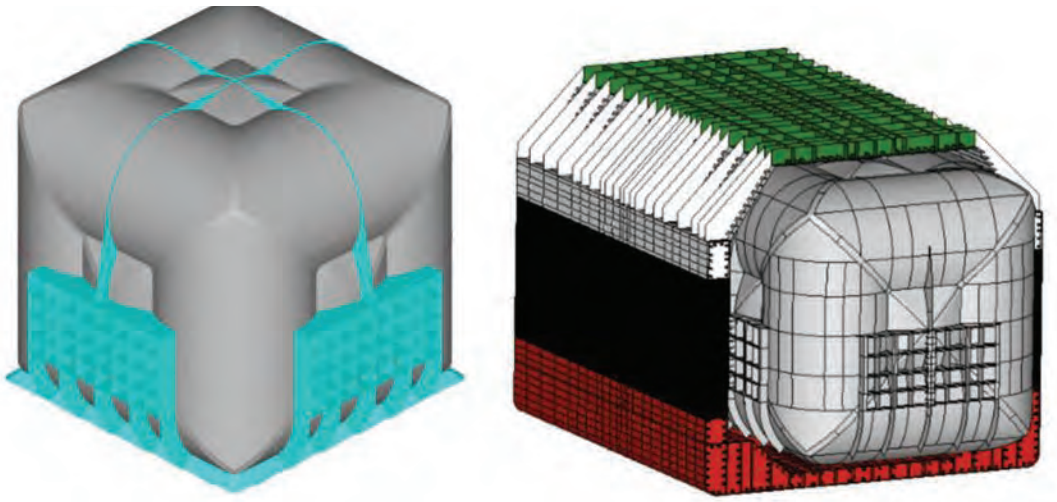


Figure 2:
Isometric Views of CDTS

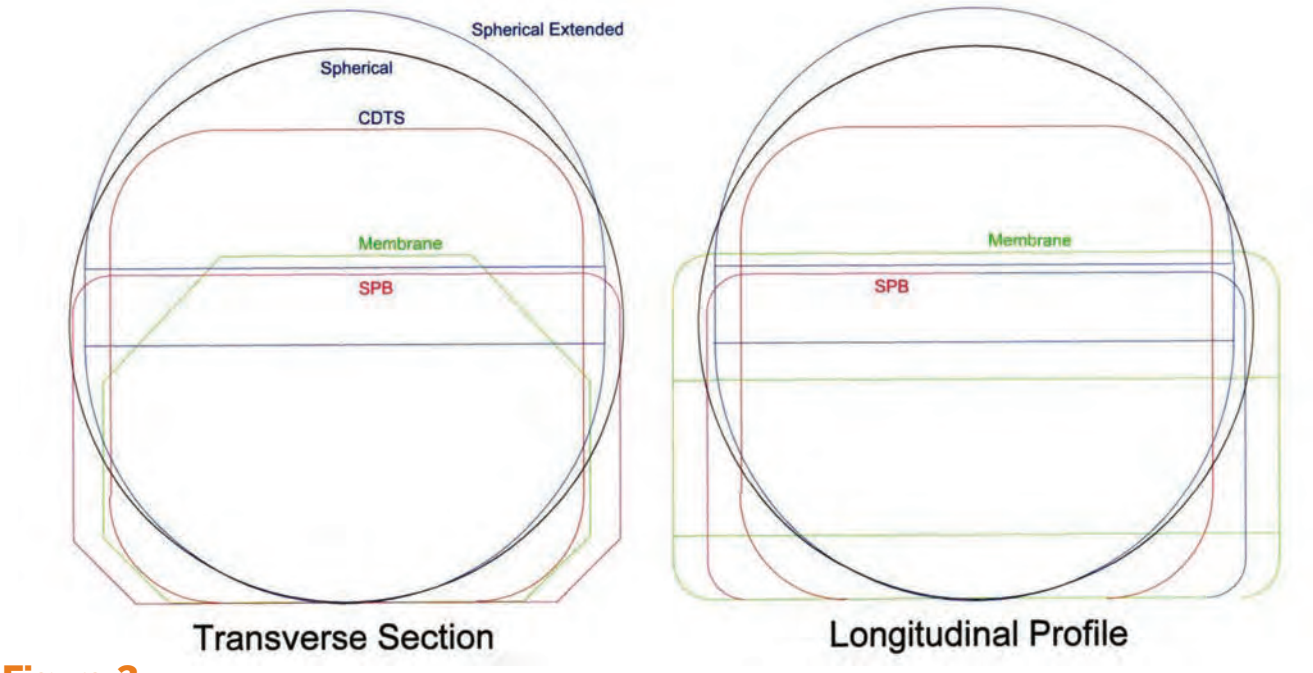


Figure 3:
Comparison of Outlines for the Five Containment Systems for Equal Volume

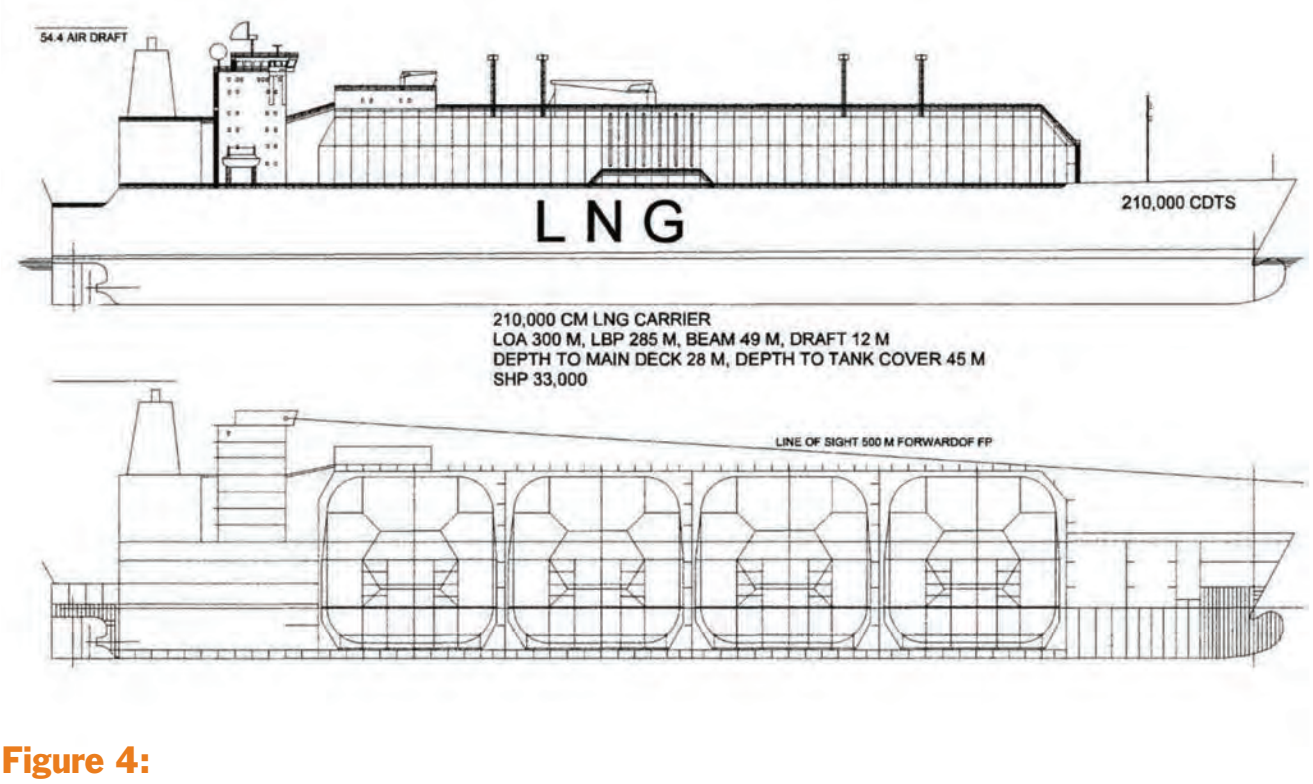


Figure 4:
CDTS 210,000 m3 Concept Design for 300 m LOA and 49 m Beam Restriction

with any other system. Figure 2 gives isometric views of the CDTS and its installation in a ship.

The comparison of tank outlines are shown in Figure 3 for the spherical, spherical extended, membrane, SPB and CDTS tanks of equal volume. Table I shows the capacity benefit of the CDTS over the other containment systems for the same Length Overall (LOA) of 300 m and within the new Panama Canal beam restriction of 49 m. The spherical extended tank would enable the LNG Capacity to increase to 180,000 m3 within the 300 m LOA and 49 m Beam restrictions. Note that the pure spherical tank LNG Carrier would have a beam of 52 m and that the largest total spherical LNG Carrier capacity for the new Panama Canal would be 155,000 m3 compared to the CDTS LNG Capacity of 210,000 m3.

Figure 4 shows a conceptual design for a 210,000 m3 LNG Carrier with the CDTS

Altair ProductDesign provided the structural design expertise and technology that was used to complete the development of the CDTS design, and enabled the Approval-In-Principle (AIP) from ABS.

Altair's HyperWorks Suite of software was used to ideate design solutions, and subsequently to analyze and optimize the CDTS tank. Altair's HyperWorks suite is a computer-aided engineering (CAE) simulation software platform that allows businesses to create superior, market-leading products efficiently and cost effectively. The HyperWorks platform offers modeling, visualization as well as ideation, analysis & optimization solutions.

Although the constituent parts, of the CDTS comprise of simple shapes, the overall geometry is structurally complex with significant design improvement opportunities. Starting from 2005, the HyperWorks suite of advanced structural design, analysis and optimization tools were used to improve the design to meet the structural objectives which could not otherwise be attained by the proposed original design. An earlier paper RAMOO, 2009 describes the finite element analysis and optimization of the CDTS as applied for LNG applications. The design tools (software) used included:

- Optimization Techniques: Topology Optimization, Free-Size Optimization, Size/Gage Optimization
- RADIOSS Non Linear Transient Dynamic Analyses for ALE & SPH analyses to predict sloshing loads
- AcuSolve CFD Analyses for Fluid & Heat Transfer analyses
- HyperStudy (MDO) was used to develop the thermal management strategy such as position, locations, and volume of LNG spray-in.

TABLE I: Design Comparisons for Restricted Length & Draft of the Four Containment Systems

	Spherical	Membrane	IHI SPB	CDTS
LBP (m)	285	285	285	285
BEAM (m)	49	47	49.5	49
DEPTH (m)	25.9	27.4	32	28
DRAFT (m)	12	12	12	12
DISPLACEMENT (t)	123,090	126,758	135,468	148,881
LIGHTSHIP (t)	36,774	34,610	41,590	44,895
DEADWEIGHT (t)	86,316	92,148	93,878	103,996
DEADWEIGHT COEFFICIENT	0.701	0.727	0.693	0.699
CARGO CAPACITY (m^3)	155,000	170,000	170,000	210,000
RELATIVE CAPACITY TO MEMBRANE	86	100	100	124
RELATIVE CAPACITY TO SPHERICAL	100	116	119	135
RELATIVE CAPACITY TO SPB	86	100	100	128
SHP (KW)	30,418	30,771	34,206	32,896
SHP/Capacity	0.196	0.181	0.201	0.157

BY REGU RAMOO

BY THOMAS LAMB

The Authors

Thomas Lamb retired from the University of Michigan in 2006. He has over 50 years' experience in ship design, ship production and productivity, research and education.

Regu Ramoo, VP of Engineering, has 30 years of experience in using advanced CAE methods in structural design and engineering of land vehicles and marine structures.

Texas A&M Engineering Extension Service (TEEX), Emergency Services Training Institute

Marine Firefighting: Train to Survive

Fire onboard a boat or ship is generally considered the most dangerous situation on the water. While advances in technology have helped to mitigate risk, consistently investing to upgrade a crew's firefighting training, skills and equipment is the best means to keep crew, ship and cargo safe if disaster strikes.

By Greg Trauthwein

While innovative new fire-resistant materials and advanced fire suppression equipment onboard ships and boats has helped to improve fire security, technology alone is not a one-stop security blanket in the quest to keep crew and ship free from harm in the case of a fire.

"Ship operators are once again placing a huge importance on fire fighting training, an over-reliance on fixed suppression systems can be dangerous and create a sense of false security," said Capt. Ted Morley, Master Unlimited, AFNI, Chief Operations Officer, Maritime Professional Training (MPT). "Having well trained first responders is vital as they can be pro-active and adaptable to each emergency."

Firefighting training is a particular point of emphasis at MPT, and the school has invested regularly and often to ensure that it has the tools and teaches the technique that are necessary to keep modern vessels in ship shape. MPT established the Marine Tech Fire Academy and uses that facility to run more than 60 Fire Fighting classes a year, including STCW Basic Fire, Ad-

Practice makes Perfect: While there is no perfect in firefighting, continuous training in a controlled situation (left & center) raises the odds of safety and success when faced with a real-world fire (right).

Left & Center image: **Texas A&M Engineering Extension Service (TEEX), Emergency Services Training Institute.** Image on right: **T&T Salvage**

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"Incorporating that technology and topics such as advanced methods of ventilation into fire training classes is equally vital. **The methods and techniques that were taught when I first entered the industry seem almost prehistoric** when compared to what is available today."

Capt. Ted Morley, Chief Operations Officer, Maritime Professional Training (MPT)

vanced Fire, Refresher and Renewal for both, specialized courses for clients and 1405 for Land Based Fire Fighters. "We also spend more than 30 weeks a year onboard our clients vessels training while they are underway," said Capt. Morley. "MPT is also involved in writing onboard and company fire fighting procedures and doctrine, as well as shoreside resource response guidelines. That translates to almost 100 fire fighting courses a year."

Firefighting Technology

While technique and training is the foundation for any solid onboard emergency response, technology both in fire-resistant materials found on modern ships as well as the firefighting apparatus itself continues to grow in sophistication and performance yearly.

"Throughout my career, from fighting marina and boat fires while in charge of a Coast Guard response boat in the mid-1980s to routinely managing commercial vessel firefighting operations today, I have attended a number of firefighting courses over the years; tactical training has evolved based on lessons learned from actual fighting shipboard fires," said Jim Elliott, Vice President, T&T Salvage. "Technology – such as infrared, advances in firefighting systems, and improved firefighting extinguishing agents – have enhanced shipboard firefighting operations further. Advances in personal protective equipment and breathing apparatus/cylinder capacity have also gone a long way in improving safety." T&T Salvage's investment in technology includes the latest in infrared technology: "We even have an infrared system on our Unmanned Aerial System (UAS) to respond to vessel fires," said Elliott.

Morely said that technology has increased in importance, particularly in light of the move toward larger ships and smaller crews. "Technology, such as thermal imaging units and advances in suppression equipment, has become a vital component of fire fighting," said Capt. Morely. "Incorporating that technology and topics such as advanced methods of ventilation into fire training classes is equally vital. The methods and techniques that were taught when I first entered the industry seem almost prehistoric when compared to what is available today. That is the primary reason refresher training is so important."

A Growing Emphasis

Mitigating risk in the maritime sector is a necessity. The increasingly litigious nature of the world at large levies stiff penalties for anyone who puts hazardous materials into the sea, and increasingly strict regulations from international and national authorities mean that vessel owners and operators must invest in marine firefighting training and technology to ensure compliance.

"The recent implementation of the

U.S. Coast Guard's Salvage and Marine Firefighting regulations is the primary driver in increasing the importance of marine firefighting training in the United States," said Elliott. "When a vessel is at a pier, these regulations require a marine firefighting remote assessment within an hour of notification, an on-site assessment within two hours and trained firefighting teams and external firefighting systems – such as a tug or portable fire pump – on-scene within four hours. For "nearshore" operations, within 12 miles of shore, a firefighting team should be on-scene within 8 hours and, for "offshore" operations, out to fifty miles, a firefighting team should be on-scene within 12 hours. To achieve these response time standards, marine salvors must continuously train and exercise their fire teams."

"While simulation plays an ever increasing role in the training offered by TEEX, **our marine firefighting courses have retained a heavy reliance on hands-on live fire training."**

Kirk Richardson, Texas A&M Engineering Extension Service (TEEX), Emergency Services Training Institute.

Additionally, there is a growing recognition of the hazards of shipboard firefighting and the need to provide advanced training to land-based firefighters, Elliott said. The unique command and control requirements for marine firefighting operations, combined with the number of agencies and stakeholders involved, require specialized Incident Command System training for all parties, including Federal, State, local, municipal and industry responders.

"Ship operators are seeing the importance of having well trained, thinking, doing fire fighters available onboard to respond," said Capt. Morely. "While regulations have improved their safety, fire is still the number one threat these vessels face. The IMO recognizes that and has worked with member nations to improve the training while at the same time industry is working to improve their policies and procedures, many companies go well beyond the regulatory requirements for fire training."

In addition, the complexity of ships and offshore structures makes updated firefighting skills desirable for all involved.

"Live fire and emergency response training for the maritime industry continues to evolve," said Kirk Richardson, Texas A&M Engineering Extension Service (TEEX), Emergency Services Training Institute. "As vessels, terminals, and offshore facilities become more complex, personnel must be prepared to adequately deal with any type of emergency. Incidents vary from fire

"Technology – such as infrared, advances in firefighting systems, and improved firefighting extinguishing agents – have enhanced shipboard firefighting operations further. Advances in personal protective equipment and breathing apparatus/cylinder capacity have also gone a long way in improving safety."

Jim Elliott, Vice President, T&T Salvage

fighting, confined space rescue, water rescue, hazardous materials, and others. In addition, personnel must be adapt at managing the incident, using the appropriate Incident Command structure."

Investing for the Future

As with any other sector of any other industrial training, a commitment to continual investment in facilities, technology and people is the ante to stay in the marine firefighting training game. New equipment and modern facilities are the rule.

"The emergency response training centers, located in College Station and Galveston, Texas represent more than 330 acres of hand-on training projects and support area, and currently the two facilities are valued in excess of $475million," said Richardson.

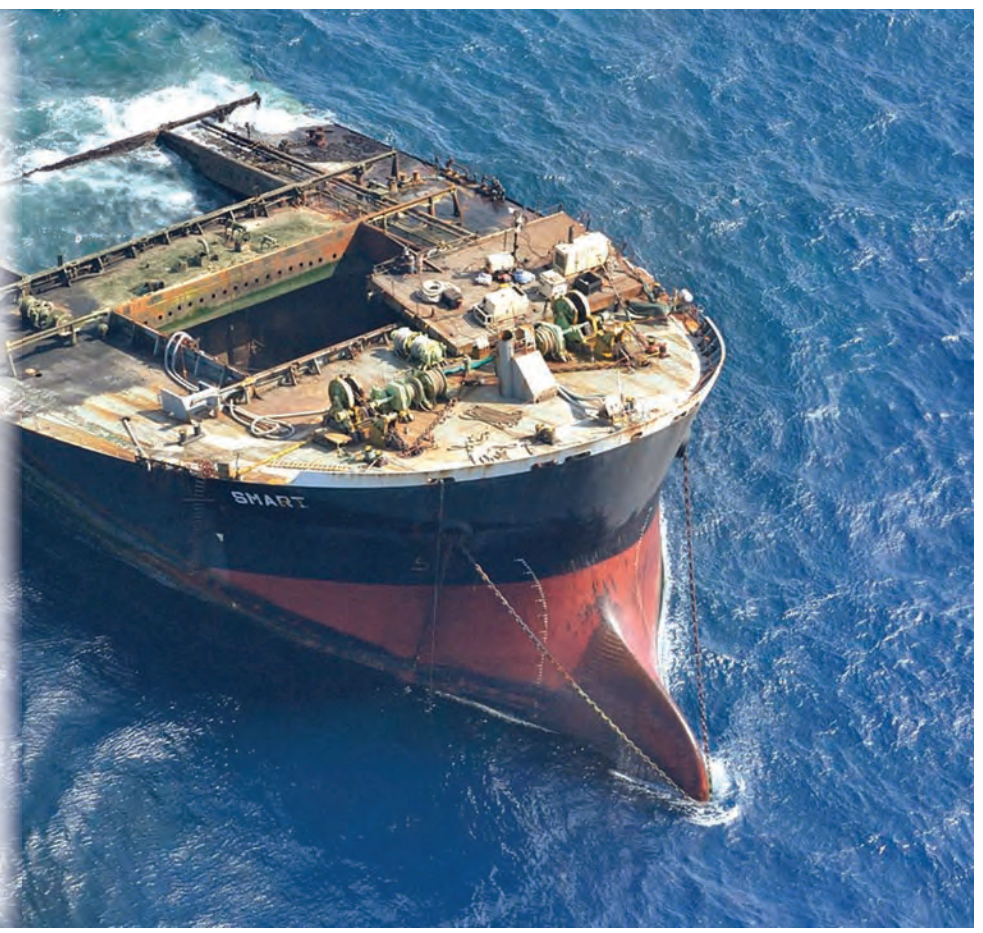
He said that the Marine Training project area in College Station has recently had the Engine Room prop completely rebuilt (including the replacement of the diesel propulsion engine, generator sets, air compressors, boiler front, electrical switchgear and related fuel, hydraulic, and support equipment.) In addition, the vessel superstructure has been upgraded to include new interior compartments, which are used for fire fighting and search and rescue operations. The vessel deck is being upgraded with new flammable liquid and LPG propane fueled props.

