December 2022

MARITIME REPORTER AND ENGINEERING NEWS

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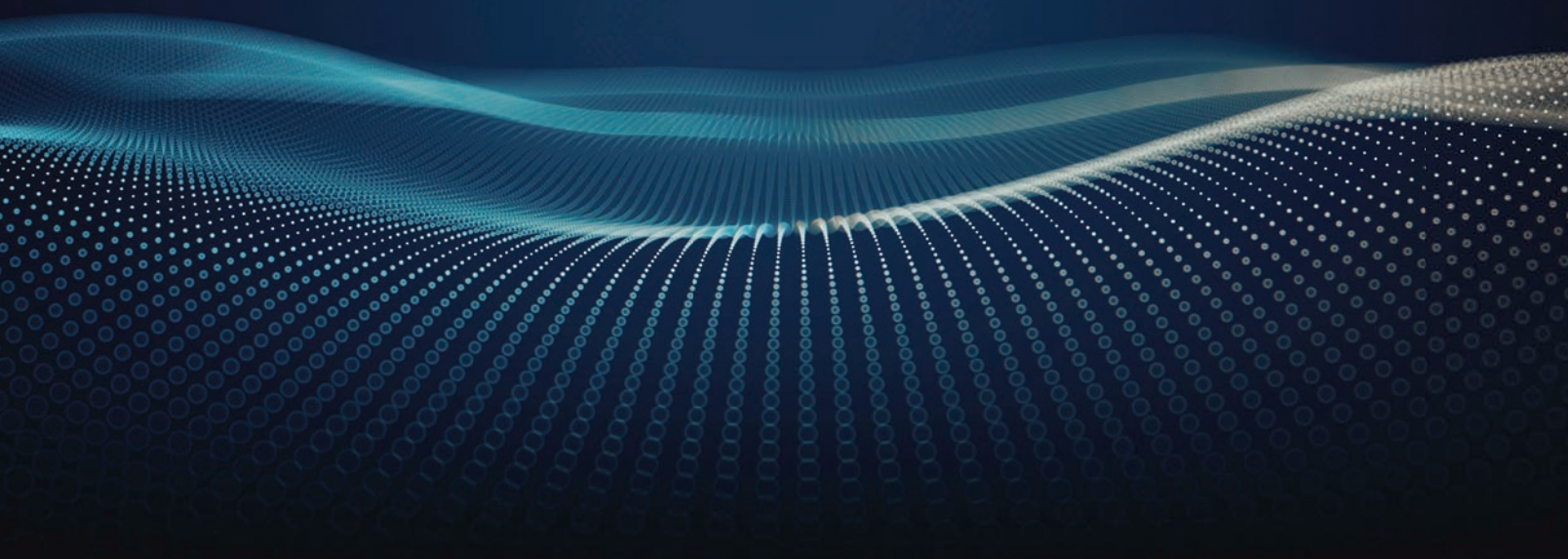

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Great Ships of 2022

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MARITIME REPORTER AND ENGINEERING NEWS

MARINELINK.COM

ISSN-0025-3448
USPS-016-750
No. 12 Vol. 84

Maritime Reporter/Engineering News (ISSN # 0025-3448) is published monthly except for March, July, and October by Maritime Activity Reports, Inc., 118 East 25th St., New York, NY 10010-1062. Periodicals Postage Paid at New York, NY and additional mailing offices.

POSTMASTER:

Send all UAA to CFS. NON-POSTAL AND MILITARY FACILITIES send address corrections to Maritime Reporter, 850 Montauk Hwy., #867, Bayport, NY 11705.

SUBSCRIPTION INFORMATION

In U.S.:
One full year (9 printed issues) $90.00;
Two years (18 printed issues) $150.00

Rest of the World:
One full year (9 printed issues) $140.00;
two years $180.00 (18 printed issues) including postage and handling.

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This year's "Great Ships" edition broadly demonstrates the direction that maritime is headed, one defined by reducing carbon emissions to the air and water, punctuated by a wealth of new and emerging technologies – and the dusting off and sprucing up of some old ideas. The direction is clear, but the pace is not.

This year's Ship of the Year is the MV George III, the first of Pasha Group's two new 'Ohana Class', Jones Act-qualified containerships, operating on LNG from day one in service. George III is the first LNG-powered vessel to fuel on the West Coast and the first to serve Hawaii. The 774-foot-long vessel surpasses the IMO 2030 emission standards for ocean vessels. Designed and built from scratch, with the first delivered and the second on the way, the project was not without challenges. The first was the availability of fuel in sufficient quantity to ensure smooth operations. Whatever fuel you're considering, Pasha Group's activity in this regard may serve as a role model, as the company developed a joint venture called West Coast Clean Fuels with World Fuel Services who deliver 70% of the bunkers in the LA Basin.

While much focus, rightfully so given its cost to overall operations, resides on the fuel, George III further exemplifies the wholistic approach to complete ship design and systems integration … dozens of 'little things' that cumulatively work to ensure fuel economy and emission reduction.

For example, the hull form is optimized, undergoing model tank testing at the Maritime Research Institute of the Netherlands (MARIN), the result being a twisted, leading-edge rudder and a high efficiency propeller to match that hull form. Apart from the hull, the ship features self-polishing copolymer paints; a full-spectrum of modern bridge kit – hardware and software to ensure the best route is plotted and followed; and SCR on the auxiliary engines.

While the new LNG ships are a physical manifestation of the Pasha Group's commitment to ESG matters, it's not the only move as **George Pasha IV** said the company's ties to the community and environment concerns are long-tenured, noting the company's pioneering role in terminal projects, including the Port of Los Angeles Green Omni Terminal that started with solar battery power electric vehicles, including heavy cargo handling equipment. "We were early on, and so we've had some struggles trying to make all of that work, but we had some support from MARAD grant money to install a microgrid and take that to a more practical next-level as well."

So George III, impressive as it is, is far more than a new ship. It embodies the decarbonization and digitalization technology that is driving this transcendent period in maritime. It demonstrates how public/private partnerships can work. Finally, it illustrates the 'no silver bullet' solution to meeting and beating 2050 mandates, as all great leaps in technology transformation are first defined by thousands of small steps.

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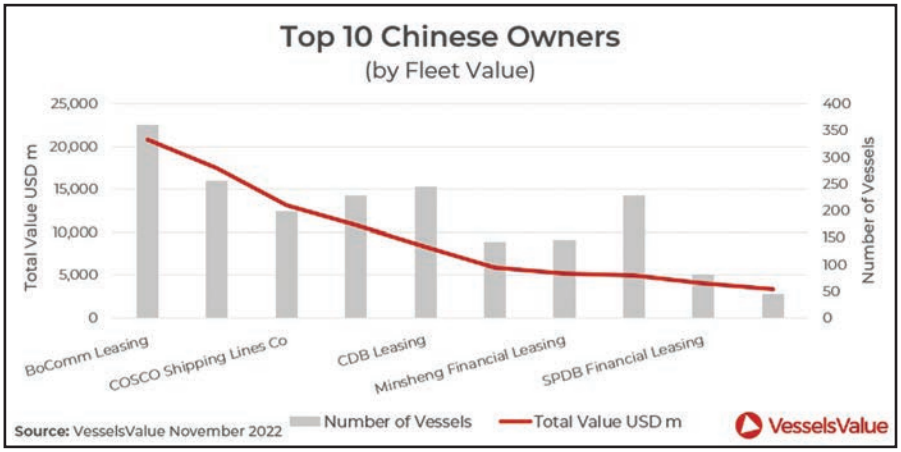
Chinese Shipowners

Courtesy of our friends at VesselsValue, we take a deep dive into the Chinese maritime market. Despite nearly three years of COVID lockdowns, which largely continue in mainland China, the numbers speak for themselves.

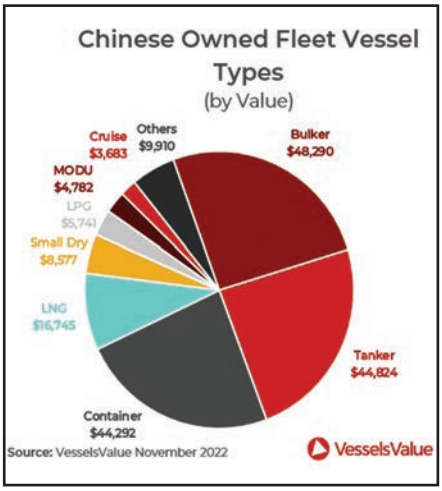
Top 10 Owners

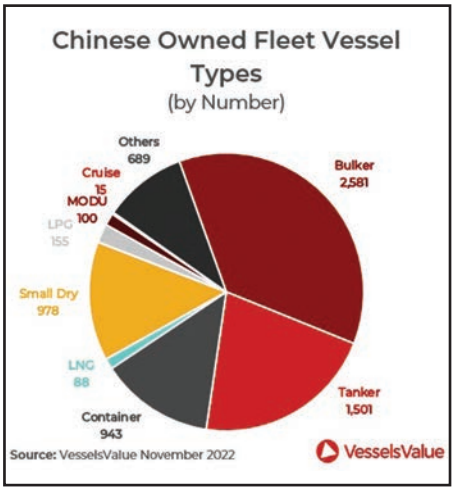
Company	# of Vessels	Total Value ($)
BoComm Leasing	360	20,811
ICBC Financial	256	17,424
COSCO Shipping	199	13,134
CMB Financial	229	10,847
CDB Leasing	244	8,258
COSCO Shipping	141	5,834
Minsheng Financial	146	5,199
COSCO Shipping Bulk	229	4,906
SPDB Financial	81	4,076
China VLCC	45	3,353



Chinese 2nd Hand Purchases

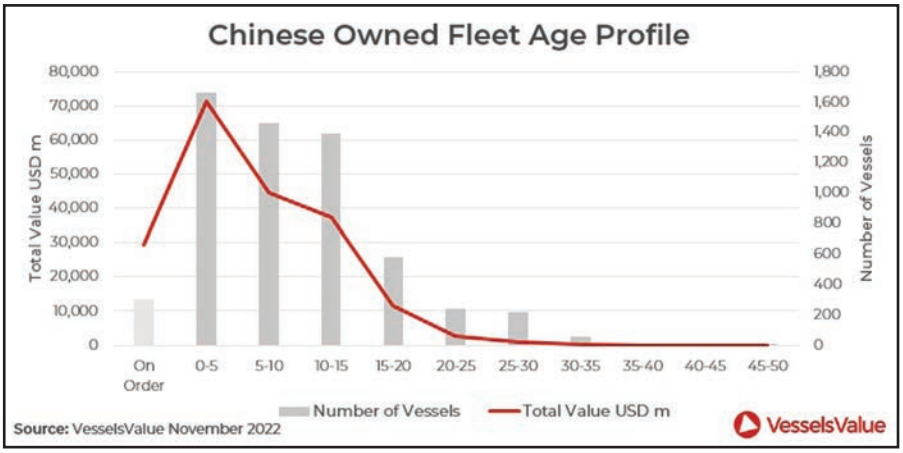
Sale Date	# of Vessels	Total Spent ($)
2010	155	2,482
2011	117	1,216
2012	104	1,252
2013	130	1,724
2014	121	3,503
2015	112	2,699
2016	238	6,189
2017	270	7,227
2018	347	8,087
2019	459	9,482
2020	545	12,780
2021	713	15,903
YTD 2022	428	11,291





Chinese Owned Fleet Age Profile

Age Group	# of Vessels	Total Value ($)
On Order	300	29,433
0-5	1,658	71,316
5-10	1,459	44,594
10-15	1,388	37,317
15-20	583	11,524
20-25	238	2,697
25-30	216	763
30-35	58	171
35-40	7	24
40-45	5	2
45-50	1	8



ABS Wavesight

New name with a long digitalization pedigree

By Greg Trauthwein

As digitalization in the maritime sector gains speed, the American Bureau of Shipping (ABS) has launched a new maritime software as a service (SaaS) company, ABS Wavesight, to effectively consolidate all digital products under one roof, offering ship owners a one-stop-shop for it's A-to-Z digital solutions. In an interview with Maritime Reporter TV in advance of the announcement, **Paul Sell**s (pictured right), the CEO and the president of the newly formed ABS Wavesight provided the rationale behind the new company. "ABS has been, for over 160 years, a strong technical contributor to classification services and to the maritime industry as well. With a lot of the changes that are going on in the industry right now, ABS felt that it was time to consolidate the digital products that are under our broad umbrella and bring them back to market in a product-focused organization as an ABS-affiliated company." ABS Wavesight's purpose-built, integrated solutions are designed to "ensure a cohesive user experience that reduces costs, improves safety and designs out inefficiencies."

