LEADERSHIP
FOR A

FUTURE

2024 ANNUAL REVIEW

ABS
& AFFILIATED COMPANIES

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PRIMA MESSAGE

CHAIRMAN'S MESSAGE

LEADERSHIP FOR A SMARTER, CLEANER, SAFER FUTURE

2024 saw the emergence of a new formula for success in our industry. It describes how success is now a function of your ability to manage the interaction of technology and innovation along with a focus on people and readiness for change set against the level of risk.

These forces are now inextricably twined together and, throughout the coming decade of change, will drive the development of our industry.

For shipping, we can see two stories playing out.

These stories are shipping for shipping, which speaks to the environmental compliance for our industry, and shipping for the world, highlighting shipping's pivotal role in tomorrow's energy mix, specifically as a carrier of future fuels, in particular the emerging blue and hydrogen value chains, and liquid carbon dioxide (CO_2).

Amid the resulting landscape of unprecedented, disruptive change, ABS retained its focus on the new boundary conditions of safety, availability and scalability of fuels and infrastructure. We also concentrated on the importance of new and evolving relationships: government to government, government to industry, owners to charterers and ships to ports, which will be key to success in this dynamic new normal.

ABS is built to be effective in this intersection of safety, regulations and technology, which will be the heartbeat of all the innovation in the years to come.

2024 saw our safety-centric, mission-driven strategy continue to serve us well, and we built on these foundations by investing in the transformation of class services and people development. Leveraging our domain expertise as class leader to create new growth opportunities and value for our clients was the hallmark of a year that forms a remarkable chapter in the story of ABS.

The ABS-classed fleet broke through 300 million gross tons at the end of 2024, meaning it has more than

doubled in size since 2009. This is directly attributable to our strategy and investments, which also underpin our number one position in global orderbook share with both shipowners and shipbuilders, which was retained again last year.

Among shipbuilders, ABS remains number one for orderbook share in the United States (U.S.), Singapore, China, South Korea and Brazil. For owners, ABS is number one for existing fleet share in Greece, Denmark, Hong Kong, Singapore, Taiwan, the U.S. and Brazil, and we continue to maintain our leading position across the offshore market.

In the global marine sector last year, we continued to lead in classed tonnage of the existing fleet for tankers. We also led the orderbook share for tankers and containers and maintained strong orderbook positions with gas carriers.

In 2024, ABS again achieved the industry's lowest lost-time injury rate, with zero recorded lost-time incidents. Our hull and machinery casualties were again the lowest by far of all our competitors, as they have been for 16 years running, and we maintained our global leadership and the number one position in all three major Port State Control regions, which we have held since 2017.

In the rapidly evolving field of advanced technology and operations, we expanded our lead with enhanced services and capabilities. We deepened our relationship with Governments, particularly with a wide range of agencies in contract research and development, including the U.S. Maritime Administration, which selected ABS to establish and operate its new U.S. Center for Maritime Innovation.

The problem set posed by the rapid pace of change brings a golden opportunity for innovation, focused not only on developing new technology solutions but also new relationships, regulations, supply chains, infrastructure and safety paradigms on a worldwide scale – a mix that cannot be satisfied without collaboration of a scope and breadth that has rarely been seen before.

ABS supported the industry with pivotal new research delivering unprecedented visibility into the ecosystem of shipping, underscoring the collaborative efforts required to retrofit existing fleets and to enhance the capacity of shipyards to deliver new, technology advanced vessels at scale and pace.

It is increasingly clear that new nuclear technology is going to be key to meeting environmental requirements, so ABS helped the industry understand the game-changing potential of small modular reactors at sea, in a series of studies and events with leading government and technology partners. We also developed the world's first comprehensive set of Rules for floating nuclear power plants, a critical step toward making this technology a reality.

> *This is what industry leadership is all about:*
>
> ***building the future even as that future defines itself.***

No matter the pace of change, safety has always been the first priority at ABS and will remain so. This is the foundation of all our collaborations and ensures that even the most rapid advances are delivered under an umbrella of safety. This is especially important today, as shipping is just beginning to develop the technologies and its future role as the carrier of new fuels and the mover of captured carbon. ABS and its partners helped bring about some significant advances during the year, but still it remains to be seen which of the technologies under development have a world-scale reality in store.

It is an exhilarating time for technology developers, but the best is yet to come. You may feel change is rapid now, but when we finally discover which fuels and technologies are able to jump the gap from potential to actual, then we shall see truly rapid disruption.

ABS achieved some important results during the past year by working closely with maritime and offshore leaders, helping bring forth answers to the toughest technical questions raised by fuel innovations. For example, we approved novel designs for very large ammonia carriers, ammonia engines for tankers, biofuel-powered ultramax bulk carriers and methanol-fueled ultramaxes; and, of course, we produced the industry's first requirements for the design, construction and classification of liquefied CO_2 (LCO_2) carriers, which will be some of the most critical links in the carbon value chain.

Carbon capture is key to realizing the transformational potential of blue fuels and their power to support compliance, but the development track for it to become an efficient, profitable activity is challenging. Currently, only 0.13 percent of all generated carbon is being captured; we need a broader, capture solution that we can commercialize to make the blue fuel dream a reality. Certainly, deep collaborations over the next decade will get us the answers to our carbon value chain questions, but for the present, we know that thanks in part to the pioneering work from ABS in 2024, the maritime industry will have LCO_2 carrier designs ready and qualified operators ready to operate them.

The rise of digital technologies, cyber-enabled equipment and the growing artificial intelligence (AI) component of our industries' decision-making, management and control systems has given rise to a new safety challenge.

ABS has been an industry trailblazer in understanding the new safety paradigm introduced by the addition of software as the third leg of the safety stool alongside hull and machinery. We continued this effort throughout 2024, supporting the development and application of remote-control and autonomous technologies for ships and offshore platforms, the use of digital twins for predictive maintenance, and the development of AI-based technologies that can generate real time insights, risk assessments and behavior monitoring to improve hazard detection through visualization. This predictive ability allows us to tackle the major boundary condition of digitalization and decarbonization – the unintended safety consequences of rapid technological advance.

Embracing a fully digital operating model will fundamentally alter the nature of safety. I believe this new forward-looking, predictive safety frontier represents nothing less than a paradigm shift in the performance of our industry, with the potential to unlock huge safety gains. But there remains significant work to be done in training, systems development and cybersecurity, to mention a few areas, to ensure the industry is able to fully capitalize on the opportunity before us.

In 2024, a resurgent offshore industry turned to ABS for support on mission-critical aspects of major offshore projects with engineering and risk management solutions. We maintained and built on our global leadership by anticipating the demands of a rapidly evolving industry and positioning ourselves to be ready to meet its needs.

A fine example of our continued support for innovation in the offshore energy sector is the new ABS *Rules for Building and Classing Offshore Units* (Offshore Rules), which were introduced last year.

The update brings multiple Rule sets into a single, unified document with risk-based approaches for verifying new technologies, to support today's fast-moving technology innovations.

The ABS value proposition is derived from the three different parts of our business – with Bureau's core classification services, the ABS Group of Companies, Inc.'s (ABS Group) risk and consulting services and ABS Wavesight's maritime software as a service (SaaS) working together to deliver enhanced value for our clients.

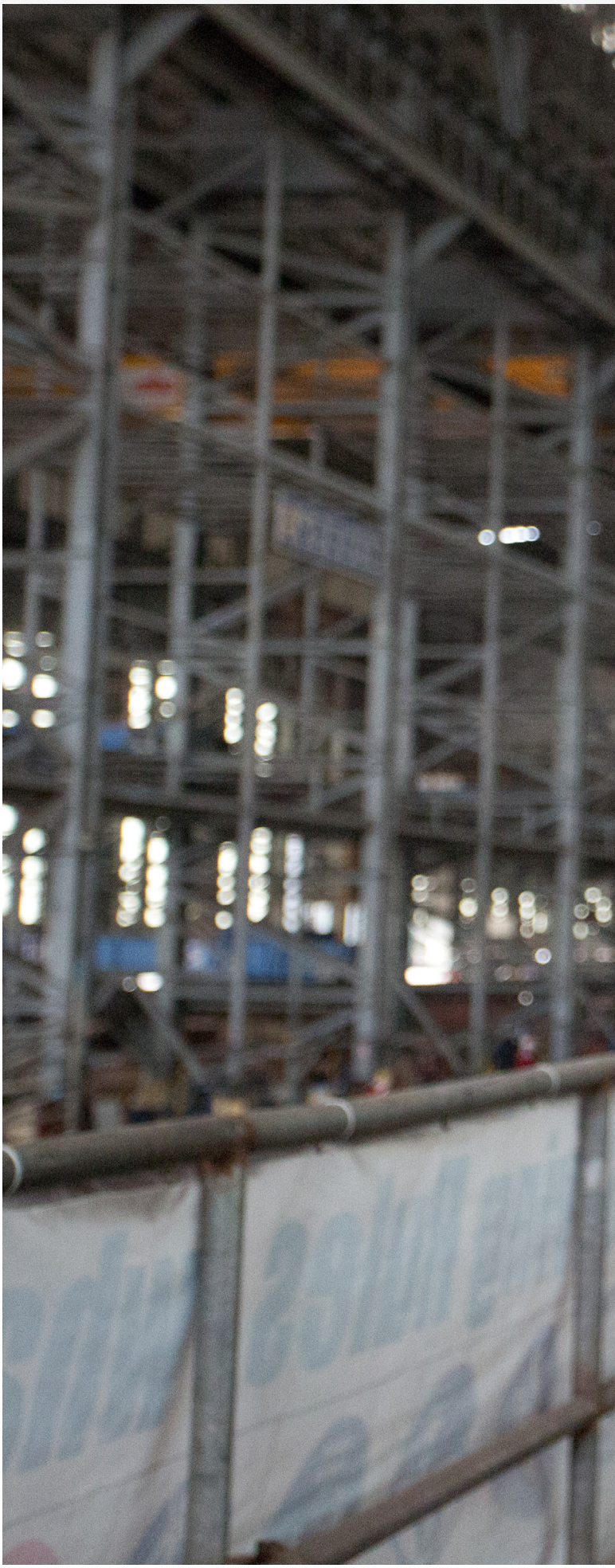
Over the course of the year, our ABS Group experts provided practical, tailored solutions across industries and governments. Its outstanding work saw ABS Group subsidiary ABS Consulting named on Forbes' list of the World's Best Management Consulting Firms for 2024, solidly placing the organization among the leading consulting firms globally.

ABS Wavesight revitalized and restructured its processes and systems in 2024 into an industry-leading organization dedicated to helping clients streamline compliance while maintaining competitive, efficient and sustainable operations. This commitment saw ABS Wavesight's flagship platform Nautical Systems (NS) unveil more than 100 new enhancements across all its modules and suite of mobile applications designed to deliver a range of enhanced capabilities to clients.

Across the business, we leveraged our leadership position, helping the marine and offshore industries innovate and optimize performance with an unwavering focus on safety.

The common thread connecting all of the year's achievements of the year is the importance of people. No matter how advanced your technology, it simply makes the role of the people in the loop ever more critical. Remember, technology has no sense of humor or common sense. And key to the performance of people is culture. Here we have genuinely excelled. Our culture, the SPIRIT of ABS – Safety, People, Integrity, Reliability, Innovation and Teamwork, underpinned by Quality – is the bedrock on which everything we have achieved together is built. It is a core set of values, traits that make us truly unique.

It has been an honor to lead the remarkable personnel who make up our global team. Their sweat and ingenuity has allowed us to record another exceptional year of performance, leading the industry toward a smarter, cleaner, safer future. This Annual Review is their story and their triumph. As we navigate the turbulent waters ahead, I am confident that this team, focused on our mission and guided by the SPIRIT of ABS, will continue to deliver safer seas for all.



Chris

Christopher J. Wiernicki
Chairman and CEO of ABS
Chairman of ABS' Affiliated Companies


ABS
Protector

INDUSTRY LEADING SAFETY AND QUALITY

INDUSTRY LEADING SAFETY AND QUALITY

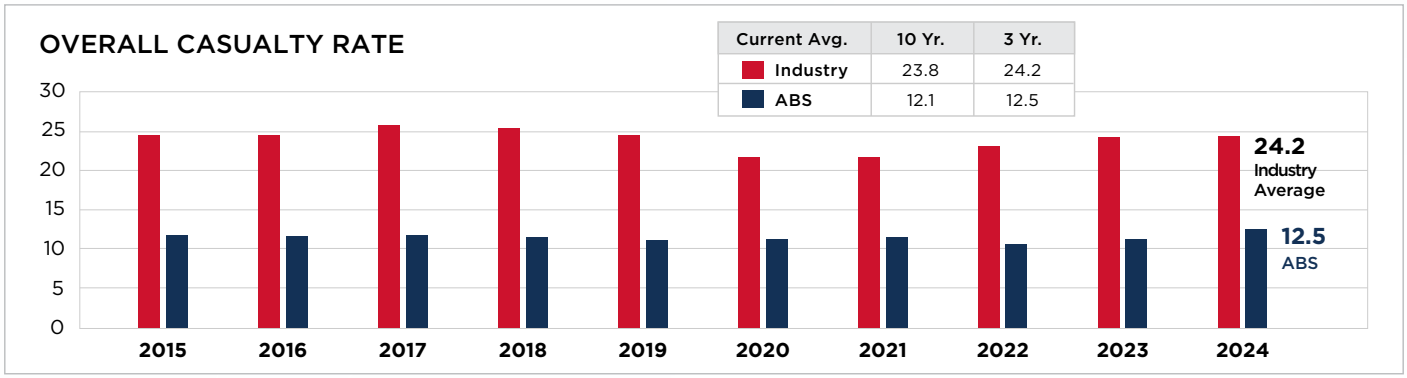
SAFETY LEADERSHIP

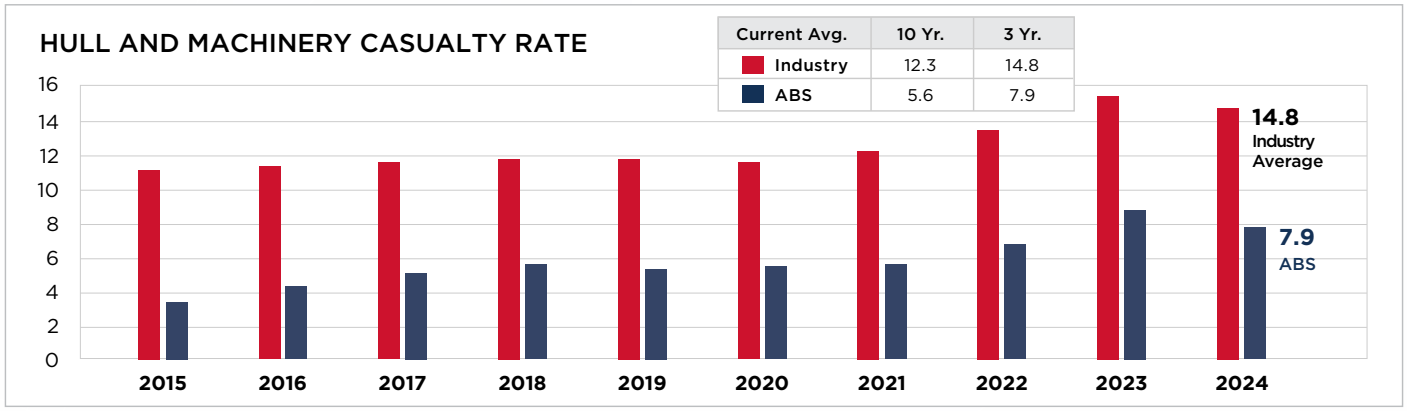
Safety is the foundation of everything ABS does and is an endless pursuit. For ABS, safety is a core value. The organization has built its reputation as an industry leader in maritime safety underpinned by a commitment to continual improvement and developing a strong safety culture for its workforce. ABS makes a difference both to people's working lives and the quality of the environment. ABS empowers employees with the knowledge, tools and authority to maintain safety at work and in everyday life. The organization's safety record has been compiled on countless ships, offshore facilities, shipyards, industrial sites and offices globally. ABS is vigilant in its goals to improve safety practices and dedicated to keeping the workplace a safe environment.