In staying current with maritime trends, TEEX operates an LNG live-fueled training project at Brayton Field,

Salvage Report

MV Smart

Titan Salvage, now a part of Ardent, completed a complex removal of the wreck of the cape-size MV Smart coal carrier in South Africa. The wreck itself was a challenge, made worse by weather conditions that prevail on the South African coast. The removal of the vessel, which was entered in North P&I Club by owner Alpha Marine, was accomplished on time and on budget due to collaboration with the South African Maritime Safety Authority (SAMSA), Titan and North. On August 19, 2013, the 151,279 DWT bulk carrier ran onto a sand bar shortly after setting sail from Richards Bay coal terminal in a 7m Indian Ocean swell. It was carrying 147,650 tons of coal, 1,769 tons of fuel oil and 129 tons of diesel. The crew was rescued and, a days later the 273 m long ship split into three parts. Smit Salvage, part of Boskalis Westminster, together with Smit Amandla Marine and South African salvor Subtech Group removed the fuel first, achieved without spillage, followed by 10,000 tons of coal slurry in the ruptured no. 9 hold. They then refloated the separated stern section and scuttled it offshore. Titan Salvage won the tendering process to perform the lightening, refloating and scuttling of the partially buried bow section. The contract was unusual because of the extent to which Titan assumed the operational risks associated with the project, so minimizing the chances of a cost overrun. The bow section was refloated and scuttled in December 2014 and the remaining mid-section cut down and buried at the beginning of September 2015, with rehabilitation of the seabed completed immediately thereafter.



which uses live LNG and allows students to observe the safe handling protocols used for an LNG leak and/or fire scenario. “LNG shipping companies and terminals worldwide participate in the training provided, using this prop,” said Richardson

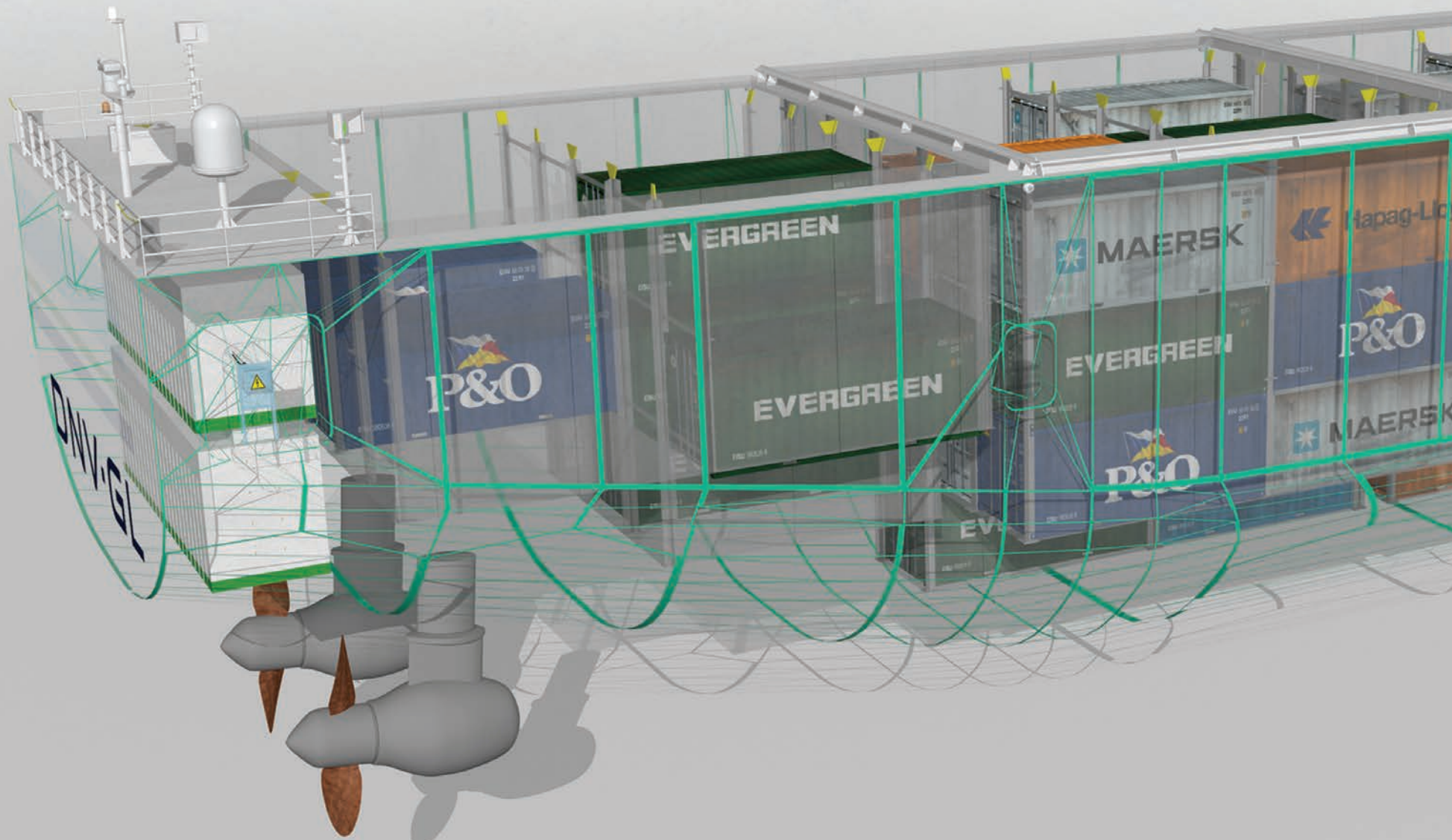
MPT is in the midst of a vast expansion, and over the last two years MPT has invested more than $500,000 in its Fire Fighting programs, including additional new scbas, new turnout gear, new compressor and cascade system for filling, new technology for the classrooms, and a new Pierce fire engine used in our 1405 course as well as in our IMO programs.

‘Investment’ also means taking care of the treasure trove of gear already in house, as MPT’s Capt. Morely explains. “MPT currently has more than 80 Survivair 4500 psi scba’s equipped with carbon fiber bottles, more than 200 sets of turnout gear, and more than 2000 ft. of fire hose,” just to name a few. “Every student is sized and issued gear for the duration of their training that is theirs alone, and that gear is all cleaned and inspected before being issued to the next class. It’s something simple but maintaining the gear is not only good for the gear, it’s good for the students wearing it.”

Investing in new equipment and training is the mantra, too, at T&T: “T&T Salvage has invested heavily in not only building arguably the nation’s largest deployable marine firefighting capability but also in training our own personnel and contractors,” said Elliott. “T&T marine firefighters attend basic and advanced firefighting courses plus supplemental courses in LNG Firefighting and hands-on equipment deployment and operations training. Personnel also attend infrared and UAS infrared certification courses. In addition to this comprehensive marine firefighting training regimen, all personnel complete Hazardous Waste Operations (HAZWOPER) certification courses; respirator protection/SCBA courses; First Aid/CPR; OSHA rigging and signalperson courses; and myriad other marine related courses to ensure consistent, safe and effective operations. Of significance, all of this training is routinely proven in actual operations and exercised in drills.”

Fire Fighting Simulator

VSTEP launched RescueSim, its Advanced Fire Fighting Simulator (AFF) for shipboard incidents, a simulator designed to enable users to experience and train any incident on board a ship first-hand. It is built to fully support and comply to the STCW Advanced Fire Fighting courses. RescueSim includes functionality, environments, emergency equipment and objects that are common to specific types of shipboard incidents and essential for STCW compliant AFF Training. A typical setup includes an instructor station and training stations for the on-scene commander and fire team leaders. An instructor is in full control during the training and can influence the scenario for the participants in the simulator during the exercise. Instructors can also build any on board incident scenario using the instructor toolbox. RescueSim AFF simulator can be linked with VSTEP’s NAUTIS ship bridge simulators for additional incident command training of ship bridge personnel.



Current Status & Future Prospects for

Unmanned V

There is a global boom in the development of unmanned systems, from below the ocean's surface to high in the sky to the world's roads. Add to this list the maritime industry, on both military and civilian vessels. Maritime Reporter & Engineering News examines in depth recent developments taking place in Europe to discover general thoughts and technical trends driving the future of unmanned shipping.

By Henrik Segercrantz

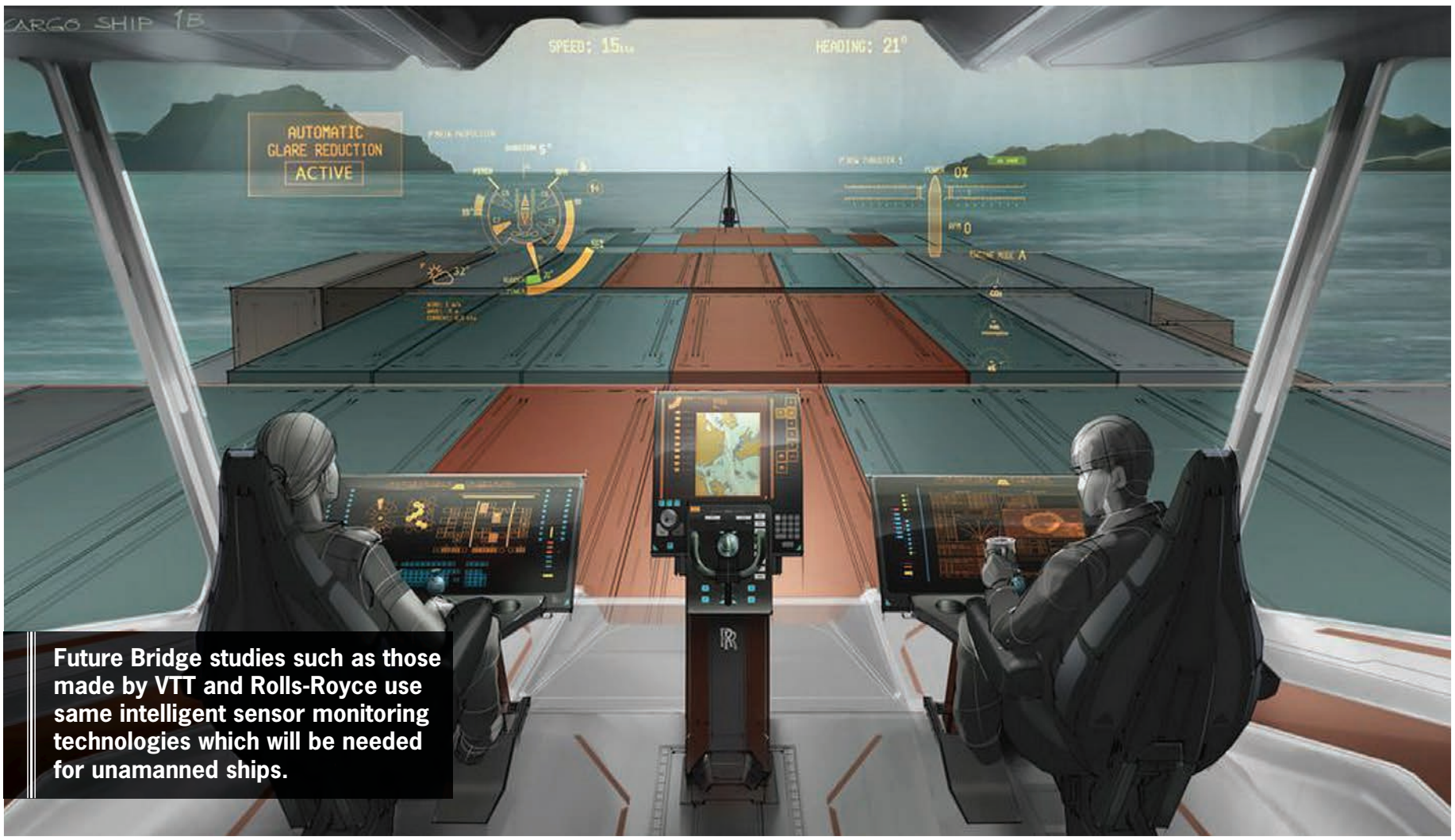
Vessels

Norway's unmanned 100 TEU coastal marine transportation system ReVolt is to be powered by a 3,000kWh battery to provide a range of 100 nautical miles. With no crew onboard DNV GL has estimated a total saving of up to $34 million over its estimated 30 years time in service.

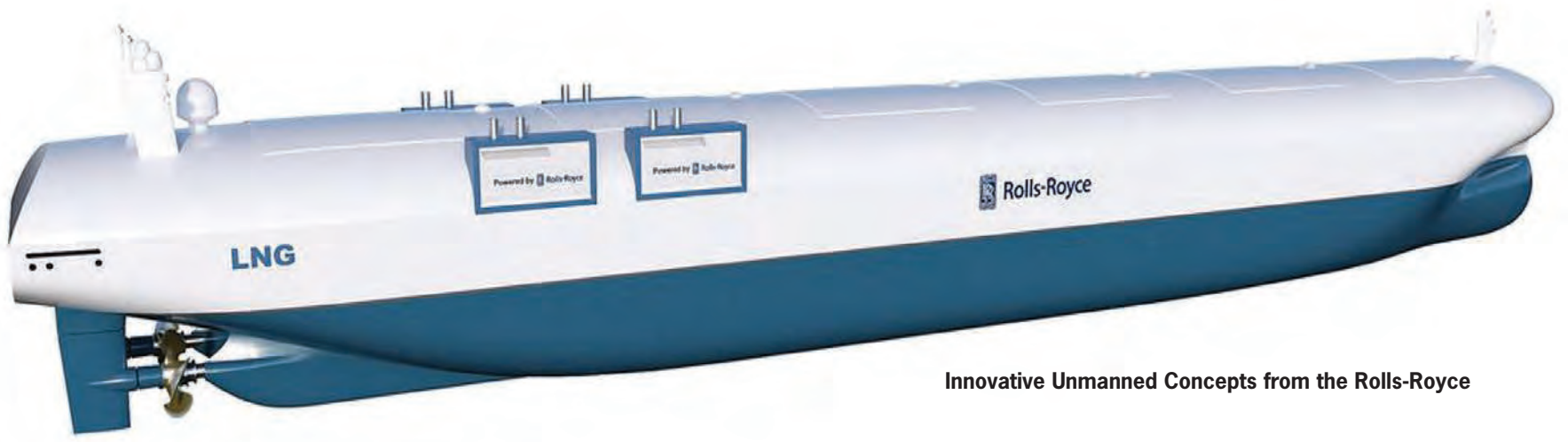
The joint European Research Project MUNIN was finalized in August 2015, a project financed by the EU and initiated by German research institute Fraunhofer Center for Maritime Logistics and Services. Participating partners in the three year project were research institutes, universities and private companies from in eight European countries including Germany, Norway, Sweden, Iceland and Ireland. The concept of autonomous shipping was analyzed both theoretically and through developing practical solutions and technical systems for autonomous operation of a ship. There were many matters under a close microscope, from needed developments in ship-to-shore communications to fully enable autonomous operations, including legal aspects, risks and economics of such systems. The main practical focus was directed at the development of the autonomous control systems aboard a bulk carrier remotely controlled from a shore control center, simulation based and integrating the various functions needed.

A 'Shore Control Center' was designed capable of supervising vessels worldwide using electronic nautical charts. Just as within the airline industry, critical situations are monitored both by the onshore operator in charge of that particular sea segment, and by software, both onboard and

Wärtsilä has developed augmented reality goggles which makes it possible to provide the onboard service person with remote expert advice regardless of the ship's location.



Future Bridge studies such as those made by VTT and Rolls-Royce use same intelligent sensor monitoring technologies which will be needed for unamanned ships.



Innovative Unmanned Concepts from the Rolls-Royce

ashore. The system includes a built-in possibility for outside intervention. The relating 'Unmanned Bridge' development included an 'Automated Lookout System' capable of conducting evasive actions autonomously and according to international regulations from preventing collisions at sea. An 'Advanced sensor system' for this purpose was also developed and tested. A system had been developed to recognize small objects on the water surface and transmits warnings accordingly. A weather routing system providing an efficient and safe journey, common on many ships already today, is a natural part of a future unmanned vessel. Also an 'Autonomous Engine Room' was developed with relevant engine functions monitored remotely on multiple monitors. Remote condition monitoring was enabled to predict eventual engine service needs at an early stage, enabling service to be done when the vessel is in port.

With relatively low $3.5 million budget, the MUNIN project achieved the realization of a virtual system which can safely analyze and test unmanned ship operation in a maritime environment where there are also conventional vessels in operation, a likely future scenario. A virtual ocean environment is achieved utilizing also the sea traffic management results from the MONALISA, another EU funded research project. Another outcome from the MUNIN project, presented at Nor-Shipping in Oslo in June by project manager Hans-Christoph Burmeister, is the idea of a similar classification for an unattended 'Watch-free bridge' arrangement, to be applied during deep sea voyages, comparable to that of the unattended machinery spaces, which already exists. This would allow for flex-time work by only one or two nautical officers onboard with the shore station taking over the watch periodically. The new SOLAS regulations anticipated in year 2024 should address this.

Global Projects

MUNIN is just one example of an unmanned shipping development project, and there are a number of similar projects initiated on national levels and by maritime companies independently or through industry collaborations.

Norway is looking into an unmanned transportation system with a small size container vessel to handle transportation along its long coastline. This project, called ReVolt, is based on a 100 TEU battery powered vessel operating at a speed of six knots. In Finland a number of companies, including Inmarsat, four universities and the VTT Technical Research Centre have initiated the AAWA Advanced Autonomous Waterborne Application research project, the goal of which is to develop commercially viable remote controlled vessels for commercial use and related technology. The ambitious project is to last until year 2017, and has Finnish Tekes funding. VTT is also coordinating a project on future bridge concepts for tugs, cargo vessels and platform support vessels using same intelligence technologies as will be needed in unmanned ships. In addition to joint projects companies such Wärtsilä, ABB and Rolls-Royce are all involved also with their own developments of technologies which can, in the end, be utilized also in future unmanned ship operations.

Practical Technical Aspects

At 'The Autonomous Ship' panel discussion arranged at Nor-Shipping in June, many aspects of unmanned ship operations were dealt with by Martin Kits van Heyningen, President and CEO of KVH Industries, Oskar Levander, VP for innovation engineering and technology at Rolls-Royce Marine, and by Ronald Spithout, President, Inmarsat Maritime, among others. In overview it was generally agreed that ships need to be much more reliable in the future, allowing for predictive maintenance based on detailed monitoring.

When considering unmanned shipping, there obviously is no need for a deck house meaning there will be more space for cargo. Many systems onboard today will become redundant when there is no people onboard. But people will still be needed, both for ship maintenance in ports and for manning the ship control stations ashore. Ship systems will become more standardized, as is the case in the airline industry.

Speakers at the unmanned events of Nor-Shipping pointed out that unmanned shipping will first be seen on smaller local ships, requiring only one Flag state authority to provide permission. Norwegian offshore supply vessels and road ferries were among the mentioned potential early autonomous ship applications.

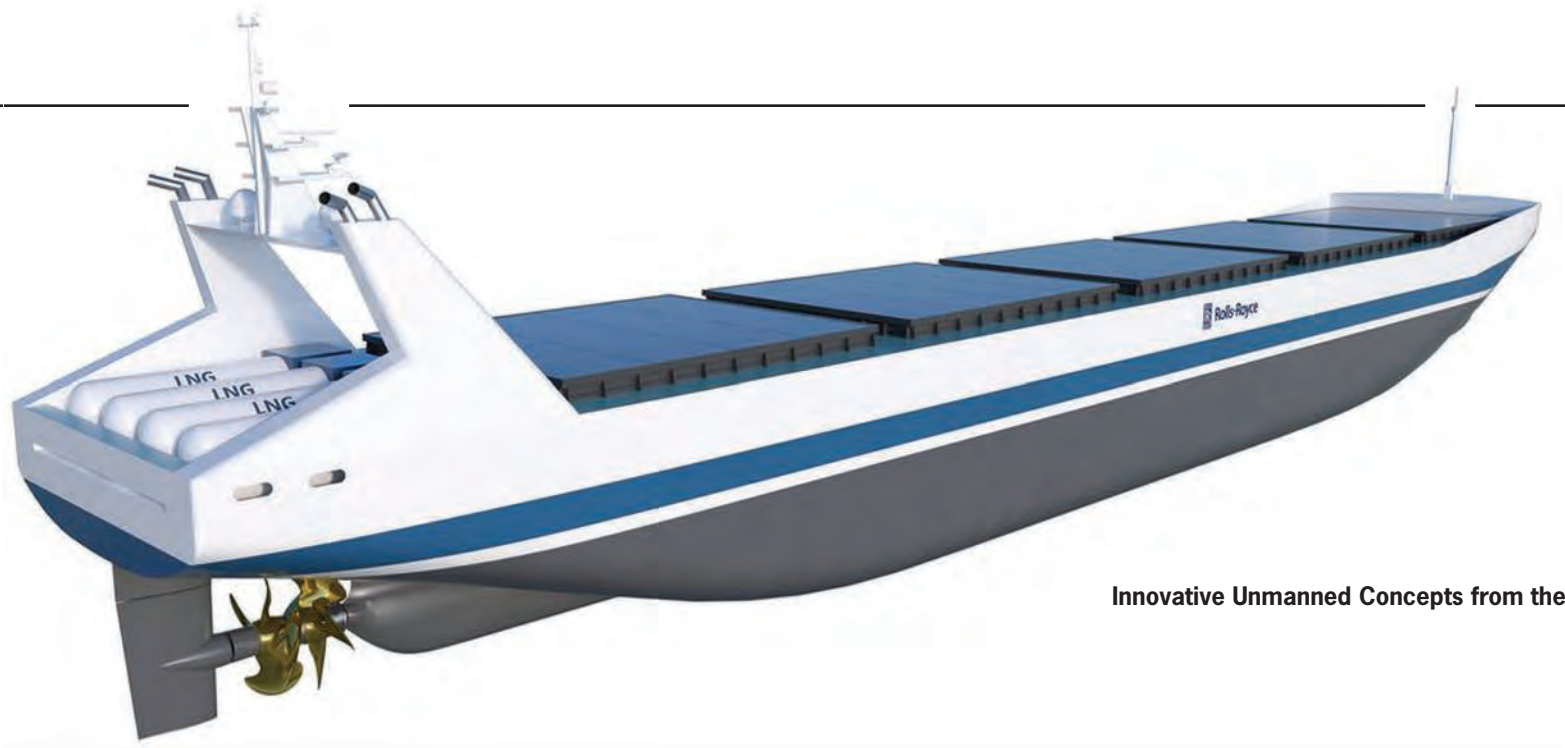
Technologies needed would first be applied on not completely unmanned cargo ships, moving some functions ashore, using for example remote support with augmented reality helmets, making any person onboard capable of doing complex and advanced tasks. This approach has in fact already been tested in practice by

Unmanned Mine Hunter

ASV was enlisted as part of the Thales-BAE consortium to develop and deliver an operational unmanned mine countermeasures system, a program which seeks to offer a low risk, robust and reliable solution into the UK/French Maritime Mine Countermeasures (MMCM) requirement.

The USV capability to be provided by ASV is proven in action through the Halcyon multi-role USV. "Developed from the Halcyon design, the more complex and capable mark II offers greater efficiency, stability and an increased payload capacity" said Dan Hook, Managing Director, ASV.

The program output will be two identical systems for evaluation against several predefined operational scenarios. Following an initial de-risking study, detail design has now begun. This first official stage comprising a design study prior to system build is scheduled to run until the end of 2016. This will also involve working with the end user to define the requirement and place consideration on other external factors. Stages 2 and 3 will include the system manufacture and demonstrations.



Innovative Unmanned Concepts from the Rolls-Royce

Wärtsilä, in the development of its field service working methods. The company has developed augmented reality goggles, suitable for use onboard ships and offshore rigs where GSM nor Wifi is suitable. The goggles give the user the capability to perform tasks onboard with the system expert providing advice remotely even from the other side of the world.

The obstacles of man-made regulations affecting unmanned shipping operations have been looked into by many. Levander noted that a global effort with international stakeholders coming together and redefine the international regulations and rules, is required. This would naturally come through the next renewal of the SOLAS rules. Dr Vincent J G Power at University College Cork predicted, within the MUNIN project, that an entirely new legal regime will not be needed for unmanned ships, and colleague Dr. Bénédicte Sage-Fuller unofficially predicted that there would be no significant increase in insurance premiums for unmanned ships.