Paul Sells, CEO & President, ABS Wavesight

What is the ABS Wavesight offer?

Sells, an engineer who has both a shipbuilding and a digital solution background, said: "[ABS Wavesight] includes everything that's under ABS's portfolio today, including Nautical Systems, which has been in the market and powering shipping companies for all of their technical services and management needs for over 30 years.

"We're also bringing in My Digital Fleet, which includes compliance. It includes vessel performance and voyage performance optimization solutions to meet the modern needs of the decarbonization drive in the industry. And then, finally, we're very excited to talk about our Electronic Logbooks products as well, which are very fast to get onto and help you get out of paper and are approved by many flag states," Sells said. Nautical Systems is ABS' fleet management system that provides comprehensive tools to improve reliability and performance. My Digital Fleet is an AI-driven analytics and performance visualization platform. The two solutions are collectively installed on more than 5,000 vessels across the global fleet.

According to ABS, ABS Wavesight builds on these capabilities by integrating both products to offer "unparalleled visibility into fleet assets and real-time insights that drive sustainable operations and reduce operational risks."

In a press release marking the ABS Wavesight launch, ABS said that the company would provide: Risk-based business intelligence with the ability to support predictive decision-making using artificial intelligence; CII impact calculation and prediction to avoid risk and improve the score; Deep insight into fuel spend while improving the efficacy of vessel routes; and seamless integration of industry-trusted, third-party data into one single platform. In addition, the aim is to provideinsights needed to help shipowners reduce their carbon footprint, while driving ESG initiatives and increasing profitability. "The immediate benefit to the ship owner will be the integration and seamless user experience that we'll be bringing to bear. So your technical managers are logging into Nautical Systems, or perhaps your operations manager are so logging into MDF, and all that information will eventually be interoperable and portable."

Sells said that vision is for ABS Wavesight to provide our clients with "unmatched value" through a suite of products that offer integrated solutions vs. fragmented vendor offerings, open APIs vs. closed systems that don't share data, and a flexible architecture for easy system integration and maintenance vs. costly upgrades every few years. Sells said the immediate top prioprities are to consolidate the company's products, build consistent and cohesive user experiences, and ensure that ABS Wavesight's customers are able to access everything in the company's portfolio to meet their business needs.

Tip #42

Testing ... *What's the Point?*

We talk a lot about assessment and how to get it right. But in order to make good decisions about testing, we have to understand why we test in the first place - and the answer is not what most people think. This is a problem because knowing the answer is critical to designing an effective training and assessment program. It informs all aspects of testing from the length and makeup of tests to what we test, how we test, when we test, and whether a test needs to be proctored.

When asked why we test trainees, most will provide an answer along the lines of "to see if they know the required knowledge / can perform the desired skill". This is a misleading answer, and it leads us to false conclusions about how we should test. It leads us to conclude that if someone masters a test, they are fully competent - possessing all the required knowledge and skills. This is wrong and we need to stop thinking of assessments as providing this kind of information. They do not.

The critical point here is that testing can never comprehensively assess all knowledge required in a role or the ability to perform a skill under all potential conditions. It can test whether some knowledge is known, or if a skill can be performed under specific and limited conditions. But it can never assess the full breadth of knowledge or competencies required by a worker. This means that it is not possible for a test to tell us whether someone is fully competent!

Given the above, then what is the point of testing? The goal of testing is much like the goal of a financial audit. In a financial audit, we understand that due to time and resource constraints, we can only ever examine a small fraction of accounts or transactions. Testing of trainees is an audit process of sorts, where instead of testing everything, we test only a subset or a sampling of the knowledge and skills the trainee requires. We then extrapolate from the results of that sample

to make assumptions about how well they understand everything else they need to know. But in a financial audit, there are very specific rules about how the audit is to be performed and how the work leading up to the audit (the accounting) must be conducted, otherwise the audit can become useless.

The very same is true for training and testing if we want to maximize the uptake of knowledge and skills, and if we want our assessments to provide useful information.

Understanding the fact that exams are more like audit processes than comprehensive evaluations is critical because it changes a great deal about how we approach training and testing. For example, much like with a financial audit, we need to be very conscious of how we select the sample of items we actually test.

Getting that wrong means we are far more likely to miss critical gaps. Also like a financial audit, it means that the goal of the test is not only the act of sampling itself, but perhaps more importantly the motivation it creates in the trainee to learn the full breadth of materials.

This creates very important implications for how we communicate with our trainees and conduct our testing. It informs us of whether and how we should allow repeated attempts on tests. It tells us about the utility of test randomization. It guides us in terms of the need for and the mechanisms to achieve trainee motivation and how to use that motivation to maximize knowledge and skills.

All of these implications will be discussed in the next edition of Training Tips for Ships. In the meantime, I'll leave you by restating the core idea of this article: testing can not tell us whether someone knows everything they need to know or fully possesses the skills needed for a role. Next we will look at how to use that fact to ensure our training program comes as close as possible to those goals.

Until then, keep well and sail safely.

The Author

Goldberg

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Vessel Autonomy in Offshore Wind

Scaling up operations through technology and regulation

By Elizabeth (Liz) Kretovic, *ABS Director – Business Development North America Offshore Wind*

Autonomous technology is adding value to the offshore wind (OSW) industry, its supply chains and government policy with the potential to deliver benefits such as increased operational efficiency and safety, and reductions in human error and operational costs. With the unique needs for wind leases and their relative close proximity to shore, a wider group of systems and technologies can be deployed.

A Developing Regulatory Landscape

Autonomous technology is the result of rapid advancements in sensors and imaging, vessel connectivity, machine learning, and more. However, regulation, engineering and mind-set all present challenges as significant as the development of technology itself.

The IMO's Maritime Safety (MSC), Legal (LEG) and Facilitation (FAL) Committees have all completed their separate Regulatory Scoping Exercises on autonomous operations.

From the review of the various instruments by the Maritime Safety Committee (MSC), the scoping exercise identified a list of 11 common potential gaps and/or themes which needs to be addressed to advance the development of regulations for autonomous operations. From this list, the IMO has identified four potential gaps and/or themes as high-priority issues that cut through critical IMO instruments and may require a policy decision or determination to progress further.

The IMO has embarked on plans to develop goal-based requirements for autonomous operations with the target of publishing these requirements by January 1, 2028.

Moving Forward

Industry mindsets are changing. Conversations about 'fully autonomous' vessels to autonomous and remote control functions, will have a big role to play in future OSW operations.

There is potential for fully autonomous vessels to be used in specialized tasks and fully autonomous vessels are likely to be limited to smaller units operating in controlled areas such as port waters, or perhaps on local, point-to-point voyages.

However, vessel owners and operators see the possibility for autonomous functions to be applied to conventional commercial vessels in the near future to improve seafarers' work and duties to help relieve their workloads, as well as to improve situational awareness. Good situational awareness happens when crew have a complete picture of their vessel's position in relation to nearby ships and/or other risks. For autonomous navigation, autonomous collision detection and collision avoidance functions should be able to monitor and analyse their surroundings with a high level of accuracy and make changes when necessary based on the analysis of precise data.

While simulation techniques for determining how autonomous functions will operate in practice are growing in sophistication, the recent test onboard Prism Courage was significant for being the first case to be undertaken on a vessel in actual operations. The Prism Courage voyage demonstrated that the continuous improvement of navigational safety in the future will require improved situational awareness and far more exchange of navigational and voyage data between vessels and shore.

Subsea Autonomous Operations

Autonomous operations have a critical role to play in subsea operations. This includes site investigation to support conducting survey operations, mapping ocean floors, through to passive acoustic monitoring to assess protected species and natural resources. In order to be granted a permit to develop wind farms, extensive environmental due diligence is required. Autonomous operations can help to provide further benefits to this sector of the renewables industry.

ABS continues to provide the necessary verification and certification for this process. The role for Class in Third Party assessments is to support risk evaluations and to help qualify autonomous and remote control tools before wider deployment and adoption. Class review and approval frameworks

are critical in achieving industry confidence of safe working practices in offshore operations with the need for very high system reliability.

The success of these new technologies is dependent on thorough testing and verification to prevent potential failures, covering comprehensive, diverse and critical situations for both normal and abnormal operational conditions.

As technology continues to evolve and autonomous functions are increasingly applied to more vessels used in the OSW industry, there are several issues that will require continual focus, including connectivity, the use of augmented reality, human factors and cyber security. Continuous and reliable communication and connectivity between the vessel and the remote operator station is a key enabler.

ABS collaborated with Sea Machines and Foss Maritime to advance adoption of autonomous operations at sea by issuing approval in principle (AIP) to their vessel autonomy system, the SM300, that provides autonomous navigation and collision detection and collision avoidance (CDCA). Foss is to install Sea Machines' SM300 system on board its harbor tug Rachael Allen to enhance safety and efficiency of operations. Overall, the system will function for routine transit and stand-by operations with the goals of enhanced safety and alleviating crew fatigue.

Going forward, ABS believes the OSW industry will see an increasing number of projects focused on addressing the challenges of autonomous and remote-control functions. Interest is already growing in uncrewed survey systems, seabed analysis and collecting underwater acoustic data. By providing support to industry through certification with Approval In Principle (AIP), and ABS's Technology Qualification, it paves the way for operators to qualify autonomous systems and their operations to improve their safety, competitiveness and productivity.

Projects addressing the testing and validation of these technologies and testing the interoperability between these functions and existing conventional vessels will be a particular focus as the OSW industry embraces an increasingly complex range of offshore autonomous and remote control functions.

Anemoi Marine Technologies

Wind Propulsion and the Race to Decarbonization

By Vincenzo Severino, *Technical Sales Engineer*

Wind propulsion, which was used to power ships for thousands of years before fossil fuels became readily available, is making a comeback. As a completely renewable resource, wind is an appealing and beneficial option in the race towards decarbonization.

Rotor Sails make use of the aerodynamic phenomenon known as the 'Magnus Effect.' As the cylinder rotates within an airflow, a forward thrust force perpendicular to the apparent wind direction is created, which delivers additional thrust to the vessel. The thrust generated can either provide additional vessel speed or maintain vessel speed by reducing power from the main engine. The tall cylindrical sails can be installed on the main deck, bow or elsewhere with sufficient space.

They were first installed on a vessel over 100 years ago. But through research and innovation, Anemoi engineers have reimagined the technology for modern use.

In June, Lloyd's Register granted Approval in Principle (AIP) for a SDARI (Shanghai Merchant Ship Design and Research Institute) designed 210,000 DWT Newcastlemax bulk carrier installed with Anemoi Rotor Sails to improve efficiency and reduce environmental impact.

The Newcastlemax AIP is part of a joint development project (JDP), signed in 2020, with Anemoi Marine Technologies, Lloyd's Register, and SDARI and brings together the OEM, classification society, ship designer, and ship owner to develop a series of energy-efficient vessel designs equipped with Rotor Sails. Oldendorff Carriers is the shipowner partner for this Newcastlemax design.

The AIP covers the structural integration for a ship design with six 5x30m Rotor Sails and Anemoi's Rail Deployment System, which sees the Rotor Sails move transversely across the deck to avoid inference with cargo handling; and the structural integration for a ship design with four of Anemoi's folding (tilting) 5x35m Rotor Sails.

Lloyd's Register assessed the calculation used to estimate the impact the Rotor Sails will have on the Energy Efficiency Design Index (EEDI) and validated that the newbuild Newcastlemax would have its EEDI score reduced from 1.92 to 1.37 (29% reduction) by installing six 5x30m Rail Rotor Sails and 1.47 (23% reduction) by installing four 5x35m Folding Rotor Sail.

EEDI is a significant driver for the installation of Rotor Sail technology and, as we grow closer to the implementation of EEXI and CII, they too become important incentives for Rotor Sails, along with the overarching reductions in fuel consumption and associated emissions.

Installation

Incorporating Anemoi Rotor Sails is a straightforward process because wholesale changes to the vessel structure, or dry docking, is not required. The Rotor Sails, along with all the necessary equipment, are delivered dockside. Each Rotor Sail is installed in a single crane lift and connected to the foundation on the ship's deck once the vessel integration work is complete.

Prior to this taking place, a feasibility study - which is unique to each vessel - will have been conducted to determine the optimal Rotor Sail positioning. This is to maximize performance within the vessel constraints and the required Deployment System for the vessel.

The vessel integration stage is crucial to the process and in-

cludes the design and installation of the structural foundations and the electrical cabling from the vessel main switchboard to each Rotor Sail. The vessel integration can be completed during the construction phase of a newbuild vessel, or during a survey at a shipyard for a retrofit vessel.