ABS SAFETY PERFORMANCE

In a long safety tradition, each year's successes form the foundation of the next year's achievements, fueling the voyage that has made ABS a global Health, Safety, Quality and Environmental (HSQE) leader. The ABS field staff continues to have weekly safety meetings, and office staff meet monthly to discuss specific safety issues locally or cover elements of the safety theme that ABS develops each year. In 2024, the safety theme was "Safety Awareness for Everyone (SAFE)," which was a call to action for all personnel to prioritize safety in every aspect of their work. It represented a shared responsibility to create a zero-incident workplace. The program emphasized the behaviors that are most likely to impact the occurrence of an incident based on ABS incident data.

In 2024, ABS issued 12 Golden Eagle Health and Safety awards to individual employees worldwide dedicated to a proactive health and safety program, and the Chairman's Safety award was issued to five port offices. This further demonstrates that ABS is a safety-driven organization and is a testament to the safety awareness of its staff, their commitment to safe practices and procedures, and the success of the organization's overall safety methodology.





Source: ABS, Lloyd's List Intelligence, Casualty Database, December 2024

OCCUPATIONAL HEALTH AND SAFETY PERFORMANCE

The organization's ongoing safety excellence initiative incorporates strong occupational health and safety processes and policies, including a Stop Work Obligation rule authorizing all personnel to intervene if safety is in question in any aspect of their work. ABS continues to increase engagement in leading safety behaviors, including timely reporting of potential incidents or hazards and documenting near misses. Health and Safety campaigns and robust incident reporting campaigns were used to reinforce reporting non-loss incidents.

- Three-year averages of key safety measurements for ABS continue to be among the best in the maritime industry:
- ABS personnel continue to make good use of the global reporting system to capture unsafe conditions, unsafe behaviors, near misses, and work-related injuries or illnesses.
- ABS maintained its ISO 45001 certification in 2024, with external audits performed by the British Standards Institute (BSI).

QUALITY PERFORMANCE

Through 2024, the organization's focus on industry fundamentals allowed ABS to grow its classed fleet to 300 million gross tons (m gt); strengthen its leading position in existing fleet and orderbook share; maintain industry leadership across the entire global offshore market; and continue to guide the industry in safety.

In 2024, ABS continued high-quality service delivery to a global client base. ABS maintained its leading position on overall Port State Control (PSC) performance, being the top-performing Recognized Organization (RO) in the three most active PSC regions of the world since 2017.

0 **U.S. Coast Guard (USCG)**
ABS maintained zero RO-related detentions for the last 16 years.

≤1 **Paris MoU**
ABS had one or fewer RO-related detentions each year over the last 12 years.

1 **Tokyo MoU**
ABS averaged one RO-related detention per year over the last nine years.

ABS GROUP OF COMPANIES, INC. SAFETY PERFORMANCE

Building on the parent organization's ongoing commitment to its safety mission, ABS Group of Companies continued to prioritize health and safety excellence throughout 2024.

Recognition of Excellence: Two employees were honored with the prestigious Golden Eagle Health and Safety award for their outstanding contributions to workplace safety. Additionally, the Chairman's Safety award was presented to the U.S. Engineering Team at the corporate headquarters for their exemplary efforts.

Proactive Safety Reporting: ABS Group employees actively utilized the global reporting system to identify and document unsafe conditions, unsafe behaviors, near misses, and work-related injuries or illnesses. This proactive approach underscores the organization's dedication to fostering a safe work environment.

ISO 45001 Certification: ABS Group successfully maintained its ISO 45001 certification in 2024, following rigorous external audits conducted by the British Standards Institute (BSI).

This achievement reflects ABS Group's ongoing commitment to enhancing its health, safety, quality and environmental culture, as well as its performance and management systems.


INDUSTRY
LEADING
PERFORMANCE

INDUSTRY LEADING PERFORMANCE

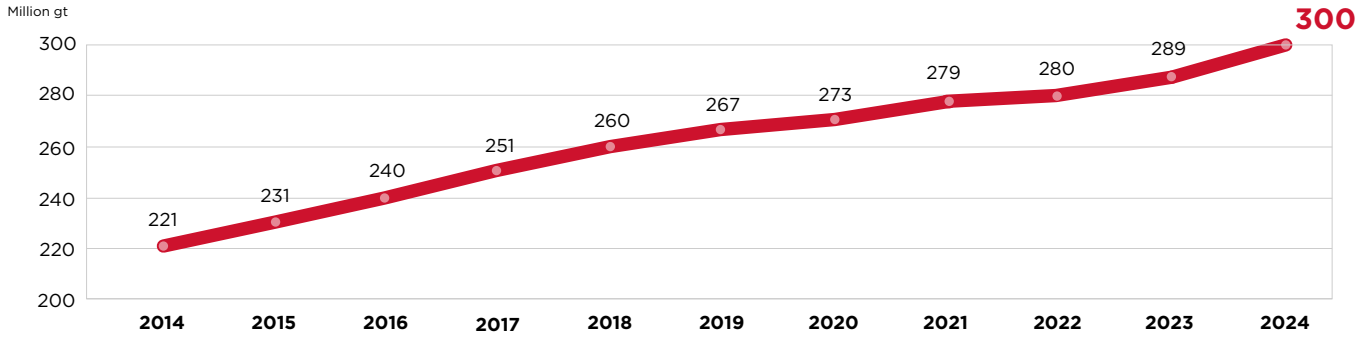
Leading Orderbook for Shipbuilders

- Brazil
- Greater China
- Singapore
- South Korea
- USA

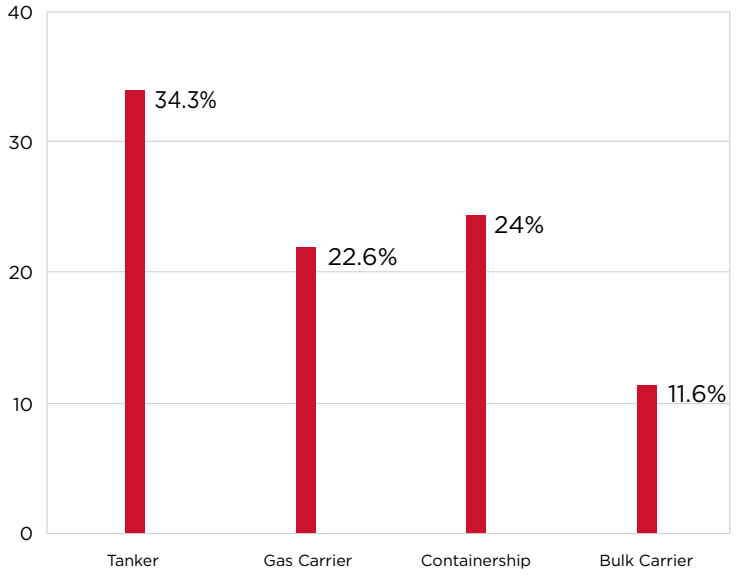
Leading Existing Fleet for Owners

- Brazil
- Denmark
- Greece
- Hong Kong
- Singapore
- Taiwan
- USA

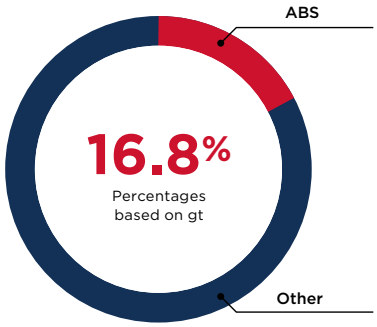
EXISTING FLEET 2024



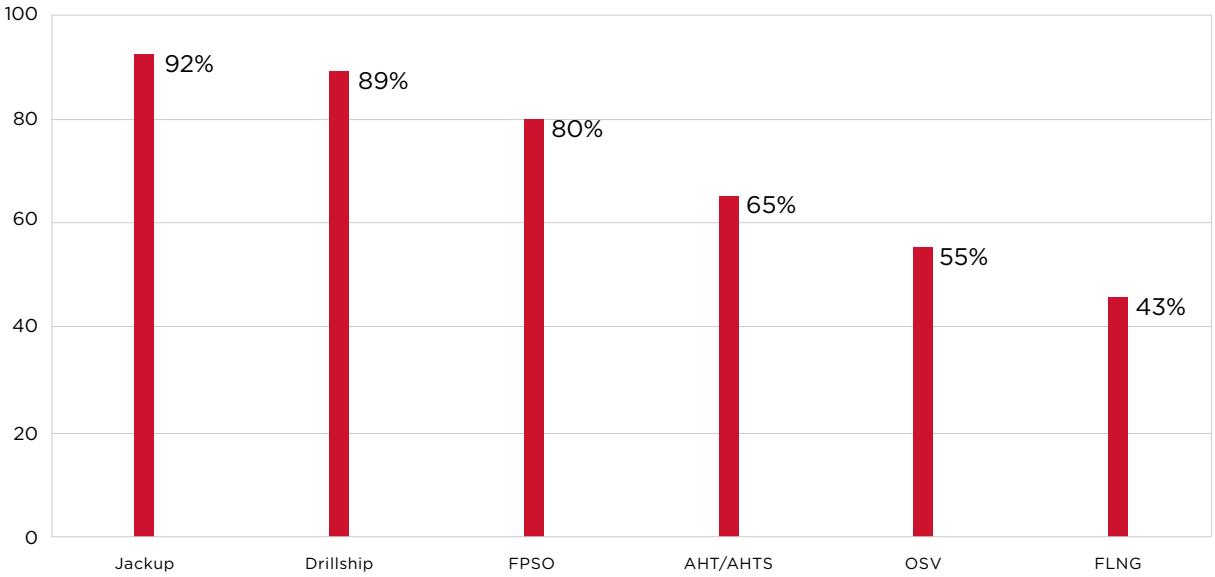
MARINE ORDERBOOK SHARE 2024



EXISTING FLEET 2024



OFFSHORE ORDERBOOK SHARE 2024



SUSTAINABILITY AND TECHNOLOGY

SUSTAINABILITY AND TECHNOLOGY

In 2024, the maritime industry continued to deliver advancements in sustainability and technologies supporting the trend toward net-zero emissions and more efficient operations. Through a series of landmark projects, collaborations and achievements, ABS built on its industry leadership in these areas throughout 2024, helping the maritime and offshore sectors meet sustainability goals and develop advanced technologies in the drive toward net-zero emissions by 2050.

LEADING INDUSTRY'S SAFE DEVELOPMENT OF ALTERNATIVE FUELS AND ENERGY

The industry is evaluating a variety of alternative fuels and energy sources as regulations continue to drive shipping toward lower emissions. While use of fuels such as liquefied natural gas (LNG) and methanol is growing, industry leaders are continually developing the technology and infrastructure needed to support the adoption of electrification, ammonia, hydrogen and even nuclear energy.

Electrification has broad application potential, either as a primary or hybrid energy source or in support of port operations. As a global leader in electrification, ABS contributed to the European Union's (EU) BlueBARGE Project, a 36-month program of collaboration between 14 international partners to develop a power barge solution for supplying electricity to moored and anchored vessels. ABS joined the BlueBARGE Project in April and is supporting the project in the areas of safety, classification and regulatory compliance. Focusing on containerized green energy supply modules, the consortium is seeking to address integration challenges and regulatory compliance while exploring technical alternatives to support the maritime industry's decarbonization transition. Among the variety of containerized power supply modules under consideration are battery systems, hydrogen fuel cells and hydrogen generators.

In support of the ongoing evolution of shipboard power systems, ABS and the Hyundai Group signed a memorandum of understanding (MOU) to collaborate on assessing the technical feasibility of medium-voltage direct-current (MVDC) power systems for ships. Under the MOU, ABS and HD Korea Shipbuilding & Offshore Engineering (HD KSOE) will work on design assessment, new technology qualification and development of technical requirements, safety standards and regulatory compliance for this emerging technology.

SPOTLIGHT

ABS 2024 Outlook Reveals Fleet Shift Toward Sustainable Fuels

In June 2024, ABS released the sixth edition of its industry-leading Outlook series, *Beyond the Horizon, Carbon Neutral Fuel Pathways and Transformational Technologies*. The new Outlook featured a deep examination into carbon-neutral fuel pathways and transformative technologies and a long-term energy forecast exploring the constraints and opportunities inherent in the evolving global trade dynamics that are shaping the future of shipping.

Providing a new level of visibility into the ecosystem of shipping, the Outlook underscored the collaborative efforts needed to both retrofit the global fleet and prepare the world's shipyards to deliver the vessels of the future. Notably, the publication revealed an active shift in the composition of the global fleet toward sustainable energy sources, with about 50 percent of the current orderbook (in gross tonnage) contracted for dual-fuel engines and alternative fuels, particularly LNG, methanol and ammonia. These three fuels will take an increasing percent of the orderbook heading into 2050, according to the fuel mix forecast, while fossil fuel use is expected to decline by 15 percent over the same period.

The Outlook also sees a robust invigoration of global shipbuilding, with demand for new vessels and retrofits driving the appearance of new shipyards, an increase in capacity at existing builders and an expansion of repair yard capacity through at least 2035.

ABS evaluated potential applications for nuclear energy in maritime and offshore through multiple initiatives in 2024. In July, ABS and the Korea Research Institute of Ships and Ocean Engineering (KRISO) began working together to advance small modular reactor (SMR) technology for use on board ships and floating power plants. In this collaboration, KRISO is to focus on core SMR technologies and designs, while ABS is to provide analysis of applicable regulatory guidelines and international standards for the designs. The immediate goal of the collaboration is to produce a floating SMR power plant capable of supplying electricity to islands and isolated areas. A long-term goal of the project is the development of global standards for nuclear-powered ships. Then, in October, ABS launched the industry's first comprehensive set of Rules for floating nuclear power plants at a joint forum with Idaho National Laboratory. Following the forum, ABS announced a report that examined the potential for using nuclear energy to power LNG carriers (see spotlight).

SPOTLIGHT

Industry-Leading Exploration of Nuclear-Powered LNG Carriers

In a groundbreaking initiative reviewing nuclear energy as a maritime fuel, ABS collaborated with Herbert Engineering to produce a study assessing the potential of a SMR to serve as the power plant on board a standard LNG carrier. Land application of this technology is well understood, but its adaptation for use at sea has not been deeply explored until now.

Specifically, the study addressed the use of a high-temperature, gas-cooled reactor (HTGR) on the design, operation and emissions of a 145,000 cubic meters (m^3) LNG carrier. The goal of the report was to help industry better understand the feasibility and safety implications of nuclear propulsion and to support future development projects. The study revealed important information regarding design considerations such as shielding, weight distribution

and heat and energy management. It also indicated that the best design approach features a reinforced hull with the reactors located at the stern and the batteries forward; this in turn led to the discovery that, given these constraints, nuclear propulsion is best suited for larger-size carriers.

SPOTLIGHT

ABS Releases Industry's First Advisory on Methanol Bunkering

With the publication of *Methanol Bunkering: Technical and Operational Advisory*, the maritime industry's first advisory specifically addressing methanol bunkering, ABS continued its industry leadership in supporting the development of methanol as a maritime fuel.

Industry interest in methanol as a fuel has steadily increased in recent years, as can be seen by an ever-growing orderbook for methanol-powered vessels. As with all fuels, methanol has advantages and challenges, and the ABS advisory provides insight into their impact on bunkering — whether truck-to-ship, ship-to-ship or land storage tank/terminal-to-ship. For example, although methanol requires generally lower capital investment for newbuilds and retrofits since it does not require pressurization or cryogenic fuel tanks and systems, its fuel tanks need roughly 2.5 times more space than oil tanks, with cofferdams required in some cases for protection. Because it is a toxic and flammable low-flashpoint fuel that can emit deadly vapors during bunkering, methanol also requires very specific safety precautions in handling.