A key technology for unmanned shipping is flawless high-capacity and high-speed satellite communication, which also has to be secure. According to Ronald Spithout, President, Inmarsat Maritime, a cluster of satellite cells for communications is being developed, providing security and redundancy. “A new network is being launched near the end of the year. We will see a completely new way of dealing with traffic signals,” he said, assuring the audience that entirely new technologies currently being developed will be able to meet the requirements of shore communication for unmanned shipping.

Cyber Security

Cyber security is an increasing concern for shipping, and will be one crucial element in unmanned ship operations. Tor E. Svensen CEO of DNV GL Maritime pointed this out at the presentations made by the classification company. He said the costs are coming down for high-speed ship to shore data communication and has given the opportunity to combine different types of data, and to start optimizing the ship and voyage in a quite sophisticated way. This will offer the opportunity for malicious attacks, and attempts to actually control or damage ships or property. The area of cyber security will see a lot more attention in the years to come, addressed in the rules and procedures. DNV GL has been working on formulating procedures for software development and integration, and on testing of control systems and addressing vulnerability to external threat, and has acquired, and is developing further, technologies for hardware-in-the-loop testing methods to assess control systems and their robustness. DNV GL has also been working with the US Coast Guard on building a regulatory framework and in implementing maritime cyber security standards.

We Will see Autonomous Shipping

As with autonomoutly operated cars, there does not seem to be any doubt regarding the future of autonomous shipping. KVH Industries’ Martin Kits van Heyningen noted, talking about the autonomous developments in other sectors - “the SpaceX will soon be flying space station crews autonomously, so maybe the autonomous ship is not that far fetched after all.” At the concluding seminar of MUNIN, arranged in August in Hamburg Germany, project manager Hans-Christoph Burmeister from Fraunhofer CML said “The question is not whether, but when autonomous shipping will become reality.” Wolfgang Franzelius, Head of DNV GL’s Safety Technologies, Maritime Technology and R&D, said “The autonomous ship is feasible and useful, and as far as its operation is safe and secure, it will be accepted and realized.” “Why are we going this way?” asks Oskar Levander from Rolls-Royce. “It is all about making ships more efficient and safe. That is the driver.”

The Head of Class

Christopher J. Wiernicki

Chairman, President & CEO, American Bureau of Shipping; Chairman IACS

The global maritime industry faces myriad challenges in the ongoing quest to run safe, profitable operations in an oftentimes tumultuous environment. More than ever vessel owners are faced with daunting regulatory and technical challenges, and the world's leading classification societies remain the foundation upon which successful marine operations are built. Last month we visited with Christopher J. Wiernicki, the head of ABS and the newly elected head of the International Association of Classification Societies (IACS), for insight and analysis.

By Greg Trauthwein

I'm sure when you assumed the mantle of leadership at ABS, you had goals. Can you share with our readers your goals from the outset, the progress that has been made in achieving them, and how they have changed during your tenure at the top?

I laid out a very straightforward set of goals from my first day in this role:

1. Align the organization around the seven core values that represent the Spirit of ABS and support our mission. These values are safety, teamwork, innovation, integrity, quality, reliability and a focus on people.

2. Establish ABS as the technology leader driving Class of the Future.

3. Be the most efficient provider of quality and responsive class services.

4. Embrace a workplace safety leadership mindset focused on employee safety behavior.

5. Position ABS for the future to compete on value by making strategic investments in people, systems and technology.

As with any strategic agenda change comes with time but we are making tangible progress in achieving these goals so far. I see our global workforce aligned around our objectives and responsive to the needs of the industry.

We are aggressive in our pursuit of technology leadership.

Class of the Future continues to evolve and we know advancing predictive, data-driven analytics is essential to this. We have invested in R&D initiatives that will further these goals. Through our robust technology program in Houston and in five additional technology research centers around the globe, we are funding some of the most innovative research in the industry. We are moving forward with ground breaking nanotechnology research in icephobic surfaces for improved Arctic safety. This year ABS is advancing more than 150 research projects. Our stature as the provider of class services speaks for itself.

In 2014 we added more than 15m gt to the ABS classed fleet from 2013. This was due to a combination of new vessel deliveries and Transfer of Class Agreements which alone brought in a net total of 5m gt to the ABS fleet. In total, the ABS fleet grew by more than seven percent year-on-year. In the challenging economy of 2015 we continue to hold strong and continue to maintain the leading new order market share amongst our competitors. A workplace safety mindset is in place as we see positive movement in key indicators including a reduction in lost time incidents. We closed 2014 with 2 LTIs and remain focused on hitting our target of zero this year.

We continue offering technology to improve safety through software quality management. This year ABS achieved an industry first when we rolled out the important ISQM notation and the first drillship was delivered with this notation. No other classification society has classed drilling equipment and essential marine equipment with a software notation addressing software quality during construction.

We are strategically investing and developing next generation work flow platforms that will enable our people to unleash their creativity and knowledge and significantly improve efficiency and response time. Bringing new tools to our engineers and surveyors and optimizing the way they work.

Positioning ourselves for sustainable success remains a priority. We've expanded our training and development offering. Earlier this year we launched "Blue Print for Your Future" a program for developing our talent in areas ranging from technical expertise to team management. We continue to build on our strengths to ensure that we retain our competitive edge.

Big data is the substance that ties together regulations of the future, technology advancements, and Class of the future.

I believe Big Data will enable enhanced decision-making, insightful discoveries and process optimization that will create a safer and more efficient industry.

Defining IACS role in cyber safety issues is a priority for me. The future of class and the next generation of maritime regulations are going to be driven by data to a degree that has never been seen. With more data comes the risk of data security and the need for consistent verification and validation of systems and subsystems, periodic cyber safety risk assessments, and a consistent approach to capturing lessons learned. **Drawing on best practices from other industries, IACS will develop unified requirements for the design, manufacture, installation, testing, and commissioning of such systems.**

While the marine industry is no stranger to strong cyclical pulls, many sectors continue to struggle from the financial crisis of 2008 and now the precipitous drop in oil prices over the past 16 months. How do these strong cycles affect the role and/or the activity of class?

ABS has been a mission-driven organization for more than 150 years, so we have seen our share of shipping cycles. What is important to remember is that irrespective of market conditions, our focus is on our mission.

That is an uncompromising constant, and it is what dictates everything we do. We understand also that what will sustain us is continued investment in our people and the systems the industry will require.

Cycles are temporary but our vision is long term—develop our people and the bright minds of the future, build the "state-of-the-art" systems and solutions the industry requires and nurture the future with a commitment to R&D.

I have tried to regulate the amount of pressure on our organization to achieve this balanced approach and allow us to see beyond the industry cycles. We focus on identifying practical solutions that allow safe operations to be maintained and that help our clients comply with the rapidly shifting regulatory environment in which we find ourselves.

Today ABS is overseeing more than 150 maritime and offshore technology projects that will help identify, test, and bring to reality innovative concepts that impact safety, asset operations, and environmental responsibility.

These include technologies that are already coming into the mainstream such as environmental and operational efficiency applications and the use of alternative fuels such as LNG. The next generation of maritime technologies, including ice-phobic coatings and tools to enhance cyber safety and systems integrity, are in development at ABS.

How has class adapted to meet growing challenges to ship owners?

Owners are facing multiple challenges today that span an unbelievably broad spectrum – from the economic landscape in China and a global energy map redrawn by U.S. shale production to the global economic slowdown and the rapid development of new and untested technologies.

In the face of this uncertainty, there is also a need to meet an increasingly complicated and accelerated regulatory timeline and to improve operational efficiency. For owners to compete, they need support in managing ever-increasing technical risk.

Additionally, as regulations around emissions such as NOx, SOx and CO2 are set to take effect and the question of Ballast Water pervades the marine industry, there is a definite need for guidance.

Successfully navigating this landscape is going to require a new generation of technical leadership from Class with an appreciation and heightened awareness of technical risk.

Greater input into techno-economic decision making without compromising safety will be important. ABS has invested in the developing the technology to help owners in managing this risk and support them in making choices regarding their assets with all the information in their hands. Techno-economic modeling goes beyond technical evaluation of energy-saving measures by providing owners with a fuller understanding of the positive impact of embracing the use of environmental and energy-saving devices.

I also see an emphasis on risk-based and predictive-based class roles that can keep up with the fast-paced technological development.

Recognizing the importance of data analytics and cyber safety as the foundation for the next generation of safety systems is key. Big data is the substance that ties together regulations of the future, technology advancements, and Class of the future. I believe Big Data will enable enhanced decision-making, insightful discoveries and process optimization that will create a safer and more efficient industry.

Equally important is providing owners with the tools and knowledge to make the necessary choices for the long term. Today's regulatory environment is rapidly shifting and the cost of compliance is putting pressure on owners as never before—impacting future capex and long term sustainability.

Class has had to become far more proactive in recent years. At ABS, this means taking a holistic approach to the role of defining safety, operational efficiency and compliance with environmental regulations. This is essential to maintaining the confidence of industry and to ensuring that the role of Class remains in touch with rapidly changing industry needs. As the marine and oil and gas industries evolve, so do the expectations for Class services.

While, for example, bridge technology is better than ever and our ability to track and monitor assets at sea is without compare historically, ships continue to collide; while technology and accrued knowledge to build ships stronger, ships continue to break: What is being done, or should be done, to address the number of "human factor" incidents in the marine environment to reduce casualties?

ABS has a unique perspective on this issue because we work at the interface of technology and the human factor. There is no question that new technology and increasing use of big data will reshape and transform the way we think and work.

But I think the real value of big data will come from its secondary usage not just its primary applications.

ABS focuses on the critical role of the human element as the root of effective safety standards and practices. The ABS Safety & Human Factors Group is working on the ergonomic design of marine engineering spaces, and providing guidance on other technical aspects of the onboard habitat to assist industry with safeguarding the human element in maritime and offshore environments.

We play an important role in setting a benchmark for monitoring personal safety at sea through the Mariner Personal Safety project, which is a collaborative effort between ABS, Lamar University of Beaumont, Texas and maritime industry partners around the world.

The ISM Code already requires owners to track injuries and close calls so the question we wanted to answer was whether companies would pool the information they had already collected. Its objective is to create a large international database of injury and close call (near miss) incidents which can be reviewed and analyzed to identify trends, possible causes, and potential lessons learned.

It is time to change industry's view of Human factors in shipping. There is a growing recognition that safety culture is key to the most familiar, concrete goals of business: efficiency, productivity, quality and profitability. Integrating Human Factor design practices and principles that reflect human capabilities and limitations can result in installations that are more cost-effective, safer and easier to operate and maintain.

We cannot ignore the importance of the human in the Big Data and technology reality. At the end of the day it is the common sense, innovation and creativity that people possess that prevails and defines this new Big Data reality.

You recently took the helm as IACS chair, and I understand that IACS will release a document with an updated IACS strategy. Can you share with us the overview content of these updates?

The IACS strategic plan addresses both the current and future needs of the shipping industry by focusing on three key areas: structural, machinery and cyber system integrity. On the IACS website specific initiatives are listed and topics addressed range from human factors to Energy Efficiency Design Index (EEDI) to LNG Bunkering and continued research on whipping of container ships.

Priorities for 2015-2016 strike a balance between the completion of ongoing projects and the need to look forward and formulate the next generation of IACS guidelines, unified and procedural requirements, addressing existing and emerging challenges.

One of our top priorities is the completion of the IMO Goals Based Standards Process in manner that is technically sound and responsive. Looking at emerging issues facing the industry, I believe IACS needs to clearly establish a role in cyber safety. Individual class societies already are working on this most pressing issue, and IACS formed the Expert Group Cyber Systems in 2015. The group's scope and terms of reference

includes examining design and architecture, construction evaluation methodologies and certification, testing/commissioning processes and whole-of-life procedures for monitoring, maintenance and performance management.

From this – and looking at best practices from other industries – IACS will develop unified requirements for design, manufacture, installation, testing and commissioning of such systems.

The final item on the agenda is the IACS relationship to IMO. In my opinion, many people do not understand the amount of effort IACS and its members put into supporting IMO. IACS Council has re-dedicated the organization to continuing this course and enhancing it.

I think it's fair to say that nothing speaks more to IACS' dedication to IMO than its continuing ongoing participation in the process and communication with the IMO staff.

In the coming year we plan to further strengthen our relationship with the IMO and work to raise awareness about our dedication to the organization and its goals.

In your experience, what has been the greatest contribution of IACS to the overall functionality and operation of class?

The greatest contribution of IACS derives from its core purposes. The purpose of IACS through its member classification organizations is three-fold. First, recognize address and cultivate safety-related issues dealing with structure, minimum standards, and cyber safety. Secondly, to facilitate the development and implementation of minimum safety standards and ensure they are applied consistently. Finally, IACS serves as an independent technical advisor on safety-related issues to both IMO and the industry.

IACS plays a role that no other industry group can fulfill – an independent advisor to IMO and the industry. The technical knowledge it brings to bear is second to none.

The strength of this relationship has enabled many contributions to the industry—it's enabled IACS to develop Common Structural Rules (CSR). For nearly a decade now CSR has been in place and is helping to drive a safer and more uniform shipping industry.

In the case of container ship safety, IACS has responded to the industry's needs after the MSC Napoli and the MOL Comfort incidents. IACS assembled expert teams to develop a set of Unified Requirements which defined and ensured minimum requirements relating to Container Ship safety. Requirement S11A addresses Longitudinal Strength Standard for Container Ships and S34 focuses on the Functional Requirements on Load Cases for Strength Assessment of Container Ships by Finite Element Analysis.

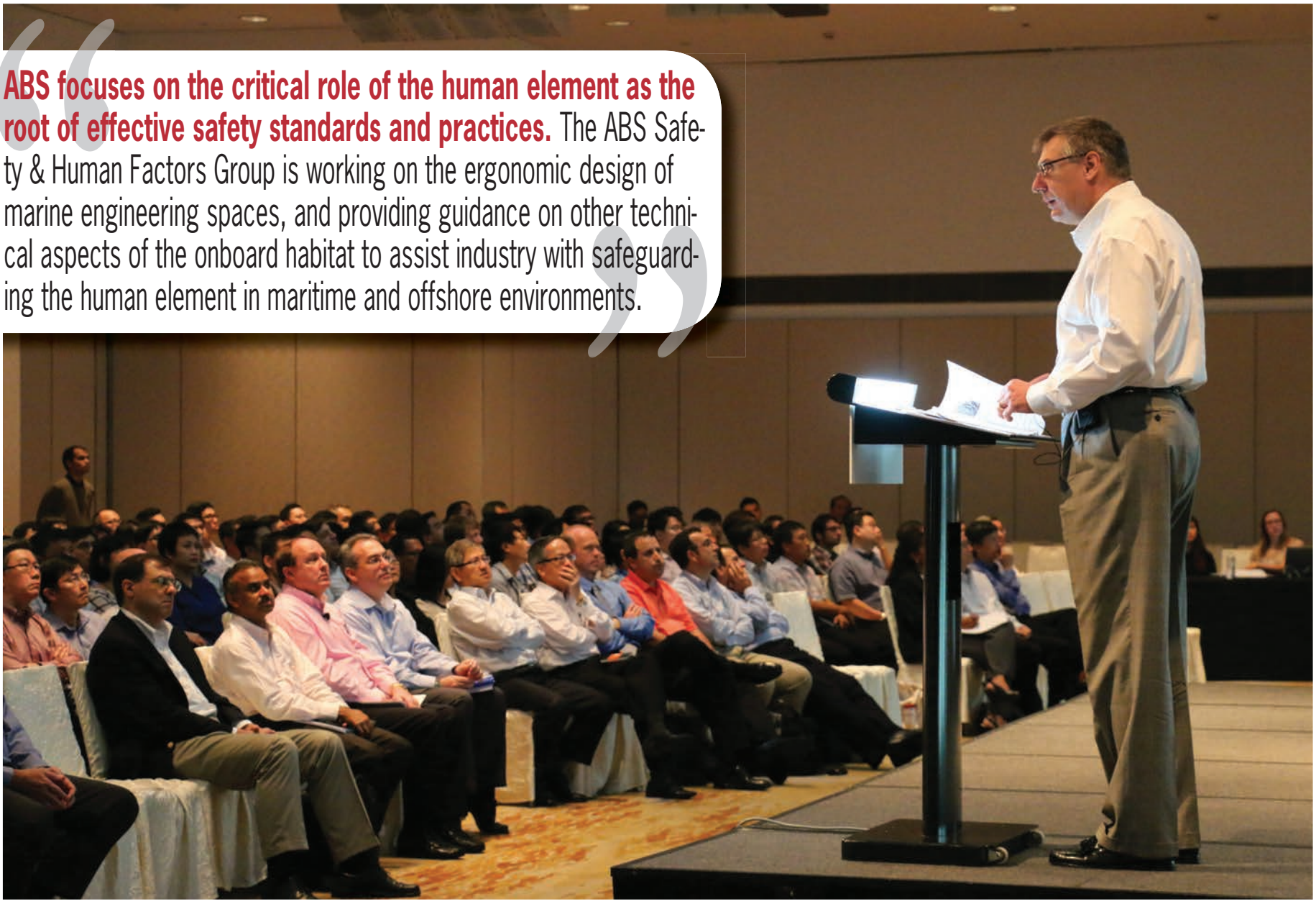
During your tenure at the helm of IACS, what do you hope to achieve?

As the newly elected IACS Chairman, I have defined three forward-looking strategic areas to be the focus during my tenure: completion of the Goal Based Standards, position IACS for the future and stand up a Cyber system integrity program to complete the 3rd leg of the safety stool mentioned earlier.

These initiatives will define the next generation of guidelines, unified and procedural requirements and solutions to existing and emerging challenges and help ensure long term viability for IACS to meet the future needs of the industry.

IACS has put in place a structure that provides consistency of implementation by its members of CSR and will continue to support members so that they achieve that consistency in their own rule application.

The IACS Council is committed to providing resources needed to complete the Goal Based Standards process and this is being done in a structured manner, which will demonstrate rules are compliant. We look forward to completing this process in the coming year and believe the resulting requirements will extend



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the current safety record and possibly enhance the safety margin.

Defining IACS role in cyber safety issues is a priority for me. The future of class and the next generation of maritime regulations are going to be driven by data to a degree that has never been seen. With more data comes the risk of data security and the need for consistent verification and validation of systems and subsystems, periodic cyber safety risk assessments, and a consistent approach to capturing lessons learned. Drawing on best practices from other industries, IACS will develop unified requirements for the design, manufacture, installation, testing, and commissioning of such systems.

My commitment to IACS is to ensure the organization continues to be the "gold standard" for classification society performance and position it for the challenges of the future. Through teamwork, technology, and a legacy of safeguarding industry, we will demonstrate continuous vigilance with an eye on safety, quality, and environmental protection.

Reflecting on your career to date with the American Bureau of Shipping, what do you count as your greatest success (or mission accomplished) that you find most gratifying?

I'm proud of the many accomplishments ABS has seen during my 20 year career here. I have had the honor to have been part of many "firsts." I think the biggest success – in general terms – is how ABS continues to capitalize on its foundation as a technology-driven organization while growing and developing a global team that is aligned behind our core mission.

The ability to apply core engineering and technology knowledge together with our cumulative experience continues to be a key differentiator in developing practical and innovative solutions that help industry move forward. Our impact across the industries we serve is clear when looking at the chronology of milestones in which we've played a role.

Our long history in classing marine assets includes classing the first containership in 1956 and the first purpose-built containership ten years later. And our leadership in this area continues. We classed the world's first ultra-large container ship in 2006, in 2011 ABS was selected to class the series of world's largest containerships, and in 2015 ABS-classed the world's first LNG powered containership. We've had similar successes in every segment of the maritime industry.

I think we can say we are also the front runner in the gas sector. In 2012 ABS was selected to class a dual fueled LNG-powered offshore supply vessels, this OSV began service in the Gulf of Mexico in 2015. We've led in gas carrier classification from the outset, classing the first LNG carrier in 1958. And just last year, we added the world's first VLEC as well as an FLNG vessel built for use offshore Malaysia.

In offshore, we have been involved in every barrier-breaking technology in the industry and have claimed an industry leading position in all sectors. We classed the first mobile offshore drilling unit in 1958, and we've been first to class nearly every type of production unit, including spars, tension-leg platforms and semisubmersibles. Most recently ABS granted AIP for a next-generation drillship design, which operates in 12,000 ft water depth and can accommodate a 20,000-psi BOP system.

Anyone would be proud to lead an organization with this track record.

I take a great deal of pride in ABS and how we continue to set the bar for performance. We've made history time and again with achievements that put our organization head and shoulders above the competition.

But with all these achievements it is our people that stand out for me. I am fortunate to head up a group of ABS employees who are passionate about the work they do. I take great pride in watching the accomplishments of this team and seeing the embodiment of the spirit of ABS and the seven core values – safety, teamwork, innovation, integrity, quality, reliability and a focus on people – exemplified in each of them daily.

I am proud of our past, but I'm dedicated to our future. We are forging a path today that will continue to place us in a class by ourselves. We are introducing new ways of working, and in the end, we are redefining class without redefining the safety mission class is built on.

IRClass: Celebrating 40 years

Indian Register of Shipping (IRClass) is India's "National" Ship Classification Society, formed to fill the need for having an Indian ship classification society due to the increase in Indian flagged commercial shipping tonnage, post-independence. Accordingly, **Sir Ramaswamy Mudaliar** first proposed to set up a National Classification Society.

In response the Ministry of Shipping & Transport convened a meeting in Delhi on May 29, 1967 and proposed that a Steering Committee be constituted for the purpose. The Steering Committee, in 1971, recommended the formation of a Classification Society, and in the middle of 1974 a Promoters Committee was formed to cover the groundwork. It was decided that the society – established April 4, 1975 – would be non-profit and called the Indian Register of Shipping, with no share capital, no shareholders and distributing no dividends. IRClass is collectively managed by those whose interests it serves; profit is not the motive. The board of IRClass includes representatives from ship owners, flag administration, underwriters, ship builders, ship repairers, general engineering industry and professional bodies.

Activities Today

According to **Arun Sharma, Chairman & Managing Director**, the primary activity of Ship Classification is being offered under the IRS banner. It carries out classification and statutory design appraisal, surveys and certification work on behalf of Flag States when authorized by various governments via IMO Conventions and Codes.

- Classification Services: IRClass ensures compliance of the ship with international codes and rules right from the ship design, construction and throughout her operative life, thus assisting ship operators and owners to maintain the asset quality, avoid PSC detention, denial of entry and expensive repairs.
- Statutory Services: IRClass carries out statutory design appraisal, surveys and certification work on behalf of a number of Flag States, towards compliance with following IMO Conventions and Codes:
- International Convention on Loadline
- International Convention for the safety of Life at Sea (SOLAS)
- International Tonnage Convention
- International Convention on Maritime Pollution Prevention (MARPOL)
- Specification Services: The experience and knowledge accumulated through classification work enables IRClass to provide technical advisory and supervisory services for many government agencies and ship owners. IRClass provides independent technical support and impartial advice to owners. Owners get value for money, coupled with highest standards of quality during construction, conversion or refit. IRClass specification services have been used extensively by various ship owners including national administrations, port authorities, oil companies, etc. Specification services are provided for pre contract as well as post-contract stages.