Assessing Performance

Anemoi has developed a Fuel Saving Assessment Model (FSAM) to predict fuel and emissions savings from various sizes and classes of vessel. Central to FSAM are four key data sets which are: Rotor Sail performance data (harvested from Anemoi's full-scale UK test facility), vessel performance data, route data and wind data. FSAM uses this data to simulate thousands of historic voyages over a five-year period to ensure the results accurately reflect the wind conditions experienced on the chosen route. Any additional drag and increased generator usage are also included so that the net results are fair and transparent.

For a 310,000-dwt VLCC trading the Bonny-Ningbo route and fitted with five Rotor Rails, FSAM predicts an annual fuel and emission saving of 13.5% which equates to 1,622 tons of fuel and 5,044 tons of carbon saved each year.

The Anemoi Rotor Sail System is comprised of the Rotor Sail itself, the Foundation, Deployment System (if required), wind sensors and Electrical, Control, and Automation systems. The main components of the Rotor Sails are the "Rotor" (the cylindrical, rotating part), the support Tower, upper and lower bearings, and the electrical drive system.

The Rotor is built from lightweight composite material and the Tower is a steel column structure.

The Rotor Sails have a control station located on the bridge which automatically controls the speed and direction of the Rotor Sails, as well as monitoring the performance and status of the system. The control system is designed to maximize performance and minimize crew input with automated speed and direction setting, equipment monitoring, safety features and performance reporting to stakeholders using a ship to shore data transmission.

Anemoi Rotor Sails are built to last 25 years and regular maintenance includes: periodic visual inspection of components and primary structural items, bearing lubrication replenishment and greasing of mechanical components. Minimal crew input is required to use Anemoi Rotor Sails due to the automated control unit. However, to ensure the maximum benefit is extracted and the equipment is well understood, Anemoi provide full training for the crew and on-shore technical departments.

All Anemoi Rotor Sails are automated and respond to the wind conditions to maximize performance with no crew interaction required. All safety features, shutdowns and alarms are automatic. Crew

Image courtesy bound4blue/MMSL Pte. Ltd.

Marubeni taps 'Suction Sails' for Bulk Carrier

MMSL PTE. LTD., a wholly owned subsidiary of Marubeni Corporation based in Singapore signed an agreement with **bound4blue** to install four suction sails on the Crimson Kingdom. The 229-m Panamax bulk carrier will be retrofitted in 2023/24 with four 26-m eSAILs, expected to be the largest suction sails ever built and installed on a vessel.

Image courtesy GT Green Technologies

Grant Funding for GT Green's AirWing

GT Green Technologies secured grant funding from the UK DoT following this year's Clean Maitime Demonstration Competition Round 2 for its proprietary AirWing propulsion solution, currently in development. Patent-pending, AirWing is designed to help ships produce between 10% - 30% fuel savings for retrofits and even greater savings for newbuilds.

Image courtesy Berge Bulk, Yara, BAR

WindWings for Pyxis Ocean, Berge Olympus

Cargill, Mitsubishi Corporation, BAR Technologies (BAR Tech) and Yara Marine Technologies (Yara Marine) said that Mitsubishi Corporation's five-year-old, 80,962-dwt bulk carrier Pyxis Ocean is the first vessel to undergo installation and deployment of BAR Tech's pioneering wind propulsion technology WindWings, delivered by industrialization partner Yara Marine. The installation is anticipated for deployment at the beginning of 2023. In a separate announcement, Berge Bulk, BAR Technologies, and Yara Marine Technologies have reached an agreement to install four WindWings by Yara Marine Technologies on board the **210 DWT bulk carrier Berge Olympus** (pictured). The large, solid wing sails on board these bulkers will measure up to 50-m high and will be capable of reducing CO2 emissions by as much as 30 percent through a combination of wind propulsion and route optimization. WindWings will be installed on board Berge Bulk's vessel in the second quarter of 2023.

With Ships ...Great or Not ...
Beauty is in the eye of the Beholder

By Rik van Hemmen

Former flagship of the Holland-America line HAL Cruise ship SS Rotterdam serving as a hotel in Rotterdam.

My father was on the new construction team of the 1958 SS Rotterdam V, a visually iconic passenger liner that is presently a static hotel and event space in Rotterdam Harbor. When she entered service, her looks were much discussed and generally compared to her very graceful older running partner, the 1936 SS Nieuw Amsterdam II.

I have pictures of both vessels in my office and I think the older vessel is the prettier vessel. Beauty is in the eye of the beholder, but, regardless, the SS Rotterdam is a beautifully proportioned and almost timeless vessel.

When the SS Rotterdam was completed, my father received a commemorative book about her construction and at some stage I got my hands on it. I remember reading that after the foremast had been installed the designers and owners felt the rake was not correct.

They went into boats and studied the vessel from afar and at various angles and decided to change the rake by just a few degrees. Not an inexpensive proposition, but the leadership felt it should be right, rather than good enough. I must have been 12 or so when I read this and remember thinking how does one know it is right?

Boat prettiness was a continuous family discussion whether related to traditional Dutch sailing vessels (bulky but with massive amounts of presence and balance), S&S yachts (sleek), or being struck by the incredible sexiness of West Coast tuna seiners such as built by Campbell and Martinac in the 70's and, remarkably, as late as the early 90's.

However, our family also discussed the almost overnight disappearance of commercial ship prettiness best expressed by the uncomely 1984 Nieuw Amsterdam III as the harbinger of cruise ship ugliness.

Still, these ugly vessels made money, and what is pretty anyway? **Lester Rosenblatt,** who loved pretty ships, once told me it is all in the eye of the beholder. He observed that a monstrously ugly passenger vessel with all cabins filled with paying passengers has got to be the most beautiful thing in the world to the vessel owner, and in that regard he was right.

But I had a hard time looking past all that disproportionate ugliness and for that I specifically blame two gentlemen I never met.

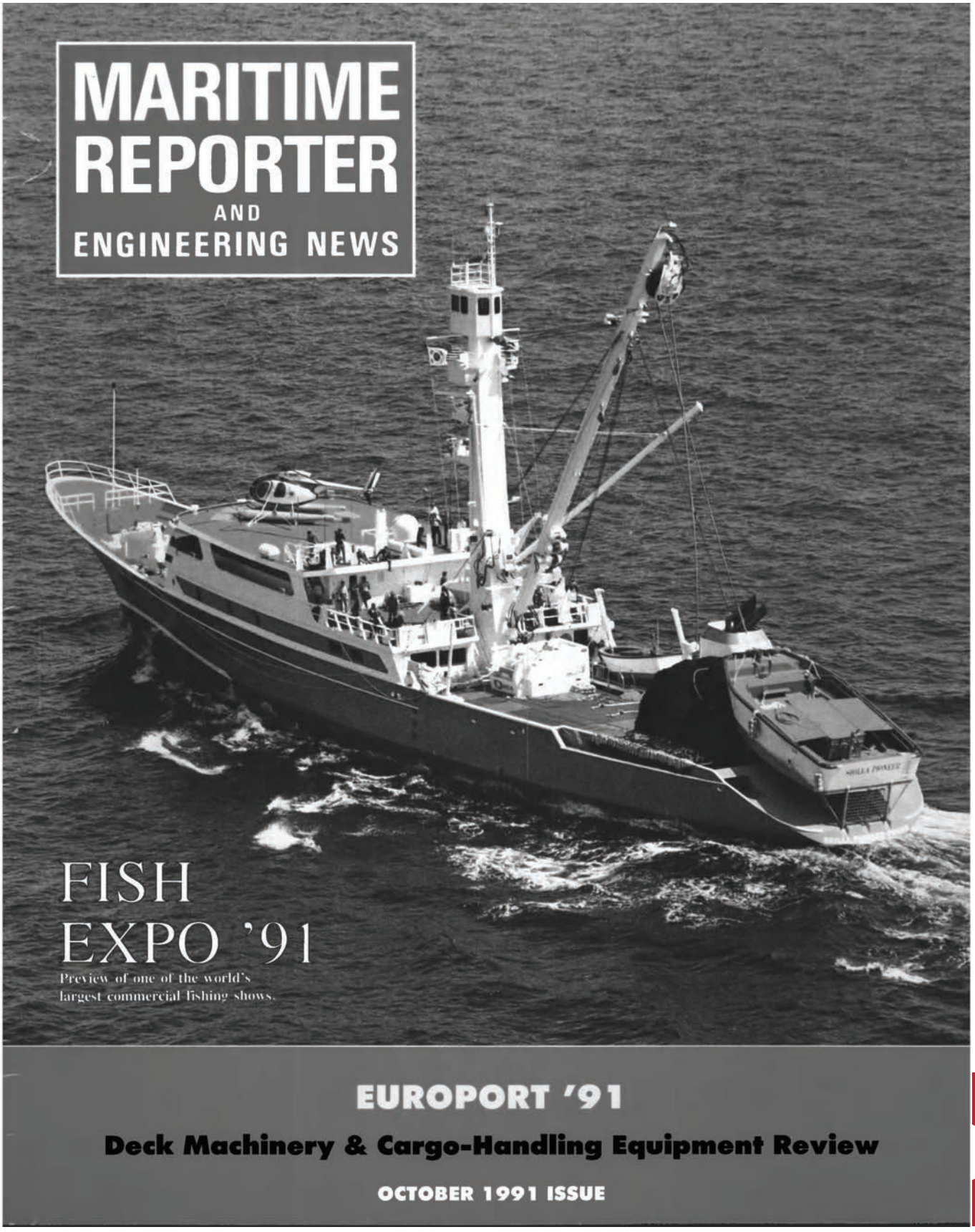
In the late 70's and early 80's, I was interning for a defense contractor with a nice technical library and during lunch I would poke around and take out stuff to read later. I ended up skimming through quite a number of years of USNI Proceedings and Naval Engineers Journal.

In skimming through the December 1979 Naval Engineers Journal, a paper called "Visual Effectiveness in Modern Warship Design" by Lt. John Charles Roach and Herbert Meier contains a single page illustration that struck me, because it very succinctly laid out what I had been feeling since I read about the SS Rotterdam foremast rake adjustments.

It also explained why I thought those West Coast tuna seiners were so sexy. Those boats ticked all the boxes as outlined in the illustration. And it is so simple; just a few things to keep in mind. With just a little additional energy, a designer can improve a concept from blah to quite nice with just a few strokes of the pen or the mouse.

I returned the journal to the library without making a copy (I paid an internet publisher to retrieve a copy for this article), but the illustration never left my mind. That also meant that, thanks to Roach and Meier, I became Esthetic Design Sensitized. I became infected with EDS and would look at a vessel and think: "What is the matter with these people? With just a few minor adjustments this design could have gone from blah to beautiful."

So having drawn attention to this illustration, and Roach and Meier's work, I now hope that those who see it will also be infected with EDS and join me in the "let's make things a little prettier" movement.


MARITIME
REPORTER
AND
ENGINEERING NEWS
FISH
EXPO '91
Preview of one of the world's
largest commercial fishing shows.
EUROPORT '91
Deck Machinery & Cargo-Handling Equipment Review
OCTOBER 1991 ISSUE

It is not an easy task and to be Esthetic Design Sensitized can be frustrating at times.

A few years ago, I partnered in the purchase of a 1986 Transworld 50 trawler. She is no blushing virgin, but wherever she shows up, she is always the belle of the ball. People love her and, despite her faded gelcoat and far from pristine teak, we get nothing but compliments about her looks.

But, based on my Roach and Meier infection, I can't look past her flaws. One is particularly troublesome, since I could potentially fix it. Her mast rake is wrong; it should have been much more upright. If only the designer had been sensitized by Roach and Meier back in 1986, I would not have to suffer so in 2022.

Is it actually too late? Has the world simply given up on pretty ships?

Until very recently I despaired, but then I saw a Marinelink.com posting on two new fishing vessel orders at Karstensens shipyard in Denmark. There was a thumbnail of what appeared to be a rather anachronistic looking fishing vessel. I clicked on it and discovered that Karstensens was building two fishing vessels that, while not quite as sexy and EDS perfect as 1970's West Coast tuna seiners, certainly were designed to be sexy. And from their appearance it was clear somebody was willing to spend some effort and money on it too! Moreover, these two vessels were not outliers. Karstensens started building nice looking vessels in 1917 and actually never stopped building nice looking vessels.

Attractive large fishing boats? Really? Maybe not all is lost. Keep it up Karstensens! You have my vote to be included in Greatest Ships.

For each column I write, **MREN** has agreed to make a small donation to an organization of my choice. For this column I select the **Mandell Rosenblatt Prize for Esthetics in Ship Design** that is awarded annually at the US Naval Academy. *https://www.usna.edu/EngineeringandWeapons/_files/2022_Program_Handout.pdf*

Vessel #478 HERØYHAV, is being built by Karstensens Shipyard and will be powered by the highly efficient Wärtsilä 31 engine as well as host of Wärtsilä propulsion solutions.