The advisory was welcomed as an important addition to the growing body of work supporting development of a global methanol value chain, providing insight into the challenges of bunkering methanol and strategies to address them.

The emerging ammonia sector saw a succession of technological advances supported by ABS during the year. In April, ABS issued a new technology qualification (NTQ) for an innovative ammonia-to-electrical power system developed by Amogy. ABS assessed its integrated reactor system, which splits ammonia into its base elements of hydrogen and nitrogen so that the hydrogen can be fed into a fuel cell.

Then, in September, ABS granted approval in principle (AIP) to a novel ammonia fuel supply system designed by Nikkiso Co., Ltd. to be retrofitted on existing vessels. In yet another industry first, ABS also released *Ammonia Bunkering: Technical and Operational Advisory*, which gave the maritime community unprecedented insight into the risks, challenges, safety issues and training requirements surrounding ammonia bunkering.

Hydrogen received significant support from ABS through its involvement in the forward-looking LH_2CRAFT project, a notable research initiative funded by the EU that seeks to develop revolutionary new storage technology for liquid hydrogen (LH_2).

Administered by Hydrus Engineering and Dresden Technical University, the project's goal is to overcome the technical challenges of large-scale LH_2 storage, specifically aiming to develop a 200,000 m^3 containment system that will hold the liquefied gas at -253° C. ABS is to review the containment, handling and distribution technologies as they develop.

Hydrogen and wind-assisted propulsion were the subjects of two groundbreaking reports delivered by an ABS-led consortium to the European Marine Safety Agency (EMSA) in September at the Shipbuilding, Machinery and Marine Technology (SMM) trade show in Hamburg, Germany. Titled *Potential of Hydrogen as Fuel for Shipping and Potential of Wind-Assisted Propulsion for Shipping*, the reports provide 360-degree views of these emerging technologies and represent the organization's latest efforts to aid EMSA in its support of Europe's plan to transition to carbon-neutral shipping. Designed to inform researchers and decision-makers alike, the reports deliver insight on a variety of key aspects to each, including sustainability, availability, scalability, economics, safety and the evolving regulatory landscape.

INDUSTRY LEADERSHIP FOR ENERGY AND OPERATIONAL EFFICIENCY

Outside the scope of fuels, the maritime industry continued to develop technologies as part of the broader trend toward net-zero emissions. ABS supported advancements in carbon capture, utilization and storage (CCUS), the decarbonization of ports and a wide range of energy efficiency technologies (EETs) throughout the year.

In February, ABS released its *Requirements for Liquefied Carbon Dioxide Carriers*, the maritime industry's first-ever publication dedicated to the design, construction and classification of vessels that could transport captured carbon dioxide (CO_2) in liquid form. The industry sees transportation of CO_2 as a key element of the future carbon value chain.

SPOTLIGHT

Groundbreaking Report Assesses Decarbonization Readiness of US Ports

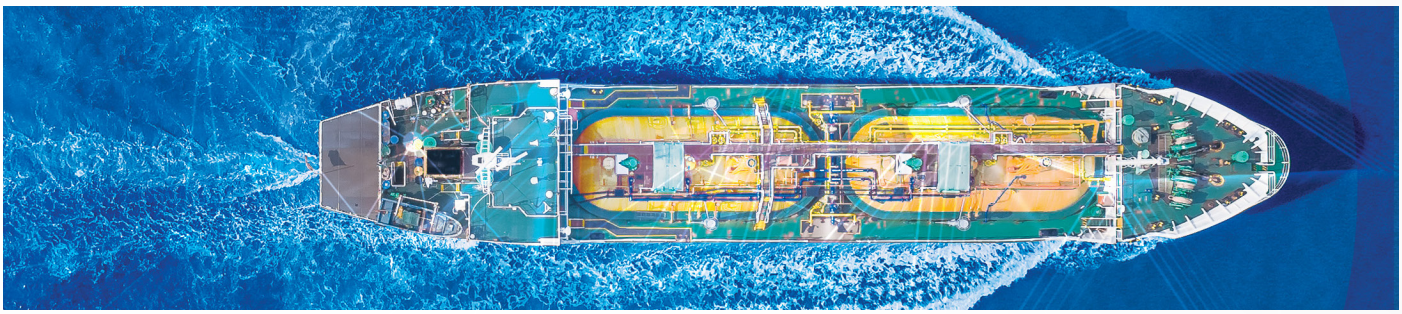
A unique collaboration between ABS and the American Association of Port Authorities (AAPA) produced a groundbreaking report on the state of decarbonization readiness among ports in the United States (U.S.). The jointly produced *Port Decarbonization Survey: Trends and Lessons Learned* delves into the details of the plans, achievements, challenges, state of infrastructure and general preparedness for decarbonization that exists throughout the vast network of U.S. port facilities. One of the most notable findings of the report was that, while some ports have decarbonization plans in place and have made strides in building the needed infrastructure, there remain significant challenges throughout the industry in advancing emissions-related projects, including financial constraints, physical space limitations and a low state of technology readiness.

Based on data and feedback from the AAPA membership and input from port authorities and vessel operations experts, the report is expected to help ports across the country learn from each other's experiences and help policymakers understand what is needed to advance port decarbonization.

In April, ABS and the U.S. Department of Energy (DOE) signed an MOU under which they would collaborate on decarbonization and clean energy development for the maritime domain. The effort brings together the expertise of ABS and the DOE's Office of Energy Efficiency and Renewable Energy to assist energy transition efforts in the U.S. and internationally.

ABS' leadership in the global maritime energy transition was underscored when the annual ABS Sustainability Summit kicked off the SMM Exhibition in September in Hamburg. Attendees heard a lineup of industry leaders discuss a wide range of topics including carbon pricing, regulatory realities, technical challenges and opportunities presented by the energy transition.

At the Gastech exhibition and conference in Houston, held not long afterwards, ABS and HD KSOE signed an MOU aimed at cooperation to advance the development and certification of innovative systems for next-generation, zero-carbon ships. The MOU focuses on integrating advanced technologies in three areas: a novel LNG cargo handling system that fully suppresses boil-off; a new ammonia supply system for large vessels; and a high-efficiency reliquefaction system with cold ammonia fuel supply.



LEADING INDUSTRY TOWARD DIGITALIZATION

Digitalization has a growing role to play in supporting more efficient operations across the marine and offshore industries. In 2024, ABS worked closely with industry leaders to support the safe development and adoption of digital technologies and, by extension, the security of the vast quantities of data generated by such tools.

In February, ABS awarded an ABS SMART (SHM) Tier 3 Product Design Assessment (PDA) certificate to Light Structures AS for its innovative SENSFIB Smart Structural Health Monitoring system. The system uses fiberoptic sensor-based technology for structural health assessment and prediction. The SMART (SHM) certificate requires a rigorous examination of structural health monitoring systems to assess if they meet industry-leading standards for safety, reliability and performance.

ABS awarded HD Hyundai Group an AIP in May for the design of two critical functions aimed at autonomous operation on board a proposed offshore platform currently under development. Awarded at the Offshore Technology Conference (OTC) in Houston, the AIP addresses the Autonomous Machinery Health Management Function (HiCBM) and the Autonomous Safety Management Function (HiCAMS), both of which are based on artificial intelligence (AI) technologies. The award followed the signing of an MOU to work together on industry-leading autonomous projects, building upon a previous Strategic Framework Agreement where ABS worked with both KSOE and HD Hyundai subsidiary, Avikus. The collaboration led to the autonomous operation of the LNG carrier *Prism Courage* for approximately half of a voyage across the Pacific Ocean.

Looking further into the future for AI, ABS, HD KSOE, HD Hyundai Heavy Industries (HHI) and the Liberian International Ship & Corporate Register signed an MOU to collaborate on the application of AI to eliminate ship safety blind spots. Specifically, the MOU aims to use advanced AI-based technologies to increase situational awareness for seafarers by providing high-fidelity, 360-degree visibility around the vessel.

SPOTLIGHT

Autonomous Technology Supporting Safety

The maritime industry sees advanced digital technologies, particularly autonomous systems, as an avenue to promote safe working environments as the industry starts to implement alternative fuels.

ABS awarded AIPs for two new autonomous technologies for ammonia-fueled ships developed by HD KSOE and HHI. One was for an unmanned ammonia engine room, and the other for an AI-based safety package for the engine room. Recognizing that autonomous operation depends not on single, standalone products but on vast systems of interconnected devices and equipment, ABS and HD Hyundai have worked together for years to develop the technology basis for providing reliably safe levels of such interconnectivity. The unmanned ammonia engine room, for example, links remote control and monitoring to the navigation bridge, while the AI-based safety package ties in with the HiCAMS and HiCBM for equipment management and such safety functions as rapid-response firefighting.

The maritime industry continues to develop remote-control operations with an eye toward enhancing overall safety and efficiency. In May, the ABS-classed FPSO *Liza Unity* became the first FPSO to receive the REMOTE-CON notation from ABS. The notation attests to the vessel's alignment with international standards and its design and construction in accordance with the ABS *Requirements for Autonomous and Remote Control Functions*.

As the adoption of digital tools continues to grow, cybersecurity is seen as an essential step in protecting increasingly connected fleets. In June, ABS awarded a Cybersecurity PDA certificate to MAN CEON, a cloud-based digital platform developed by MAN Energy Systems that integrates data analytics, machine learning and predictive technologies, allowing users to optimize the performance of their MAN ES machinery. It digitally links the equipment to a cloud-based storage platform where the performance data is stored and then accessed for such uses as real-time monitoring from shore. The Cybersecurity PDA attests that the system manufacturer has identified and remedied any system-specific vulnerabilities and, therefore, that the system protects the client vessel's cybersecurity profile.

LEADERSHIP IN SUPPORTING DEVELOPING TECHNOLOGIES

ABS also supported a broad range of technological advancements over the year, impacting several aspects of the maritime and offshore landscape.

In July, ABS awarded AIPs to two new designs in liquefied gas containment and transport from Jiangnan Shipyard. One was Jiangnan's patented insulation system, PnFCOMBi, and the other the design of an ultra-large ethane carrier (ULEC). The insulation system can be used for Type-B low-temperature cargo containment at temperatures down to -163° C. The ULEC is the first ship design using Jiangnan's lightweight BrilliancE II Type-B containment system, which proposes a three-tank configuration free from sloshing and structural resonance issues. The AIP is the latest step in a long-running cooperative effort with ABS to advance gas carrier technology.

Additive manufacturing (AM), also known as 3D printing, is another advanced technology that is expected to support more efficient operations as industry leaders are exploring the potential for the technology to enhance and streamline part replacement whether in port or at sea.

In May, ABS and an HHI consortium signed a pioneering agreement to embark on a joint development project (JDP) aiming to help make commonplace the onboard manufacture of repair parts – the first time ever that a classification society has been involved from the start of such research. The JDP will see ABS, HHI, CScam, a 3D printer manufacturer and KITECH, a digital library developer, create a digital library of parts designs for onboard 3D printing and work to develop a framework and methodology for producing and assessing parts manufactured at sea. In parallel with this effort, ABS, HHI and CScam have started NTQ procedures for 3D printing systems.

Following in July, ABS embarked on a Singapore-based project to explore the rapid verification and validation of 3D printed parts through a new model-based qualification process. Like traditional manufacturing, AM currently relies on physical tests for verification and validation of mechanical performance, but, due to its digital nature, may also be able to adopt model-based approaches that could accelerate the qualification and approval processes. There are many challenges to overcome if the idea of next-day approval of 3D printed parts is to become a reality, but, working with Singapore's Agency for Science, Technology and Research and Mencast Marine, with the support of Singapore's Maritime and Port Authority, ABS will seek to develop data-driven probabilistic models for predicting defect formations in printed parts and raise industrial use cases for verification and validation.


GLOBAL
MARINE

GLOBAL MARINE

ABS is as rooted in its safety mission today as it was 163 years ago, providing safety leadership for an industry that has seen a multitude of technological evolutions. As the global maritime industry faced new challenges in 2024, the organization maintained its position as a leader in class and non-class maritime services throughout the year.

ABS continued its safety leadership in the maritime industry during 2024. The ABS-classed fleet grew to 300 million gross tons (m gt) in 2024, and ABS further strengthened its number one position in global orderbook share at 22 percent, holding leading positions with both shipowners and shipbuilders. Among shipbuilding countries, ABS is number one for orderbook share in the United States (U.S.), Singapore, China, Brazil and South Korea. ABS is number one for existing fleet share for owners in the U.S., Hong Kong, Singapore, Greece, Denmark, Taiwan and Brazil. In 2024, in the global marine sector, ABS continued to lead in classed tonnage of the existing fleet for tankers. ABS also led the orderbook share for tankers and containerships and maintained strong orderbook positions for gas carriers and bulk carriers.

SUPPORTING ADOPTION OF ALTERNATIVE FUELS

The global orderbook for dual-fuel and alternative-fuel vessels continued to grow in 2024. In support of this trend, ABS worked with the maritime industry to promote the practical and safe application of these fuels. By awarding approval in principle (AIP), ABS can help the maritime community innovate and safely bring futuristic concepts to life.

Among the advanced vessel designs that received an ABS AIP in 2024 was a 50,000 deadweight (dwt) medium-range tanker powered by ammonia, developed by a team led by HD Hyundai Mipo. Another ammonia-related AIP was granted to Samsung Heavy Industries (SHI) for the novel design of a midship section and cargo tank of a 96,000 dwt ammonia carrier, which resulted from a joint development project (JDP) with ABS.

When it comes to the safe application of ammonia, the industry needs an understanding as to how the toxic fuel disperses in the event of a release. In October, ABS completed a safety evaluation of potential ammonia dispersion for an ammonia-fueled, gas turbine-driven liquefied natural gas (LNG) carrier designed by Hanwha Ocean. In collaboration with Hanwha, ABS conducted computational fluid dynamics simulations that modeled numerous ammonia release scenarios due to accidental leakage from the engine room, the pipeline and the bunkering stations on deck. The analyses concluded that the design meets ABS requirements, and its 3D high-fidelity simulations will help the client with decisions as the vessel advances through its detailed design phase.

SPOTLIGHT

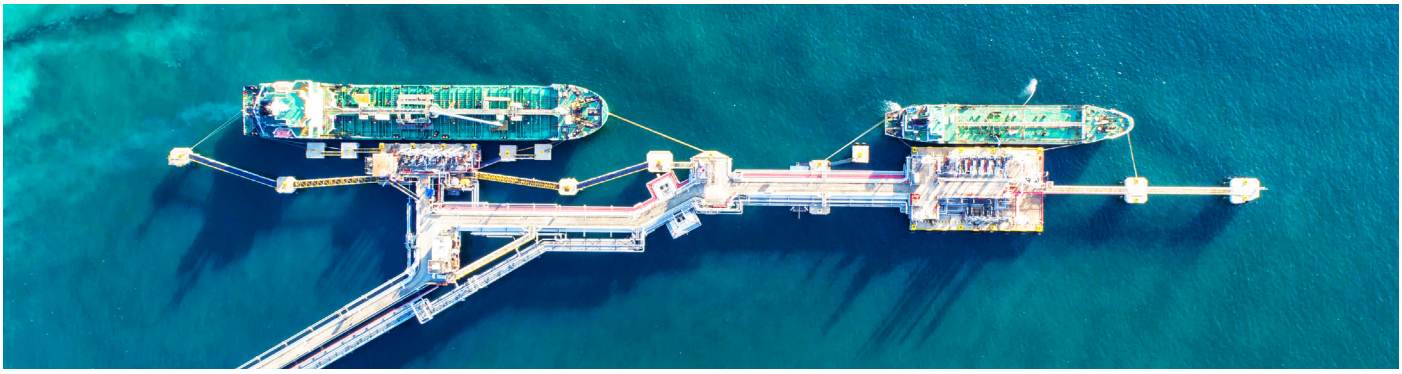
Vessel Earns World's First ABS Biofuel Notation

The maritime industry sees biofuels as having great potential in the future fuels landscape. They are liquid hydrocarbon fuels with similar composition and properties to fuel oil, but are produced from renewable sources such as crops, agricultural and forestry waste, animal waste or vegetable and animal fats. Therefore, biofuels can offer greenhouse gas emissions reductions from well to tank. Their compatibility with existing power generation systems makes them attractive as a drop-in alternative fuel that may minimize the need for new equipment, retrofits or redesign.