Moving Forward

The professional progression of IRClass has been quite remarkable, according to Sharma, and notably it has secured full membership of IACS. Of the more than 50 ship classification societies worldwide, only 12 are full members of IACS. Within 15 years of its formation it was admitted as an "Associate Member" of IACS, and with an increase in its classed tonnage, an unblemished safety record and high standards of professional skill and integrity, IRClass was admitted as a full member to IACS in 2010.

Even with its success, IRClass rides the same cyclical rollercoaster of the maritime industry at large. "The maritime sector has been going through tough times in the last few years which has impacted many organizations," said Sharma. "However we believe that the worst is behind us and green shoots of recovery are being seen. We have utilized the past year to restructure our organization to prepare ourselves for incumbent growth opportunities."

Arun Sharma, Chairman & Managing Director

Looking ahead, Sharma sees many areas of opportunity.

"India is widely acknowledged as a future growth engine for the global economy, and India's manufacturing, infrastructure and energy sectors have been receiving unprecedented levels attention," said Sharma. "The high GDP growth rates in India have resulted in increasing demand for Technical Assurance services in several new sectors like Renewable Energy. We believe that the role of classification societies has grown beyond maritime classification services and there is an increasing focus on Beyond Class services to cater to a larger canvas encompassing several other industries apart from marine.

"This century is being seen as the Asian century with the balance increasingly shifting to Asia Pacific for growth. We therefore see opportunities in three main geographies – South East Asia, Middle East and Africa and have plans to increase our presence in these regions."

As IRClass expands, Sharma recognizes the need to stay innovative, and to that end he sees several areas of potential development in the years to come, including:

- **Clean Fuel Technology:** "As the world is increasingly moving towards cleaner fuels, IRClass is continuously making efforts to cater to the new industry segments like LNG."
- **Offshore Energy:** "We have made forays into the offshore sector and are fast gaining credentials in the Oil & Gas domain."
- **Training & Education:** "Maritime Professional Development – Skill development is an important area of focus which we cater to through our IRClass Academy."

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Mattias Jorgensen (left) VP Business Development, Foreship

Foreship: New CFD Methodology

In the quest to model real conditions faced by ships at sea for design purposes, earlier this summer Foreship unveiled details of a live project that has factored real sea states into CFD-based hull form optimization. The company reports that the results of 'in wave' analysis had confounded expectations, leading to a design decision contrary to those informed by conventional model testing.

The Project

The project involved a modelled comparison of two different bow sections for a newbuild cruise ship, a project focused on optimizing the ship's resistance in waves. According to Matthew Patey, Foreship Project Manager Offshore, the project reflected the opportunities available in the market, and that in wave CFD modelling could be applied to any ship type or structure. It could also be used to consider other factors affecting design decisions, specifically slamming, Patey said.

"Discussions with cruise ship owners concerning how to optimize hull forms for real conditions have been ongoing for several years, and have been a leading impetus for developing practical 'in wave' tools. A lot has also happened in the field of CFD over those years."

Mattias Jörgensen, Foreship VP, Business Development added: "Our initial work was not client-specific, and looked at the methodology of CFD simulation based on real conditions. We developed simulations – including average wave heights that remain constant throughout the cycle of the ship and along the entire length of the hull form. The complexity of the computations was significantly increased when compared to a traditional calm water simulation."

OpenFOAM

Foreship's development of a new methodology used the open source CFD software package OpenFOAM. Inputs include the baseline 3D hull form and any possible restrictions, with normal operational conditions based on expected wave heights, wave periods and speed range. The typical work scope for the RANS-CFD optimization program considers the impact of head waves in one representative wave condition and three ship speeds.

In its first practical application, the new methodology was used to determine the differences in bare hull resistance in waves of a bulbous bow and a vertical stem bow to assess hull form variants for best performance for a 300m length cruise ship optimised for 18 knots. The beam, draft, block coefficient and submerged hull length were constant.

The full significance of the change in approach only became clear after running the new Foreship RANS-CFD analysis, said Janne Niittymäki, Foreship's Head of Hydrodynamics. "It is conventional thinking that a bulbous bow is the optimal solution in calm water, but above a certain threshold condition (wave height and period) the vertical stem becomes the optimal solution. But what is the threshold?"

The Results

Using the new method, Foreship reports that the simulations showed that in calm water the bulbous bow could be considered a marginally better solution in speeds ranging between 14-18 knots. At 22 knots the vertical stem was demonstrably better, achieving 2.7% less resistance. However, in conditions simulated to include head waves (H = 1.75m, T = 8s), the vertical stem reduced hull resistance by above 2% even in small regular head waves across the 14, 18 and 22 knot test speed range.

"When the first estimates came through, I have to say that I did not believe them," said Niittymäki. "I believed that the vertical stem would be seen to be the better option at some point, but not at such low wave heights. The resistance in waves was shown to be clearly better across the whole speed range in the case of the vertical stem version. We knew that even small waves might affect how the optimal hull form was decided on, but it is only now that we have the

new methodology that we can measure precisely what the effect will be."

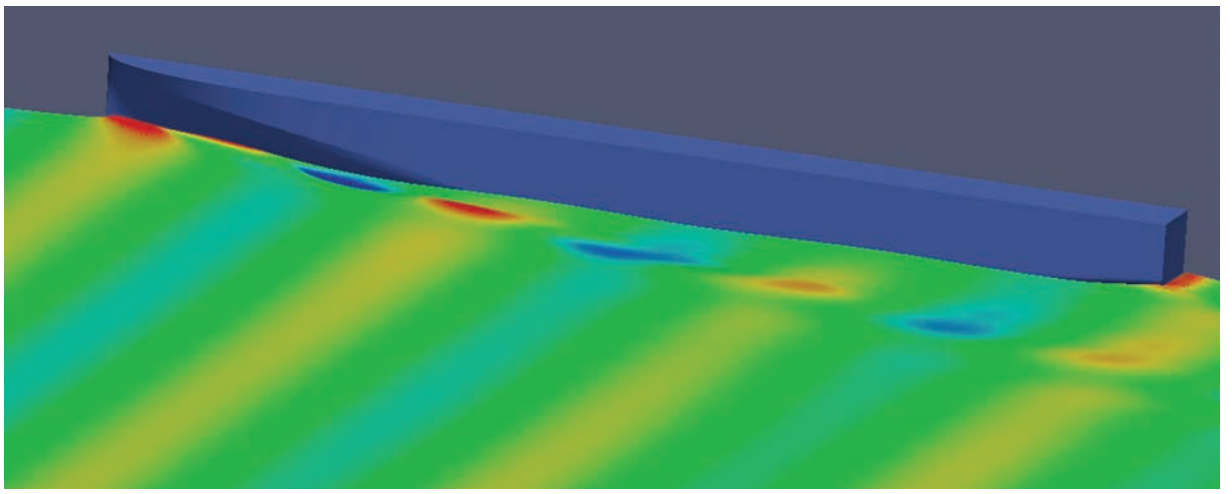
A 2% margin of improvement in terms of frictional resistance is a big deal.

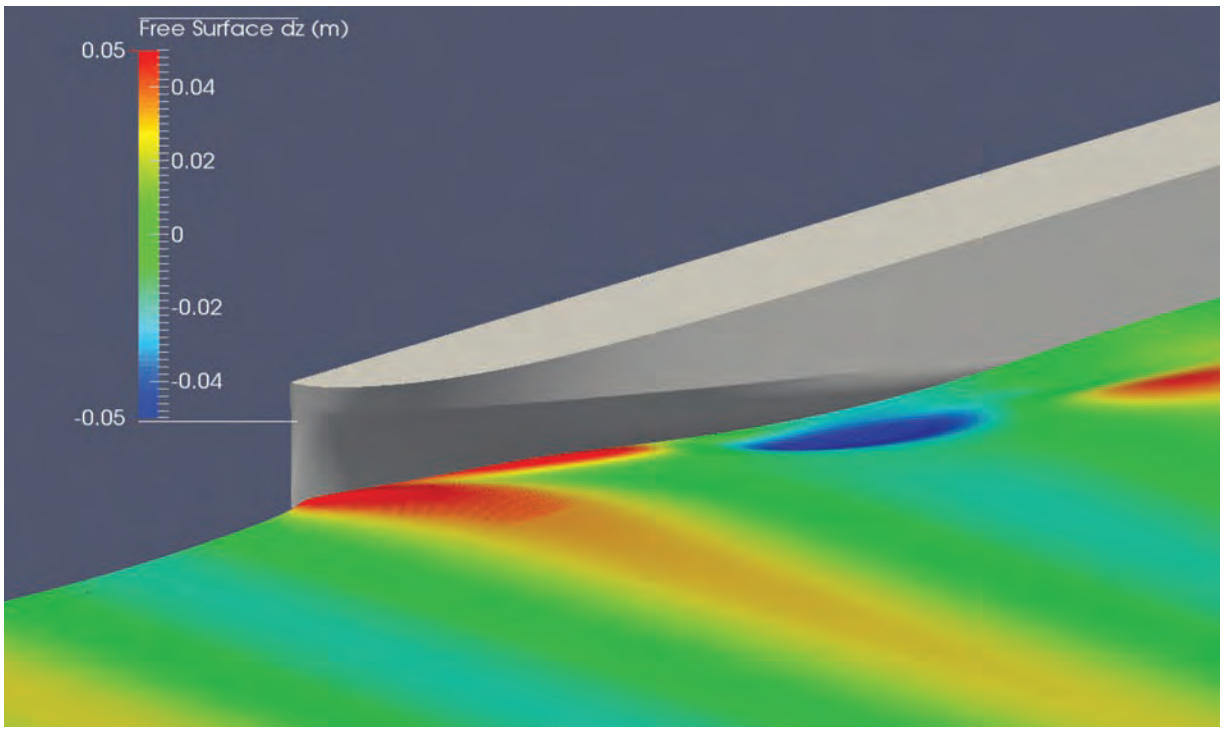
"Naturally, this would not be so significant for other vessel types, but the point is that the methodology is in place to simulate other factors, such as seakeeping or slamming, which may be the leading consideration for other owners," said Niittymäki.

"Used at an early stage, CFD based on real sea states will improve design decisions on resistance in waves to optimize an entire hull form, but also save the time it takes to wait for a model basin and the cost of model testing," said Patey. "In addition, CFD simulation is repeatable in a way that model testing is not, meaning that small adjustments can be easily modelled. The simulation can be run quite quickly; part of the development plan for this methodology was that it would need to be commercially applicable."

Feeding real sea state data into Finite Element Method software could be used as a design tool to address slamming and structural design issues in both the passenger ship and offshore context, said Patey. Modelling using real sea state inputs could also be valuable when it comes to evaluating vibrations, and the same methodology may be adaptable to emulate the extreme waves experienced on rigs.

For the moment, however, Jörgensen believes attention should focus on what has already been achieved. "It was truly a surprise to our hydrodynamics specialists how close to calm seas conditions the vertical stem bow becomes preferable to the bulbous bow," he said. "This new approach to CFD opens up significant new potential for commercial ship design."





SCANIA Expands its Engine Range for Marine Applications

By Peter Pospiech

Scania, a tradition-rich Swedish industrial company will celebrate in 2016 its 125-year in existence. Very early on in 1902, the first engines for marine applications were produced. In fact, the market was considered so promising that the company's new factory, which was built in 1907, was described at the planning stage as "intended particularly for the manufacture of automobiles and boats."

Scania, since 2014 a 100% daughter company of VW, is a manufacturer of trucks, buses, marine and industrial engines and a true propulsion pioneer. Today the company employs approximately 42,000 employees with an annual turnover of $11 billion.

SCANIA Marine Engine Program

The marine diesel engines of Scanua are installed in a variety of vessels, including inland navigation vessels, coaster and sea-going ships, as well as passenger and authority ships, including life boats and trawlers. Today's product range for main and auxiliary drives – with a speed range between 1200 and 2300 rpm – includes:

- **a 9-liter engine at 162 kW,**
- **a 13-liter engine with up to 551 kW, and**
- **a 16.4- liter engine with 735 kW (1,000 HP).**

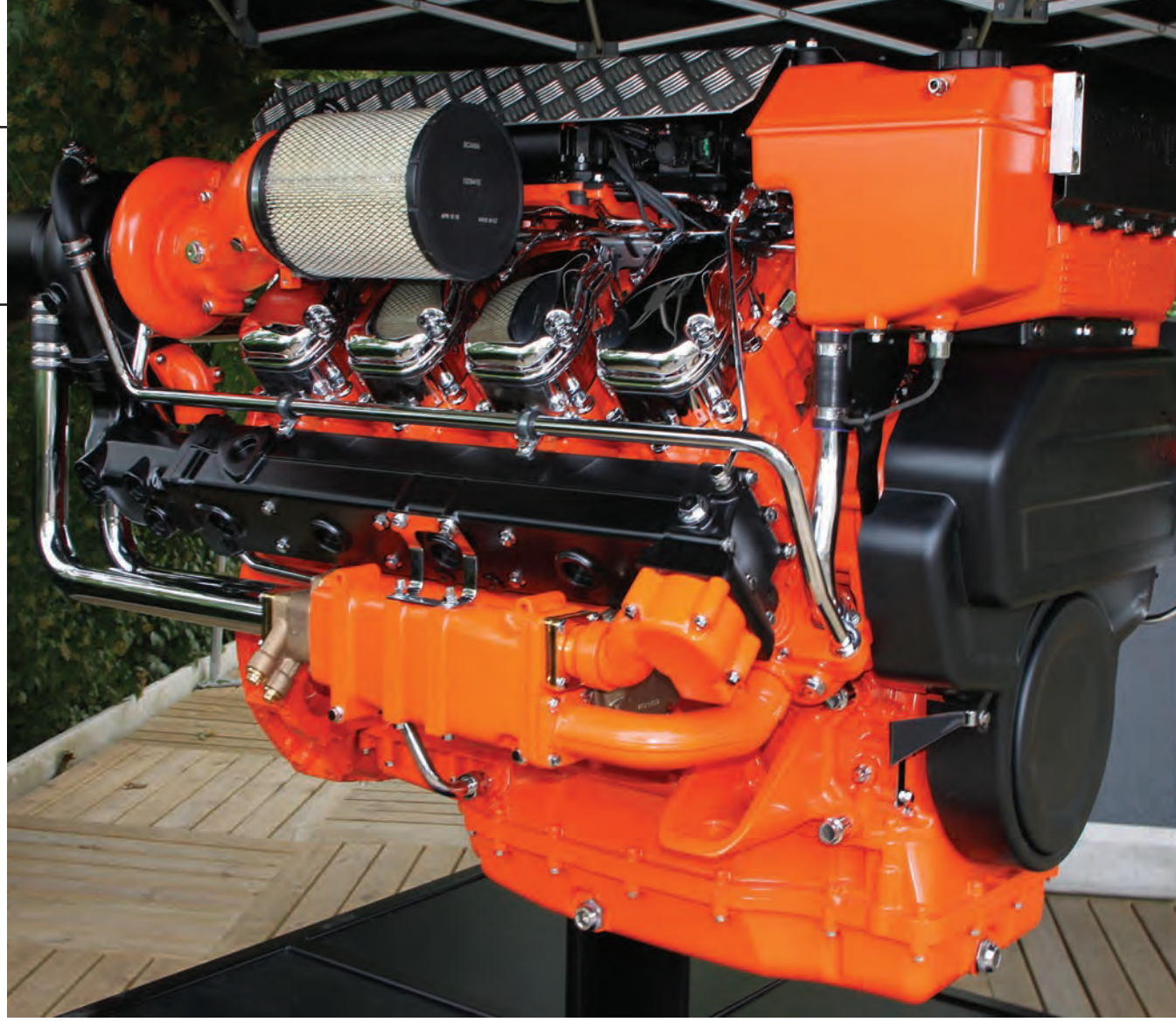
Meet the DI16 076M Engine

The company has just added the 16.4 liter V8 engine, internal type designation: DI16 076M, into its marine range. Typical customers are, according to Scania, "coast guard, patrol vessels, military defense forces, police and other naval authorities using high speed vessels."

The new engine delivers an impressive maximum power output of 846 kW (1,150 hp) at 2,300 rpm and is suitable for both propeller and waterjet applications. The power rating is divided into two: patrol craft short and patrol craft long.

According to Scania's power definition "patrol craft short" stays for: Intended for intermittent use where rated power is available 1 hour in 12 hours period. Between full load operations engine rpm must be reduced at least 10% from maximum obtained rpm.

Image above: Skipper Helge Skärlen and his trainee Petra Nilsson in the state-of-the-art navigation bridge.



Scania's new XPI engine with common-rail features 846 kW at 2,300 rpm.

"Patrol craft long" is defined as: Intended for intermittent use where rated power is available 1 hour in 6 hours period. Between full load operations engine rpm must be reduced at least 10% from maximum obtained rpm. Accumulated total service time maximum of 2,000 hrs/year.

Of particular interest for shipping companies and shipyards is the fact that the physical size (footprint) of the complete installation has been decreased, which means that former Scania V8's can be easily exchanged.

The turbocharged and after-cooled engine is available as 8-cylinder, in V-90 degrees configuration, only. With 130 mm bore and 154 mm stroke it features a displacement of 2.04 liters per cylinder. The mean piston speed is of 11.8 m/s. With the total displacement of 16.32 liters the engine is capable of developing an output of 846 kW (1.150 HP) at 2.300 rpm. With this power increase of 11.5%, compared to the former engine, Joel Granath, Vice President Engines, said: "We are now taking one step further away from the competition."

With these values a power per cylinder of 105.75 kW has been reached, which corresponds to a mean effective pressure of 27.52 bar.

The torque rating of up to 4,150 Nm is particularly high for this output class. This ensures ample performance even at low revs, while facilitating running at favorable revs in all conditions, including high sea and high load.

Individual cylinder heads with four valves per cylinder promotes repairability and fuel economy. Specific fuel consumption is according to Scania at its best point of 199 g/kWh and the specific oil consumption is 0.15% from fuel consumption. The new DI 16 076M fulfills the emission standards IMO II, EU Stage IIIA and US Tier 2, Scania said.

The engine is equipped with a Scania developed Engine Management System, EMS, in order to ensure the control of all aspects related to engine performance. The 16.4 liter new engine features the company's own developed and in-house manufactured common-rail XPI fuel-injection system, which is already used since 2007 in SCANIA's engines for trucks and industrial applications.

"The XPI system injects more fuel into the cylinders in a shorter time, providing more power," said Svante Lejon, senior technical adviser within the company's R&D division. "However, this also places higher demands on both the filtration system and the cleanliness of the fuel, as the system is more sensitive to particles."

According to Scania, vital for marine installations is that the engine is compact, has easy-to-fit auxiliaries and is designed for easy servicing. The companies V8-engines traditionally meet all of these requirements thanks to the compact vee-design, which reduces the overall length. Ancillaries can be efficiently accommodated inside the 'footprint' of the engine.

Scania's-Saver ring, placed at the top of each cylin-

The common rail on the engine.

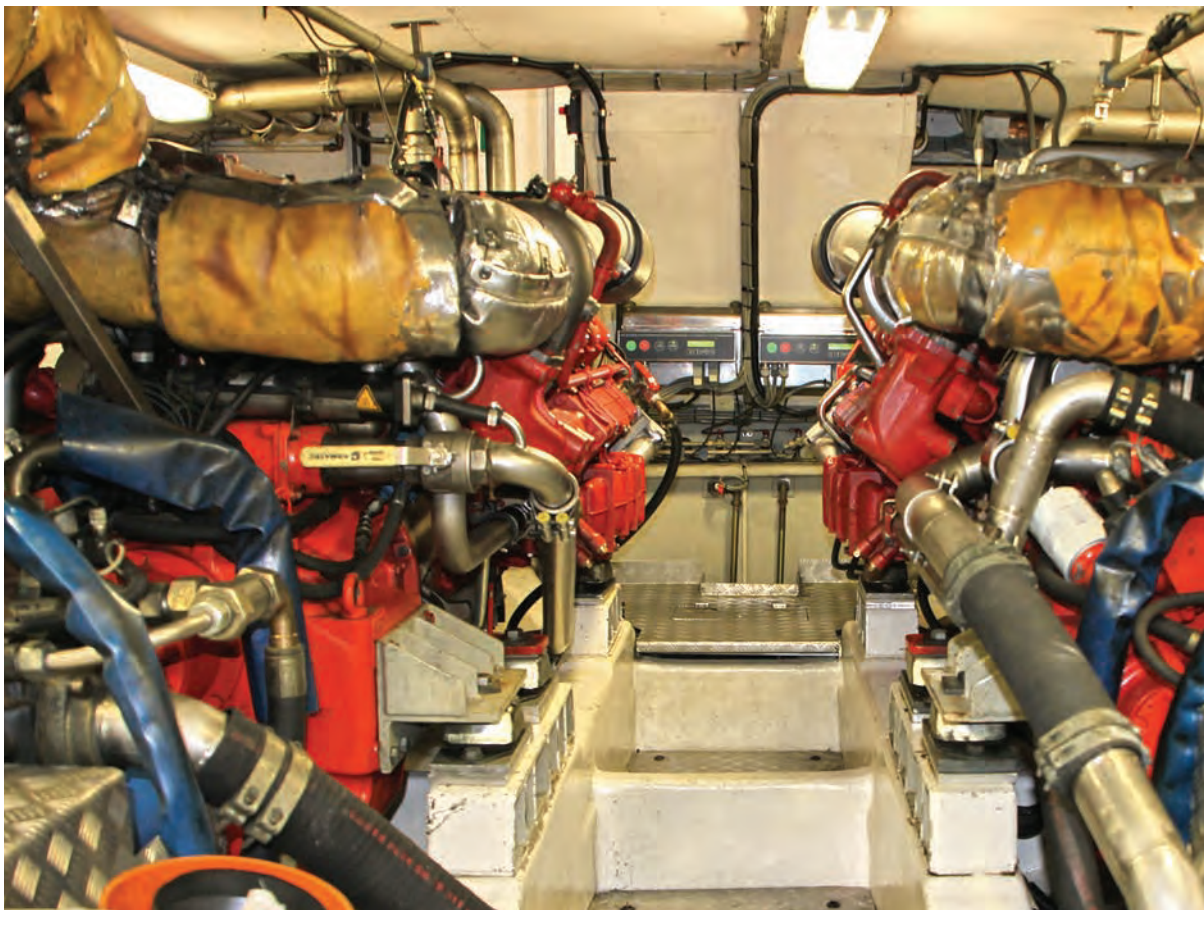
der liner, reduces carbon deposits on the edge of the piston crown and reduces cylinder liner wear. The strength optimized cylinder block contains wet cylinder liners that can easily be exchanged. Pistons are made of steel.