*West Coast tuna seiner by Campbell and Martinac gracing the cover of the October 1991 edition of **Maritime Reporter & Engineering News**.*

Image Credit - Olivier Dugornay/IFREMAR

INSIDE IFREMER

Maritime Reporter & Engineering News' Tom Ewing *was part of a select group of journalists invited to attend the Sea Tech in Brest, France. Here he reports on* **IFREMER – l'Institut Francais de Recherché Pour l'Exploitation de La Mer** *– or "French Research Institute for Exploitation of the Sea".*

Brest is an ancient maritime city on France's Atlantic coast, its history rich in all things shipping and maritime, from commercial vessels to nuclear subs to newly built wooden sailing vessels to post-graduate oceanic research and training.

The opportunity to attend Sea Tech included an invitation to visit selected sites focused on maritime challenges. The full Sea Tech program covered almost four days. Its broad theme focused on "Maritime Transport: Towards Smarter & Greener Solutions." The agenda ranged from adapting to climate change to sustainable polymers to electronic navigation to polar exploration.

Not surprisingly, one top thematic focus, across the entire conference agenda and within posters and exhibits, was on efforts to decrease maritime related CO2 emissions. Approximately 100,000 ships cross the seas every day, responsible for 3% of the world's C02 emissions, as well as 13% of SOx and 15% of NOx. Policy makers and their scientific and technical allies in France, and, indeed, in all of western Europe, are homed in on breaking this maritime-CO2 connection and that big changes can and will result from new digital applications, new propulsion (or old, depending on how you view sails) and, of course, new technologies and hardware.

Another Sea Tech message, particularly from Brest: big imaginations wanted, welcomed and supported. There is a deliberate and thoughtful maritime cabal in Brest to attract research, support it, attract commercial interests and establish a glidepath to move to commercial production. As energy generation changes, Brest – part of the Brittany region of France – wants to be in the forefront of every change and economic development. Officials want their hometown and region to reap the benefits from new investments in a new energy economy.

"A Caudal Fin"

Bluefins is one project that exemplifies and showcases the big-picture thinking that characterizes teamwork in Brest right

now. Bluefins exemplifies creative, out-of-the-box ideas. But not wild-eyed ideas. Rather, ideas focused and grounded on ways to support shipping and vessels as they operate today, ideas that can maintain large scale, efficient maritime operations. Potentially, Bluefins could cut CO2 from vessels by 20% without impacting a vessel's standard operations and practices.

On one level, Bluefins is a singular start-up, the brainchild of a naval architect and a mechanical engineer with a combined 40 years of maritime experience. On another level, Bluefins highlights the supportive infrastructure established by French industrial and business associations, established specifically to connect new ideas with money, research and business expertise to create new energy tools – again, workable projects at scale, not laboratory R&D. Finally, there's a third level: French governmental and public institutions are all-in with supporting these initiatives. The result is a rich, deep and well-connected economic and creative milieu to select and foster promising projects and help them advance.

Olivier Guisti is Bluefins' CEO, a naval architect and expert in hydrodynamics. Dominique Leroux is CTO, a mechanical engineer who spent 20 years at IFREMER, the French research institute. His work focuses on designing mechanical and hydraulic systems meant for oceanographic exploration.

IFREMER – l'Institut Francais de Recherché Pour l'Exploitation de La Mer – or "French Research Institute for Exploitation of the Sea" is France's premier ocean science research institute, established in 1984, a merger of existing marine fisheries and oceanography agencies. Its programs are international in scope. IFREMER manages the French Oceanographic Fleet. Its budget is 240M€ annually and it operates under the joint authority of the French Ministry for Higher Education, Research and Innovation, the French Ministry for the Ecological and Solidary Transition, and the French Ministry of Agriculture and Food. Its vision is to advance science, expertise and innovation in three broad areas:

- Protect and restore the ocean;
- Sustainably use marine resources to benefit society; and,
- Create and share ocean data, information & knowledge.

During a meeting at the Bluefins' lab and development site, Guisti explained that the germ of the Bluefins idea, and its working concept, are based on propulsion dynamics observed in whale tail fins. Bluefins seeks to design a zero fuel auxiliary propulsion system that converts energy from waves. In its construct, the Bluefin will consist of a hydrofoil attached to a ship's stern through a set of mechanical articulations. "Just like a whale's tail fin propels the animal forward," Guisti said, "our hydrofoil converts the pitching motion of the ship into forward propulsion." He further referred to the invention as a "caudal fin."

In addition to fuel savings – and CO2 reduction – the external device will reduce vessel pitch. Container ships, LNG carriers, tankers and bulk carriers are expected future markets. Controls will allow maximum gains in varying wave and wind conditions. Importantly, the fin can be raised out of the water and set securely when sea conditions are not favorable, and the lifted

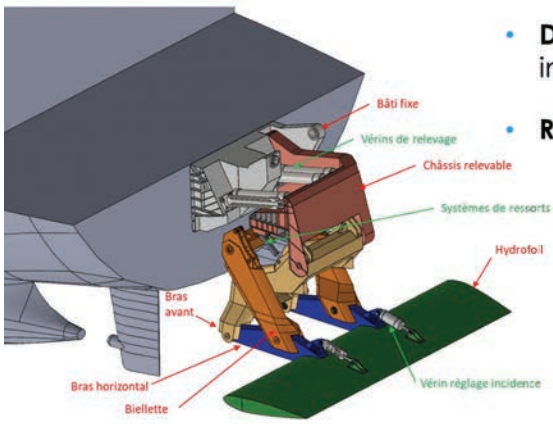
Image Credit - Olivier Dugornay/IFREMAR

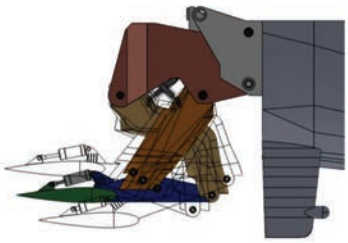
Olivier Dugornay

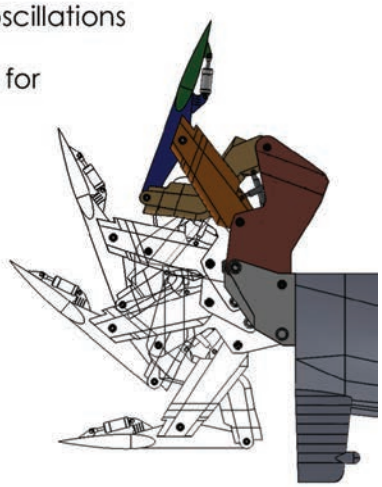
SOLUTION

WAVE-ENERGY CONVERTING TECHNOLOGY

- **Articulated hydrofoil =>** amplification of oscillations
- **Dedicated algorithm =>** control of the foil for increased efficiency
- **Retractable =>** for safety purposes







BLUEFINS

BLUEFINS SAS - CONFIDENTIAL

position allows mooring configurations and emergency towing.

Guisti cites advantages vis-à-vis other alternate propulsion ideas. External mounting means Bluefins can be retrofitted; it's not a device just for new vessels. External placement does not impinge on cargo space, such as alt-fuels like LNG or maybe even hydrogen. It won't interfere with loading/unloading operations. And it doesn't demand fundamental vessel redesign and new piloting skills, issues that add complexity and challenge to new wind-sail technologies and systems.

Guisti said potential clients and partners include shipowners and charters. Preliminary outreach is underway with Asian shipyards. "It's a trendy topic," he commented. Next steps include a model vessel in 2023, field trials in 2024 and, hopefully, commercialization in 2025. It's important to note Bluefins' developmental context. Its website lists five partners:

- BPIFrance, a French Sovereign Fund that invests in startups;
- Greenpact, a "start-up studio dedicated to ecological transitions;"
- CITEPH, a group of 15 large engineering and energy companies, which itself is part of a much larger group called EVOLEN that includes 250 energy companies working towards "carbon neutrality by 2050."
- The French Government; and,
- IFREMER.

Bluefins partnered with IFREMER in 2021, which holds the hydrofoil patent. Development is within the IFREMER facility in Brest. For a start-up like Bluefins, location is critical.

The IFREMER facility includes an ocean-wave simulation lab referred to as the Technological Research and Development (RDT) unit. The test basin is 50m long, 20 m deep and 12.5 m wide. Researchers can program specific wave shapes and wave lengths that flow along the channel. Waves can range from predictable to chaotic, or what Guisti calls "rogue waves." It can generate regular and irregular swells with a maximum peak-trough amplitude of 45cm. There are two traction bridges, 25-tonnes and 5-tonnes, for models and associated material handling.

This equipment allowed Guisti and his colleagues to confirm Bluefins numerical modeling. "In our case," he commented, "for such an innovative technology, it was important to have an experimental proof." Guisti estimated there are just four such wave labs in France, none as large as the IFREMER facility, and, he added, likely available only at a cost to the researchers. The point is, as an incubator, Brest is unique. It would be hard for a startup like Bluefins to start somewhere else. Brest officials want to make sure people know that.

Bluefins was a winner of a "Concours Innovation" competition which IFREMER started in 2021. Project reviewers include investors, incubators, scientists and entrepreneurs. Startup awards are around 250k€. Alexis Mareschi, an IFREMER spokesperson, explained that priority interest is given to projects "which can develop a startup (company) and can become a solution either from the ocean, e.g., marine renewable energy, biotechnologies, or for the ocean, i.e., addressing climate change, pollution or overfishing."

For selected projects, IFREMER does not set a time-to-market deadline. Two recent awards show this wide flexibility, in interest and timeliness. One award went for a new communication system for scuba divers, expected to be market ready in a few years. Another, a biotechnology project using deep sea micro-organisms to produce hydrogen, is expected to take much longer – about 10 years. Importantly, for those applicants not chosen as an IFREMER winner, IFREMER still helps applicants establish alliances with other funding partners. Good ideas are redirected, not rejected.

Guisti was asked about making the jump from laboratory to factory, turning Bluefins into an actual product for sale and installation. He said current partners will help facilitate that transition. One partner in particular, Greenpact, has specialized experience in "deeptech projects, with a track record in taking early stage technologies to the market." Guisti said Bluefins is on the lookout for manufacturing and integration expertise, and they are looking to hire additional staff.

"World Campus of the Sea"

As important as IFREMER's efforts are to advance startups like Bluefins, IFREMER's work itself is coordinated within a larger organization in Brest called the "Campus Mondial de la mer," or World Campus of the Sea. In fact, the Sea Tech conference is a product of the Campus Mondial, which might be thought of as an incubator of incubators.

The Campus keeps what otherwise might be distant players working closely. It seeks to establish complementary efforts among regional academic, scientific, economic and institutional organizations involved in marine science and technology and the maritime economy. It is the first such maritime and marine association in France. Its scope includes the tip of the Brittany region – Brest and the nearby cities of Roscoff, Morlaix, Quimper and Concarneau. Its governing board includes individuals from the French Navy to SHOM – France's hydrographic and oceanographic service – to the IRD, the French Institute for Development as well as business, academic and engineering groups. These regional partners contribute funding, currently 350k€ per year.

One Campus goal is to "be the crucible of forward thinking." Another is to "animate and support the community," again, with a focus on maritime activities. It is upfront regarding one bottom line outcome: "to ensure that this concentration of knowledge in Brittany in the field of marine science and technology leads to more business and job creation."

Success is never guaranteed, of course. But chances go way up when more and more people, working from the same playbook, are on the lookout together. If something can succeed, people in Brest will likely spot it first, and help it grow. As the world's energy demands change, Brest will be leading, not following.