In April, Carras Hellas SA became the world's first shipowner to receive the ABS Biofuel-1 class notation, which was awarded to its ultramax bulk carrier *Carras Aquataurus*. The owner plans to use biofuels nominated up to B30, meaning 70 percent fossil fuel and 30 percent biomass-generated biofuel.

Methanol is a growing alternative fuel option with more than 200 methanol-capable vessels on order, methanol represents one of the more mature alternative fuel options. In support of methanol's growing role, ABS awarded an AIP in January to Lemissoler Navigation Ltd. and Shanghai Merchant Ship Design and Research Institute (SDARI) for the design of a 65,000-dwt methanol-fueled ultramax bulk carrier, the first such methanol vessel for China's shipbuilding industry. The vessel has been thoroughly optimized, and its preliminary Energy Efficiency Design Index (EEDI) was reviewed and indicated that the vessel exceeds EEDI Phase 3 standards. ABS completed design reviews based on class and statutory requirements.

The industry sees hydrogen as a key enabler of the future clean energy economy, as it figures high in the decarbonization projections of many industrial sectors for fuel, feedstock, energy storage and load balancing uses. Demand for hydrogen as a clean fuel source is expected to grow with time, in turn driving the creation of a global fleet of hydrogen carriers and the infrastructure to support them. ABS and SHI began an intense collaboration through a JDP aimed at developing a design for a practical liquefied hydrogen (LH_2) carrier. The project culminated in September with ABS issuing SHI a general design approval for the detailed design of a LH_2 cargo containment system and cargo handling system for 20,000 cubic meters (m^3) capacity LH_2 carrier, which is to be followed by a mock-up verification on the road toward commercialization of the design.



GUIDANCE FOR AN EVOLVING INDUSTRY

As the industry continued to face waves of change in the form of alternative fuels, evolving regulations and new technologies, ABS provided leadership and support through a range of initiatives and service offerings throughout 2024.

In February, ABS opened the doors of its Global LNG Academy in Doha, Qatar, a facility unequalled for its integration of digital technologies with training programs. Supported by QatarEnergy in coordination with industry partners, the Center underscores ABS' support for Qatar's National Vision 2030 and its Tawteen Program, which focuses on developing education and quality employment opportunities for Qatari nationals. The state-of-the-art facility offers a learning experience unique in the industry, providing a combination of onboard, classroom and immersive simulation training classes. These include the MetaSHIP, powered by Orka, a highly realistic virtual ship created on-scale from real vessel drawings. The virtual ship provides a dynamic and realistic simulation training environment covering all ship operations and hazardous zones.

In June, ABS published a new class notation developed to help the containership sector safely expand its cargo carrying capabilities: the CLP-V(PARR) notation. This is effectively a safety technology assistance measure that enables vessels to add an extra tier of containers on deck while accounting for the effects of parametric roll. The CLP-V(PARR) measure continues ABS' long tradition of leading-edge safety developments by combining its Computer Lashing Program notation and mandatory parametric roll guidance to calculate load reduction factors on specific routes and voyage sections rather than on a complete voyage. By integrating into commercially available weather routing and voyage planning software, CLP-V(PARR) provides a revolutionary level of analysis and operational guidance that, for example, can allow an additional 640 containers onto a 15,000 twenty-foot equivalent unit (TEU) vessel or 960 containers on a 24,000 TEU vessel.

SPOTLIGHT

ABS Unveils Plans for a Pioneering Ship Safety Center in Greece

In June, ABS unveiled plans to create a pioneering new ship safety center in Athens that will harness the power of new immersive training techniques, game-based learning and virtual reality environments for the Greek shipping community. Named the Hellenic Ship Safety Center, the cutting-edge facility will prepare seafarers to handle both the challenging complexities of today's maritime world and the evolving multidimensional demands of tomorrow's industry; its remit includes paying special attention to such evolving challenges as alternative fuels and the disruptive technologies emerging from the decarbonization and sustainability journeys.

Supported by the Hellenic Ministry of Maritime Affairs and the Union of Greek Shipowners, the Hellenic Ship Safety Center will offer education and training focusing on such critical emerging

safety issues as the handling of dynamic fuels and the risks generated by cyber-enabled systems, and address the requirements for special skills, education and training presented by evolving new technologies such as hybrid battery and nuclear propulsion along with other decarbonization-driven changes on board.

In September, ABS announced expansion of its footprint in Australia with a physical presence in Port Headland, a key trading zone for dry bulk minerals in the Eastern Hemisphere. Authorities there have begun a substantial development effort to support the global energy transition and meet their own net-zero goals, which includes a multimillion-dollar hydrogen hub, port infrastructure expansion and improvement and an accelerated clean jobs training program.

In October, ABS convened its U.S. Maritime Strategy Workshop in Washington, D.C., in an effort to bring together industry and government leaders for consensus-building on key policy and commercial priorities. This was the third in a series of workshops intended to provide key decision-makers with credible input and recommendations from a multistakeholder base in order to help inform development of a U.S. national maritime strategy, and was organized in conjunction with the U.S. Federal Maritime Commission, the Office of Senator Mark Kelly and the Office of U.S. Representative Mike Waltz.

Following an agreement signed at Italy's Ministry of Infrastructures and Transport in December, ABS announced that it would deliver audits of the International Ship and Port Facility Security Code (ISPS Code) on behalf of the Italian Administration from January 1, 2025. As a Recognized Organization of the Italian Administration, ABS will conduct statutory activities including approval of Ship Security Plans, security verifications, issuance of Interim International Ship Security Certificates and International Ship Security Certificates for ships with ABS Class.

SUPPORTING NEW TECHNOLOGIES

Throughout 2024, ABS set in place building blocks for the maritime industry of tomorrow as it pioneered new ways of working that capitalize on the latest advances in digital technologies.

Early in the year, ABS introduced enhancements to ABS *Rules for Building and Classing Marine Vessels* (Marine Vessel Rules), including a comprehensive methodology designed to enable the safe and rapid adoption of innovative technologies through a risk-based path for class approval. In an industry first, it offers an unprecedented approach to supporting development and deployment of next-generation concepts and technologies, particularly those needed in the industry's drive toward decarbonization. Thanks to this enhancement, the ABS Marine Vessel Rules now include an extensive set of newly-developed functional requirements and a standardized risk-based methodology that are the result of years of collaboration with industry and its regulators; these combine to allow novel, alternative arrangements and new technologies to be accepted if their compliance with the Rules' functional requirements can be demonstrated. At the same time, the familiar ABS prescriptive Rules remain in place for conventional designs, technologies and arrangements, which will follow the traditional approval process. The enhanced Rules add to ABS' traditional framework a comprehensive risk-based approach that could encourage industry to break new ground, leap its barriers and innovate with confidence.

An additional building block for the future was the launch of Eagle Unified, a groundbreaking, industry-leading structural design verification tool. Incorporating over 100 features requested by users of its digital engineering software systems, this single software tool supports many vessel types including containership and LNG carriers, and will address liquefied petroleum gas, ammonia, hydrogen and carbon dioxide (CO_2) carriers in future editions. Released in May, Eagle Unified is designed to manage data-heavy, next-generation engineering tools such as 3D plans, integrated computer-aided engineering models, advanced simulations, streaming data platforms and other digital assets, including, ultimately, a fully scalable digital twin system for compliance and safety.

In June, ABS expanded on its industry-leading work in using advanced technologies to augment traditional class surveys and inspection by approving a range of ship repair and retrofit work processes for remote survey at Qatar Shipyard and Technology Solutions. As part of the project, ABS tested, validated and approved remote survey for a number of activities including stern tube wear-down inspection, rudder clearance inspection and rudder plug opening inspection. This approval marked the culmination of a pioneering JDP that explored how techniques developed by ABS for its program of remote survey for vessels in service could be applied to optimize workflow at the shipyard.

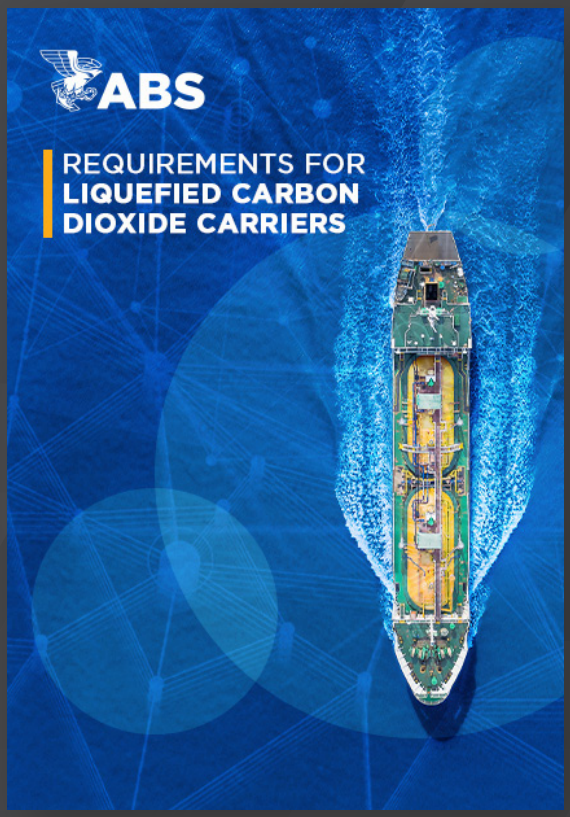
With carbon capture, utilization and sequestration (CCUS) looming large in the future of the global industry, many companies are working to support the budding CCUS value chain. One of the emerging keys in that value chain for the maritime sphere involves the operation of liquefied carbon dioxide (LCO_2) carriers. ABS, which leads the industry in supporting early entrants into the carbon value chain, celebrated another maritime first when, in April, it awarded ECOLOG an ISM Document of Compliance for the operation of LCO_2 carriers on behalf of the Bermuda Flag Administration. Later in the year, ABS awarded an AIP to ECOLOG for a unique low-pressure LCO_2 carrier (see spotlight).

SPOTLIGHT

ABS Aids Development of Landmark LCO_2 Carrier Design

Continuing its industry leadership in decarbonization technologies, ABS supported a joint industry project to develop detailed designs for a groundbreaking LCO_2 carrier. At the conclusion of this collaborative effort, ABS awarded an AIP to the design of a low pressure, shallow-draft, low-carbon-footprint 40,000 m^3 LCO_2 carrier for ECOLOG Services Ltd.

The project focused on solving difficult problems related to the critical characteristics of LCO_2 itself, to the effects of various CO_2 compositions on the resilience and commerciality of the containment and cargo handling systems, and to the special requirements of low-pressure and shallow-draft operations. The project team included Hanwha Ocean (hull and cargo tank design), Babcock LGE (cargo handling systems and integration), ECOLOG (cryogenic gas transport) and ABS, which provided design review in accordance with the requirements in the ABS Marine Vessel Rules and the ABS *Guide for Liquefied Gas Carriers with Independent Tanks*.



In addition to the work with ECOLOG on LCO_2 carriers, ABS awarded AIPs for two LCO_2 carrier designs produced under a JDP among major Japanese maritime companies. The carriers, one 50,000 m^3 and the other 23,000 m^3, feature innovative new Type-C cylindrical cargo tanks made of carbon manganese steel that do not require post-weld heat treatment. The project team included Mitsubishi Shipbuilding Co., Ltd.; Nihon Shipyard Co., Ltd.; Kawasaki Kisen Kaisha, Ltd.; Mitsui O.S.K. Lines, Ltd.; Nippon Yusen Kabushiki Kaisha; Mitsui & Co., Ltd.; and Mitsubishi Corporation.

RECOGNIZING LEADERS AROUND THE WORLD

ABS has a long history of engaging in special efforts to recognize individuals and groups for making contributions in lifesaving, safety and the betterment of the industry. In September, ABS continued its biannual tradition of sponsoring a special ceremony recognizing the contributions made by German shipowners and seafarers to the Automated Mutual Assistance Vessel Rescue (AMVER) reporting system. Sponsored by the U.S. Coast Guard since 1958, AMVER receives distress calls at sea and diverts the nearest vessels to aid in the search and rescue efforts. In 2023, the AMVER program saved the lives of nearly 800 individuals. At the 2024 ceremony, 308 vessels and 54 German-managed companies were honored a with presentation of the traditional colored pennants that recognize their selfless commitment to helping all in danger at sea.

ABS later sponsored the *Empowering Diversity: Women Leading the Way in Middle Eastern Maritime* event in Dubai, honoring the progress and individual achievements of women in the Middle East's maritime community. More than 120 representatives from the region's maritime sector attended a panel discussion among executives from some of the area's leading companies, who shared their experiences, challenges and insights relating to diversity and leadership in the maritime world.

GLOBAL PERSPECTIVE

GLOBAL OFFSHORE

When it comes to supporting the offshore energy sector, ABS has some of the deepest roots outside of the first explorers and producers themselves. Not only was ABS present as technical and safety advisor at the world's first oil well placed out of sight of land in 1947; but industry leaders have relied on ABS to provide technical safety assistance with every groundbreaking advance in the decades since. These advances have included the invention of bottom-standing, jackup and floating platforms; creation of the first drillships, floating production, storage and offloading (FPSO) and floating production units (FPU); development of dynamically positioned (DP) vessels; and the sector's first challenging steps into deepwater exploration and production solutions. ABS has left its mark on the very foundation of the modern offshore energy sector.

Solidifying its place as an industry leader in the offshore sector in 2024, ABS continued to lead in all segments of the offshore orderbook – exploration, production and supply vessels. ABS maintained 92 percent of jackup orders, 89 percent of drillship orders, 80 percent FPSO orders, and 55 percent of all offshore support vessel (OSV) orders.

PROMOTING SAFETY IN APPLYING ADVANCED TECHNOLOGIES

ABS has long provided advanced technology services to support mission-critical aspects of major offshore projects with engineering and risk management solutions.

Such was the case when offshore subcontractor Genesis North America engaged ABS to support the Ru'ya project, a production capacity improvement plan for Qatar's Al Shaheen oilfield. Operated by the North Oil Company, Al Shaheen is one of the world's largest carbonate fields and Qatar's largest offshore oilfield, and the Ru'ya project intends to boost its production capacity by approximately 100,000 barrels of oil per day (BOPD). This important project, announced in August, calls for an ABS advanced analysis team to lead a safety engineering program that will provide risk mitigation and asset integrity support, as well as perform a number of critical safety studies including dropped object analysis for subsea pipelines and cables.

A month later, bp selected ABS to provide class and service support for its high-tech Kaskida project off the southern coast of the United States (U.S.). Per bp, this advanced deepwater FPU will have the capacity to produce 80,000 BOPD and is set to unlock a possible 10 billion-barrel resource in a geology that was once unproduceable for its high-pressure, high-temperature (HP/HT) characteristics. These fields require equipment with a pressure rating of 20,000 pounds per square inch (psi) versus the 15,000 psi typical of deepwater fields offshore U.S. ABS will act as the independent third-party verifier (I3P) for the project's HP/HT equipment. The organization will also act as the Certified Verification Agent (CVA) for the U.S. Bureau of Safety and Environmental Enforcement (BSEE), as it has done for the majority of floating production solutions offshore U.S. It will also act on behalf of the U.S. Coast Guard to inspect and approve design, construction, installation and equipment.