In spite of higher performance and tighter emission levels, Scania has been able to raise maintenance and oil-change intervals to 500 hours. Series production of the new XPI common-rail engine is scheduled for the beginning of 2016.

Swedish Sea Rescue Society, SSRS, relies on SCANIA Engines

Compact, maneuverable, powerful and therefore fast – that is the boat "Björn Christer" – one of a total of three boats in the 20 m-class, which are the biggest class of modern, very fast rescue boats. Built in 2005 by shipyard "Swede Ship Composite" based in Hunnebostrand, the SAR-Boat featured from the very beginning two of Scania's V8 DI 16M engines with outputs of 681 kW (900 hp) each. The vessel is designed to be self-righting. Propulsion is accomplished by two KaMeWa Rolls-Royce FF-jets 550. Hull is made of weaves of E-glass, layered on Jotun Vinylester. The 30-ton displacement boat has a draft of only 0.90 m, which allows for operation in shallow waters like the Stockholm Archipelago. In June 2015 the boats drive units was repowered by two SCANIA DI16 076M with rated outputs

Two of the power packs are installed on SAR boat "Björn Christer."



With two times 846 kW at 2,300 rpm via two KaMeWa Rolls-Royce FF 550 jets the vessel accelerates up to 39 knots.

of 846 kW each, increasing the speed from 30 to 39 knots. Skipper Helge Skärlen said during a test drive in the archipelago that Björn Christer covers the southern part of the archipelago, but it is also able to operate in the entire Baltic Sea for 10 hours before refueling.

Watercat M18 AMC Combat Support Service Vessel (CSSV)

The latest vessel developed by Marine Alutech is the Watercat M18 Armored Modular Craft (AMC). It's a new landing craft, which is designed to fulfill all modern requirements for future combat support vessels. It has been recently announced that Marine Alutech will deliver 12 of these Watercat M18 AMC multipurpose high-speed landing crafts to the Finnish Navy during 2014-2016. The vessels are powered by two Scania DI16 076M engines producing 846 kW each at 2,300 rpm. The boats feature two Rolls-Royce 40A3 waterjets, producing a top-speed of 50 knots. The Watercat M18 AMC is suitable for troop transportation, medical and evacuation tasks, landing operations, patrolling and escort tasks, as well as combat and battle support scenarios. The vessel has been specially designed for archipelagic, coastal and offshore conditions with an effective heating and air-conditioning system allowing heat and extreme cold, arid or humid climates.

The stop distance from full speed, up to 50 knots, is only 60 m.

Towboat Honors Structural Engineer Dobson

Joe Gregory, owner of New Generation Shipbulding of Houma, La., reports that his firm's latest delivery will join the La Porte Texas-based Martin Marine fleet of 29 inland push boats and 54 inland marine tank barges. Martin also operates four offshore tug/barge units. The latest delivery, one of New Generation's 75 X 30 X 10-ft. pushboat, is the Rex Dobson. With an operating draft of 8.5-ft. these towboats have a 32-ft. eye level from the wheelhouse. The wheelhouse has huge windows extending to the deck level forward and a full walk around exterior deck extension. The elevation is gained by having the wheelhouse sit atop three lower decks. These contain five crew cabins providing accommodation for up to seven crewmembers. A well-appointed galley, with granite counter tops, and mess, with a large flat-screen TV, occupy the forward part of the main deck cabin with the aft part or fiddly providing storage over the main engines.

The main engines are a pair of Cummins QSK38-M each of which develop 1,000 hp at 1,800 rpm. The engines are fitted with Twin Disc MG5321 gears with 6.39:1 reduction turning open stainless-steel five-blade Kahlenberg 74- by 53-in. propellers on seven-inch shafts. Each propeller has two forward mounted flanking rudders with a single steering rudder behind. The props and rudders are protected by stump-jumpers fabricated from six-inch square half-inch tubing.

Main deck equipment includes two 40-ton electric winches mounted forward. Auxiliary power is provided by a pair of Cummins 6BTA5.9- liter powered 85 kW generators.

By Alan Haig-Brown

At the commissioning, left to right: Jason Adams, Owner Raymond Louviere Field Foreman; Donald Baudoin, shipyard superintendent; Rex Dobson, shipyard structural superintendent; and Bart Foret, Field Foreman

(Photo: New Generation Shipbuilding)

Ulstein's X-BOW Turns 10

Pictured left is the subsea vessel Island Performer (Photo: Ulstein)

While new designs often grab headlines, mature designs that have enjoyed success are perhaps better indicators of true progress in marine technology. When the Ultstein X-Bow made its debut 10 years ago, some scoffed at the unusual design characteristics. They laugh no more, as the Ultstein X-Bow hull line design turns 10.

Now in its tenth year, the 100th X-BOW shipbuilding contract was signed, and the X-BOW's derivative, the X-STERN – a similar solution for the ship's stern – has been contracted on its first two vessels. "The X-BOW was developed during 2003-2004 – one of the latest tough periods for the offshore industry - and revealed in 2005 together with the contract for the first vessel, an anchor handling tug supply vessel for Bourbon Offshore Norway," said Gunvor Ulstein, CEO, Ulstein Group.

"The shipowner, having seen an early sketch on the first page of a magazine, challenged us to present some realistic ideas for a vessel with a backward-sloping bow. 'This instigated a dedicated effort on the part of several players', including design experts from Ulstein. Bourbon Offshore Norway was convinced by the bow design that came about from this exchange of ideas, because the bow would eliminate slamming, keep up speed in a head sea and protect the fore-deck area from green sea and spray, while simultaneously improving comfort and rest for crews in transit," she said.

The very first feedback came from the very first vessel, Bourbon Orca, and it came from the cook: "I don't have to call the captain to make him reduce speed while I'm preparing dinner. The casseroles stay put."

X-BOW highlights through the years ...

2005
- First contract X-BOW - AHTS for Bourbon Offshore Norway
- Contract two X-BOW PSVs - Bourbon Offshore Norway

2006
- Contract X-BOW SUBSEA - Island Constructor, SX121 for Island Offshore
- Bourbon Mistral X-BOW PSV delivered

2007
- Contract X-BOW-SEISMIC RV - four for Eastern Echo (WesternGeco), two for Eidesvik/CGG Veritas

2008
- Contract X-BOW SEISMIC RESEARCH - six for Polarcus

2010
- Launch of the PX121 design

2012
- 12 X-BOW vessels delivered - four The Ulstein Yard, four Brazil, two China, two Spain

2013
- 13 X-BOW vessels delivered - five The Ulstein Yard, six China, one Brazil, one Spain
- Contract X-BOW HEAVY LIFT - Toisa

2014
- 12 X-BOW vessels delivered - two The Ulstein Yard, seven China, one Spain, one Brazil, one Norway

2015
- 18 X-BOW vessels to be delivered - five The Ulstein Yard, 10 China, three Singapore
- X-BOW number 100 - First with X-STERN - two for Windea

2016-2017
- 19 X-BOW vessels to be delivered - two The Ulstein Yard, four Japan, nine China, three Brazil, one U.S.

KVH Debuts mini-VSAT Broadband 2.0

At London International Shipping Week held in September, KVH Industries, Inc. introduced the second generation of its mini-VSAT Broadband solution for the maritime market, providing a combination of data delivered at high speeds and at low price points, with vessel operational and crew entertainment/ informational content, tools, and support, optimizing broadband effectiveness in serving the needs of seafarers. ***Tom Mulligan*** *reports.*

"Competitive market factors make it clear that the maritime industry needs to change how it thinks about connectivity and its impact on competitiveness and profitability. **KVH's mini-VSAT Broadband 2.0** helps maritime enterprises meet their complex operational requirements, while providing affordable communications and engaging content for their onboard personnel."

Martin Kits van Heyningen, CEO, KVH Industries

Based in Middletown, RI, KVH Industries is a provider of in-motion satellite TV and communications systems, designing, manufacturing, and supplying mobile satellite antennas for applications on vessels, vehicles, and aircraft. The company provides news, music, and entertainment content to a range of industries including the maritime, retail, and leisure sectors, with its UK-based subsidiary Videotel providing training films, computer-based training and e-Learning content.

Expanded Service: Flexibility & Quality Content

KVH's expanded VSAT service, mini-VSAT Broadband 2.0, encompasses rugged, reliable antennas and other hardware, flexible airtime options, extensive operations and entertainment content, innovative content delivery, and comprehensive support from a single global provider. "The future competitiveness of the maritime industry will be affected by how rapidly shipping operators take advantage of big data," said Martin Kits van Heyningen, CEO, KVH. "It's important to adopt a big data mindset: data is becoming a resource in its own right. The maritime industry has been slow to adopt big data even though the industry faces many challenges for which data capture and analysis can provide answers, from meeting an increasing number of maritime regulations to improving the fuel efficiency of vessels underway. The maritime industry has spent the past 20 years trying to limit the amount of data going on and off vessels, while the rest of the world has been doing the exact opposite in adopting big data."

Computer analysis of big data greatly exceeds human capacity in providing information that can make a maritime operation more efficient: real-time analysis of such data as engine monitoring and fuel consumption combined with operational data provided through satellite communication, for example weather data, enables the optimization of a voyage for financial performance, not just for time and distance.

The maritime industry is also looking to satellite communications and broadband services to improve quality of life for seafarers through the provision of informational and entertainment programming which users can access in their off-duty periods. This combination of demand for big data for operational purposes and the need for an efficient onboard broadband entertainment service is driving developments in onboard VSAT-based broadband services.

"Other satellite communications providers respond to increasing broadband demand by simply increasing airtime rates. We knew there was a better solution," said Van Heyningen. "We provide maritime customers with affordable, usage-based plans at the data speeds they need to take advantage of new cloud-based applications for improving operational efficiency and we give them the tools they need for bandwidth management by user and vessel.

"Competitive market factors make it clear that the maritime industry needs to change how it thinks about connectivity and its impact on competitiveness and profitability," he said. "KVH's mini-VSAT Broadband 2.0 helps maritime enterprises meet their complex opera-

KVH's IP-MobileCast content delivery service is designed to bring entertainment and operational data to vessels at sea via the mini-VSAT Broadband network.

tional requirements, while providing affordable communications and engaging content for their onboard personnel."

Meeting Maritime Requirements

Brent Bruun, KVH's Executive Vice President, Mobile Broadband, said that KVH has been and continues to be an innovative technology company focused on mobile products and services addressing large markets and that its products have always been designed around maritime market requirements. The product history includes the Sailcomp digital compass introduced in 1982; the TracVision TV-at-sea system introduced in 1994; and more recently, fast and affordable mobile communications systems, including mini-VSAT Broadband, which was introduced in 2007.

"The mini-VSAT Broadband service provides an end-to-end global communications solution, with the capability of leveraging readily available commercial satellites to expand network capacity," said Bruun. "It is designed to meet current maritime industry trends, where we need to change how we think about connectivity and content delivery, as data access is now a necessity to attract the best seafarers. We are entering a big data era for operational efficiency."

"It's a digital world, even at sea"

Mike Mitsock, KVH's Vice President, Marketing, added: "It's a digital world, even at sea," and asked whether the maritime industry has what it needs to succeed. He emphasized the newly introduced mini-VSAT Broadband 2.0 system is a complete global maritime communications solution, offering the connectivity maritime operators need, providing global onboard connectivity; hardware and network management; licensed content; and affordable content delivery underpinned by a comprehensive service and support program.

Mitsock said the mini-VSAT Broadband 2.0 system is connecting ships faster and more affordably through open and metered plans that deliver data at the network's highest speeds, typically as fast as 4 Mbps: "This makes it 40% less expensive to get the same amount of data at 50% higher speeds, and in some cases, at a 15 times faster speed at one-third the cost." KVH offers a number of fixed-rate speed-based plans with clear monthly data allotments to suit each user's requirements. A second key feature of the new system is myKVH, a secure, personalized management portal that allows the user to track vessel status and location, as well as data use. This enables the allocation of customized operational and crew data use for every individual onboard or by user profile. Daily or monthly allocations can be assigned, and appropriate alerts by email and/or SMS text sent to users when 50, 80 and 100% of their allocations have been used.

In addition, the KVH OneCare customer support program provides an array of service offerings that includes application engineering, with standard proven solutions, network planning and integration, and custom work as required; solution deployment, with equipment installation, testing and service commissioning, and initial user training; and ongoing operating support, with technical assistance, preventative maintenance, and extended warranty options.

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"Content onboard is a business necessity"

"Content onboard is a business necessity, not a 'nice-to-have'," said Nigel Cleave, CEO of KVH's subsidiary Videotel, "and KVH has a comprehensive portfolio of operational and entertainment content for optimizing safety and efficiency, keeping the crew happy, and improving crew recruitment and retention. For example, IP-MobileCast: Operations Content provides critical data for operations, with large data files delivered automatically, reliably, and affordably. Charts include electronic chart updates and weather data are provided in the detail required for voyage optimization and training packages provide safety training onboard covering both the latest legislation and operational practices, an important requirement nowadays as the quality of crew and training standards have been identified as risks to the safety of shipping. KVH delivers this content through a variety of means, including as e-training and through multicasting, and is partnering with industry leaders to optimize this delivery."

In addition to operations content delivery, IP-MobileCast entertainment content delivers a very wide range of entertainment, including news, sports, movies, TV episodes, and music content, stored on a KVH onboard server for immediate access. This gives the ability to stream different programming to multiple devices at the same time at no additional cost, the content being accessible on TVs, crew member tablets, smartphones or laptops.

Content Delivery Technology

The mini-VSAT Broadband 2.0 system makes use of KVH's TracPhone V-IP series satellite communications antenna hardware, which comprises terminals that transmit the data on and off the vessel at sea; there are three choices, from smallest to largest: TracPhone V3-IP, TracPhone V7-IP, and TracPhone V11-IP. mini-VSAT Broadband connectivity is provided through KVH's maritime VSAT network, a C/Ku-band satellite network with 26 beams and 19 satellites providing global coverage. The network was launched in 2007 and KVH has continued to expand it: it now features MPLS and global static IPs for the highest possible data security.

Content delivery is based on IP-MobileCast technology, in which multicasting delivers content without affecting vessel data consumption or performance. According to Robert Hopkins, Jr., Director of IP-MobileCast Services at KVH, there is a shortage of bandwidth at sea, meaning that today large data files such as digital charts and movies are still predominantly delivered physically. Other data such as weather is mainly delivered in low resolution, which is satisfactory for determining the position of, for example, cold fronts, but not sufficiently detailed to enable proper voyage planning for fuel consumption optimization purposes. Maritime satellite service providers cannot support streaming video, and roughly half of a commercial vessel's data usage is wasted by the crew on fruitless Internet browsing . Hopkins said the challenge is how to deliver needed content via satellite affordably, without degrading the operations network.

Through the use of multicasting and an onboard server, one transmission sends the file to all licensed vessels, which is cached on the server for immediate access, overcoming the reduced efficiency of unicast delivery, in which a file is transmitted to each user on each receiving vessel, the number of transmissions equaling the number of users. Thus KVH's content delivery strategy, based on IP-MobileCast, enables up to 500 GB/month of entertainment and operational content to be provided, typically in the ratio of 80% entertainment to 20% operational information.

"IP-MobileCast doesn't harm or compete with a vessel's Internet access or VoIP services," said Hopkins. "Beam capacity is sized for peak loads, leaving about half the network capacity unused, and multicast data are transmitted in unused bandwidth, at a lower priority than standard IP traffic. The use of multicasting is therefore highly efficient in that it does not use any of the data allotment of the mini-VSAT Broadband system's airtime plan."

The rugged, gyro-stabilized TracPhone V-IP antenna systems are designed by KVH for the mini-VSAT Broadband network.

KVH's mini-VSAT Broadband network is extensive and provides broadband service to thousands of vessels at sea.

BMT Fluid Mechanics to

Validate FLNG Design

The emergence of the floating liquefied natural gas (FLNG) concept has seen an unprecedented focus on development activity and has reinforced the commercial interest in these facilities. However, as the industry strives to make the concept a reality, in addition to the already formidable risks present in conventional projects, a plethora of distinctive risks associated with FLNG have now been added to the mix, with little industry experience to learn from. Simply adapting risk and safety concepts of land-based LNG developments is not the solution, believes Suba Sivandran, Head of Oil and Gas at BMT Fluid Mechanics, a subsidiary of BMT Group. Suba highlights the unique safety concerns which need to be considered and provides insight into the benefits of using Computational Fluid Dynamics (CFD) to complement physical modelling through Wind Tunnel Testing and ensure oil and gas operators have confidence that the design is fit for purpose in all operating conditions.

Growing demand for natural gas as a clean-energy alternative to traditional fossil fuels has resulted in unprecedented innovation in the global offshore LNG industry. In the last 10 years alone, producers have made rapid efficiency improvements within the value chain, first through the use of re-gasification vessels and then floating storage and re-gasification units (FSRU). FLNG represents the latest development in this fast-moving industry sector.

Floating above an offshore natural gas field, the FLNG facility will theoretically produce, liquefy, store and transfer LNG and potentially liquefied petroleum gas (LPG) and condensate at sea before carriers ship the product direct to market. Although this approach has its benefits, it also presents its own challenges. When considering the design and construction of the FLNG facility, every element of a conventional land-based LNG facility needs to fit into an area a fraction of the size, while maintaining appropriate levels of safety and giving increased flexibility to LNG production. Furthermore, the offshore environment and associated metocean conditions, including wave motions, can create significant challenges.

Advantages of FLNG units include a reduced use of materials, land and seabed and therefore, cost and a reduced impact on coastal habitats by avoiding pipelines, dredging activities and jetty construction. In addition, the flexibility of the concept allows for a gas field to be exploited and then theoretically, it can be simply moved to another location, rather than having to be decommissioned. Owners must anticipate future requirements and deliver long-term performance, which in turn, places even greater pressure on ensuring optimum design and asset integrity management of the facility.

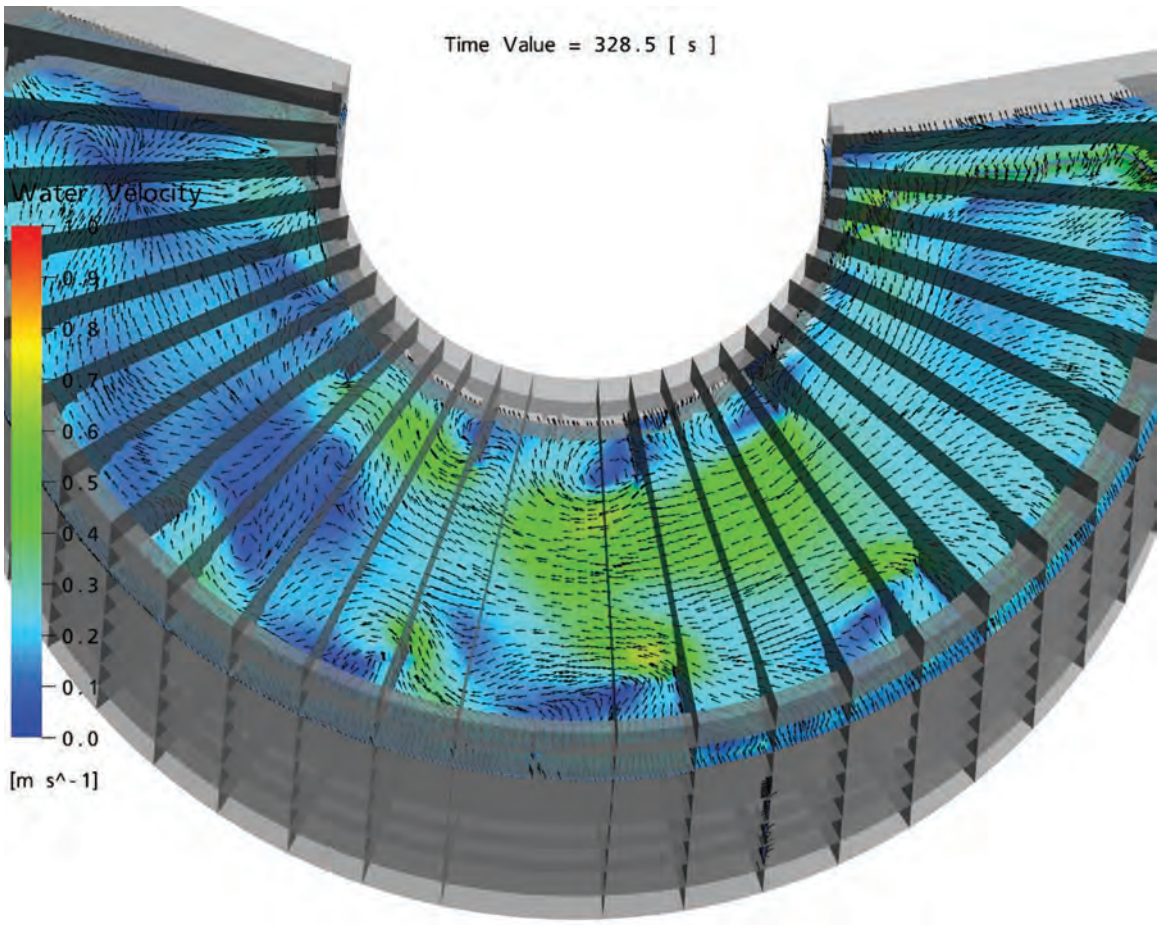
As the number of proposed FLNG facilities increase to meet the demand for transportation of gas reserves stranded in remote offshore locations such as South East Asia and Africa, it is essential that the safety risks are fully understood within the concept design phase. These risks relate to: metocean conditions; impact on marine environment; possible likelihood and consequence of fire and explosion; security and evacuation and in-service maintenance. The effective management of all of these risks should involve a quantitative assessment to help optimize the design, incorporate mitigation measures and devise hazard and management strategies.

The greatest opportunities to reduce risks are during the initial hazard assessment stage within the conceptual design phase whereby an inherently safer design can be achieved. Once a more detailed design has been agreed, there may be limited scope to apply hazard avoidance methods.

The offshore oil and gas industry is increasingly moving towards a more proactive approach to risk mitigation and away from a reactive approach. A formal safety assessment or safety case approach is a structured way of handling risks. Through an initial hazard assessment, hazards are identified and measured qualitatively. Certain hazards that are deemed to have the potential to cause a major accident event (MAE) are then taken forward to the consequence assessment stage where these hazards are then assessed quantitatively. In the final stage, hazards are quantified in terms of risk to personnel, environment and asset through techniques such as a Quantitative Risk Assessment (QRA) so as to demonstrate everything has been done to ensure that risks are reduced to as low as reasonably practicable.