MV GEORGE III

Owner: The Pasha Group
Type: LNG Containerships

Image courtesy Pasha

MV George III Main Particulars

MARITIME REPORTER TV

Ship Name	MV George III
Ship Type	Containership
Ship Builder	Keppel AmFELS, Brownsville, TX
Material	Steel
Ship Owner	The Pasha Group
Ship Operator	Pasha Hawaii
Ship Designer	Keppel AmFELS
Delivery Date	July 28, 2022
Flag	U.S.
Classification	American Bureau of Shipping (ABS) +A1, Container Carrier Circle E, +AMS, +ACCU, BWT, TCM, NIBS, ENVIRO, PMP+, GFS (DFD) (ME/AE), UWILD, CPS, HIMP, HVSC, RRDA, SH, SHCM, CLP-V (Voyage from USWC to Hawaii), CSC, ESA
Length, o.a.	236m (774.3 ft.)
Length, b.p.	220m
Breadth, (molded)	35m (114.8 ft.)
Depth, (molded)	21m
Draft, (designed)	10.8m (35.4 ft.)
Draft, (scantling)	11.9m
DWT (at design draft)	43,500 metric tons
DWT (at scantling draft	43,527 metric tons
Speed	23 Knots
Fuel Type	. Main Engine is able to burn dual fuel LNG Primary, VLSFO and/or ULSFO
Main engines	(1) dual-fuel 30,000-kW MAN B&W 7S80 ME-GI-Slow Speed, Two stroke, direct drive. Aux Engines: 3 MAN B&W 6L35/44 dual-fueled generating sets
Alternative Marine Power	Vessel is equipped with CAVOTEC AMP system
Propellers.	(1) 28' MAN fixed-pitch 5-bladed propeller
Generators	3 X 2760 KW MAN dual fuel diesel generators model 6L35/44DF
Engine controls	MAN Control System / Kongsberg Monitoring
Radars	KONGSBERG K-BRIDGE (2)X-BAND , (1) S-BAND
Depth Sounders	SKIPPER GRAPHIC DEPTH SOUNDER GDS 101
Auto Pilot	K-BRIDGE AUTO PILOT
AIS	.TRON AIS TR-8000 AIS CLASS A TRANSPONDER
DGPS (2)	SAILOR 65xx GNSS/DGNSS
GMDSS	SAILOR 6300 MF/HF DSC, SAILOR MF/HF 600A/600B RADIOTELEX, SAILOR 6110 MINI-C GMDSS, SAILOR 6390 NAVTEX, (2) SAILOR 6222 VHF DSC_
SatCom	INMARSAT-FB SAILOR 7016C (VSAT)
Fire extinguishing systems	E/R Water Mist System, Cargo Hold Co2, E/R Co2, FGSS Room CO2, LNG Fixed Dry Chem, Paint Locker CO2, Galley Wet Chem, EDG CO2, LNG Water Curtain, LNG Tank Water Curtain,
Fire detection system	SCANTEC – CARGO HOLD MONITORING, CONSILIUM-
Heat exchangers	Alfa Laval Plate Type
Lifeboats	2 x Norsafe Lifeboats (1 of which is a rescue boat)
Liferafts _	(2)VIKING 16-PERSON LIFERAFTS, (2) VIKING 20-PERSON LIFERAFTS, (1) VIKING 6-PERSON LIFERAFT
Coatings	Hempel Paint
Ballast Water Mgmt System	Alfa Laval Pure Ballast 3

Operating on Liquefied Natural Gas (LNG) from day one in service, the MV George III, the first of Pasha Group's two new 'Ohana Class', Jones Act-qualified containerships, features a state-of-the-art engine, an optimized hull form, and an underwater propulsion system with a high-efficiency rudder and propeller. George III is the first LNG-powered vessel to fuel on the West Coast and the first to serve Hawaii. The 774-ft. Jones Act vessel surpasses the International Maritime Organization (IMO) 2030 emission standards for ocean vessels. With the first delivered and the second on the way, George Pasha, IV, President and CEO, Pasha Hawaii and Ed Washburn, SVP, Fleet Operations, Pasha Hawaii, discuss the challenges and reward of building two new LNG-fueled containerships from scratch.

Earlier this year Pasha Hawaii welcomed the newest member to its containership fleet with the arrival of George III at the Port of Long Beach in California, where it began its maiden voyage to Honolulu, Hawaii. This is the first liquefied natural gas (LNG) powered vessel to fuel on the West Coast and the first to serve Hawaii. The 774-ft. containership was built in Brownsville, Texas, by Keppel AmFELS, marking the first of two new Ohana Class containerships to join Pasha Hawaii's fleet, serving the Hawaii/Mainland trade lane.

Operating fully on natural gas from day one, the new Jones Act vessel surpasses the IMO 2030 emission standards for ocean vessels, and energy efficiencies are also achieved with a state-of-the-art engine, an optimized hull form, and an underwater propulsion system with a high-efficiency rudder and propeller.

Named after George Pasha IV's late father, the second vessel in the Ohana Class, the Janet Marie which is named after George Pasha IV's mother, was scheduled to join Pasha Hawaii's fleet at the end of 2022.

While the project was ultimately a success, there were some roadblocks to navigate along the way. Shipbuilding by its very nature is fraught with potential risks, premised mainly on the lack of serial production which allows efficient manufacturers to work out the bugs. Building an original design with an increasingly common, yet still far from mainstream LNG fuel system, raised the risk profile.

"The biggest obstacle was building a ship during a global pandemic," said Ed Washburn, SVP, Fleet Operations, Pasha Hawaii. When the pandemic started, the shipyard starting to shut down because, at the time, "shipyard workers were not essential workers." But The Pasha Group persisted, and "through the Infrastructure Securities Act and together with American Maritime Partnership, we were able to contribute to that act and include shipyard works as essential workers. In addition, travel restrictions created havoc with the delivery and commissioning of key equipment, some of which was coming in from Europe and South Korea. "I would say that was the largest obstacle."

Image courtesy Pasha

Another obstacle was not pandemic, rather regulatory, as "we're the first ship in the United States to be built to the international gas fuel ship code," said Washburn. "Our U.S. flag state regulators had to interpret that code, and they interpreted it differently than the international market in some instances. We felt a little bit of pain on the interpretation on some rules that were different than the international market."

As shipowners globally mull the alternative fuel future, he offers some insight on The Pasha Group's choice of LNG.

"I would advocate for it, but don't expect it to be easy. One of the other challenges is fuel infrastructure? That's always

Image courtesy Pasha

George Pasha, IV, *President and CEO, Pasha Hawaii*

been a chicken and the egg type scenario, and I've been looking alternative fuels almost my whole career," said Washburn. To mitigate that risk, "we developed a joint venture called West Coast Clean Fuels," said Washburn. "Part of our joint venture is World Fuel Services who deliver 70% of the bunkers in the LA Basin and also clean marine energy who specializes in LNG."

"I would say if you want to help your communities and help the environment, LNG is the way to go," said Washburn. "It is the only fuel that is capable today of running a high-horsepower ocean going vessel with an alternative fuel. We're going to pass the 2030 IMO standards by a great deal. 2050 may be a challenge, but it is the right fuel for the future and the best fuel available."

The Ohana class was designed from scratch via collaboration between the shipowner and ship yard to meet The Pasha Group's specific needs, and offers several additional features aimed at operational efficiency and emission reduction.

"What we have today is the most hydrodynamically efficient container ship in the world," boasts Washburn. "Our ship went through computational fluid dynamics design for hull form that was checked and further optimized. The hull form went to the Maritime Research Institute of the Netherlands (MARIN), and they model tested it and developed a twisted, leading-edge rudder and a high efficiency propeller to match that hull form.

Apart from the hull, the ship features Hempel self-polishing copolymer paints; a full-spectrum of modern bridge kit – hardware and software to ensure the best route is plotted and followed; and Selective Catalytic Reduction (SCR) on the auxiliary engines to reduce NOx. "All the equipment is state-of-the-art," said Washburn. "Our budget was $225 million, but if we had $2.25 billion, I don't think we could have done much more."

Apart from the two newbuilds in the Ohana Class, The Pasha Group is currently in the process of converting one of its 42-year-old steamships. "We'll take delivery of her in April [2023] with an LNG power plant," said Pasha IV. "That will leave us with one more reserve ship to decide whether we're going to invest further and convert that ship to LNG."

Pasha Group Celebrates 75

"What started out as a personal vehicle storage company has evolved into a world-class global logistics and transportation company," said George Pasha IV. "As we mark our 75th anniversary and welcome George III to Long Beach, we are proud to continue my family's legacy of innovation and environmental stewardship, while recognizing our employees as our extended 'Ohana'."

"We started out with humble beginnings. My grandfather had two gas stations in San Francisco, which [essentially] formed the current company," said George Pasha IV. "My dad joined him in high school and decided that he'd like to do something bigger and different than just gas station work. So we built, over about a 50-year period, a logistics and transportation company, and started handling new vehicles for the OEMs. That was the initial legacy business. From there we diversified into break bulk and other commodities."

According to George Pasha, IV, the company took a turn into shipping when around 2000 "General Motors encouraged the industry to build a pure car truck carrier for the Hawaii trade lane. In 2005, we delivered the first pure car truck carrier and still the only pure car truck carrier in the Jones Act trade. In 2015, we were getting ready to deliver a second ship, a combination ship for the Hawaii trade lane. We were talking to the folks at Horizon Lines, and those discussions led to an opportunity to acquire the Horizon Hawaii assets … quite a leap for us."

The Horizon acquisition, according to George Pasha IV, "just about doubled the size of our company in every way that you can measure it from a top line revenue, head count, and EBITA point of view. So today as we look at 2022, we're a little more than a billion dollars in revenue, with about 2200 teammates that support the day-to-day operation of the business."

While the new LNG ships are a physical manifestation of the Pasha Group's commitment to ESG matters, it's not the only move as George Pasha IV said the company's ties to the community and environment concerns are long-tenured.

"The LNG ships are certainly one manifestation, but we've had the opportunity to pioneer a number of terminal projects," he said. "One was in the Port of Los Angeles and called Green Omni Terminal that started with solar battery power electric vehicles, including heavy cargo handling equipment. We were early on, and so we've had some struggles trying to make all of that work, but we had some support from MarAd grant money to install a microgrid and take that to a more practical next-level as well."

Keeping the family business growing and successful is the mantra of George Pasha IV and his management team today. "First and foremost, we're a family business based on family values. My grandfather was very hands-on in his service station work; he was visible, very much a part of the success of the team from the floor plates up. That's certainly still the case with the company today."

As his grandfather was a product of the depression, he was more conservative by nature, whereas "my dad grew up in the 50s, a more idyllic time," said George Pasha IV. "He was much more entrepreneurial and aggressive, and he certainly was a great early steward in terms of setting us off into the trajectory that we're in now. It's with great pride that we're able to put his name on the stern of the George III, and we wish he was here. My grandfather would love to be in the engine room of the George III; he was an automotive engineer, and he would be extremely proud of and interested in what's happened over the course of the last 75 years."

The Interlake Steamship Company

MARK W. BARKER

Owner: The Interlake Steamship Company
Builder: Fincantieri Bay Shipbuilding
Designer: Bay Engineering, Interlake Maritime Services

By Eric Haun

The Interlake Steamship Company's newest vessel, the Mark W. Barker, ranks high among most noteworthy vessels built in North America in recent years. The first U.S.-flagged freighter built on the Great Lakes in nearly four decades, it is a modern, versatile addition to the otherwise aging fleet currently serving the region's vital Jones Act trade.

"This is truly a historic celebration for our company and for the United States maritime industry as we proudly christen the newest vessel to join the U.S. flag fleet on the Great Lakes and our first new build in 41 years," said Mark W. Barker, president of The Interlake Steamship Company and the vessel's namesake, during a September christening ceremony held for the vessel in Cleveland. "While this ship may bear my name, it is a testament to the innovation, skill and grit of our employees who have powered our industry and propelled our company for more than 130 years."

Believed to be the first newbuild for U.S. Great Lakes service built on the Great Lakes since 1983, the new River-Class, self-unloading bulk carrier is as "Great Lakes" as it gets—conceived, designed and constructed locally—using local materials. Built at Fincantieri Bay Shipbuilding in Sturgeon Bay, Wis., the 639-foot vessel was made from iron ore mined in Minnesota by Cleveland-Cliffs, and carried on U.S.-built, U.S.-crewed, and U.S.-owned Lakers to Cleveland-Cliffs' Burns Harbor mill in Indiana. There the pellets were forged into steel plates and shipped to the Wisconsin shipyard.

"This American-made vessel is not only a veritable Great Lakes success story, it is a Cleveland ship, through and through," said The Interlake Steamship Company's chairman,

James R. Barker. "Designed to navigate the winding curves of the Cuyahoga River, built with Cleveland-Cliffs steel and coated with Sherwin-Williams paint, the M/V Mark W. Barker was most significantly built as part of a long-term partnership to move Lake Erie-mined salt for Cargill Inc."

The Jones Act qualified vessel, measuring 639 feet in length, 78 feet in beam, 45 feet in molded depth and 28,000 dead weight tons, will transport raw materials traditionally carried by lakers such as salt, iron ore and stone to support manufacturing throughout the Great Lakes region. And it has also been thoughtfully designed in preparation for the new cargoes of the future.

"If you toured the ship, you may have noticed in many respects that it is very different than a traditional Great lakes self-unloader. This is intentional as we made unique changes to the design of the ship so that it could be more versatile and more capable in meeting our customers' needs," Mark Barker said. "For example, the ship has large load-bearing MacGregor hatches that will allow project cargo to be loaded and carried on top of them."