SPOTLIGHT

ABS Releases Best-in-Class Update to Offshore Rules

In a move to support innovation in the ever-evolving offshore energy sector, ABS introduced new *Rules for Building and Classing Offshore Units* (Offshore Rules) in December, which became effective at the beginning of 2025. The update brings multiple rule sets into a single, unified document with risk-based approaches for verifying new technologies along with easier navigation to support clients.

The forward-looking initiative is part of a multiyear collaboration with industry, shipyards, owners, equipment manufacturers, designers and regulators to support today's fast-moving technology advancements and innovations driven by digitalization and decarbonization.

ABS has consolidated its existing rule sets, including those for mobile offshore units and floating installations, into one easily accessible publication featuring a new format with enhanced graphics for increased clarity, expanded search capabilities and greater transparency regarding mandatory and optional notations.

SPOTLIGHT

ABS Provides Industry-Leading Guidance for PSV Hybrid Battery Conversion

In May, SEACOR Marine selected ABS to help the OSV leader integrate hybrid battery power into its fleet.

ABS provided survey and engineering review services for the integration of a lithium-ion based energy storage system into the platform supply vessel (PSV) *SEACOR Yangtze*, making it the seventh vessel in the company's fleet to have earned the ABS ESS-LiBATTERY class notation. In addition to the energy storage system, the PSV also features the company's first closed bus DP operations. Building on this success, four further PSVs are scheduled for hybrid battery upgrades in 2025. When these are completed, more than half of the company's PSV fleet will be powered by hybrid systems.

Another advanced technology project began in October when Petrobras contracted ABS to help develop a life extension program for some of its aging assets. In this case, the project is to provide and test a digital twin solution for real-time condition monitoring for one of the four FPSOs in Petrobras' Cessão Onerosa oilfield. Condition monitoring is critical to supporting older assets, and ABS was chosen because it is a recognized leader in development of effective life extension programs. As part of its solution, ABS is using structural performance management software from Swiss company Askelos SA, which integrates operational data to provide continuous fatigue assessments, and which ABS will evaluate over the course of a year.

SUPPORTING DEVELOPMENT OF INNOVATIVE TECHNOLOGIES

One of the hallmarks of advancing technology, particularly in the offshore sector, is receiving approval in principle (AIP) from ABS, an important first step on the road to classification. An AIP attests that a novel concept design, even if not yet fully evolved, complies with the intent of all applicable ABS Rules and/or codes and appears to be feasible from safety, technology and regulatory points of view. A number of significant AIPs issued in 2024 also attest to ABS' continued leadership role as a safety authority in the global offshore energy community.

In March, ABS awarded an AIP to the design of a new floating storage and offloading (FSO) unit to OceanSTAR Marine & Offshore Investment. Designated OceanSTAR FSO-01, the ship-shaped hull design is meant specifically to service the midsize FSO market, featuring a storage capacity of 750,000 barrels, strengthened deck areas, expandable living quarters and piping routings that can adapt to topsides use for either FPSO or FPU applications.

July was highlighted by an AIP for a novel motion-compensated gangway developed by Nantong Pengrui Offshore Technology Co. and COSCO Shipping Shipyard (Nantong). The gangway design proposes to increase personnel safety when transferring to and from offshore facilities. ABS completed design reviews based on class and statutory requirements.

September also saw a pair of notable AIPs new technologies in development. The first was awarded at the Gastech exhibition and conference to IMODCO Terminals SA for jetty-less terminal concepts that propose to move frequent, large-volume ammonia transfers away from shore. In approving the design, which stems from a proven jetty-less system for crude oil, ABS reviewed designs for a Catenary Anchor Leg Mooring (CALM) buoy, CALM soft yoke and tower loading unit that together are intended to move ammonia transfers away from shore and mitigate the risk of leaks into populated areas. Later in the month, an AIP was granted to the design of a 268 meter (m) floating liquefied natural gas (FLNG) facility from Wison New Energies, which is intended for offshore and at-shore operation at a production capacity of 1.2 million tonnes per year.

Ammonia technology was also the subject of an AIP awarded in October to Samsung Heavy Industries (SHI) for design of an ammonia FPSO. Designated the Samsung Ammonia Blue, the innovative design features a number of advanced safety components and a projected production capacity of 1.2 million tonnes of ammonia per year.

ABS wrapped up the year with an AIP for Hanwha Ocean's Pre-FEED Standard FPSO Design. This design is intended to create an asset optimized for deployment in the deep waters of West Africa. The FPSO design is 340 m long and capable of storing approximately 2.38 million barrels of crude oil, with a daily crude oil production capacity of 190,000 barrels. To address environmental regulations, the FPSO is set to incorporate technologies such as zero-flaring, greenhouse gas monitoring, and an energy management system. All equipment has been electrified to reduce operational costs throughout the unit's life cycle. Additionally, advanced digital solutions, including cybersecurity, digital twin and predictive maintenance, have been integrated.

COLLABORATING FOR THE FUTURE OF OFFSHORE ENERGY

Collaboration is seen as an essential part of supporting the evolving industry as emerging technologies grow increasingly complex. Take, for example, the collaboration agreement signed between ABS and the Korea Marine Equipment Research Institute (KOMERI) at the Offshore Korea Conference in November. This agreement, broad in nature, has both organizations cooperating for the advancement of technology research and development in the shipbuilding and various marine industries. This involves use of research facilities and equipment, testing and certification activities, and mutual information exchanges through professional education programs including seminars and workshops. In 2024, ABS engaged in a number of such collaborations and partnership projects seeking to better the industry and find solutions to some of today's most vexing offshore technology questions.

Two projects with Seatrium illustrate this very well. At the Offshore Technology Conference (OTC) in May, the two organizations signed a three-year Technology Collaboration Agreement (TCA) designed to foster a series of cutting-edge projects along four lines of research: decarbonization, electrification, new energies and digital transformation. The latest step in a long-running collaboration that has seen ABS and Seatrium deliver a number of pioneering industry firsts, this TCA aims to support the commercialization of a broad range of innovative technological advancements and solutions.

Seatrium later contracted ABS Class for two newbuild FPSOs for Petrobras, continuing the class society's longstanding involvement in the P-series FPSO platforms with P-84 and P-85. The companies announced that they will work together to develop units incorporating technologies that aim to enhance operational efficiency and reduce environmental impact, thus stimulating decarbonization, digitalization and innovation in the offshore sector. A larger goal of the project is to promote a shift toward a condition-based class methodology for floating production assets.

A multiyear agreement between ABS and Hanwha Offshore, signed at the Gastech exhibition and conference, focuses on accelerating sustainability, digitalization and cybersecurity, three elements of the global energy future that are tied very closely together. Overall, the agreement aims to support commercialization of a broad range of innovations in such areas as green retrofit projects, carbon capture, electrification and energy efficiency enhancement.

SPOTLIGHT

ABS Launches Industry's First Comprehensive Rules for Floating Nuclear Power

Nuclear reactors have powered U.S. military vessels for 70 years, in some cases displaying notable reliability and longevity — like the world's first nuclear-powered naval surface ship, the carrier *USS Enterprise*, which remained in service from 1960 to 2012. With so much research, data and experience behind nuclear technology, industry leaders are starting to consider advanced reactor designs for commercial maritime use. There is potential that nuclear systems can dramatically scale back the industry's carbon footprint and accelerate its decarbonization efforts while also lowering operating costs.

Last year, ABS underscored its industry leadership in this field by releasing the world's first comprehensive Rules for floating nuclear power plants. The ABS *Requirements for Nuclear Power Systems for Marine and Offshore Applications* provides the first-ever classification notation for nuclear-powered assets such as FPSO units. Uniquely, the requirements allow designers to consider any type of reactor technology and propose a framework for nuclear regulators to collaborate with Flag administrations and ABS for complete regulatory oversight and license.

The Rules were unveiled at a forum for nuclear industry leaders, held jointly with the Idaho National Laboratory (INL), that was convened at ABS' world headquarters in Texas. The forum was the latest step in a broad collaboration between ABS and INL to test and demonstrate advanced reactor technologies. ABS has been working with

government and industry leaders for several years on investigating the application of advanced nuclear technology in the commercial maritime and offshore ecosystems. This work includes research with the U.S. Department of Energy and participation in multiple new technology qualification (NTQ) and AIP projects with industry.

Attendees to the joint INL forum saw presentations on the latest reactor technologies from leading companies, as well as the release of a detailed study produced by ABS and Herbert Engineering modeling the design, operation and emissions of a floating nuclear power plant. Discussion about the regulatory landscape around nuclear power plants was another key feature of the event, followed by workshops with offshore industry leaders to explore their requirements and understand operational challenges floating nuclear power plant technology will have to overcome.

SUPPORTING DEVELOPMENT OF OFFSHORE RENEWABLE ENERGY

ABS been a leader in offshore renewables since the first semisubmersible offshore wind turbine, *WindFloat I*, hit the water in 2012.

In 2024, ABS Class services aided development of several notable offshore wind service vessels. In February, ABS awarded an AIP to Yantai CIMC Raffles Offshore for the design of a dual-fuel methanol, high-capacity, heavy-duty, offshore wind turbine installation vessel (see spotlight).

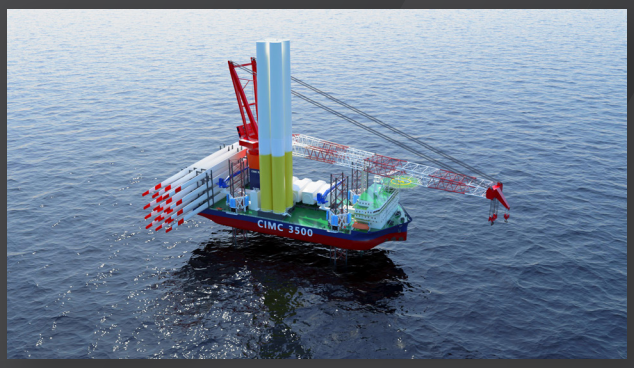
In May, a new feeder fleet of two tugs and two barges to serve a wind turbine installation vessel (WTIV) was ordered to ABS Class by Edison Chouest Offshore (ECO). The novel locking and stabilizing mechanism between barge and installation vessel is designed to render installations less dependent on weather conditions, thus reducing installation time. The same month, ECO launched the ABS-classed *ECO Edison*, the first U.S.-flagged Jones Act offshore wind farm service operation vessel (SOV). The *ECO Edison*, engineered and constructed by ECO for long-term charter to service offshore wind farms in the Northeast U.S., operates on diesel-electric power meeting EPA Tier 4 emission standards and features a proprietary ECO Variable Frequency Drive to substantially reduce fuel consumption and GHG emissions. It also features an integrated motion-compensated gangway and is one of the first ships –if not the first – that meets the U.S. Safer Seas Act regulations mandating that cameras be installed in corridors leading to cabins.

SPOTLIGHT

ABS Approves Methanol-Fueled WTIV

Methanol as a maritime fuel is gaining increasing popularity in the global vessel orderbook, attracting owners with such benefits as low emissions, low cost and excellent energy density. Although decarbonization discussions tend to focus on large ships opting for methanol, designers in the smaller vessel classes are also exploring use of this alternate fuel.

In February, ABS awarded AIP to Yantai CIMC Raffles Offshore for the design of a dual-fuel methanol, high-capacity, heavy-duty, offshore WTIV. The proposed vessel would be capable of carrying seven sets of 14-megawatt (MW) wind turbine components, or four sets of components for 20-MW units, currently the largest wind turbines manufactured; the design also features a 3,500-ton leg encircling crane, a dynamic positioning system (DPS) that aligns with ABS Class requirements DPS-2, and a maximum lifting height of 228 m above sea level.



Throughout the year, ABS provided additional support for offshore wind technology developments beyond support vessels. One of the critical pieces to the success of any floating offshore structure is its mooring system, and floating offshore wind farms are no different. That's why mooring technologies became the subject of a pioneering collaboration agreement between ABS and Dutch synthetic moorings specialist FibreMax. Under this agreement, announced in June, the companies will work together to develop optimal solutions for floating wind farm moorings, with the overall aim to jointly develop relevant stiffness parameters for the needs of this emerging market. ABS is to provide qualification services for fiber and small rope testing and to develop test methods and representative analyses focused on stiffness, while FibreMax is to provide expertise on stiffness using its Parallel Wound Technology (PWT).

In July, ABS issued an AIP for an innovative elevator-style wind turbine assembly system designed by CLS Wind. The system proposes to be an easy, safe and rapid means of installing and maintaining turbines and nacelles without the use of large cranes and heavy-lift barges or vessels.

Later in the year, ABS and Akselos announced the signing of a memorandum of understanding (MOU) to advance engineering and certification processes for floating offshore wind projects. The two organizations plan to collaborate on solutions aimed at optimizing design, reducing costs and improving efficiency for the floating wind sector globally.

GLOBAL GOVERNMENT

GLOBAL GOVERNMENT

Governments around the world engage ABS for marine classification and related services for their fleets of military and other public vessels as well as a broader range of analysis and advisory services related to enhancing the safety, security, efficiency and sustainability of their marine transportation systems.

SUPPORTING THE U.S. GOVERNMENT

ABS has a unique relationship with the United States (U.S.) government. Under U.S. statute, ABS is the classification organization for U.S. government vessels. ABS also is an important partner for the U.S. Coast Guard (USCG) as a Recognized Organization supporting the USCG mission for safety, security and environmental protection. Multiple agencies rely on ABS for many types of class-related and other technical analysis and advisory services related to their fleet maintenance and operations. Additionally, ABS is a leader in supporting a wide range of agencies in contract research and development (R&D) work under grants and cooperative agreements. This R&D work covers traditional marine engineering topics as well as other topics like clean energy development in the maritime domain, maritime energy transition, cybersecurity for vessels and port facilities, advanced manufacturing technology, and many other areas.

ABS had another successful year with the U.S. government, highlighted by noteworthy new partnerships with key agencies:

- The Maritime Administration (MARAD) selected ABS to establish and operate its new U.S. Center for Maritime Innovation.
- ABS and the U.S. Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy (EERE) signed a memorandum of understanding (MOU) for cooperation on clean energy development in the maritime shipping domain and energy efficiency of maritime operations.
- ABS and the USCG Research and Development Center signed an MOU for cooperation on a wide range of new technologies driving innovation in the U.S. maritime domain.

Government Fleet Support

In 2024, ABS continued supporting the Military Sealift Command (MSC), one of the largest fleets under ABS classification in the world. ABS successfully enrolled three additional MSC vessels into the Condition-Based Program (CBP), a program which provides maintenance planning and monitoring for enhanced life-cycle sustainment. This increased the total number of enrolled vessels to 16 while preenrollment activities for two more vessels are underway. In support of the CBP, ABS and MSC worked together to complete Virtual Vessel Alignment for all CBP-enrolled vessels, laying the groundwork for seamless data sharing and integration to enable efficient machinery service status monitoring.

ABS also provided class services in support of several MSC shipbuilding projects in 2024, including the *John Lewis*-class Fleet Oilers, the Expeditionary Sea Base, the Towing and Salvage Tugs, and the Expeditionary Fast Transport projects. Additionally, ABS received commitments in 2024 to provide class services on several MSC vessel acquisition projects, including accommodation barges, barracks barges, submarine tenders and a new block of *John Lewis*-class Fleet Oilers, to name a few. As part of ongoing critical cybersecurity support to the MSC fleet, ABS assisted MSC in achieving cybersecurity notations, ultimately resulting in Authority to Operate (ATO) certifications for several operational technology (OT) systems.

2024 marked the second year of execution of the multiyear contract with the Naval Sea Systems Command (NAVSEA) for technical and engineering support services. The contract provides a basis for expanded support from ABS to the U.S. Navy for classification, class-related, certification, life-cycle support, and technical advisory services across several programs and classes of maritime assets and systems. The U.S. Navy also engaged ABS for review of multiple new ship design and construction programs and for collaborating with NAVSEA 05D on surface ship bridge design standards. Additionally, ABS delivered Rules training courses and enabled enhanced ship design information sharing through the ABS MyFreedom™ Client Portal.