Within the consequence assessment stage, Computational Fluid Dynamics (CFD) can be used as a design tool to achieve an inherently safer design. Through assessment of gas releases and fire scenarios and natural ventilation of the FLNG process topsides, recommendations can be made concerning process equipment arrangement and mitigation and prevention strategies. Optimization of the process topsides layout can be achieved to ensure less congestion and less confinement. This can include physical separation of major components containing hydrocarbons and where necessary, the introduction of barriers (e.g. blast walls) to prevent the escalation of risk should a hazard be realized. CFD should be seen as a design tool used to design for scenarios that are credible

Marlin free surface velocity field



while following a risk-based approach.

Wind tunnel testing can also help ensure we are designing for safety. Over the last six years we have carried out testing on seven FLNG designs to assist designers in understanding potential mean forces and moments acting on a FLNG vessel.

Wind and current measurements can be combined to determine heeling moments for a stability analysis and wind forces and moments are also necessary inputs to analyses of the mooring and thruster systems. Similarly, operations within the offshore industry are becoming more complex and riskier due to ship sizes and vessels finding themselves in close proximity of one another. As such, it is important to understand the aerodynamic proximity effects associated with side-by-side operations through the use of wind tunnel testing.

Wind tunnel testing and advanced techniques such as CFD can play an integral role in helping to refine the design of an FLNG vessel. CFD should never be seen as a replacement to physical modelling, but rather a complement and the key is being able to interpret and understand the results of theory and experiment.

Bringing the two techniques together, the risks surrounding helicopter operations, which present another common MAE in offshore oil and gas, can be greatly reduced by using CFD and wind tunnel testing. Two of the biggest impacts to helideck environmental conditions are turbulence and hot turbine exhaust. Wind turbulence generated from airflow over obstructions such as the process topsides and turbine exhaust can significantly increase the risk involved with helicopter approach and landing.

Standards such as CAP 437 Standard for Offshore Helicopter Landing Areas and NORSOK C-004 Helicopter Deck on Offshore Installations provide guidance and a prescriptive approach to Helideck Operations and Helideck Design. Using CFD and wind tunnel testing together we can optimise helideck location and determine the best compromise between conflicting requirements so as to identify helicopter operating limitations likely to be imposed due to turbulence, downdraft or hot gases. With the CFD model validated against the wind tunnel testing, we can then rapidly run simulations testing further scenarios and optimise the design such as estimating the likely helideck downtime.

Developing advancement and most importantly, commonality in the methodology that combines reliable testing and simulation-based prediction of 3D wind fields and forces acting on large scale offshore vessels and floating production systems is key. Such an approach will provide operators and designers of these structures with the opportunity to drive forward these designs with ever increasing reliability and efficiency.

In today's current economic climate when it may seem tempting to take short cuts and save on capital expenditure, optimising design early on in a project can help to not only reduce risks to personnel, environment and asset but also reduce costs by avoiding conservatism.

A thorough approach to design and a clear understanding of the risks present to an FLNG project can also be used to increase confidence with investors and financial institutions. Taking a risk based approach to design will ensure there won't be any nasty surprises further down the line.

Hard problems demand Soft(ware) solutions

Make no mistake, the commercial maritime industry will always revolve around heavy duty machinery and mega-machines designed to weather some of the toughest operating conditions on earth. But in recent years a proliferation of Software Solutions has evolved to help the machines operate more efficiently and cost effectively. MR editors report on latest developments in maritime specific Software Solutions.

Design

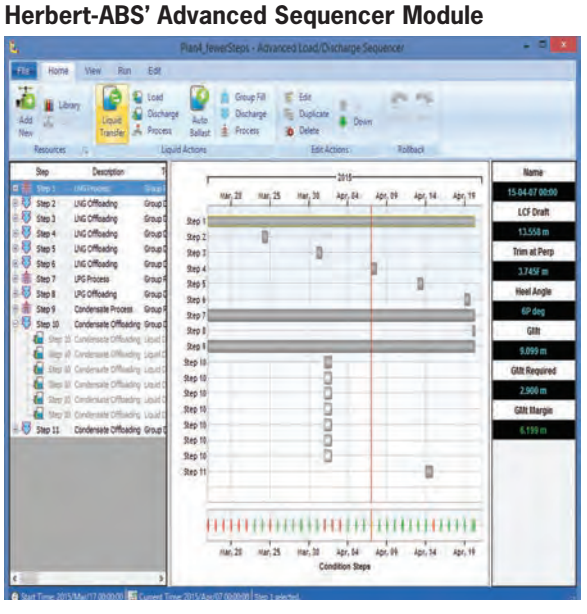
Kværner Verdal AS selected **AVEVA Bocad Steel** and AVEVA Bocad Offshore for use at its design and fabrication yard in Verdal, Norway, as Kværner required a specialized structural steel design solution that provided out-of-the box functionality and integration. In AVEVA Bocad Offshore, Kværner has a software created for the design, detailing and fabrication of all forms of offshore steel structures. When integrated with Kværner's AVEVA PDMS deployment, these structural steel solutions provide a complete 3D engineering solution. AVEVA Bocad can directly write data for the production parts into AVEVA Marine's manufacturing database. AVEVA Hull Detailed Design also writes into this database for plate and profile parts to be sent to production, so data coming from both AVEVA Bocad and AVEVA Hull Detailed Design can follow the same path; parts can be nested together for a given block for instance and later on sent to production. By doing so, the shipyard can optimize its production handling by gathering parts described by both systems in the same production stream.

Herbert-ABS Software Solutions LLC introduced the Advanced Sequencer Module for CargoMax loading computers, a tool designed to allow for rapid development of time-based sequences, such as oil loading or discharging, ballast water exchange, long-term FPSO production and off-loading planning, or bulk pile loading and bottom discharge sequences. The Advanced Sequencer Module accounts for pump rates, tank groups, resource availability, and linking start and stop times to quickly generate a sequence. Individual conditions can be generated for any time interval, and graphical and tabular results are presented to show important results, including any alarmed values. The Advanced Sequencer Module can be linked to other tools available within CargoMax. For example, an Oil Tanker using the Load/Discharge Rate tool to monitor a discharge operation and calculate rates, can automatically generate a sequence in the Advanced Sequencer, to quickly ensure that the current operation will not run into unsafe conditions in the future. An exciting aspect of the Advanced Sequencer Tool is the Automatic Ballast Generator. This allows an operator of an FPSO or FLNG to plan the long-term production and offloading sequence for the vessel, and at the touch of the button, generate a corresponding ballast plan that keeps the vessel within safe operating limits and target drafts and trims.

Designed For Sea from **Dassault Systèmes** is designed to enable electrical systems engineers to define, simulate, analyze, and validate the design of integrated electrical systems for the entire vessel. Based on Dassault Systèmes' 3DEXPERIENCE platform, Designed For Sea is a solution designed to help naval architects, discipline engineers, designers, shipyards and their suppliers to define, simulate, analyze and validate a ship or platform design while adhering to owners' requirements, industry regulations and class standards. With it engineering teams can create, evaluate, and validate design options in real time through advanced 3D simulation and analysis early in the process. The 3DEXPERIENCE platform is designed to provide a unique, collaborative environment that efficiently captures engineering know-how, company rules and standards for reuse at any time and from anywhere in new projects, hence reducing design cycle time. Designers can find design principles, components or sub-systems that fulfill a certain design requirement using the platform's integrated search-based application that searches through structured and unstructured information.

Nupas-Cadmatic signed a contract for the delivery of 3D design and information management software to Drydock World Dubai (DDWD), making it the largest single deal in Nupas-Cadmatic's history and a breakthrough for Nupas-Cadmatic in the offshore industry. Nupas-Cadmatic's delivery includes the design system licenses, system installation, user training as well as support services for over 150 simultaneous users of the software. One of the most significant

Herbert-ABS' Advanced Sequencer Module



ABB

Krill Systems

projects on which Nupas-Cadmatic solutions will be used is the BorWin3 platform that will serve in the North Sea. The platform transfers about 900 MW electricity from an offshore wind farm to Germany. The platform will be completed in 2019.

AVEVA E3D Insight is a mobile app that is designed to streamline the reviewing and approval of design content. Based on technology already available in Plant industries AVEVA will soon release a new version of AVEVA E3D Insight that is fit for use in the shipbuilding industry. The latest version of AVEVA E3D Insight has extended capabilities which will now enable shipyards, marine EPCs and ship owners to visualize, inspect, comment upon and approve ship designs wherever they are in the world in a seamless and timely manner bringing added value in many cases where collaboration is a key factor to quality and performance. Advances include:

- Design review and approve within the design environment
- Design check and production feedback from the workshops
- External reviewers giving comments and approval (ship-owner, class societies)
- Live connection to the design database means that decisions are made against the best known state of information.
- The ability to collate and keep track of design decisions supports compliance by ensuring transparency and traceability of the decision process.

With the release of **ShipConstructor 2016 R1.1, SSI** said it provides enhancement for the offshore rig construction market, particularly with regards to weld management. ShipConstructor 2016 R1.1 is particularly geared towards early adopters of ShipConstructor's latest productivity-enhancing capabilities; the predominant portion of new features are focused on ShipConstructor Subscription Advantage Pack clients. SSI continues to enhance ShipConstructor's WeldManagment product improving the ability to more efficiently model several common situations in rig building such as welding two sides of the same part to create structural pipes. UDA strings for weld objects and other innovative features have also been incorporated into an updated and modernized Weld Manager Palette interface. SSI said with this update Subscription Advantage clients will now be able to get a technical preview of a new Pipe Modeling Tool Palette which enables a more streamlined workflow for efficient pipe modeling.

Shipflow 6 comes with a new module for computing ship motions in waves and the Shipflow RANS solver is up to 10 times faster than its predecessor. Shipflow Motions is a new flow solver for computing ship motions in waves. It is a time accurate fully nonlinear boundary element method which can be used to compute ship motions and added resistance in regular and irregular waves as well as wave resistance, sinkage and trim in calm water. Typical results are time series and response amplitude operators. The developers believe that the method will be a useful tool for ship designers with higher accuracy than traditional potential flow methods while at the same time being faster than the available RANS methods.

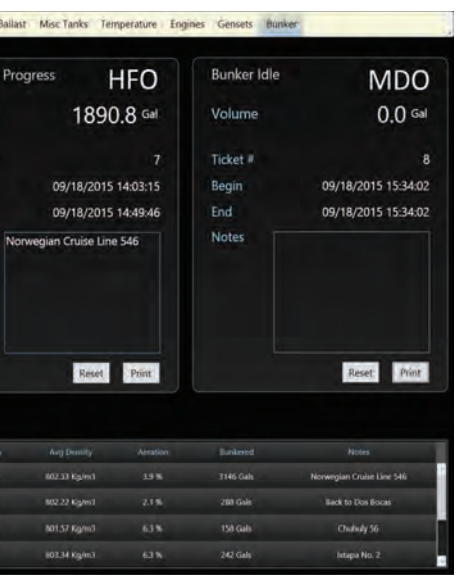
NavCad is a ship resistance prediction and propulsion analysis tool for naval architects and marine engineers. The 2015 release features a Premium addition that includes a host of new analysis capabilities. The new Prismatic Wave Drag module, a wave-theory prediction for residuary resistance, is a powerful feature in this new edition, and this is **HydroComp's** first calculation methodology that can be used in place of a typical parametric prediction.

The Prismatic Wave Drag (PWD) module greatly expands the scope of NavCad and allows for a more first-principles connection between the hull-shape and the wave drag. Instead of simply describing the hull with parameters like length on waterline, displacement, and longitudinal center of buoyancy, the computational model uses a distribution of the hull's geometric properties to describe the shape of the hull form. This distribution is described by evaluating "stations" along the length of the hull, where each station has a sectional area, beam on waterline, and a vertical center of area (VCA). The entered data can also be used to calculate sensitive parameters like half entrance angle and the stern shape factor (for Holtrop and other similar prediction methodologies).

Operation

ABB and **MeteoGroup** recently won an order to outfit 140 container vessels with software to optimize routes. The companies will equip 140 containerships from Maersk Line with advisory software to optimize routes, boost maritime safety and protect precious cargo based on factors including the hull design and the weather. ABB combines its Octopus motion-monitoring, forecasting and decision-support software, with MeteoGroup's SPOS Seekeeping plug-in. Once fitted on Maersk Line ships, it is designed to enable captains to define on-board loading conditions, and more accurately determine areas of the ocean where their ship's motion is likely to exceed threshold values. Routes can then be optimized automatically to skirt adverse conditions, ensuring cargo arrives safely and on-time at its destination port. ABB's Octopus advisory suite includes a 3D hydrodynamic database for each individual hull type. This means ABB's software, together with MeteoGroup's plug-in, is designed to produce accurate calculations about how a ship will respond to dynamic weather and ocean conditions.

Turkish ship management company DITAS Marine Operations and Tanker Management Co. chose **DNV GL's ECO Insight** fleet performance management



Dassault Systèmes

Eniram

solution to improve the performance of its 10 tankers. “We were looking for a solution that is easy to implement and to use,” said Koray Yaş, Ditas’ Technical & New Building Manager. “Less than four weeks after the kick-off workshop we have commenced the fleet roll-out already.”

The performance management portal ECO Insight is designed to deliver a comprehensive and easily accessible way to manage the performance of a fleet, including voyage, hull & propeller, engine & systems performance. It enhances fleet reports with industry data such as Automatic Identification System (AIS), weather, or fuel, and provides benchmarking capabilities. Advanced engineering methods, for example hull fouling predictions based on CFD, are also packaged into the portal. The portal comes with an optional on-board vessel reporting system called Navigator Insight. It ensures high quality data collection on board through smart plausibility checks against specific vessel particulars.

Wah Kwong Ship Management (HK) Limited will adopt **DNV GL’s ShipManager** integrated fleet management software suite. Wah Kwong provides maritime transport in the bulk carrier, tanker and LPG segments, operating a current fleet of 26 vessels, with nine more newbuilds on the way. It recently decided to implement ShipManager software from DNV GL, with the aim to simplify and optimize ship management by allowing extensive fleet-wide data collection and analysis. “We aim to continually improve efficiency and safety and strive to be ‘best in class’ when it comes to operating our fleet,” said Tim Huxley, CEO Wah Kwong Maritime Transport Holdings.

“By streamlining our processes across all ship management functions, we will relieve the documentation burden, particularly for those at sea, while better monitoring and improved data quality will assist in all key decisions we make.” But Huxley realizes that ultimately the success of the investment in ShipManger depends on the staff and crew, noting that ease of use was a driving force in selecting the best system to implement.

Braemar Engineering reported that its new Second Failure Module dynamic positioning DP software was installed on a vessel, and Kyle Eddings, Manager DP and Offshore Projects at Braemar Engineering reported that the first Second Failure Module is now undergoing Beta Testing. The Second Failure Module is a software tool developed by Braemar Engineering designed to allow a more in-depth understanding of the Dynamic Positioning (DP) System, enabling crew members and operators to study second level failures and understand more fully the effects they will have on the power plant and DP capability. The overriding goal is to mitigate these risks in advance. The software purportedly helpful for planning prolonged DP operations, where critical preventive maintenance requires a piece of equipment to be down for a period of time. Additionally the Second Failure Module acts as a highly valuable training tool, enabling DP and Engineering Staff to study the first and second failure effects on their equipment and learn how best to mitigate those risks.

As ever stringent emissions rules come into force regionally and globally, some vessel owners struggle with the best, most efficient means to manage. For those mulling a dual fuel solution, **Krill Systems** offers a solution: Krill Bunkers DBPM-1. Krill Bunkers DBPM-1 incorporates OIML/MID approved (Coriolis) mass-measuring meters to minimize inherent inaccuracies found in two and three phase Heavy Fuel Oil (HFO) transfers. In both lines, flow rate, temperature and density are displayed in real time both digitally and graphically and a ‘Bunkers in Progress’ display area shows the total volume of bunkers delivered, ticket numbers, start and stop times and an area where additional notes can be entered. Tickets can be printed as soon as bunkering is completed. Bunker history, showing all relevant information, including aeration percentage, is always stored and displayed for all bunkering events. Back-flow oil is measured as a negative and therefore reflected as bunkers not having been delivered. Design flexibility inherent in all Krill solutions allows for a high degree of customization of the basic system to meet specific client requirements. And using Microsoft SQL server database technology, Krill records all Bunker loading data, with 2-second resolution, for onboard display.

Eniram Limited released Eniram Performance 3.0, an upgrade specific to the cruise vessel market. Eniram Performance is designed as a robust decision-support tool that offers real-time operational guidance to optimize a vessel’s overall energy management in order to save fuel.

The system is designed to predict required energy and fuel consumption taking into consideration a wide range of variables such as wind and currents for each specific voyage.

Of particular importance is the Key Performance Indicator (KPI) screen that works like an electronic scorecard, showing traffic light values against commonly-agreed targets. The KPI screen starts with a high-level KPI, namely the total fuel consumption on the vessel which is then broken down to specific energy consumers like propulsion and service power. Service Power is, for instance, further split down to Hotel, Machinery and HVAC.

Icon Research recently launched a new DK-20 Diesel Doctor instrument and version 6 engine analysis software, built to be more portable, rugged, easy to use and accurate with new features such as a touch-screen and built-in test. The Diesel Doctor allows users to see how engines are performing and to take action to ensure reliable, efficient operation while avoiding the unexpected. The new version 6 software is a complete rewrite and is compatible with Windows XP, Windows 7 and Windows 8. Although it has the same general feel of the previous generations, the Diagnostic Reporter has been improved such that engine analysis reports can be viewed instantaneously. The ability to compare and analyze propeller curves and shop/sea trial data is now also possible. Existing DK-2 based systems can be upgraded to work with the new version 6 software.

Photo: Mercury Marine

Nauticus Machinery to New Market

For the first time the DNV GL’s Nauticus Machinery software designed for the shipping industry is being used for recreational size marine engines, Mercury Marine has chosen the software for analysis and validation of inboard and sterndrive engines, including transmission and driveline configurations. Nauticus Machinery’s Torsional Vibration tool is an application for the analysis of torsional vibration. Torsional vibration can cause fatigue in engine components, leading eventually to possible breakage of shafts or other machinery parts. With the aid of the software, engineers can prevent this damage by optimizing the design. They can also perform analyses on configurations that have been affected by fatigue, which enables understanding of the underlying causes. Mercury Marine produces outboard, inboard and sterndrive engines; gasoline or diesel inboards and sterndrives power everything from small boats with 115 hp engines to large recreational yachts with 430 hp engines.

MARITIME REPORTER AND ENGINEERING NEWS

EDITORIAL CALENDAR

		BONUS DISTRIBUTION
JANUARY Ad Close: Dec. 21	**Ship Repair & Conversion Edition** Market: Passenger Vessel Operation Optimization Technical: Marine Salvage & Recovery Product: Maritime Propulsion: Gears, Thrusters, Waterjets & Propellers Country Reports: Spain & Portugal	**PVA Maritrends** Jan. 22-26 Washington DC
FEBRUARY Ad Close: Jan. 21	**Cruise Ship Technology Edition** Market: U.S. Navy Technology Technical: BIG DATA: Satellite, Data, Tracking & Communications Product: Marine Coatings & Corrosion Control Country Report: Italy	**Cruise Shipping Miami** March 14-17, Miami, FL **Asia Pacific Maritime** March 16-18, Singapore **ASNE DAY** March 2-3, Arlington, VA **NACE Corrosion** March 6-10. Vancouver **PSOCE 2016 Florida** March 17-19, Tampa, FL
MARCH Ad Close: Feb. 22	**Green Marine Technology** Market: Training & Education: Maritime Simulation Centers & Technology Technical: Workboat Fleet Maintenance & Repair Product: Green Marine Fuels & Lubricants and Emission Technologies Country Report: Japan	**CMA Shipping** Mar 21 -23 Stamford, CT **Workboat Maintenance** April 12-14, New Orleans, LA **Sea Japan** April 13-15, Tokyo
APRIL Ad Close: Mar. 21	**The Offshore Annual** Market: Port & Ship: Loading and Unloading Technology & Equipment Technical: Satellite Communication Product: Deck Machinery, Winches and Ropes Region Reports: Scandinavia: Denmark, Finland, Norway & Sweden	**OTC** May 2-5, Houston, TX **Inland Marine Expo** May 10-12, St. Louis **Portsecure 2016** May 18-20, Toronto
MAY Ad Close: Apr. 21	**The Marine Propulsion Edition** Market: RIB & Patrol Boat Report Technical: Workboat Design & Construction Product: Marine Electronics: Navigation Radar & ECDIS Country Reports: Greece & Turkey Special Report: U.S. Coast Guard Annual	**Posidonia** June 6-10, Athens **Sea-Air-Space** May 16-18, National Harbor, MD **SeaWork** June14-16 Southampton, UK **CIMAC CONGRESS** June 6-10. Helsinki
JUNE Ad Close: May. 20	**Annual World Yearbook** Market: Maritime Simulation & Training Centers Technical: Dredging Vessel Technology Product: Pumps, Valves, Pipes & Insulation Country Reports: U.K. & Ireland	**Marine Money Week** June 21-23, New York, NY
JULY Ad Close: Jun. 21	**Marine Communications Edition** Market: Tugboat, Towboat & Barge Technical: Oil Spill Response & Recovery Product: Marine Electronics Equipment & Supplier Guide Country Report: Singapore	JULY SPECIAL CONTENT ELECTRONIC EDITION www.whitepapers.marinelink.com
AUGUST Ad Close: Jul. 21	**The Shipyard Edition** Market: Offshore Deepwater: Structures and Systems Technical: Heavy Lifting Solutions: Maritime Cranes, Winches, Windlasses & Capstan Product: Ballast Water Technologies Country Report: The German Maritime Cluster	**SMM HAMBURG** September 6-9, Hamburg, Germany
SEPTEMBER Ad Close: Aug. 22	**Maritime & Ship Security** Market: Caring for the Mariner: Onboard Amenities Technical: Maritime Propulsion: The Hybrid Drive Solution Product: Clean Water Technologies Region Report: U.S. West Coast Maritime	**Shipping Insight** October, Stamford, CT
OCTOBER Ad Close: Sep. 21	**Marine Design Annual** Market: Ship Classification Societies Technical: Marine Firefighting, Safety & Salvage Product: CAD/CAM Country Report: The Netherlands	**SNAME** November 2-4, Bellevue, WA **Arctic Technology Conference** October 24-26, St. John's
NOVEMBER Ad Close: Oct. 21	**Workboat Edition** Market: The 'LNG-as-Fuel' Revolution Technical: Deck Machinery, Winches & Ropes Product: Marine Coatings Special Report: Gulf of Mexico Builder and Supplier Guidebook	NOV. SPECIAL CONTENT ELECTRONIC EDITION www.whitepapers.marinelink.com **Workboat Show** Nov. 30-Dec. 2, New Orleans, LA
DECEMBER Ad Close: Nov. 23	**Great Ships of 2016** Market Report: The Autonomous Ship: Command & Control Technical: Shipyard Automation: Welding & Cutting Equipment Product: Marine Engine Guide Country Reports: China & Korea	**Surface Navy Association 2017** Crystal City, VA

Viega SeaPress System

Viega LLC offers the Viega SeaPress system for marine pipe-joining applications. The Viega SeaPress system, available in copper-nickel, can be used in a variety of pipe applications from potable water to fuel to fire sprinklers. The Viega SeaPress system is a 90/10 copper-nickel alloy that's specifically suited for sea-water systems. It is a copper-nickel press fitting with a double-press connection. Viega SeaPress is available with adapters to easily transition to imperial and metric sizes. Viega also offers Viega ProPress systems in copper and 304 or 316 stainless steel, as well as Viega MegaPress in carbon steel for applications including fuels and lube oil systems for the marine market.

www.viega.us

Turbocharger Overhaul

Royston Limited carried out the overhaul of turbochargers on two Tidewater Marine OSVs Marine in the oilfields off of South West Africa. Royston engineers completed the full overhaul of Napier NA297 turbochargers on the Melton Tide FiFi and offshore support vessel, as well as the Netherland Tide, multi-purpose support vessel. Two Napier turbocharger installations on the Melton Tide, powered by dual Wärtsilä 9L26 engines, were serviced at Walvis Bay, Namibia. The work on the two CAT C280-16 engine-powered Netherland Tide involved four turbocharger overhauls while berthed at the Sturrock drydock in Cape Town, South Africa.

www.royston.co.uk

Photo: Royston

Schottel Debuts New EcoPeller

Schottel launched a new thruster optimized for open sea and coastal operating conditions: the Schottel EcoPeller.