While five large hydraulically controlled stackable MacGregor hatches will allow the ship to transport specialty cargoes such as steel coils and windmill towers and blades, the vessel's large hatches and cargo holds add even more capability. This ship will carry an average of 25,000 tons per trip, which is equal to the carrying capacity of 250 train cars, and 1,000 trucks. "The hatch openings are much larger than you'd see in a typical self-unloader. The hatches create a 46- by 80-foot opening into rectangular cargo holds below. This rectangular cargo hold will allow the vessel to carry close to 40% more cargo than a current vessel in the same trade. This box-shaped cargo hold will also allow to be able to utilize the ship to carry cargoes that may have not traditionally moved on the Great Lakes," Mark Barker said. "It is important that we have the ability to move new types of cargo to meet the needs of the changing supply chain of the future."

For added flexibility during cargo operations in congested ports, the unloading boom is located on the forward end of the ship, which many Great Lakes customers find more advantageous to allow placement in preferred areas for access at their docks, The Interlake Steamship Company said.

"This new vessel not only brings with it additional cargo carrying capacity and capabilities, it is the most versatile in our fleet and strategically sized to navigate into nearly any port on the Great Lakes," said Brendan P. O'Connor, Vice President of Marketing and Marine Traffic. "The M/V Mark W. Barker will give us unmatched ability for cargo operations and to carry unique project cargoes because of her square-shaped cargo holds, her larger hatch openings, reinforced cargo hatches which can support deck cargo, and a forward mounted unloading boom. She truly was designed to be a vessel for the future."

Among other notable features, the Mark W. Barker is the first ship on the Great Lakes with engines that meet EPA Tier 4 standards; its two 4,000-horsepower (hp) EMD engines use selective catalytic reduction (SCR) system to meet the strict emissions rules. The main engines turn a single four-blade, controllable-pitch Kongsberg Kamewa propeller through a Lufkin twin-input, single-output gearbox. The is also equipped with 1,000 hp Kongsberg bow and stern thrusters. The ship is reported to have a top speed in excess of 15 knots, though it can cruise somewhere around 13.5. For added efficiency, the ship's hull has been optimized and all systems have been designed to ensure low energy consumption, while a Kongsberg high-lift rudder optimizes the wake through the propeller.

Greg Trauthwein

The Interlake Steamship Company president Mark W. Barker with the crew of his namesake vessel.

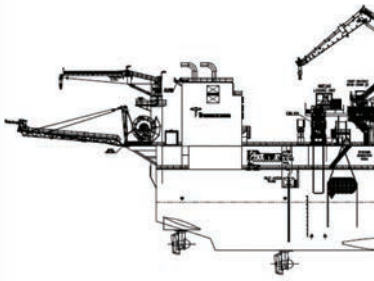
For its electrical power requirements, the vessel is provided with one Caterpillar 940-kW ship service diesel generator, two 2,500 kW shaft generators and one Caterpillar 274 kW emergency generator.

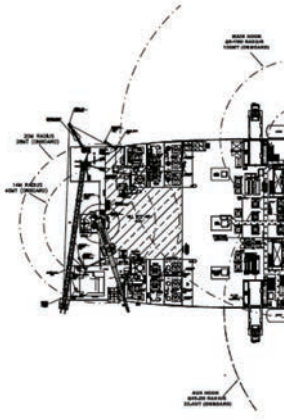
Certainly, building a vessel that's the first of its kind in several generations brings a unique set of challenges, but doing so during a pandemic creates a whole new level of difficult. "Construction was not without its challenges," Mark Barker said. "This ship was built in the midst of a global pandemic during which the country was experiencing government-mandated shutdowns, supply chain disruptions, labor shortages and challenges not previously seen in our lifetimes. However, despite all those challenges, the project moved forward, and the work got done. We took delivery of this beautiful vessel this past July."

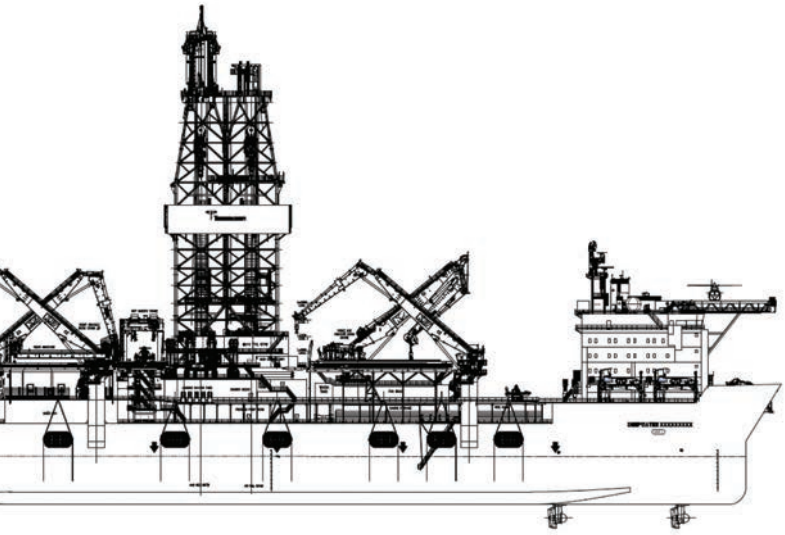
The vessel promptly entered service after delivery, taking a brief break for its official christening in September. The ceremony was a who's who event bringing together some of the biggest names in the U.S. maritime industry—a testament to a venerable Great Lakes shipping company ands groundbreaking new vessel.

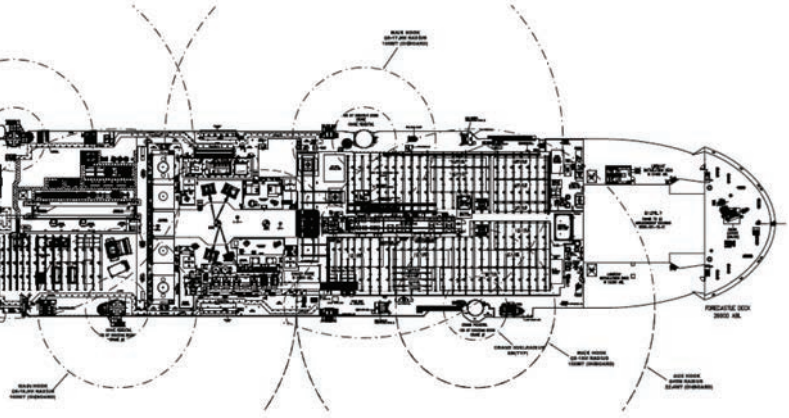
A Look inside the DEEPWATER ATLAS

Marijana Sosic, Manager, Technical Marketing, Transocean discusses the "World's First Eighth-Generation Ultra-Deepwater Drillship"









Deepwater Atlas Main Particulars

Dimensions	816.6 x 139.4 x 64 ft. (depth) (249 x 42.5 x 19.5m)
Draft, operating	33.5 ft (10.8m)
Draft, transit	26.3 ft. (8m)
Accomodation	220
Displacement	92,053 mt
Transit speed	12 knots
Maximum drilling depth	40,000 ft. (12,192m)
Shipyard	Jurong Shipyard, Singapore
Classification	DNV
Flag	Marshall Islands
Main power	6x Wärtsilä 16V32E 4-stroke
Total power	46,080 kW
Emergency power	Cummins CSMXTA60OLGS
Power dist.	3x Siemens 11KV AC switchboards with AGP
Thrusters	6x Rolls-Royce UUC 455 FP variable speed azimuthing thrusters
DP system	Kongsberg
Storage Capacities	
Fuel oil	53,069 bbl.
Liquid mud	20,548 bbl
Base oil	6,289 bbl.
Brine	19,580 bbl.
Drill water	23,989 bbl.
Potable water	12,975 bbl
Bulk material	38,140
Sack storage	10,000 sacks

The Deepwater Atlas was launched this year in Singapore. What, specifically, is so special about it?

The Deepwater Atlas is the first of its kind eighth-generation drillship that will offer 20,000 psi well control capabilities and a 3.4 million pound hoisting capacity. The Deepwater Atlas and the Deepwater Titan, the Atlas' sister-rig that will follow her to the Gulf of Mexico next year, offer the highest rated equipment in the industry. These eighth-generation, ultra-deepwater drillships will allow Transocean, and its customers, to access high pressure and high temperature reservoirs that previously were not accessible. The equipment on our newest drillships can reduce the time it takes to drill a deepwater well, bringing total costs down.

Among the special aspects of the Deepwater Atlas is the story she tells about resilience. Despite an industry downturn and global pandemic challenges, she has now made her way to the Gulf of Mexico, where she commenced drilling operations. Transocean owns the only two assets in the world specifically designed to maximize efficiencies for 20,000 psi well completions.

It has been said that this is the first 8th generation drillship in the world. What does this mean, exactly?

Transocean's eighth-generation drillships are designed to be outfitted with well control systems rated for 20,000 psi and possess a 3.4 million pound hoisting capacity. To provide this capability, upgrades were made to the derrick and a new, higher-rated drawworks, top drive and rotary table were added. This new equipment was designed and delivered specifically for these projects – marking new firsts, not only for Transocean, but for the entire industry.

For context, seventh-generation rigs offer 2.5 to 2.8 million pound hoisting capacity, and 15,000 psi well control systems. Sixth-generation rigs offer a hoisting capacity of up to 2.0 million pounds and are rated for water depths up to 10,000 feet. Seventh- and eighth-generation rigs are designed for water depths of up to 12,000 feet.

How, specifically, will these ships create an opportunity to drive the total well cost down?

The upgraded hoisting capacity will provide our customers with numerous cost and time-saving opportunities, especially when drilling programs and well configurations require the handling of heavy, large diameter casing strings. With a higher hook load, more work can be accomplished in a shorter period. Additionally, the 20,000 psi blowout preventer (BOP) stacks have been designed with extra attention to features that result in reduced maintenance times. The well test and completion deck is the biggest in the offshore drilling industry. The aft hull was designed for improved efficiency, which was accomplished by reducing double-handling of equipment and materials.

Transocean's eighth-generation drillships are designed to be outfitted with well control systems rated for 20,000 psi and possess a 3.4 million pound hoisting capacity. Seventh-generation rigs offer 2.5 to 2.8 million pound hoisting capacity, and 15,000 psi well control systems. Sixth-generation rigs offer a hoisting capacity of up to 2.0 million pounds and are rated for water depths up to 10,000 feet.

– Marijana Sosic, Manager, Technical Marketing, Transocean

The completed drillship features three-million pound hook-load hoisting capacity. Why is this important?

The hoisting capacity of the drawworks is 3.4 million pounds with a net hook load of 3.0 million pounds. The weight of the traveling equipment, including the motion compensator that maintains the drill string position, the traveling block and hook, are all included in the hoisting capacity. This allows us to pick up a full 3.0 million pounds at the elevator. This is important to Transocean, and our customers, because it is more cost effective. The maximum capacity is higher than on any other rig, allowing us to run longer casing strings, reducing handling, running and cementing times.

Deepwater Atlas and its sister ship Titan were ordered back in 2014, and they're only being delivered now. Can you provide some color on the challenges faced since the original order? The rigs reportedly cost $2.25B in total, versus $1.08B when originally ordered.

While the rigs were originally ordered in 2014 just before the industry downturn, these two projects shifted in 2018 when one of our customers approached us with an opportunity to design and construct a rig capable of drilling in 20,000 psi environments – the new frontier of ultra-deepwater drilling. As a result of the new rig design and construction management contract, and a five-year drilling contract, we shifted gears and got to work to accomplish the design, construction and delivery requirements set forth in the construction contract. The initial contract for the Deepwater Titan adds $830 million in backlog and the initial contract for the Deepwater Atlas adds $252 million in backlog to Transocean's industry-leading $7.3 billion backlog as of October 13.

How much do these high psi BOPs add to the cost? Can they be installed on rigs in the existing fleet?

The 20,000 psi BOP stacks are very complex, requiring certain modifications to the rig: the entire well control system would require modification and upgrading. The work would take existing rigs out of operation and include hull piping changes, among other things. Essentially, it would be similar to replacing an entire air conditioning and heating system and all of its associated duct work – when it is working efficiently in a new house – within a year or two of its installation.

Transocean has said that, apart from the two rigs being "the most capable and highest specification rigs in the world" they are also equipped to reduce fuel consumption and cut emissions. Can you share further info on how this is being done?