Throughout 2024, ABS supported the USCG with class and class-related services for several new construction programs, including the Polar Security Cutter, the Offshore Patrol Cutter and the Waterways Commerce Cutter programs. ABS continued to support the shipyards delivering the longstanding Fast Response Cutter and National Security Cutter vessel acquisition programs. ABS was able to provide additional enhanced design review and specialized technical support to several of these projects through the multiyear technical support services contract mechanism established in 2023. ABS began providing classification services and transition support for the acquisition and transfer of the ABS-classed commercially available polar icebreaker procurement. ABS also partnered with affiliate, ABS Group, to compete for and successfully win a contract to develop and provide digital twins in support of the USCG's initiative to deploy condition-based maintenance processes and technology for the Fast Response Cutter class platform.

With MARAD, ABS continued to provide class and class-related services to the Strategic Sealift and Ready Reserve fleets. Most notable in 2024, ABS provided class services in support of the delivery of MARAD's National Security Multi-Mission Vessel (NSMV), *Patriot State*, the second of five purpose-built state-of-the-art training vessels built for the U.S. state maritime academies. ABS also provided class services for the remaining three NSMVs, of which the final hull started construction in early 2024 and is destined for California State University Maritime Academy.

ABS continued support for the National Oceanic and Atmospheric Administration (NOAA) during an exciting phase of new vessel acquisitions, including two new vessel classes: the Auxiliary General Oceanographic Research (AGOR) Variant (Class A) with its primary mission of oceanographic monitoring, research and modeling; and the Class B with primary mission of ocean mapping and nautical charting. The AGOR variant was under new construction attendance by ABS in 2024, while the Class B was in detail design and engineering plan review, scheduled to start construction in 2025.

In addition to the above, ABS continued to provide class and class-related support to government fleets with the U.S. Army Corps of Engineers, Army Watercraft Division, National Science Foundation/University-National Oceanographic Laboratory System, and State Government ferry programs. ABS provided early program support to the National Science Foundation Antarctic Research Vessel program in the form of engineering review and advisory support related to class requirements and objectives.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SPOTLIGHT

ABS to Support U.S. Center for Maritime Innovation

The U.S. Department of Transportation Maritime Administration (MARAD) selected ABS to establish and maintain the U.S. Center for Maritime Innovation (USCMI) as its secretariat. Support for the congressionally-authorized center comes from MARAD's Office of Environment (OE) through the Maritime Environmental and Technical Assistance (META) program. The Center will promote the study, research, development, assessment and deployment of emerging marine technologies and practices related to the maritime transportation system. The USCMI will serve as a strategic resource for advancing the U.S. maritime industry, and will be critical for engaging industry, academia, government and other stakeholders in the setting and execution of multiyear research priorities that drive innovation.

U.S. Center for Maritime Innovation

Contract R&D Support

ABS supports a wide range of contracted R&D projects with agencies around the world. The contract R&D team focuses on opportunities that support overall ABS research objectives, including energy transition, digitalization, applied research and offshore safety. Since the beginning of this collaboration in 2020, the team has seen tremendous success.

Energy Transition in the Maritime Domain

In 2024, ABS continued its support of the energy transition in the maritime domain including working with multiple universities and national laboratories on offshore wind development, supporting marine energy device developers, exploring advanced nuclear applications in the maritime domain through the U.S. DOE, and supporting technical research focused on maritime energy transition. Some highlights of these activities include:

- Supported by DOE Advanced Research Projects Agency-Energy (ARPA-E) to develop an advanced decision-support tool designed to optimize intermodal maritime freight transportation (IFT) for holistic greenhouse gas (GHG) emissions reduction. This innovative approach evaluates the impact of current and future low-emission fuels on the entire IFT system, optimizing fuel-mix and routing decisions to maximize efficiency while ensuring system resilience.
- Supported by DOE to lead the Accelerated Nuclear Demonstration project to significantly reduce the timeline for deploying advanced nuclear reactor technology for commercial maritime applications. This initiative has provided foundational tools, frameworks and insights to advance nuclear solutions for the maritime industry, accelerating energy transition efforts and integrating nuclear technologies into future maritime operations. Through strategic collaborations, detailed guidance and industry engagement, the project has positioned advanced nuclear reactors as viable, competitive solutions for maritime energy.
- Supported by MARAD to lead a study to understand current U.S. capabilities for design and construction of low- or zero-emission commercial vessels that also significantly reduce vessel-generated underwater radiated noise (URN) and to outline barriers, opportunities, requirements and other emergent considerations, including research priorities for the integration of GHG and URN reduction measures into U.S. vessel design and constructions.
- Supported by the Environmental Protection Agency's (EPA) Clean Ports Program, in collaboration with Port Authorities as the Principal Investigators, to study feasibility of marine vessels and supporting infrastructure investments that align with port emissions goals and objectives, and EPA best practices. Specific projects include conducting technical feasibility and infrastructure readiness studies for mobile charge barges to facilitate vessel life-cycle emissions reductions at berth and conducting technical feasibility and infrastructure readiness studies for methanol bunkering for both onshore and mobile concepts of operations.

Digitalization

ABS played a critical role in supporting the ongoing transformation in digitalization and connectivity within the U.S. government marine and offshore industries. Some highlights of these activities include:

- Sponsored by National Shipbuilding Research Program (NSRP) on Digital Twin Verification and Validation (V&V) project to establish critical guidance to foster collaboration and trust between government agencies and the shipbuilding and repair industry. The deliverables provided tools and guidance for training workers in advanced analytics and decision-making processes, empowering both government and commercial teams to harness digital twin technologies effectively.
- Sponsored by NSRP, the Cyber-Ready Ships project has developed a comprehensive roadmap and implementation framework to address the complex cybersecurity compliance requirements for U.S. shipbuilders. With diverse requirements across government agencies and various ship types, the project aimed to streamline processes for delivering cyber-ready ships by aligning shipyard activities, supply chain contributions and certification standards. The roadmap ensures that new ship builds meet both governmental and industry-specific cybersecurity requirements, enabling fleet owners and operators to secure ATO certifications efficiently. With the completion of this project in 2025, it will lay the groundwork for a unified, efficient approach to delivering cyber-ready ships, promoting resilience across U.S. government fleets while fostering industry-wide collaboration and innovation.

Applied Research

- Supported by the DOE and directed by the Pacific Ocean Energy Trust, the U.S. Testing Expertise and Access to Marine Energy Research (TEAMER) program accelerates the viability of marine renewables by providing access to the nation's best facilities and expertise. ABS was selected for support in four projects to provide new technology qualification, engineering analysis, numerical modeling and computational fluid dynamics (CFD) simulations. ABS has provided key support in the design and testing of current and wave energy technologies with Hydrokinetic Energy Corporation, the University of Hawaii, E-Wave Technologies and the University of Michigan.
- Funded by the National Institute of Standards and Technology (NIST) to develop standards and guidance for the rapid qualification of metal-based additive manufacturing (AM), ABS is leading the project to develop tools and technologies to accelerate approval of new metal-based AM applications.
- Supported by the DOE, the Ultraflexible Smart Floating Offshore Wind Turbine (USFLOWT) project aims to transform the floating offshore wind market significantly on the ultra-compliant, modular and scalable floating wind system optimized using control co-design (CCD) principles. The progress made in 2024 has positioned USFLOWT as a leading solution for cost-effective and scalable floating offshore wind technology. The successful completion of key milestones in design, testing and commercialization efforts ensures that the project is on track for future large-scale deployment, bringing the industry closer to achieving a sustainable and economically viable offshore wind energy solution.
- Through a collaborative agreement between MARAD and Volpe, ABS provides direct support to Volpe by providing verification, validation and advisory services for their maritime emissions platform development to advance performance optimization. ABS assisted the project through supporting the data sourcing process for scaling and improving the model's outputs for industry use.

Offshore Safety

- The Bureau of Ocean Energy Management (BOEM) selected ABS to lead an innovative project to provide a baseline estimate of spill occurrence rates for the purpose of planning and risk assessment in the National Outer Continental Shelf (OCS). ABS will work with inter-company affiliate ABS Consulting to compile a database for oil spills and utilize machine learning (ML) models to analyze the data and provide results.
- BOEM in conjunction with Bureau of Safety and Environmental Enforcement (BSEE) selected ABS to lead an innovative project to provide a comprehensive evaluation of the various alternatives renewable energy technologies that will impact BSEE/BOEM during the energy transition. This project will evaluate the current and future outlook of the various technology deployments to the outer continental shelf region. In addition, the project will evaluate any safety and environmental risks with regard to BOEM's permitting and environmental protocol.
- Awarded by the National Institute for Occupational Safety and Health (NIOSH) to design, build and roll out a field-based, near-miss and lessons-learned sharing system for the commercial fishing industry. The goal is to improve safety awareness among commercial fishing vessel captains and crews by providing actionable lessons learned.
- The Offshore Energy Safety Institute (OESI) awarded ABS three prime projects in which the improvement of safety in the offshore industry is the primary focus. These include the risk-based evaluation of the effectiveness of the BSEE Regulations 30 CFR Part 250, studying the effect of human factors in offshore crane lifting incidents and identifying recommended minimum system and personnel safety considerations for the design of marine energy technology.
- Awarded by the National Academy of Science (NAS)-Engineering Medicine, ABS was selected to lead an innovative project to investigate, develop and evaluate various methodology to help enter safety assessment activities into the Safety and Environmental Management Systems (SEMS) which would improve the organizational safety culture while reducing unsafe behaviors. This project will leverage BSEE-based, NAS-related safety culture toolbox research to enhance safety culture activities and future safety assessments within various industries.
- Awarded by the NAS-Engineering Medicine, ABS was selected to lead an innovative project to identify and assess how the energy transition could impact the southern coastal waters of the U.S. ABS will examine what challenges might exist with the current Safety Management Framework in the region. In addition, ABS will provide recommendations on how to proactively adapt to these new emerging risks associated with the energy transition.

SUPPORTING INTERNATIONAL GOVERNMENTS

Canada

In 2024, ABS continued to provide strong support to the Canadian Coast Guard (CCG) under its Delegated Statutory Inspection Program (DSIP). Of the 127 CCG assets of length 12 meters or greater, 119 are enrolled in DSIP with ABS. Further, 31 of the largest ships are fully in class with ABS.

Throughout 2024, ABS completed 158 authorized emergent tasks under the DSIP contract. These ranged in scope from review of updated grey water systems and through survey and engineering support for extended refit periods.

ABS' strong support to the Royal Canadian Navy continued in 2024 under the sixth year of the 35-year Non-Combatant Classification Society Services (NCCS) contract. Of the 78 assets that ABS has oversight, 18 are fully in class. Highlights for 2024 include:

- Two additional *Harry DeWolf*-class Arctic Offshore Patrol Vessels were delivered into ABS Class. Four of the six planned vessels are in ABS Class, and the fifth will be promoted for ABS Class consideration review in 2025.
- Two of the four Large Naval Tugs being built to ABS Class by Groupe Ocean were delivered and brought fully into class. The second pair of tugs will deliver in 2025 and 2026.
- The Sea-to-Shore Connectors, self-propelled barges that can move large quantities of supplies or personnel to and from shore quickly and can be stored or transported like standard shipping containers are being transferred to ABS. The Sea-to-Shore Connector has multiple uses and configurations, is Canadian made, and engineered to be assembled from the platform of the upcoming *Protecteur*-class joint support ships (JSS).

Throughout 2024, ABS completed 43 authorized emergent tasks under the NCCS contract.

For Transport Canada in 2024, ABS collaborated with Canadian domestic shipping partners on eight different projects assessing efficiency improvement technologies for shipping on the Great Lakes and St. Lawrence Seaway. Working with shipowners Fednav, Groupe Desgagnés, Algoma Central Corporation and Oceanex, the projects included characterizing the benefits of wind assist on the Great Lakes, shore power options, the use of batteries, fuel cells and methanol as a fuel. ABS led these projects, building and expanding the understanding of feasibility and value of these technologies in the Canadian Marine Industry context.

ABS was awarded tasks to evaluate the need for and ultimately propose solutions for correction factors to the IMO Carbon Intensity Indicator (CII) calculation methodology for the Canadian domestic fleet. The need for Canadian unique factors is particularly apparent on the Great Lakes where self-unloaders dominate the landscape characterized by short transit times, operating through many locks and often unloading at minimal infrastructure facilities.

The Transport Canada Eastern Canadian Ferry Project progressed well in 2024 with Chantier Davie Canada Inc. (CDCI). CDCI is building two ferries of different designs with ABS. The *Holiday Island II* is a double-end diesel-electric/battery hybrid ship and the *Jean Lapierre* ferry for Madeleine Island service has hybrid electric propulsion with an ice class. The drawing submission and review/approval process for the *Holiday Island II* began in 2024.

© Royal Canadian Navy

India

The ABS government engineering services (GES) team supported Larsen & Toubro (L&T) Shipyard with the launch of Samarthak, the first of two vessels, as part of the Indian Navy multi-purpose vessel (MPV) project. The MPV program is designed, reviewed and surveyed to the ABS *Guide for Building and Classing International Naval Ships*. The GES team collaborated with the ABS India Survey team to provide continuous support toward the successful completion of the plan review and delivery of the vessel, which is anticipated in June 2025.

International Contract R&D Support

ABS was actively engaged in supporting maritime research through various initiatives in Europe, including, among others, the Horizon Europe program, which is the European Union's (EU) key mechanism for tackling climate change, helping to achieve the United Nations' (U.N.) Sustainable Development Goals and boosting the EU's competitiveness and growth. In 2024, ABS assisted several noteworthy research and development projects, with key highlights as follows:

- Delivered the last two sustainability studies of the six studies projects on alternative fuels and power sources for the European Maritime Safety Agency (EMSA). These studies examined the Potential Use of Nuclear Power for Shipping and of Synthetic Fuels for Shipping, with previous studies examining the potential of biofuels, ammonia, hydrogen and wind-assisted power for shipping. ABS also kicked off the BlueBARGE EU-funded project, which will enable the development and testing of a new cold ironing model through an offshore supply of electrical power to moored and anchored vessels, as the project's administrative and financial coordinator and supporting the consortium in safety, classification and regulatory compliance.
- Delivered the first reports of the EMSA study developing guidelines for the safe use of ammonia as fuel onboard marine vessels.
- Joined as consortium partner several new EU-funded projects with topics revolving around sustainable shipbuilding practices and material circularity in the EU, developing and demonstrating the safety and viability and accelerating the adoption of Sustainable Alternative Fuels (SAFs) in waterborne transport and developing related port solutions.
- Continued work on projects around the management of communicable diseases on board cruise ships, reviewing design methodology for technology related to storage and transportation of high-volume ammonia as fuel for ships and reviewing containment systems for liquid hydrogen long-term storage and long-distance transportation for commercial vessels.

ABS also supported the Singapore government, working with the Republic of Singapore Navy (RSN), the Maritime and Port Authority of Singapore (MPA) and the Singapore Economic Development Board (EDB). Some of the key projects for 2024 included:

- Delivered a simulation for at-sea, ship-to-ship replenishment for the RSN.
- Delivered a customized learning course about AM for the RSN.
- Awarded the Multi-Scenario Emergency Response and Incident Toolkit (MERIT) project by the MPA. This project aims to develop a simulation tool to model evacuation procedures and mitigation measures during an emergency situation, such as an ammonia leak incident.
- Awarded the Model-Based AM Qualification for Maritime Industry project by the MPA. This project will develop and implement standards for evaluation and acceptance of model-based approaches for AM qualifications as well as to implement rapid qualification of AM applications in the Singapore maritime industry.
- Awarded the Research and Innovation grant from EDB to support the maritime industry with research and development in three key areas: additive manufacturing, electrification and alternative fuel and energy transition.