Schottel said the new thruster combines quality and technology with hydrodynamic insights from CFD simulations and model tests to offer a top value for the overall efficiency and course keeping stability of the ship, thus enabling owners to achieve lower fuel consumption, operating costs and emissions. The SRE is based on the Schottel SCD design principle: a vertical electric motor integrated into the Rudderpropeller. This eliminates the upper of the two angle gears as well as any necessary shaft lines. On board, the EcoPeller offers low vibration and low noise levels. Besides a plant-side, ready-for-installation assembly with an electric motor from Schottel, the EcoPeller will be available with an option for additional electric motors according to customer needs. The EcoPeller will be available in mid-2016 in a variety of sizes for power ratings between 1,000 kW and approx. 5,000 kW, each as FP and CP variants.

www.schottel.com

Photo: Schottel

Cat's C280s Meet EPA Tier 4, IMO Tier III

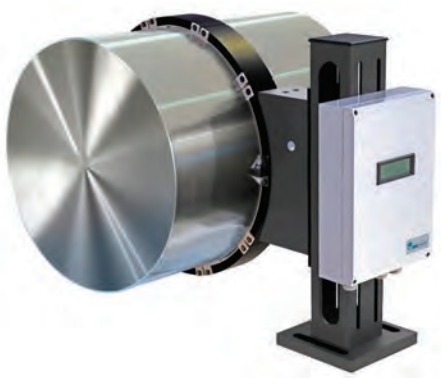
Caterpillar Marine offers its Cat C280 medium-speed diesel engines for U.S. Environmental Protection Agency (EPA) Tier 4 and International Maritime Organization (IMO) Tier III service. The C280 engines are available in eight-, 12- and 16-cylinder models spanning a power range from 2,300-5,060 kW as main engines – conventional and diesel electric – and also as auxiliary generator sets. The new engines reduce emissions, consume less fuel and have lower through-life owning and operating costs, according to the manufacturer. Nathan Kelly, Caterpillar Marine production definition engineer, said the introduction of the Tier 4 engine range enables customers to benefit from the latest NOx emission technology based on selective catalytic reduction (SCR). The choice of SCR over other NOx reducing technologies, Kelly explained, was made based on higher uptime and minimized overall total lifecycle cost. Furthermore, he said, an independent study undertaken by the International Council on Clean Transportation published in March 2014, highlights the benefits of emissions reduction technology and the wide range of companies that have adopted SCR as the most efficient solution for the marine industry.

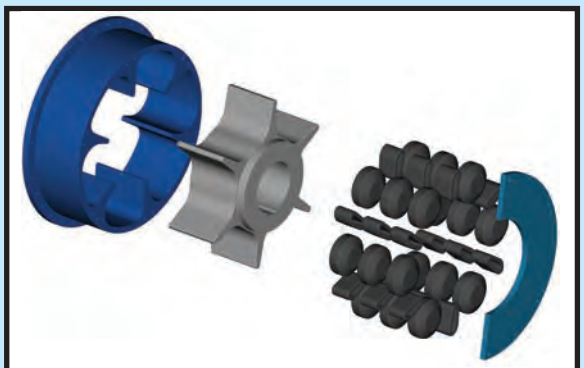
www.catpropulsion.com

SMARTPOWER Torque Meter

BMT SMART Ltd. (BMT) launched the SMARTPOWER Torque Meter, part of its Fleet Vessel Performance Management (FVPM) suite of products. SMARTPOWER Torque Meter is a dedicated measurement tool designed to provide a accurate digital output for Torque, Speed, Power, Running Hours and Total Energy. In addition, the system can provide Thrust and Dynamic data, which BMT SMART software can use to analyze the condition of the main engine, propeller and the gearbox.

www.bmtsmart.com





Couplings Help Cure Genset Vibration

Rubber-in-compression couplings help protect gas- and diesel-driven generator sets from torsional vibration according to couplings manufacturer Renold Hi-Tec. Rubber-in-compression couplings eliminate these vibration problems as the rubber blocks within the coupling are selected to dampen vibration and move the natural frequency away from the operating speeds of the engine, the manufacturer says. The couplings provide drive through rubber blocks, which are compressed, and hence the term rubber in compression.

www.renold.com

Image: Renold Hi-Tec

Mega Dock for Tug & Super Yachts

SF Marina Systems supplied a two piece tug berth, designed for vessels up to 1,100 tons. The berth measures 150 x 32 ft. with a freeboard of 5 ft. The units each weighed more than 240 metric tons. The standard units can be shipped world wide and moored with a variety of anchoring systems with infinite lengths. The concrete structures are targeting the large tugboat and super yacht markets.

www.sfmarineusa.com


Holm


MarAd
Kumar


Whitley


Bonnesen


Candito


Schottel
Fielding

Pyne Joins DHT Holdings' Board

Crude oil shipper DHT Holdings appointed Joseph H. Pyne to its board of directors, expanding the board from three to four independent directors. Pyne is the Executive Chairman of Kirby Corporation, a U.S. tank barge operator, and served as the Chief Executive Officer of the company from 1995 to 2014.

Holm to lead Marine Solutions

Roger Holm (43) M.Sc. (Econ.), has been appointed President of Marine Solutions, Executive Vice President and member of the Board of Management of Wärtsilä Corporation, effective November 1, 2015. In this position, he is responsible for Wärtsilä's Marine Solutions business globally, and will report to President & CEO Mr Jaakko Eskola.

Coles Takes the Helm at Transas

Frank Coles has been appointed as CEO and member of the Board of Directors for Transas Marine. Previously he was the President of Inmarsat Maritime, and was previously CEO of Globe Wireless.

Andersen New CEO of Hempel A/S

Hempel A/S announced that CEO Pierre-Yves Jullien will be succeeded by Henrik Andersen, Group COO of ISS A/S, by March 1, 2016. Andersen has been with ISS A/S since 2000, since 2011 as Member of the Executive Board.

Kumar to Lead MARAD Education and Training

Dr. Shashi N. Kumar, Academic Dean at the U.S. Merchant Marine Academy (USMMA), has accepted a position to serve as Deputy Associate Administrator and National Coordinator for Maritime Education and Training at the headquarters of the Maritime Administration

Huybrechts to Lead Rickmers-Linie America

Rickmers-Linie, the Hamburg-based specialist for liner services in breakbulk, heavy lift and project shipping, appointed Wouter Huybrechts as the new President and CEO of Rickmers-Linie (America) Inc.

Reimelt Heads GE Power Conversion

Stephan Reimelt has been appointed as president and CEO of GE's Power Conversion business, succeeding Joe Mastrangelo who becomes president and CEO of Power Generation Products for GE Power & Water, He will be based at the company's headquarters in Paris.

Vigor Hires SVP of Public Affairs

Jill Mackie will join shipbuilder and repairer Vigor's executive team as senior vice president of public affairs. In her new role, Mackie will provide leadership and oversight of strategic communications, community and government relations at the local, state and federal level for all Vigor companies. Mackie officially joins the Vigor team October 14.

SPO Shuffles Senior Leadership Team

SPO announced a change in leadership with the appointment of a new Managing Director in Singapore. Ron Mathison has taken over the helm as the new Managing Director on September 21, having also been appointed as Director of John Swire & Sons (S.E. Asia) Pte Ltd, with effect from August 1.

Seaspan Appoints Three

Seaspan named three senior leaders to its corporate executive team: Paul Thomas as Vice President, Engineering – Vancouver Shipyards; Matt Boydston as Vice President, Finance – Seaspan Shipyards; and Billy Garton as General Counsel for Seaspan ULC.

Royston Diesel Appoints Whitley

Marine diesel engines specialist Royston announced that appointment of Shaun Whitley as its new workshop manager at the company's Tyneside-based engineering center.

Intermarine Promotes Bonnesen

Breakbulk and heavylift cargo specialist Intermarine, LLC named Lars Bonnesen as Chartering Director Europe effective immediately. Bonnesen has more than 25 years of experience in the heavylift and project cargo markets and has held positions throughout the U.S., Singapore and Malaysia.

Candito Launches Foresea Consulting

After more than 20 years leading oil spill response organization and environmental services firm NRC, Steven Candito has launched Foresea Consulting, an advisory firm for the maritime and environmental communities.

Schottel Names Fielding & Freeman

Schottel appointed Svante Fielding and Randall Freeman to its North American organization, Schottel Inc., in Houma, La. Fielding is the new Vice President Operations. Freeman, Operations Manager in Houma since August 2015, is part of Fielding's service operations team.

ABB Orders Cable-Laying Vessel

ABB ordered a cable-laying vessel from Kleven shipyard in Norway. The new ship, scheduled to be delivered in 2017, will be custom-built to ABB specifications and measure approximately 140 x 30 meters. The vessel is of SALT 306 CLV design from Salt Ship Design in Stord, Norway.

The new ship will deploy many of ABB's marine technologies. The Onboard DC Grid and power distribution solution, for instance, will use a single DC circuit for ship propulsion to reduce power consumption. The vessel will be equipped with roll-reduction tanks and the subsea operations will be executed and monitored by a remotely operated vehicle (ROV) using cameras and sonar, avoiding the need for divers.

The vessel will also feature a complete ABB Integrated Automation System and three Azipod propulsion units. Together with an energy storage system for marine applications it will cut fuel consumption by 27 percent and reduce maintenance compared to traditional AC systems. Sensors, monitoring hardware and software will enable data to be sent to shore via a satellite link, to allow the onshore technical support centers to work closely with the ship as part of ABB's Integrated Marine Operations solution. Advanced advisory software for motion monitoring, forecasting and decision support will also be on board. The vessel will also feature to DP3 dynamic positioning technology.


Schottel
Freeman


Milaha
Al-Mannai


Thrustmaster of Texas
Vonk


IMCA
Benzie


BHG
Gilfus


BHG
Stutzman

Milaha Appoints New President, CEO
Milaha, a Qatar-based company providing marine transportation, offshore support services, port management and logistics services, announced the appointment of Abdulrahman Essa Al-Mannai as its new president and CEO.

Dometic Promotes Trigg
Dometic Group announced the promotion of Ned Trigg to Executive Vice President of Dometic's Marine division.

Keavney, Ferrie Join SMS
Safety Management System, LLC announced the addition of two new employees. In April, Brendan Keavney joined SMSLLC as the new Business Development Manager. In September, Kevin Ferrie joined SMSLLC as a Senior Consultant.

Thrustmaster Appoints Vonk
Thrustmaster of Texas appointed Bart Vonk as Sales Manager of Thrustmaster Middle East FZE, based out of Dubai. Vonk's background is in technical solution sales, having worked as a sales engineer, sales manager and area manager for Wärtsilä, Bosch Rexroth and Voith Middle East.

IMCA Names New Technical Director
Richard Benzie has been appointed Technical Director of the International Marine Contractors Association (IMCA) to replace Jane Bugler who retires after 18 years in the role.

MHI's Two New Shipbuilding Firms Begin Operations
On October 1, two new wholly owned group companies of Mitsubishi Heavy Industries, Ltd. (MHI) succeeding to MHI's ship construction operations in the Nagasaki district will commence business operations. Mitsubishi Heavy Industries Shipbuilding Co., Ltd. will handle ship constructions, while Mitsubishi Heavy Industries Hull Production Co., Ltd. will manufacture hull blocks. Mitsubishi Heavy Industries Shipbuilding will focus on the construction of LNG and LPG gas carriers. Mitsubishi Heavy Industries Hull Production will specialize in the production of large-scale hull blocks.

TOTE Creates Unified Brand
TOTE announced it has shifted operating companies Totem Ocean Trailer Express and Sea Star Line, respectively serving the Alaskan and Puerto Rican/Caribbean markets. Going forward, the companies will be known collectively as TOTE Maritime.

BHG Hires Gilfus, Stutzman
Bristol Harbor Group, Inc. (BHGI) announced the addition of naval architect Zachary Gilfus and mechanical engineer Marissa Stutzman to its naval architecture and marine engineering practice.

Kirby Selects ABS as Subchapter M Solutions Provider
American Bureau of Shipping (ABS), a provider of maritime shipping and offshore classification services, informs it has been selected by Kirby Corporation to provide classification and International Safety Management certification for 11 push boats.

BV Acquires HydrOcean
Bureau Veritas finalized the acquisition of HydrOcean, a French engineering company specializing in hydrodynamic digital simulation for the maritime industry.

The Switch Opens HQ in Helsinki
The Switch, a supplier of megawatt-class electrical drives for wind energy, marine and industrial applications, has opened its new global headquarters in Helsinki. According to Jukka-Pekka Mäkinen, President and CEO of The Switch, the primary motivation behind the location change is to be located in the center of Helsinki, making meetings with partners and clients more convenient.

Glosten Acquires NCE
Glosten, Inc. has acquired Noise Control Engineering LLC (NCE), a consulting firm specializing in ship noise and vibration control.

MPR, MPS ISO-9001 Certified
Maritime Propeller Repairs BV, together with its sister company Maritime Propulsion Services BV, acquired ISO-9001 certification. During an audit by Bureau Veritas, both companies proved to have their affairs well arranged.

Aframax Tanker for Arctic Shipping
An Aframax-sized tanker concept designed for transporting crude oil and oil product in the Arctic has been developed in a collaboration between Deltamarin Ltd. and Aker Arctic Technology Inc. Apart from being ice strengthened and equipped with other new features, the vessel will provide cost efficient and reliable tanker operations both in open water and in ice, according to Deltamarin.

First Ethane-powered Ships
The first ethane-powered ship, JS Ineos Insight, the lead ship in a series of eight 27,500-cubic-meter multi-gas Dragon-class vessels being built at Sinopacific, China, for Denmark's Evergas, was named. The new vessels configured for transport of ethane, LPG or LNG, with options for ethane, LNG and conventional diesel power, will be classed by BV. The Dragon vessels were originally designed with a dual-fuel LNG/diesel power utilizing two 1,000-cubic-meter LNG tanks on deck powering two Wärtsilä 6L20 DF main engines with a total of 2,112 kilowatts power and two shaft generators with a total of 3,600 kilowatts power. The ability to also burn ethane was added to allow use of the cargo gas as the vessels are destined initially for transport of ethane from the U.S. to the U.K. Ineos refineries.


Photo: Meyer Werft

Meyer Werft Offers Training for Refugees

German shipbuilder Meyer Werft and the Johannesburg educational institution in Surwold are expanding their collaboration by further developing already existing work for the integration of young people from socially disadvantaged backgrounds. The program offers refugees from various crises regions opportunities to further qualification and, with this, integrate into society.

In the first step, around 30 people will be accepted into the program which could start as soon as autumn 2015. With this concept for qualification as a "Metal technology specialist," these individuals are given the opportunity to prepare themselves for and qualify in a recognized training profession.

The strengths of both cooperation partners are united in one concept: the Johannesburg education institution focuses on integration and language skills, looks after traumatized refugees and also communicates the content of the metal technology specialist training in practical and theoretical modules. Meyer Werft, meanwhile, offers practical experience and a structured vocational training to enable the refugees to study for a training qualification such as construction mechanic later on.

Europort 2015

November 3-6, 2015, Ahoy Rotterdam

Europort, scheduled to be held November 3-6, 2015, in Rotterdam, is an international maritime meeting attracting an estimated 1,000 exhibitors and 30,000 visitors. The exhibition has a strong focus on special purpose ships including offshore vessels, dredging vessels, construction vessels, naval vessels, workboats, inland vessels, fishery vessels and super yachts. The following are examples of some leading Dutch maritime companies and their plans for Europort. For more information visit:

http://www.europort.nl

Alphatron: One-Man Bridge Solutions on Display

Alphatron Marine plans to showcase some new developments at Europort, including some of the world's most technologically advanced marine electronics and total solution concepts.

Bridge operations is a key area of focus, and the company will showcase its joint synergies of Alphatron and JRC, including three state-of-the-art bridge solutions, driven by the same concept and mindset of harmonizing control and advancing navigation technology.

The first is a unique, fully integrated **Alphatron Marine one man bridge** with a total of three 46-inch displays for use in semi military and or coastal patrol vessels, combining radar, WECDIS, conning, alarm monitoring and DP data in an easy to use format and where all operating panels are "within reach." A unique interfacing between thermal camera's and WECDIS allows full integration with the vessels military equipment.

As a **full merchant JRC variant**, the second innovative and integrated bridge concept is a derivative of the one men bridge targeted at larger vessels. A total of five 46-inch displays with a center console allows for easy access to maneuvering controls and all other essential operating functions with the added ability to walk around.

The third is a **tugboat variant**, being the result of a design study together with some of the biggest tugboat operators in the world. This modular tugboat variant ensures all round visibility and ship control without compromise. It will also launch its new digital chart table concept. This all new digital chart table consists of a 46-inch touch display, known from our premium bridge concept, where routes can be planned on a more realistic "paper chart" scale. The display can be electronically tilted, allowing optimal routing in an ergonomic way. In addition to the digital chart powered by Navtor, the console incorporates the necessary GMDSS communication equipment, while at the same time leaving room for the paper chart for back up purposes.

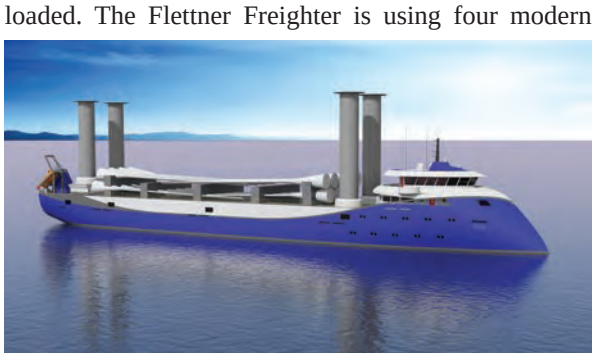
In addition the company will show Cobham's SAILOR VSAT satellite system and Sea Tel TV antenna solutions; Flir's multi sensor thermal camera's; Cnav's DGNSS system; Navis compact DP system; Yokogawa PT900 auto pilot and paperless course recorder; Eknis chair with our cabin entertainment system; and Panasonic CCTV system.

Hall 3, Stand 3405

Meet the Flettner Freighter

The 5000 DWT Flettner freighter has been developed within the European "S@IL" project. An important outcome of the project is that due to the dependence on trade winds, a 100% sailing vessel without an engine is not economically feasible within the commercial cargo transport sector. Broad research has been done to generate viable alternatives, leading to the model of wind assisted propulsion and hybrid shipping.

The Flettner Freighter has a water displacement of nearly 8,000 tons and 6320 cu. m. cargo capacity. Furthermore, the ship is equipped with one main engine of 4000 kW and has a service speed of 13 knots when loaded. The Flettner Freighter is using four modern Flettner Rotors (designed by Anton Flettner in 1928).



The Flettner Rotors create a forward lift by the rotation of the rotors and the wind. On average, the use of the Flettner Rotors results in a fuel saving of at least 18%, compared to conventional cargo vessels in the same DWT range.

The main innovation of the Flettner Freigher is the possibility to move the rear two Flettner Rotors in the longitudinal direction to accommodate for the best sail balance of the vessel and thus to optimally exploit the wind force and wind direction.

SAIL is an international cooperation in the European Interreg IVB North Sea Region under the leadership of the Dutch Province of Friesland and ends in 2015. The Flettner Freighter was developed in cooperation with a shipowner and is designed by C-Job Naval Architects. C-Job is known for earlier innovative ship designs, such as the green ferry MS. Texelstroom for TESO NV and the series of Heavy Lift Vessels for Hartman Shipping and Abis Shipping.

The ambition of the SAIL project partners is to enrich commercial shipping with innovative and sustainable vessels such as the Flettner Freighter.

Shipyard Kooiman BV

The Dutch Pilotage Service contracted with Kooiman BV for a major maintenance survey and life-extension of its SWATH vessel Cetus en Persues, measuring 25.7 x 14.3 x 2.7m and built in 2005. Shipyard Kooiman is providing refit services to extend the life of the vessel, with a net total increase in propulsion power. Additional modifications include electrical, cooling water systems, interior and accommodations. These vessels have accommodations for a three-person crew and 12 passengers. Work onthe boat started in mid September 2015. The modifications and repairs will be performed in the new building hall of Shipyard Kooiman, which measures 100 x 30m.

Image: Damen

Damen

New Yacht Range Sails to the Extremes (& Back)

Ever an innovator in design, Damen brings to the market a new yacht range – SeaXplorer – designed to survive and thrive in the earth's extreme regions, from remote tropical areas to the polar region. Tabbed as the world's first purpose-built, Polar Code compliant range of expedition yachts has been launched by Damen and its luxury super yacht division, Amels. The design made its debut last month at the Monaco Yacht Show.

The 65- to 100-meter SeaXplorer range includes three designs holding the capability to explore the seas' extremes, from the poles to the tropics and everywhere in between. The new yachts, which feature Damen's patented "Sea Axe" hull design and Polar Class double-acting hull to break through ice, is something of a fusion between the shipbuilder's commercial vessels and luxury yachts.

All details of the SeaXplorer range were designed by a dedicated Damen team in the Netherlands under the responsibility of Product Director Mark Vermeulen, while Amels is responsible for sales and marketing.

Damen said it has invested thousands of hours in research and development, ice tank testing and real expedition pedigree through detailed design input from partner EYOS Expeditions. The exterior lines were penned by AZURE Yacht Design and Naval Architecture, and the builder offers the owner's choice of luxury interior designer.