While we are always looking for ways to reduce our carbon footprint, we currently reduce emissions and fuel consumption through the use of fuel additives that optimize fuel consumption, hybrid power systems, LED lighting and a high-efficiency power plant configured to comply with Tier III International Maritime Organization emissions standards. Importantly, reducing well construction time using the design features of our newest rigs, such as their industry-leading hookload capacity, leads to less fuel consumption and emissions per well.

USS JACK H. LUCAS (DDG 125)

The Arleigh Burke-class Guided Missile Destroyer

The world's most successful post-war surface combatants

By Edward Lundquist

The Flight IIA Arleigh Burke-class guided-missile destroyer USS Shoup (DDG 86) prepares to pull alongside the aircraft carrier USS Nimitz (CVN 68) for a fueling-at-sea. Nimitz Carrier Strike Group is currently underway in preparation for an upcoming deployment.

U.S. Navy photo by Mass Communication Specialist 1st Class Nathan Laird

GREAT SHIPS *of 2022*

The USS Arleigh Burke (DDG 51) class of guided missile destroyers can rightfully be called the most successful class of surface combatants in the post-World War II era. The lead ship was commissioned in 1991, and the Navy is still building them at Huntington Ingalls Industries Ingalls Shipbuilding in Pascagoula, Miss., and General Dynamics Bath Iron Works in Bath, Maine. A total of 89 have been procured through FY2022, (with 70 delivered as of February 2022), including two in FY2022.

The design has evolved, and older ships have been modernized to stay combat relevant. Today the Navy is embarking on a new variant, the Flight III, which will feature a new SPY-6(V)1 Air and Missile Defense Radar (AMDR) system, manufactured by Raytheon Missiles & Defense, that provides vastly increased capability over Flight IIA ships. The AMDR enables Flight III ships to simultaneously perform anti-air warfare (AAW) and ballistic missile defense (BMD), which satisfies the Navy's critical need for an enhanced surface combatant Integrated Air and Missile Defense (IAMD) capability.

The Flight III represents the fourth "flight" variant of the class since the lead ship was commissioned in 1991, and includes Flight I, II and IIA.

The first 20 Arleigh Burkes (DDG 51 through 71) are 8,300-ton, 504-ft. Flight I ships. Seven more ships, designated as Flight II DDGs, have incremental combat systems improvements. The Flight IIA ships, starting with DDG 79, are slightly longer (509ft.) and considerably heavier (9,700 tons) due to the addition of an aircraft hangar and facilities to support two embarked helicopters.

All variants are powered by General Electric LM 2500 gas turbines, with Rolls-Royce AG9140 ship service gas turbine generators providing electrical power. The Arleigh Burkes are armed with a 5-inch/54 caliber (DDG 51 to DDG 80) or 5-inch/62 caliber (DDG 81 onwards) multi-purpose gun from BAE Systems. The ships are equipped with a 90-cell (Flights I & II) or 96-cell (Flight IIA onwards) Lockheed Martin MK 41 vertical launch system, capable of launching multiple Standard Missile variants, Tomahawk, Vertical Launch Anti-Submarine Rocket (ASROC) and Evolved Sea Sparrow missiles.

There have been various configuration changes across the ships in the class, such as weapon and battle management upgrades for ballistic missile defense, whether they have one or two Phalanx close-in weapon system (CIWS), and some forward deployed ships with the Rolling Airframe Missile (SeaRAM) capability. Upgrades include hull strengthening, new HVAC, WaterMist damage control system, internal compartment redesign, and HM&E (hull, mechanical and electrical) upgrades including 4160VAC ships service gas turbine generators (SSGTGs) and 1000VDC power system and a separate Propylene glycol and water (PGW) cooling system for the SPY-6 radar.

The first of the Flight III DDGs is the future USS Jack H. Lucas (DDG 125), currently under construction at Ingalls Shipbuilding in Pascagoula for delivery in 2023.

The Arleigh Burke program was programmed to conclude with DDG 112. It was expected for the Navy to shift to the DDG 1000 Zumwalt-class ships, so the production line was terminated. No DDG-51s were procured between FY2006 and FY2009. However, when the Zumwalt program was drastically truncated, restarting the DDG 51 production was prudent. The first DDG 51 Flight IIA "restart" hull was USS John Finn (DDG 113) and included the latest AEGIS combat system baseline 9 for IAMD.

While the Lockheed Martin AEGIS combat system has been constantly updated, there remain multiple baselines in

the fleet. The Flight III incorporates a significantly different and improved SPY-6(V)1 radar than the SPY-1 found on earlier AEGIS cruisers and destroyers. The new technology of the more capable SPY-6(V)1 Air and Missile Defense Radar (AMDR) is the major difference. There are also significant upgrades to the ship's electrical power and cooling systems, but not enough space, weight power and cooling for the anticipated energy weapons.

As part of the DDG 51 restart, DDGs 113 to 124, along with DDG 127, are Flight IIA ships with AEGIS Baseline 9 capabilities. DDGs 125, 126 and DDG 128 and follow are Flight III DDG-51s with AEGIS baseline 10 to exploit the enhanced capabilities of the SPY-6 radar system.

While the Navy will continue to build more Arleigh Burkes, it faces a shortfall of Ticonderoga-class guided missile cruisers, which are needed to provide air and missile defense for carrier strike groups. The replacement for the Ticonderogas will be the new "large surface combatant," now called "DDGX."

The Navy has told the Congress that it is committed to a smooth and successful transition from DDG 51 to DDG(X) starting around FY 2030. "The transition will preserve the critical shipbuilding and supplier industrial base by executing a collaborative design process with current DDG 51 shipyards and transitioning to a proven limited competition model between these shipyards at the right point in ship construction."

Both the new DDGX and Constellation class (FFG 62) frigates will have versions of the scalable SPY-6 radar and the latest Aegis baseline.

The DDG modernization program continues to deliver a comprehensive mid-life upgrade to ensure the DDG 51 class will maintain mission relevance. "DDG Mod" brings the older ships up to the latest AEGIS baseline and combat system "advance capability build," and creates commonality among both new construction ships and modernized in-service ships.

But no matter how much the Arleigh Burke systems are upgraded or modernized, there is finite room within the hull, and there is limited margin for the space, weight, power and cooling necessary to equip these platforms with future energy weapons such as lasers, high-power microwaves and electromagnetic rail guns without tradeoffs of existing systems.

While the Navy needs more ships, in part because the Ticonderoga-class has reached its expected service life (ESL), Navy leadership acknowledges that the industrial capacity of American shipyards could limit how many new surface combatants could be built, and how long it will take to build them.

U.S. Navy photo by Mass Communication Specialist 2nd Class Devon Dow/Released

The guided-missile destroyer USS Mustin (DDG 89) fires a Standard Missile 2 missile from the ship's forward and aft missile decks during a missile exercise. Mustin is one of seven guided missile destroyers assigned to Destroyer Squadron 15 and is forward deployed to Yokosuka, Japan.

Photo courtesy Yaguang Technology Group/SDARI

M/V XIN SHENG TAI
("NEW ECO")

Zero-Emission Supercapcitor Electric Ferry

M/V Xin Sheng Tai is the Zero-emission Supercapacitor, an electric ferry developed by Shanghai Merchant Ship Design & Research Institute (SDARI), built by Yaguang Technology Group Co., Ltd.

M/V Xin Sheng Tai is intended for public transit between Changxing Island and Hengsha Island located at the Yangzi River estuary. It has capacity of 165 passengers and 30 cars (or 14 trucks) and will have 24 round trips a day. The 2km crossing takes about 6 minutes. The 625kWh Supercapacitor system of the ferry to be used as main electric power and propulsion power is designed for the ferry trip of such high frequency and short crossing, which can be charged at quay of Changxing via a DC fast-charging system of continuous charging power up to 2.5MW during boarding and loading period. With rapid charge-discharge rate, high power density and virtually unlimited life cycles, no replacement of the supercapacitor is needed due to life cycles. Accurate monitoring and control of the energy can be achieved as the supercapacitors have performance of liner charge and discharge voltage.

M/V Xin Sheng Tai is designed aiming on energy-saving, environment friendliness, safety and economy. Reduction of energy consumption was achieved by hull lines optimization by CFD calculation and verified by model test carried out in SSSRI, energy conversion efficiency of the supercapacitor system is above 95%. The estimated CO2 reduction is more than 1000t annually compare with the diesel driven ferry. With low internal resistance, supercapcitors are safer than battery and do not heat as much as battery when short circuited. In addition, 2 sets of diesel generator are installed on board only when emergency for the round trip between the quay of the island and typhoon shelter.

M/V Xin Sheng Tai Main Particulars

Builder	Yaguang Technology Group Co., Ltd
Designer	Shanghai Merchant Ship Design & Research Institute, CSSC (SDARI)
Vessel's name	Xin Sheng Tai
Owner/operator	Shanghai Passenger Ship Co., Ltd
Country	China
Flag	China
Delivery date	November 2022
Length, oa	65m
Length, bp	62.5m
Breadth, molded	14.5m
Depth, molded	4.3m
Gross tonnage	1580m
Design, draft	2.5m
Design, deadweight	247t
Max speed	11.8 knots
Number of crew	10
Number of passengers	165
Number of vehicle decks	1
Total lane length	51m
Number of cars	30 or 14 trucks
Number of engines	2 (diesel – electric propulsion)
Make	Chongqing Cummins Engine Co., Ltd
Model	K19-DM
Output of each engine	507kW x 1800rpm
Propellers	2x SJMATECK (Suzhou) Marine Machine Co., Ltd
Model	SZP35A-FP
Diameter	1385mm
Material	Ni-Al Bronze
Winches	Hangzhou Botu Marine Mechanical & Electrical Equipment Co.,Ltd.
Model	225HBTYMA32-00WX & 227HBTYB-50-00WX
Capacities	Rope winding: 50kN, ≥15m/min
Radar(s)	JRC/JMR-5410-6X
GMDSS	FURUNO/FM8900S
GPS	FURUNO/GP-170
Chart plotter	Shanghai Aiwei/AWENA-1
Fire detection system	KEXUN/K1302
Fuel oil	17 cu. m.
Fresh water	36 cu. m.
Ballast water	118 cu. m.
Supercapacitor:	Capacity 75000F; Energy 625kWh
Classification society	CCS

GREAT SHIPS
of 2022

Sparky, a new all-electric ship handling tugboat, was christened in Auckland, New Zealand. The RSD-E Tug 2513 was built at Damen Song Cam Shipyard in Vietnam for owner Ports of Auckland. Equipped with 2,784 kWh of batteries, the 70-ton bollard pull harbor tug can undertake two or more assignments before being recharged—which takes about two hours—entirely emissions-free.

Sparky is a 25 m long with a six-m draft. It has a twin set of azimuth thrusters with a three meter diameter. Powerful and emission-free, the tug operates on Echandia's LTO batteries. A 2.8 MWh battery system is especially well suited for high-power operations (10 MW of peak-power, allowing for 70 ton bollard pull) and fast charging.

Echandia's battery system has a lifetime equal to the 30 year planned lifetime of the vessel – making its total cost of ownership extremely low. The total cost of ownership will be equal to or lower than that of a diesel-powered tug.

First Ship in the Cruise Industry to Test Small Hydrogen Fuel System

Viking has taken delivery of Viking Neptune from Fincantieri's shipyard in Ancona, Italy. While identical to Viking's other oceangoing ships, Viking Neptune is equipped with a small hydrogen fuel system with a nominal power of 100 kW, making it the cruise industry's first ship to test the use of hydrogen power for on board operations. Viking is using the small system as a test to determine how hydrogen fuel could be used at a larger scale in future newbuilds.

Delivery of Viking Neptune comes as Viking continues to mark its 25th anniversary. Viking Expeditions launched in January with the purpose-built Viking Octantis; her sister ship, the Viking Polaris, debuted in September. Earlier in the year, the company also welcomed eight new Viking Longships on the rivers of Europe, new purpose-built vessels for the Nile, Mekong and Mississippi Rivers, as well as another new ocean ship, the Viking Mars.

Viking Neptune is 47,800 gt, with 465 staterooms that can host 930 guests.

On September 2, a naming ceremony was held at Sakaide Works of Kawasaki Heavy Industries Ltd. for a new VLGC (very large gas carrier) that NYK will charter to Astomos Energy Corporation.

At the ceremony, the ship was named Lupinus Planet by Toru Araki, executive vice president at Astomos Energy Corporation, and the ceremonial rope holding the vessel in place was cut by his wife. Yuji Nishijima, NYK executive Officer, attended together with others from NYK. This vessel will be NYK's first liquefied petroleum gas (LPG) dual-fuel VLGC. When LPG is used as fuel, exhaust gas from the ordered VLGC will contain at least 85% less sulfur oxide (SOx) and 15% less carbon dioxide (CO_2) compared to conventional VLGCs equipped with fuel-oil engines.