TALENT DEVELOPMENT FOR CORPORATE PARTNERSHIP

TALENT DEVELOPMENT AND CORPORATE CITIZENSHIP

DEVELOPING THE TALENT PIPELINE

The pace of change in the workplace continually pushes ABS to equip its workforce to take on the challenges ahead. In this rapid evolution of technology, ABS remains well-positioned as a technical and safety leader. The core engineering and technology competence of the organization's people and the wealth of experience they bring to problem-solving is a key differentiator for ABS. Problem solving and critical thinking are key points of emphasis in career development planning for the organization.

That's why ABS is focused on developing the organization's employee base to be best in class through continuous learning, training and preparation to support the business' commitment to set standards of excellence as a leader in maritime safety – now and in the future. To do this, ABS constantly considers how to enhance employees' skills in areas like learning agility and developing a growth mindset. Both of those skills help unlock future potential for learning and growth in employees.

To that end, ABS made a significant revision to its annual performance process for employees in 2024, pivoting from a competency-based assessment to a goal-based assessment to better measure contribution, performance and growth within our workforce.

The path forward for ABS is clear based on three defining goals – safety, service and solutions. The organization has been able to achieve those goals through innovative thinking and the ability, drive and commitment of highly experienced employees. The ABS team remains committed to the company's mission, and the SPIRIT of ABS, which stands for Safety, People, Integrity, Reliability, Innovation and Teamwork, underpinned by Quality, and is the core of everything ABS does from a career development standpoint.

As an organization committed to investing in and cultivating a sustainable, multiskilled talent pipeline across a broad range of disciplines – traditional marine and offshore architecture, engineering studies, computer science, data analytics, sustainability and digital transformation – ABS is well-prepared and ready to meet the challenges of an evolving industry.

The organization's robust internal career development efforts are aligned to best practices and designed to provide a balance of development activities for employees, using a combination of job experience, mentoring, coaching and formal training.

TRAINING

In 2024, ABS continued to expand its learning capabilities. More than 170,000 formal training hours were completed by ABS employees during the year as they continued to develop skills for the future in topics such as emerging technologies, cyber resilience and goal-based standards. Nearly 70 percent of these training hours were completed by ABS surveyors, engineers and auditors obtaining new qualifications core to ABS client services.

The organization's learners were delighted to find many new programs added this year to help them meet their learning needs. This included the unveiling of the organization's vision for next-generation learning: the ABS MetaSHIP Fleet, powered by Orka. These meta ships are one-of-a-kind, highly realistic virtual assets built to scale from vessel drawings, offering learners the opportunity to experience real-life scenarios without leaving their desk. This unique, immersive learning experience takes learners on virtual field trips in a simulated training environment, allowing them the ability to interact with the vessel, inspect equipment, take photographs, view certificates, document survey notes and much more.

The CONNECT program, which ABS launched in 2024, uses innovative methods to bridge the gaps between engineering expertise and surveyor skills through interactive workshops, knowledge sharing and technical case study reviews. This three-day program is held in all regional ABS Academies and encourages networking among attendees and those from numerous local departments while providing valuable platforms for information exchange and the latest industry insights. Forty classes were held in 2024 with 485 employees participating.

The organization also launched Engage, a four-day program held at the ABS Corporate Headquarters in Spring, Texas, for surveyors, engineers, auditors and other key departmental units. The program offers participants the opportunity to network and learn from each other's experiences while gaining insights into current business goals and initiatives, available products, tools and resources, as well as information about how to improve client service delivery. Seven classes were held for 182 employees.

To foster continuous growth and development among the organization's workforce, ABS also introduced the Professional Development Hours (PDH) program, which tracks the completion of technical training hours by ABS surveyors, engineers and auditors. The PDH program allows our employees and their managers to develop the skills most pertinent to their job and serves as a means for ABS to meet the requirements for ongoing training as stipulated in IACS PR 7, PR10 and PR 10B.

CAREER DEVELOPMENT

ABS offers employees two award-winning career development programs that are supported throughout the enterprise. These two programs, originally introduced in 2020, continue to give ABS employees access to the most current tools and resources to support their professional growth.

The Beacon Career Development Program is an "Open Enrollment" series focused on skill building in specific topics and areas, for example Critical Thinking and Problem Solving. The modules, which include web-based training, peer-to-peer learning and applied learning in their own work settings, attracted 365 participants in 2024 – a 35 percent increase from 2023.

The award-winning Propel Accelerated Leadership Development Program continues to thrive with more than 50 new participants added in 2024. Propel offers tailored development opportunities for high-potential employees. As of year-end 2024, a total of 296 employees from around the world have expanded their careers and capabilities through targeted assignments, projects and trainings delivered as part of the Propel program.

Additionally, since launched in 2020, the internal career development web pages have been visited more than 260,000 times by ABS employees looking for information or resources. The pages are continually updated and refreshed with new information on programs, helping to drive growing engagement from employees even five years since the pages were originally created.

ABS also continued the Senior Leadership program delivered in partnership with the Texas A&M Mays School of Business Executive Education center. The program is a two-week intensive program for senior level leaders to learn in an academic setting from top-tier academics and professionals. Thirteen high-potential leaders at the director, vice president and senior vice president level participated in this program in 2024.

The successful launch of the Management Accelerator program for new first-line supervisors was well received in the business, and the program continued in 2024. In addition to the Management Accelerator program, ABS launched a new variant of the program in 2024 for experienced first-line managers called Management Excellence, which focuses on refreshing best practices in management and leadership at the frontline level. A total of six cohorts of the Accelerator and Excellence program were held in 2024, with 118 new participants in 2024. These were delivered regionally across the world and assisted in building important internal networks within the organization's enterprise business.

ASPIRE AND INTERNSHIP PROGRAMS

ABS celebrated the 10-year anniversary of the Aspire early careers program in 2024. This was highlighted with a celebratory dinner in June 2024 where current and former program participants joined managers and executives celebrating the success of the program. The Aspire program is an 11-month rotational trainee program for new employees who are new graduates in the areas of naval architecture/marine engineering, mechanical engineering, structural engineering, electrical engineering, data analytics, computer science and related disciplines. The Aspire program provides participants with a unique, holistic understanding of the organization's core operational areas. Placement into the business after the program aligns the participants with their career interests and the business needs of ABS. In 2024, the program graduated 29 new participants, including three from a brand new program in ABS' first global location in Singapore. The program continues to grow, with the new cohort of joiners in 2024 representing a 34 percent growth from 2023 and introducing new program locations in Shanghai and Piraeus. Aspire alumni who are currently in the ABS workforce are more than five times more likely than the organization's general employee pool to be identified as high-potential future leaders. As such, Aspire has become the company's "early careers-early talent" pipeline.

UNIVERSITY RELATIONS

In 2024, ABS continued its commitment to advancing education and research through ongoing global university engagements and partnerships.

ABS Scholars

ABS continued supporting student success by committing $1.3M in scholarships to more than 58 universities and maritime academies worldwide.

ABS scholars are university students who have demonstrated academic excellence and exemplary leadership qualities throughout their academic career. Candidates for an ABS scholarship must be in pursuit of a degree in relevant engineering or computer science discipline.

University Engagement

ABS continues to maintain a strong on-campus presence with partner universities and academies. Throughout 2024, ABS participated in more than 60 on-campus events, ranging from career fairs, information sessions, technical presentations, scholarship recipient dinners, capstone competitions and award receptions. These engagements emphasized ABS' leading role in sustainability and the green energy transition, organizational longevity and stability, its expansive career opportunities and more.

ABS has eight standing endowments at eight institutions. ABS Chairs support connecting ABS to top talent, providing exposure to research opportunities and driving innovative collaborations.

- ABS Chair of Naval Architecture and Marine Engineering at the State University of New York (SUNY) Maritime College
- ABS Chair of Engineering at the California State University Maritime Academy (Cal Maritime)
- ABS Chair of Metallurgical and Materials Engineering at the Colorado School of Mines
- ABS Chair of Ocean Engineering at the University of California Berkeley (UC Berkeley)
- ABS Chair of Marine and Offshore Design Performance at the University of Michigan
- ABS Career Development Chair at the Massachusetts Institute of Technology (MIT)
- ABS Chair of Naval Architecture and Marine Engineering at the Webb Institute
- ABS Chair of Ocean Engineering at Texas A&M University

Texas A&M University - ABS Laboratory for Ocean Innovation

ABS APPROACH TO PERFORMANCE

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INDUSTRY-LEADING SOLUTIONS FOR TODAY AND THOUGHT LEADERSHIP FOR TOMORROW

At ABS Group, industry leadership and thought leadership go hand-in-hand. In 2024, ABS Group and its subsidiaries, which provide risk management consulting solutions and certification services globally, continued to deliver world-class technical solutions and assessments to support critical infrastructure across key industries, including oil and gas, chemical, power and energy, industrial manufacturing, retail, government, and transportation.

Over the course of the year, ABS Group provided practical, tailored solutions for a multitude of industries and government, while also delivering insightful opinions, analyses and forward-looking observations through a series of thought leadership papers, appearances at industry events and speaking on expert panels. As a result of these multifaceted efforts, ABS Group subsidiary, ABS Consulting, was named to Forbes' list of the World's Best Management Consulting Firms for 2024, solidly placing the organization among the leading consulting firms globally.

Everything ABS Group does supports safety, compliance and certification, which together lead organizations toward overall operational excellence. Driven by this philosophy, and the organization's history of more than half a century of safety leadership, business assurance and expertise covering risk in a multitude of forms, ABS Group enhanced its risk and reliability service offerings, particularly regarding new and aging assets in critical infrastructure. The business also expanded its capabilities for addressing the ever-changing threat landscape – in both the cyber and physical domains – facing commercial and government markets and the stakeholders therein that power, fuel and regulate the world.

Throughout 2024, as in past years, the thought leadership of ABS Group consultants and assessors helped drive some of the organization's most notable achievements.

ABS Consulting named to Forbes' list of the World's Best Management Consulting Firms for 2024

INDUSTRY LEADERSHIP FOR SUPPORTING ASSET MANAGEMENT

In May, ABS Consulting partnered with Sweden-based Hexagon's Asset Lifecycle Intelligence Division to create an international team of experts to aid industry in applying the company's HxGN enterprise asset management (EAM) technology for extending asset life cycles and improving productivity. The result is a team-up that combines ABS Consulting's extensive EAM expertise with Hexagon's digital solutions to help organizations better manage operating risk and achieve better visibility into asset performance, which in turn helps them shift from reactive, post-incident assessment to proactive, low-cost asset management that can deliver up to 50 percent reductions in maintenance overtime, labor and contractor costs and up to 20 percent reductions in downtime.

The same month, ABS Consulting published a white paper entitled *From Aging to Agile: Asset Management Strategies for Aging Utility Infrastructure*, which examines the challenges and complexities inherent in aging utility infrastructure and outlines effective asset management strategies that utility companies can use in their support and maintenance efforts. Produced by a team of ABS Consulting's experts, it details how utility companies can address a convergence of critical challenges, including workforce constraints, outdated systems, a growing regulatory landscape, evolving cyber and physical security threats, rising power demands and capital planning difficulties. Innovative solutions addressed include EAM enhanced by integrating computerized maintenance management systems, robust reliability programs, digital tools and artificial intelligence (AI) technologies.

Throughout the year, ABS Consulting also shared valuable insights emphasizing the importance of asset integrity management, particularly in the manufacturing and process industries. Without proactive asset management, machines can dictate operations rather than allowing organizations to plan and control them. While this may seem straightforward, it reflects the reality in many manufacturing enterprises today. Unplanned downtime significantly impacts a business's bottom line but can be minimized through effective asset management. The key lies in leveraging available data, setting key performance indicators (KPIs), and measuring metrics like overall equipment effectiveness (OEE). Many organizations fail to use data effectively or lack established KPIs, leading to reactive "firefighting" and institutionalized inefficiency. By intelligently analyzing data, setting OEE metrics, and using computerized maintenance systems, businesses can reduce unplanned downtime from common levels of 50 percent to as low as 15 percent. ABS Consulting offers expertise to help organizations implement these practices and improve productivity.

ABS Consulting regularly assists clients with programs that help ensure the safety of their employees, protect their assets, and support business continuity. In 2024, ABS Consulting assisted an international ship management company with analyzing and improving ship emergency procedures to address electrical failures that are crucial for safety of the crew, infrastructure, and the environment during entering and departing ports of call. The organization's risk assessment helped to identify additional solutions that support a secure environment for operations while maintaining compliance with local and federal standards.

GUIDANCE AGAINST GROWING CYBERSECURITY THREATS

Cybersecurity is an issue without limits, concerning activity in every corner of an increasingly data-centric, digitally interconnected world.

This was one of the main messages shared at the annual Maritime Day at the Navy Yard hosted by ABS Consulting in Washington, D.C. A longstanding contributor to the United States (U.S.) Maritime Transportation System (MTS), one of the largest of the nation's 16 critical infrastructure sectors, ABS Consulting used the day to provide stakeholders exclusive briefings on emerging threats, changes in the regulatory environment, government-industry collaborations and cyber risk mitigation solutions.

Maritime Day at the Navy Yard

In November, ABS Consulting joined expert panels of cybersecurity practitioners and maritime executives at the 2024 Maritime Cybersecurity Summit hosted by the MTS Information Sharing and Analysis Center (MTS/ISAC). Created as an event for stakeholders to share information on experiences and efforts addressing maritime cyber risks, the Summit supports port authorities and maritime owners and operators.


2024 Maritime Cybersecurity Summit Panel

The cybersecurity threat to the MTS was addressed at length by the U.S. Coast Guard (USCG), which in November issued a new Maritime Security Directive establishing minimum cybersecurity requirements for U.S.-flagged vessels, facilities on the Outer Continental Shelf and U.S. facilities subject to regulations under the Maritime Transportation Security Act of 2002. ABS Consulting published a white paper entitled Managing Maritime Cyber Risk: Rising to the USCG's New Maritime Security Directive, which provided a thorough analysis of the Directive, including its rationale and background, along with a comprehensive review of its implications for vessel owners, operators and port authorities and valuable guidance for industry on its provisions and implementation.

While the new Maritime Security Directive presents significant challenges to the U.S. maritime industry, these regulations are necessary and should be welcomed. In order to adapt successfully, the industry will require a substantial transition and, in some cases, a complete transformation from a cyber risk management perspective.

ABS Consulting is also delivering cutting-edge operational technology managed services for a leading North American refinery, enhancing the reliability of critical systems and fortifying defenses against digital threats. By leveraging emerging technology in these environments and harnessing an innovative approach to prioritizing cyber risk, ABS Consulting is supporting compliance with key security frameworks and maturity models, driving efficiencies, and improving system resiliency. This transformative effort supports operational continuity while adding safeguards to both the environment and vital critical infrastructure.

SUPPORTING GOVERNMENT AND GIS SERVICES

In September, ABS Consulting's leadership as a contractor to the U.S. federal government was recognized by the OrangeSlices AI-driven service as one of its 2025 Elev8 GovCon honorees. The OrangeSlices AI-based platform is a publicly available, searchable listing of the top information technology and consulting services contractors doing business with the U.S. government. Driven by a robust and comprehensive set of authoritative and trusted data sources, the tool is intended to help government and industry leaders find the right partner to help deliver on the important missions of the federal government.

LEADING INDUSTRY TO BETTER DATA GOVERNANCE

In August, ABS Consulting was awarded the Best Maximo Data Governance Award at the MaximoWorld 2024 conference for innovative work in helping the University of California, Berkeley implement a comprehensive data governance strategy for its critical infrastructure. Through use of the IBM® Maximo® integrated enterprise asset management software, ABS Consulting helped the university streamline operations, improve user experience and increase overall efficiency. At the presentation, Carolyn Knight, Berkely's Director of Information Technology, said "ABS Consulting's expertise has been instrumental in transforming our asset management processes. Their innovative approach to data governance has not only improved our operational efficiency but also set a new standard for how we manage and utilize critical infrastructure data. This award is a testament to the collaborative effort and the significant positive impact on our university operations."