According to Arnout Damen, Damen's Chief Commercial Officer, the SeaXplorer range shows the strength of collaboration. "It's the synergy of Damen and Amels, the shipbuilding know-how, the deep understanding of superyacht lifestyles and the right experienced partners who understand luxury expeditions," he said. "It makes the SeaXplorer a very attractive project at an advanced stage so we can have a real conversation with each client about what they want to achieve."

The three models in the SeaXplorer range (65, 90 and 100 meters) are each capable of sailing up to 40 days of full service for all guests without port call.

The vessels also carry tenders (including a dive support tender), expedition equipment, toys, submersibles, dive equipment (including recompression chamber) and up to two helicopters, all easily deployed by design.

www.damen.com

Pronomar

Pronomar will exhibit at the Europort 2015 in World Port Rotterdam, the Netherlands at stand 2303, showcasing its innovative drying systems and MERUS technology. The Pronomar drying systems are designed to quickly and efficiently dry different types of protective clothes, preventing your staff from working in wet, cold suits. The MERUS technology is an environment-friendly solution to your problems with scaling, rust and biofouling in fresh- or seawater lines. Pronomar will also showcase a new type of drying cabinet, produced from robust GRP and carrying Lloyd's Type Test Approval – produced in collaboration with new partner JoBird.

Bolideck Future Teak

Bolidt is celebrating a decade of success for Bolideck Future Teak, dubbed an environmentally-friendly and realistic alternative to traditional teak decking. Long term supporter Norwegian Cruise Line (NCL) specified extensive use of Bolideck Future Teak for the 164,000gt, 4,200 passenger capacity Norwegian Escape, the first 'Breakaway Plus' vessel due delivery from Meyer Werft in October. In total, Bolidt will supply 15,000 sq. m. of exterior decking for Norwegian Escape, with Bolideck 525 and Bolideck Select Soft featuring alongside Bolideck Future Teak. Bolidt is also supplying decking materials for 4,500 sq. m. of balcony space and interior public areas.

Another repeat Bolideck Future Teak customer is Royal Caribbean International (RCI), which has confirmed a contract for 18,000 sq. m. of decking for the 5,479 passenger Harmony of the Seas. Bolideck Future Teak will cover the outer decks of the luxury cruise ship, with Bolideck Select Soft featuring in public areas inside. Bolidt is also delivering Bolideck Select Hard for swimming pools and Bolideck Helideck for the helicopter landing platform. The 226,000gt Harmony of the Seas is due for delivery from STX France in April 2016. Bolidt products are also onboard Koningsdam, the new Holland America Line vessel type due for delivery from Fincantieri's Marghera yard in 2016, with novel design features developed by architects Adam D TIhany and Yran & Storbraaten. The largest vessel in the HAL fleet, at 99,500 gt and 2,650 passenger capacity, Koningsdam will feature 4,700 sq. m. of Bolideck Future Teak on the outer decks.

In addition, orders for cruise ship refits are strong, according to Van Overbeek, who reports that AidaDiva was fitted out with 550 sq. m. of Bolideck Future Teak and 180 sq. m. of Bolidt Select Soft during a recent refit at Blohm + Voss.

World Maritime Technology Conference 2015

November 3-7, 2015, Rhode Island Convention & Omni Hotel, Providence, Rhode Island

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www.energyntech.com

Fike Corporation HQ
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www.fike.com

Force Control Industries
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www.forcecontrol.com

ABS Booth 412

The American Bureau of Shipping (ABS), a New York not-for-profit corporation, sets standards for safety and excellence as a leading ship classification society. For more than 150 years, ABS has been at the forefront of marine and offshore energy innovation, working alongside partners to address technical, operational and regulatory challenges for safer, more secure marine and offshore operations.

www.eagle.org

Creative Systems Booth 310

Creative Systems is the originator of GHS, the PC-based simulator of vessels in fluids and fluids in vessels. It offers four software packages: GHS (General HydroStatics) - the naval architect's package; GHS/Salvage - the salvor's package; GHS Load Monitor (GLM) - for shipboard use; BHS (Basic HydroStatics) - the engineer's economy package.

www.ghsport.com

SSI Expo Lounge

SSI provides Autodesk based solutions to the shipbuilding and offshore industry. SSI develops AutoCAD based CAD/CAM software suite ShipConstructor. SSI applies information technology expertise to address challenges including sharing engineering data with other business processes and applications such as MRP, ERP and PLM tools. Shipbuilders, naval architects and marine engineers use SSI for projects such as yachts, oil rigs, tankers, ferries, warships and workboats.

www.shipconstructor.com

ClassNK Booth 220

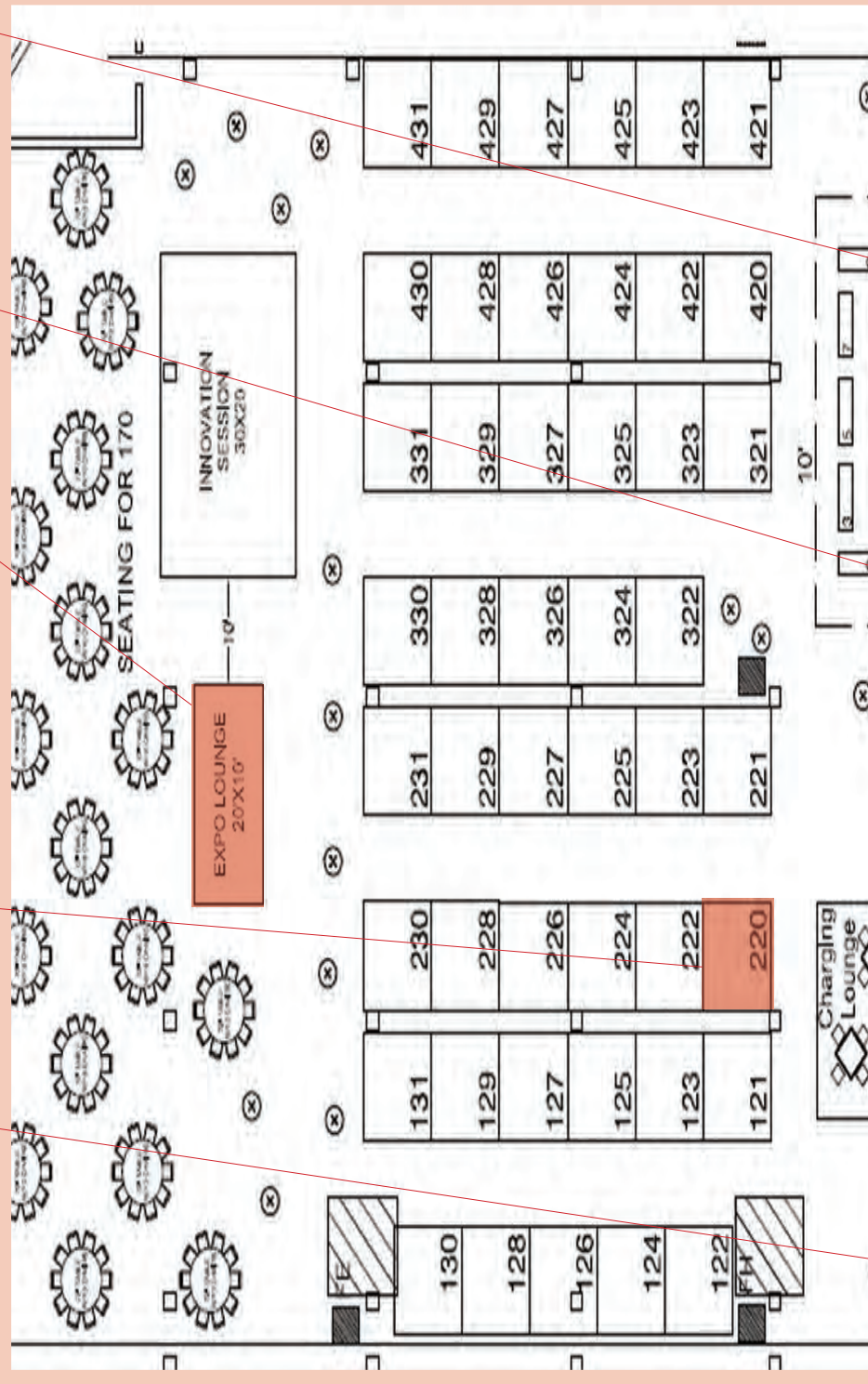
Classification society ClassNK operates as a non-profit, independent organization offering a range of services that encompass every aspect of ship classification from the development of technical rules and guidelines to the approval of ship designs and the survey and registration of vessels and installations.

www.classnk.com

Viega LLC Booth 112

Viega is a leader in press pipe fitting technology for industrial, commercial and residential projects, manufacturing and distributing plumbing, heating and pipe joining system solutions. Headquartered in Wichita, Kansas, Viega LLC employs approximately 500 people throughout the U.S., Canada, Mexico and Latin America.

www.viega.us



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www.oceaniccorp.com

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www.pepco-ft4.com

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www.stimarine.com

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www.neropes.com

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Published since 1939, Maritime Reporter & Engineering News is the world's largest circulation b2b publication serving the global maritime market, and the patriarch of a family of 4 print magazines, 10 websites and a dozen Enews services serving the commercial maritime, offshore, subsea and energy markets.

www.marinelink.com

Damen Shipyards Booth 408

Damen Shipyards Group operates 32 ship- and repair yards, employing 9,000 people worldwide. Based on its standardized design concepts, Damen offers a wide range of vessels. Damen also offers a broad range of marine components, as well as services such as repair, conversion, maintenance, spare parts delivery, training and transfer of shipbuilding know-how.

www.damen.com

Herbert-ABS Software Solutions LLC Booth 410

Herbert-ABS bridges design, classification and operational management aspects of vessels and offshore units. The company offers loading and salvage emergency response software packages and design tools to the maritime and offshore industries. Its portfolio includes CargoMax, CruiseMax, HECSALV, HECSALV Offshore, HECSDS, LMP-Offshore, Trim & Draft Optimization, Incline, Detailed Deck Plan Entry (DDPE) and Direct Damage Stability (DDS).

www.herbertsoftware.com

MAN Diesel & Turbo
Booth 300

MAN Diesel & Turbo is a provider of large diesel engines used in ships and power stations, as well as a supplier of turbomachinery. MAN Diesel & Turbo North America, headquartered in Houston, provides the full array of MAN diesel and gas engines, turbomachinery and after-sales service support.

www.mandieselturbo.us.com

Sohre Turbomachinery Booth 213

Sohre Turbomachinery Inc. provides bristle type fiber grounding brushes for use in shaft grounding (shaft earthing) of all types of stray electrical shaft currents. The brushes can also be used for instrument signal transmission and generator or electric motor on-line diagnostic work. These brushes are self cleaning, can run dry, partially or completely submerged in oil.

www.sohreturbo.com

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ALUMINUM BOATS

Moore Boat, LLC, 12303 N Piney Point Rd, Bishopville, MD 21813 , tel:(410) 524-3456, mikeearly@mooreboat.com contact: Mike Early

ANCHORS & CHAINS

Anchor Marine & Supply, INC., 6545 Lindbergh Houston, Texas 77087 , tel:(713) 644-1183, fax:(713) 644-1185, david@anchormarinehouston.com

ANTI-CONDENSATION COATINGS

Mascoat Products, 4310 Campbell Rd., Houston, TX , USA , tel:(713) 465-0304, fax:(713) 465-0302, wconner@mascoat.com

ATTORNEYS

Blank Rome LLP - Admiralty & Maritime Law, 600 New Hampshire Avenue, NW, Washington, DC , USA , tel:(202)772-5927, fax:(202) 772-5858, Grasso@BlankRome.com contact: Jeanne M. Grasso, www.BlankRomeMaritime.com

AUTOMATIC IDENTIFICATION SYSTEM

Saab TransponderTech AB, SE-589 41 Linkoping , tel:46 13 180000, fax:46 13 182377, Info.transpondertech@saabgroup.com

COATINGS/ CORROSION CONTROL/ PAINT

Hempel A/S, Lundtoftegårdsvej 91 2800 Kgs. Lyngby , tel:45 4593 3800, fax:45 4588 5518, marine@hempel.com , www.hempel.com

Tri-State Coating and Machine Co. Inc., 5610 McComas Road, PO Box 296, Salt Rock, WV V4W 3S8, USA , tel:1-800-477-4460, fax:304-736-7773, brichmond@tscminc.com contact: Beverly Richmond, www.tscminc.com

COMMUNICATIONS

David Clark Company (Wireless Headset Communication Systems), 360 Franklin Street, Worcester, MA 77060, USA , tel:(800) 298-6235 , www.davidclarkcompany.com/marine

CORDAGE

Helkama Bica Oy, Lakimiehenkatu 4, KAARINA FI-20780, Finland , tel:+358-2-410 8700, sales@helkamabica.fi

DRILLS

Hougen Inc., 3001 Hougen Drive Swartz Creek, MI 48473

ENVIRONMENTAL SOLUTIONS

Environmental Solution, Inc., P.O. Box 788, Wake Forest, NC 99835, USA , tel:(919) 740-0546, john@totalbiosolution.com

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UT 99 AG Oil Mist Separators, Schaubenstrasse 5 CH-8450 Andelfingen , Switzerland , tel:+41 52 397 11 99, fax:+41 52 397 11 90, info@ut99.ch , www.ut99.ch/en

INSURANCE SERVICES

WQIS (Marine Pollution Insurance Policies), 60 Broad Street, 33rd Floor, New York, NY , USA , tel:1-800-736-5750, fax:(212) 292-8716 , www.wqis.com

WQIS (Water Quality Insurance Syndicate), 60 Broad Street 33rd Floor, New York, NY 18974, USA , tel:1-800-736-5750, fax:212-292-8716

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MECHANICALLY ATTACHED FITTINGS (MAFS)

Viega, 100 N. Broadway 6th Floor, Wichita, KS , USA , tel:904-315-3899, fax:888-782-6188, paul.switzer@viega.us contact: Paul Switzer, www.viega.us

MILITARY PATROL CRAFT MANUFACTURERS

Brunswick Commercial & Government Products, 420 Megan Z Avenue, Edgwater, FL 80204, USA , tel:(386) 423-2900, kelsey.nemeth@whaler.com , www.brunswickcgp.com

MOORING PRODUCTS AND SYSTEMS

DCL Mooring and Rigging, 4400 North Galvez Street, New Orleans, LA , tel:504 944-3366, fax:504 947 8557, codys@dci-usa.com

DCL Mooring and Rigging, 4400 North Galvez Street, New Orleans, LA , tel:504 944-3366, fax:504 947 8557, codys@dci-usa.com

NAVAL ARCHITECTS, MARINE ENGINEERS

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Brunswick Commercial & Government Products, 420 Megan Z Avenue, Edgwater, FL 80204, USA , tel:(386) 423-2900, kelsey.nemeth@whaler.com

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The Shearer Group, Inc., 3101 NASA Parkway Suite I, Seabrook, TX , USA , tel:(281) 532-2080, info@shearer-group.com , www.shearer-group.com

NITROGEN GENERATORS

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PRESS FITTINGS

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Bayonne Drydock & Repair Corp., Military Ocean Terminal Dock Yard, PO Box 240, Bayonne, NJ 07002 , USA , tel:201-823-9295, fax:201-823-9298, ksullivan@bayonnedrydock.com

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Vice President of Vessel Services
Full Time , Senior Management / Corporate Officer
Category: Corporate / Senior Management
Required Skills:
• Bachelor's Degree
• Minimum 10 years progressively responsible experience in business development and/or marketing
• Minimum 10 years progressively responsible experience in shipping, environmental compliance, emergency response, incident command, public safety and/or related field
• Experience managing finances and personnel with demonstrated business acumen
• Experience in international business or related international experience
Preferred Skills:
• Master's Degree desirable
• Experience selling services into foreign flag shipping companies
• Professional experience with public speaking, networking and presentations
• Oil spill response and vessel inspection experience is desirable
•Technical understanding of marine vessel operations
• International maritime shipping experience is desirable
• Experience working closely with or in the U.S. Coast Guard is desirable
• Ability to prioritize and handle multiple projects in a changing work environment
• Skilled in strategic planning, operations management and leadership
• Excellent oral and written communication skills
• Extremely effective with public speaking and giving presentations
• Comfortable networking and interacting with clients and prospects
• Excellent phone and interpersonal skills (clients, colleagues, vendors)
• Proficient computer skills: (including MS Word, MS Excel, PowerPoint, MS Access, MS Visio, Adobe Acrobat Professional and other applications; and the ability to learn new products as needed).
Description:
Vice President of Vessel Services
This position description incorporates the core responsibilities of the job. It recognizes that other related duties not specifically mentioned might also be performed, and that not all responsibilities may be carried out depending on operational needs.
Position Summary: The Vice President, Vessel Services supports the Senior Vice President of Vessel Services and functions as the deputy to the Sr. Vice President of Vessel Services. The Vice President of Vessel Services is responsible for shipping vessel compliance services related to the Oil Pollution Act of 1990, Clean Water Act and other environmental laws and regulations affecting shipping companies doing business in the United States, Canada, Panama and other locations. This position will provide oversight and leadership for the day-to-day management of the Vessel Services Division staff as well as coordination between the Emergency Management Department of Response. The Vice President of Vessel Services also plays a role in organizational growth by managing client accounts and networking to expand services.
Essential Functions:
• Support the Sr. Vice President in establishing and developing strong relationships with clients, prospects and staff both nationally and internationally
• Manage staff to ensure that shipping vessel compliance and the required level of expertise is maintained at all times
• Oversee international reps for business development and client satisfaction
• Strategic planning and implementation of short and long term goals
•Establish objectives for both national and international service targets
• Coordinate oversight and management of client and prospect accounts including quality assurance for problem resolution and collection of accounts receivable
• Support the Sr. Vice President with communications and prospective client visits
• Ensure expert advice is distributed to clients and prospects regarding environmental compliance for shipping vessel traffic
• Support the Sr. Vice President in seeking opportunities to expand services and coordinate outstanding customer service
• Lead overall compliance planning, publish updates and newsletters, coordinate exercises and vessel inspections
• Support compliance of the Witt O'Brien's Spill Management Team Tabletop Exercise Program and other exercise programs
• Work with Seassurance to support Certificates of Financial Responsibility (COFR) and the provision of International Carrier Bonds (ICB)
• Oversight of VesselPro and the coordination between IT and future requirements of VesselPro
• Ensure compliance to ensure with relevant rules and regulations regarding the use of temporary employees associated with the needs of the business model
• Other duties as assigned
Working Conditions: • Requires extensive domestic and international travel (50%, with multiple weeks at a time) • May require deployment within 24 hours of notification • May require irregular/extended work hours
NOTE: The staff office is located in New Jersey, however applicants are not required to reside in the Plainsboro, NJ area. Witt O'Brien's is an international
company and all qualified applicants are encouraged to apply.
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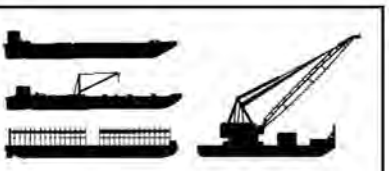

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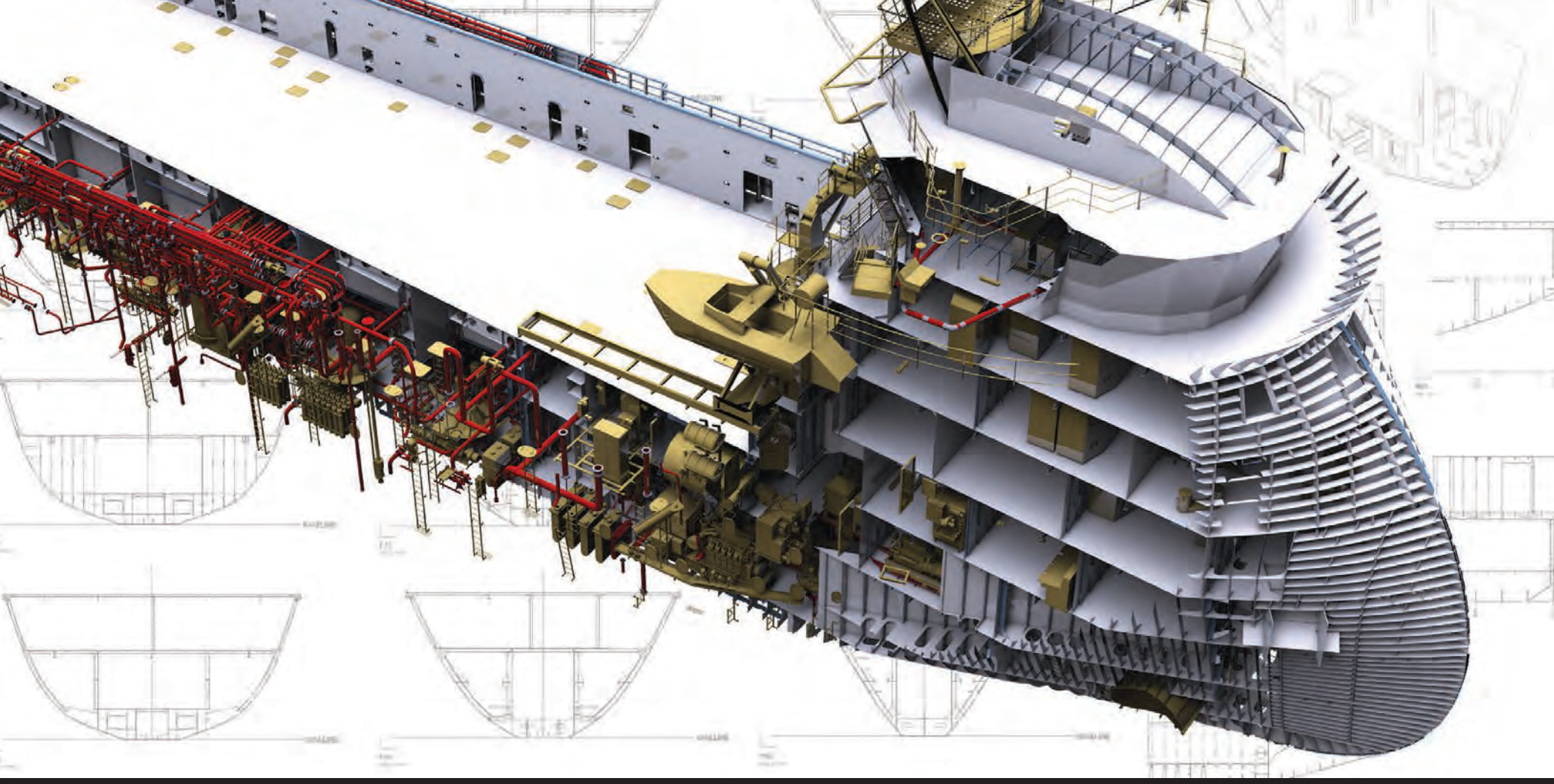

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