YARA BIRKELAND

World's First Electric, Autonomous Containership

Yara Birkeland, the world's first electric, autonomous container vessel, was christened in Norway.

The battery-driven vessel completed its maiden voyage in November 2021 and is due to enter service this year, transporting fertilizer across the fjord from Yara International's Porsgrunn plant to Brevik port. Initially, the 80-m ship will start operations as a manned vessel as part of a two-year trial period to become certified as an autonomous, all-electric containership.

Designed by Marin Teknikk and built at Vard's shipyard in Brattvåg, the 120 TEU open hatch container feeder ship features pioneering technology developed and delivered by Kongsberg Maritime, including sensors and integration required for remote control and autonomous operations, as well as electric propulsion, battery and control systems. MacGregor will deliver an automated system to enable Yara Birkeland to moor without human intervention.

Massterly, a joint venture between he Wilhelmsen group and the Kongsberg group, will operate Yara Birkeland from its monitoring and operations center in Horten.

SEYMOUR SUN & GROUSE SUN

Dual Fuel Methanol

Delivered in January 2022 and April 2022 respectively from Hyundai Mipo Dockyard in South Korea, the Seymour Sun and Grouse Sun are owned by NYK Bulkship Asia Pte. Ltd., Great Ships of 2022 and recognized recently with the "Green Ship Award" at the Singapore Registry of Ships (SRS) Forum 2022 hosted by the Maritime and Port Authority of Singapore (MPA). Each ship measures 186 x 32 m, is 30,873 gt and flies the Singapore flag.

The ships have each been equipped with a dual-fuel engine that can use heavy fuel oil and methanol. When operating using methanol as fuel, these vessels have new technology that suppresses the production of NOx by adding water to methanol to lower its temperature during combustion. As a result, these vessels can comply with the IMO's Tier III NOx emission standard without the need for an exhaust gas recirculation (EGR) system and a selective catalytic reduction (SCR) device.

YUAN RUI YANG

World's first dual fuel LNG powered VLCC

The world's first LNG dual-fuel VLCC them, Yuan Rui Yang, was delivered in February 2022 from Dalian Shipbuilding Industry Company (DSIC) for COSCO, classed by China Classification Society (CCS).

The Yuan Rui Yang will be operated by COSCO Shipping Energy Transportation Company and measures 333- x 60-m with a molded depth of 30.5 m. Using LNG as its main fuel, it is equipped with the dual-fuel engine, power generators and boiler. In gas mode, the ship's endurance can reach 12,000 nautical miles, with a combined endurance for fuel and gas of 24,000 nautical miles. It makes the design energy efficiency index (EEDI) about 39.3 percent lower than the baseline value.

CCS has further awarded class notations for the ship including Natural Gas Fuel, i-Ship(E) for ship intelligent energy efficiency, Green Ship I and NEC (III) for NOx emission control. It is designed with the C-type storage tanks, which are two 3,500 cbm LNG low-temperature storage tanks with completely independent intellectual property rights obtained for the vessel.

EAGLE CAMPOS

Suezmax DP2 Shuttle Tanker

AET took delivery of Eagle Campos, the first of another three Suezmax Dynamic Positioning (DP2) Shuttle Tankers purpose built for long-term charter to Brazil Shipping I Limited, a wholly owned indirect subsidiary of Shell. Eagle Campos' two sister vessels are currently under construction at the Hyundai Heavy Industries (HHI) in Ulsan, South Korea. In collaboration with HHI, DNV and Eaglestar, this 153,000 DWT DP2 vessel has been built to Shell's technical requirements for DP2 shuttle tankers in Brazil and will operate to the highest operational and environmental standards, including full compliance with IMO NOx Tier 3 and SOx emission requirements. Eagle Campos is classed with DNV and equipped with electrical-driven Variable Frequency Drive (VFD) cargo pumps and high-power thrusters for enhanced fuel efficiency and fully capable of operating in weather conditions expected for their class. The eco-efficient vessel is also fitted with energy-saving devices such as the Hi Pre-Swirl Duct and Rudder Bulb for improved propulsion efficiency and is already EEDI Phase 2 compliant before the regulations come into effect.

Catching the (Miros) Wave

*Real-time, cloud-based wave monitoring helps offshore operators perform more efficiently and safely, as **Jonas Røstad, Chief Commercial Officer**, explains the premise behind 'Sea States as a Service.'*

By Greg Trauthwein

Necessity is the mother invention, and Miros started in 1984 as a 'geeky science project' to provide better sea state data for platforms in the North Sea – which at the time relied on buoys; buoys that provided good data but were 'maintenance hungry.'

Born was a solution that was nurtured with national oil company Statoil (now Equinor), to create "the first prototypes of this wave radar, which was put on oil producing platforms in Norway and gave the same parameters as wave buoy would give out," said Røstad in an interview at the company's Oslo headquarters earlier this year.

Nearly four decades later, Miros has evolved into a technology company that specializes in measuring the ocean surface, providing sensors and systems for environmental monitoring to the offshore and maritime industries, including wave and current monitoring as well as oil spill detection.

Offshore Wind Efficiency

"Today, typically, offshore wind projects use weather forecasts, but what we can do is to give the actual sea state at any given point," said Røstad, helping, for example, vessel operators in the offshore wind sector cut wasted vessel trips and increase safety. "They start on the trip, and when they get out to turbine, it turns out that's the wave height is too high, so they have to make a U-turn and go back, which can also lead to turbine downtime. What we do is give real-time wave measurement within the farm, and maybe mix it with the weather forecasts. It's all about maximizing the weather window."

In fact, on some really large windfarms with diverse bathymetry, wave conditions can vary significantly at different points in the farm. In such a dynamic and fast-changing environment, absolute accuracy is always an issue, but Røstad points out that Miros instruments are "the only DNV certified wave measurement device on what they call the Alpha factor."

A big value proposition for the Miros solution is the fact that the sensors feeding data to the system are dry-mounted, not in the sea and directly exposed to saltwater, significantly reducing maintenance. Once installed and operational, they simply shoot the data stream up to the cloud, making the information easy to access for anyone with proper credentials. Layout of the sensors is unique to each wind farm, dependent ultimately on the layout of the farm, water depth and bathymetry. "[Via a pair of case studies] we have found that if we arrange these sensors right, then we can reduce turbine downtime by 1%."

Naturally there are savings to be had on the vessel side, too, and Miros, in a study together with ORE Catapult in 2019, found that by utilizing the data from its wave sensors, CTVs and SOVs saved up to 5% of fuel and CO2 emissions, too.

Studies are one thing, real world operations another, and earlier this year Subsea 7 awarded Miros Group agreements to install its internet of things (IoT) dry-sensor WaveSystem on three of its pipelay support vessels to deliver accurate wave measurements via Miros' cloud-based graphical user interface (GUI) Miros.app.

As part of three 3-year contracts and project requirements for the monitoring of wave and current to a water depth of 10 meters, WaveSystem will be installed on Seven Waves, Seven Rio

What we do is give real-time wave measurement within the farm, and maybe mix it with the weather forecasts. It's all about maximizing the weather window.

Jonas Røstad, Chief Commercial Officer, MIROS

All images courtesy Miros

and Seven Sun vessels, and the deal will see Subsea 7 gain access to Miros Cloud services delivering real-time sea state data.

On awarding the contract, Filipe Salvio, Operations Manager at Subsea 7, said "the cloud-enabled WaveSystem onboard our three pipelay support vessels allows us to deliver the best service to our customer independently of offshore weather conditions. This system provides us with accurate wave, current and speed through water data granting us to work safe, precise and highly effective at all times".

According to Røstad, Subsea 7 aims to use its system as a competitive advantage. "Subsea 7 wants to promise their clients that they can work more hours than the competitor. With knowledge about the sea state, they can work more hours because they take away that uncertainty."

The other thing is that Subsea 7 can link this to external systems, like dynamic positioning, for example, to check if they can increase the working limits of the vessel based upon real data. "So if you have limits and with experience from the data and how the vessel moves, they can actually change the limits to a higher number based upon the real-time data. Every vessel that has a limitation on the sea states [in which it could work] would benefit from this."

Image courtesy Marine Performance Systems

MPS co-founder and CTO Pieter Kapteijn with a 1-m section of a FluidicAL band with 8 oscillators.

Floating on Bubbles

Fluidical Air Lubrication

By Greg Trauthwein

Fluidical air lubrication is a system designed to generate a carpet of bubbles to help ships cut fuel consumption and emissions. Pieter Kapteijn, co-founder, Marine Performance Systems, discusses the unique design and operational benefits.

With a long career in oil and gas, Kapteijn and his partners "realized very early on that we could have a good idea about air lubrication and how to do it differently, because the core idea of air lubrication has been around for a long time, researched for more than 100 years. We added the 'fluidical' component to it, and that makes all the difference." For the past few years MPS has been working with maritime faculty of Delft University to test the idea of combining traditional air lubrication with fluidical.

"In our system, the air is injected into the boundary layer, but it's being injected through oscillators," said Kapteijn. "These oscillators are little devices that create a wave of a pulse of gas, of air. The air is then fed through a number of holes and it creates bubbles. It's the only way in which you can create masses of bubbles of the right size for air lubrication in the volumes that you need and distribute those over the bottom of the ship. That is the core to the idea."

Idea in hand, MPS started to test different oscillators, and found one that Kapteijn claims yielded 70-80% drag reduction. "So we knew we were onto something good. So then we said let's combine all these oscillators, so we have eight of these oscillators per meter of wing, the wing which guides the air into the oscillators and distributes the air underneath the flat of bottom of the ship," said Kapteijn. Another differentiator for the MPS system is the presence of bands of wings along the ship hull, to keep the air lubrication uniform along the entire hull. "Our system is so cheap and so cost effective is that we can actually fit multiple of these bands underneath the ship. We create the air layer with the first band, and then we maintain the air layer over the full length of the ship all the way to the stern," said Kapteijn.

Theory and lab results are one thing, proving success in a real-word environment is another. For this Kapteijn points to installation of its system on a Tharsis Sea-River Shipping vessel, a 110-m ship engaged in trade between the Netherlands, Germany and the UK. The system was installed on M/V Tharsis, and according to Kapteijn has "demonstrated net fuel savings of 7–10%. We fitted the first three bands with the spacing of about 15 to 25 meters and lo and behold, when we tested it, it did better than we expected," said Kapteijn.

"What we found is that the key to effective lubrication was to find the right bubble size, to inject the right volumes and to do that as efficiently as possible, but also to have control over what we call the boundary layer underneath the ship, because all the magic of air lubrication happens in a very small distance away from the skin of the ship," said Kapteijn. So we're talking about, early on something like a few centimeters, and then further along the ship, the boundary layer gets bigger. If you're able to control the way in which the air is injected into that boundary layer, you reduce the losses that you get, and therefore you use the minimum amount of air to create the air lubrication effect."

While most focus simply on the energy and emissions saved as a result of the system, Kapteijn warns that you must be mindful, too, of the energy consumed by the system in order to get a true value on the overall savings. "What we're trying to find out is how can we reduce the energy invested in lubrication to the minimum so that you can get maximum net gains from the system," he said. "To give you an example, people always ask me: 'If I invest 500kW in compressing the air and pumping it underneath the ship against the hydrostatic pressure at the wing. What do I get?' Well, in loaded condition, you get a one for two payoff. If the ship is loaded, so low in the water, what you get is about 1000kW back. And so your left with 500kW net gain. But in ballasted condition, when the ship is much higher up in the air and the amount of flat bottom as a percentage of the total wetted surface of the ship is a lot better, then you get almost four times as much."

To give shape and scale to the kit that must go onto a ship, Kapteijn discussed a pending installation onboard an 11,000 dwt bulker. "Here we have five wings; four wings are the width of the ship almost, so that's about 40 meters … the first wing is smaller because it's closer to the bow. In the end, you end up with something like 1300 oscillators, those little devices. This is a device that is 12 x 16cm and it's only 55mm thick. Eight of these are on a wing every meter so on this particular ship, we have close to 1300 of these oscillators. We use three 400 kW compressors, but effectively we use between loaded condition that is around 900-1000 kW depending on the conditions of the sea. And in ballasted condition, we use about 400-550 kW. He said maintenance on the MPS system is nearly negligible, as "there's nothing there. The wonderful thing about these fluidic oscillators is that they contain no components, they are just channels of air switching up and down, and pressing the air through these little holes. So the maintenance would mostly be limited to maintaining the compressors.

MV Tharsis at Neptune Marine yard in The Netherlands awaiting FluidicAL installation inlate 2020.

Image courtesy Marine Performance Systems

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