ABS Consulting's recognized leadership in the use of IBM's Maximo technology was underscored when it hosted the second annual Life Science Maximo Summit at its world headquarters in Spring, Texas. The event brought together professionals from across the industry to engage in insightful workshops, dynamic discussions and informative presentations relating to the Maximo platform.

As most enterprises around the world increasingly depend on data collection and analysis, they also develop a need for better data governance. While many have data governance policies in place, policy on its own is insufficient to change the way an organization manages its data. ABS Consulting offers industry guidance in this important aspect of the pursuit of operational excellence.

Establishing an enterprise data governance policy is a critical first step, but true change requires integrating policy into practice through a compliance program. This program should define clear expectations for successful implementation, helping lines of business measure progress. Effective governance also requires prioritization, timelines, and resources, achieved through a phased approach that focuses on high-priority data first, such as customer data, while addressing other data types later. By defining the scope early and engaging stakeholders beyond policy approval, organizations can manage change effectively, foster accountability and support progress. A well-structured compliance program acts as a driving force for improved data management, much like a project manager ensures milestones are met.

ABS Consulting Wins Best Maximo Data Governance Award

GUIDANCE THROUGHOUT THE LIFE CYCLE OF CRITICAL INFRASTRUCTURE

ABS Consulting's Global Engineering team specializes in managing risk for complex capital expenditure (capex) and operational expenditure (opex) projects across the life cycle of critical infrastructure assets. For large, capital-intensive engineering, procurement and construction (EPC) projects, addressing risks – design, regulatory, operational and cost – is essential at every stage, from planning to decommissioning. In an insights paper, *The Power of Due Diligence: How Adopting a Holistic 3-Step Approach Can Mitigate Capital Expenditure Risk*, ABS Consulting outlined a strategy to integrate risk mitigation across all phases of the asset life cycle. The three-step approach connects stakeholders and phases to facilitate seamless transitions and effective risk management.

ABS Consulting's global regulatory teams and industry experts, including former captains, engineers, and shipyard professionals, provide end-to-end oversight, helping to ensure projects meet contractual, regulatory, and operational milestones. By adopting this holistic approach, stakeholders gain a deeper understanding of risk profiles, enabling better decision-making and more efficient project execution. This cohesive strategy ultimately balances investment risk with reward, supporting successful outcomes.

In today's competitive landscape, companies are challenged with finding ways to maximize the return from their assets. Life extension services help evaluate the critical operational risks of process equipment and offshore assets in their current condition and the feasibility of extending their service lives while maintaining safety.

ABS Consulting is supporting an international offshore operator with life extension studies on topside structures and fixed and rotating equipment for a floating production, storage and offloading (FPSO) asset operating in one of the largest deepwater developments in the world. This strategic initiative aims to extend the service life of the FPSO by assessing the condition of the facility, identifying longevity drivers and providing recommendations for repair, refurbishment, restoration, and inspection activities to safely operate an additional 20 years.

LEADERSHIP IN ASSET MANAGEMENT AND OPERATIONAL EXCELLENCE

Although safety and compliance lead to overall operational excellence, organizations often make the mistake of viewing risk solely through a compliance lens, missing the broader value of process safety in driving performance improvements. Seeking to help companies in the chemical process industry with more-effective solutions, ABS Consulting continually highlights the need to shift from reactive firefighting to knowledge-based, data-driven asset management through effective mechanical integrity programs.

The journey to operational excellence involves four phases: Risk Mitigation (reactive repairs), Compliance (planned maintenance), Risk-Based Optimization (predictive, technology-driven risk prioritization), and Enterprise-Level Application (data-driven decision-making to optimize asset performance). By adopting a safety-oriented, preventive maintenance mindset enabled by digital transformation, organizations can reduce unplanned downtime and improve decision-making.

ABS Consulting emphasizes two key benefits of prioritizing process safety and asset integrity: preserving the right to operate by enhancing safety and regulatory compliance and improving return on investment by managing risks to achieve higher operational excellence. These benefits ripple across the organization, from the plant floor to the boardroom.

SPOTLIGHT

ABS Consulting Helps Major Chemical Processing Company Develop Globally Consistent Mechanical Integrity Program

ABS Consulting assisted Ashland, a global additives and specialty ingredients company, to enhance the mechanical integrity of its piping systems across multiple manufacturing sites. The initiative focused on improving and standardizing their inspection and maintenance, aiming to reduce risk, help ensure compliance and transition from reactive to proactive maintenance strategies.

Using ABS Consulting's systematic, seven-step approach, the team identified damage mechanisms, assessed degradation rates and developed targeted inspection plans. A key challenge was collecting critical data, often missing in legacy systems, which was resolved through innovative data-gathering techniques. The collaboration with ABS Consulting provided the client with a framework to manage risks effectively, thereby advancing operational excellence and environmental stewardship across its global operations.

LEADING COMPANIES TO EXCELLENCE THROUGH CERTIFICATION AND RELATED SERVICES

During 2024, ABS Quality Evaluations, Inc. (ABS QE), a world-leading certification body that is a subsidiary of ABS Group, continued working with companies to improve the performance of their business, systems, people and supply chains through management systems certification, verification, training and assessments. As they have done for more than 30 years, ABS QE's team of industry experts played a crucial role in helping numerous organizations achieve business excellence and obtain the necessary certifications to get their products and services to market.

SUPPORTING THE MARITIME INDUSTRY

ABS QE offers a range of certification services tailored to the marine market, helping ensure compliance with international standards and enhancing operational efficiency. These services are designed to help marine organizations demonstrate their commitment to quality, safety and environmental stewardship.

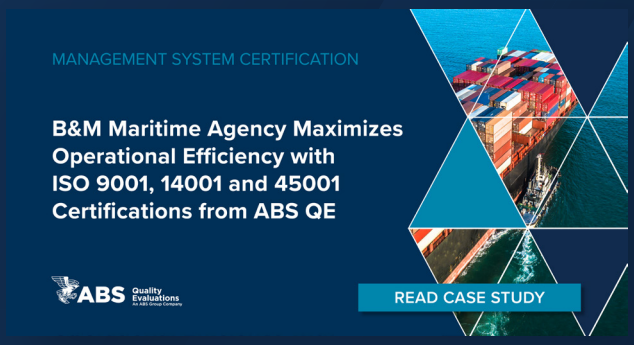
The range of certification services ABS QE provides to the marine sector cover: ISO standards, such as ISO 9001 (Quality Management Systems), ISO 14001 (Environmental Management Systems), ISO 45001 (Occupational Health and Safety); Energy and Environmental Certifications, including ISO 50001 (Energy Management Systems) and Greenhouse Gas Verification; Supply Chain and Vendor Audits; Customized Certification and Training; Integrated Management Systems Certification; and Cybersecurity Certification.

Certification to ISO standards is often seen as a milestone in an organization's journey to operational excellence. For example, in 2024 ABS QE completed certification of Leela Greenship Recycling to ISO 9001, ISO 14001, ISO 45001 and ISO 30000 (ship recycling) standards. In doing so, ABS QE's auditors conducted a gap analysis, provided targeted training and supported the company's efforts to implement the standards in its operations, which in turn helped the company meet its goals of improving organizational quality, environmental responsibility and occupational health and safety systems and practices while optimizing ship recycling operations in line with the highest international standards of safety and quality.

SPOTLIGHT

B&M Maritime Agency Maximizes Operational Efficiency with ISO Certifications from ABS QE

Chile-based B&M Maritime Agency approached ABS QE with a plan to enhance customer satisfaction, optimize business processes and minimize issues related to products and services through achieving the improvements necessary to obtain certification to ISO 9001, 14001 and 45001 standards. Audits conducted by ABS QE helped B&M achieve compliance, exceed stakeholder expectations and gain customer trust by demonstrating its commitment to quality.



RESPONSIBLE SOURCING

Drawing its values from corporate social responsibility (CSR), responsible sourcing is becoming a strategically important asset for many organizations and has been called a powerful lever for innovation because it enables organizations to reconcile price and performance with social commitment. The SA8000:2014 (SA8000) standard allows companies to demonstrate their dedication to fair treatment of workers and helps secure ethical working conditions worldwide. The standard focuses on the protection of human rights, health and safety, remuneration, working hours, freedom of association and provision of child labor or forced or compulsory labor. Many organizations are seeking to enact recognizably responsible approaches to their sourcing policies and seeking authoritative certification bodies to validate their efforts.

ABS QE is an industry leader in CSR certifications, and the only U.S.-based certification body accredited under Social Accountability International (SAI), a global non-governmental organization advancing human rights at work, whose SA8000 standard is recognized globally as a leading validator of social accountability and ethics in the workplace.

In 2024, ABS QE awarded Clarios Mexico a SA8000 certification for its eight manufacturing and recycling facilities, as well as its headquarters in Mexico. Employing over 3,900 workers in Mexico, Clarios Mexico's engagement with ABS QE will help ensure adherence to the Ten Principles of the United Nations (U.N.) Global Compact, which are based on the Universal Declaration of Human Rights, the International Labor Organization's Declaration on Fundamental Principles and Rights at Work, the Rio Declaration on Environment and Development, and the U.N. Convention against Corruption.

BUILDINGS AND INFRASTRUCTURE

The ISO 19650 series of standards provide guidelines and requirements for the development, organization and management of information within the construction industry related to building information modeling (BIM), an area of activity involving the generation and management of digital representations of the physical and functional characteristics of buildings or other physical assets and facilities. BIM helps organizations use their digital design tools in ways that are properly controlled and managed so that the design information that is developed can be produced and reviewed in a structured manner and delivered accurately and efficiently.

Infrastructure projects are also supported by certification to ISO 17020, which covers all critical stages of a project from planning to operation, ensuring that technical, regulatory, and safety requirements are met. Accredited infrastructure inspection based on this standard is a process that certifies compliance of inspections carried out at different stages of an infrastructure project, such as design, construction and performance (operation and maintenance).

In 2024, ABS QE proudly certified industry leaders such as Accenture España, L35 Arquitectos, and JG Ingenieros under the prestigious BIM ISO 19650 standard. This milestone highlights ABS QE's commitment to advancing digital construction practices and empowering organizations to streamline information management across the life cycle of built assets. By achieving this certification, these forward-thinking companies have enhanced collaboration, improved project delivery and positioned themselves at the forefront of innovation in architecture, engineering and construction. ABS QE's expertise ensures its clients stay competitive in an evolving industry, driving operational excellence and setting new benchmarks for digital transformation.

SPOTLIGHT

Chemours Company Relies on ABS QE's World-Class Audit and Certification Services

Operating from over 60 facilities across the world, The Chemours Company is a global leader in Thermal and Specialized Solutions (TSS), Titanium Technologies (TT), and Advanced Performance Materials (APM); and provides industrial and specialty chemicals products for markets, including coatings, plastics, refrigeration and air conditioning, transportation, semiconductor, advanced electronics, and more.

The organization's commitment to sustainability, the environment and health and safety is paramount and demonstrated in part by their membership in the American Chemistry Council (ACC) and adoption of the ACC's Responsible Care© Standard RC 14001, an Environment and Occupational Health and Safety Management System that is built upon the requirements of the international standards ISO 14001 (EMS) and ISO 45001 (OHSAS).

ABS QE, having participated in the RC 14001 Pilot Program and being one of the first Certification Bodies accredited to perform RC 14001 Certification Audits is a strong supporter of the ACC; long committed to the ACC's Responsible Care© initiative.

In 2024, The Chemours Company selected ABS QE to be their certification partner, entrusting ABS QE's team of experts to provide RC 14001 Certification Services. The project includes annual and ongoing certification audits of more than 20 Chemours facilities located throughout America, Europe and Asia Pacific.

ABS GROUP OF COMPANIES, INC. CORPORATE GOVERNANCE

ABS GROUP OF COMPANIES, INC. CORPORATE GOVERNANCE

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ABS
WAVESIGHT

ABS WAVESIGHT

INDUSTRY-LEADING SOFTWARE SOLUTIONS FOR MARINE AND OFFSHORE APPLICATIONS

For ABS Wavesight, the ABS affiliate maritime software-as-a-service (SaaS) company, 2024 was a banner year in terms of both evolution and market penetration.

Formed in 2022 to unify ABS digital software solutions that collectively are installed on more than 5,000 vessels worldwide, ABS Wavesight revitalized and restructured its processes and systems in 2024 into an industry-leading organization dedicated to helping clients streamline compliance while maintaining competitive, efficient and sustainable operations.

ABS Wavesight began its new era with the appointment of new chief executive officer (CEO), Staci Satterwhite, who led the company's efforts to marshal its collective expertise and develop innovative products to guide the digital transformation of the maritime and offshore industries. The first major move in this program was the launch of a groundbreaking software suite at the Posidonia exhibition in June that both introduced enhanced vessel performance and compliance capabilities and signified a major resource commitment from ABS Wavesight to develop a true SaaS platform. These product developments marked the start of an important evolution within the ABS Wavesight ecosystem that is set to pave the way for a series of new and expanding capabilities to be unveiled during the coming years.

ABS Wavesight's flagship platform Nautical Systems (NS) also unveiled more than 100 new enhancements across all its modules and suite of mobile applications, including process and application improvements and capabilities for compliance with International Maritime Organization's (IMO) new Safe Mooring regulations. One enhancement among these was the addition of Ship Inspection Reporting (SIRE) 2.0 functionality for fleet and crew management. In 2024, the SIRE system, an important tanker and barge inspection tool created by the Oil Companies International Marine Forum in 1993, evolved into version 2.0, which takes a risk-based approach that, in addition to technical aspects, also considers how human factors are integrated into operations and procedures – a step forward that

requires a change in mindset for operators and crew in preparing for and conducting inspections. Recognizing this change, NS built enhancements for its Health, Safety, Quality and Environmental and Vetting Manager module that enables users to transition to SIRE 2.0.

Another important enhancement to the NS platform in 2024 was the launch of NS-Web, the web-based version of its on-premises software, which delivers the same powerful features and functionality required for modern fleet management, but enhanced with the flexibility, accessibility and scalability of a web-based solution. Benefits of the web-based solution include elimination of most software maintenance through regular updating and cloud-based infrastructure and seamless collaboration across teams and departments. The first two modules of NS-Web, Crew and Payroll, were announced in September during the annual NS User Conference. On hand at the conference was Gregg Pelowski, Director of Total Force Management for the U.S. Navy's Military Sealift Command (MSC), who shared MSC's experiences as an early adopter, noting that "Nautical Systems is a key component of our overall management strategy to revolutionize every aspect of MSC's Civil Service Mariner program, helping us simplify and drive efficiency across our growing fleet of Combat Logistics and Fleet Support vessels. When fully implemented, this modern, cloud-based system will streamline our fleet management process while enhancing our ability to scale and optimize operations as we provide reliable, web access from ship to office."

Meanwhile, the NS Maintenance Manager and Purchasing Manager modules were selected by UNI-FLEET SDN Berhad, a Malaysia-based shipping company focused primarily on the marine transportation of ammonia across Asia, as part of the company's drive to improve maintenance and inventory processes. Maintenance Manager offers a powerful, integrated database that brings together critical maintenance and purchasing information helping to streamline scheduling, tracking and forecasting, while Purchasing Manager offers improved procurement and inventory control by facilitating competitive bidding, contracting and inventory tracking and connecting these activities back to their maintenance operations. UNI-FLEET expects that, together, the two modules will enhance its maintenance and procurement activities while streamlining processes and strengthening operational efficiency.

ABS Wavesight's eLogs™ platform also achieved a breakthrough in 2024, reaching a major milestone in adoption by the offshore energy sector through a new collaboration with leading offshore contractor Noble Corporation to supply eLogs for deployment on drillships, semisubmersibles and jackup rigs worldwide (see spotlight).

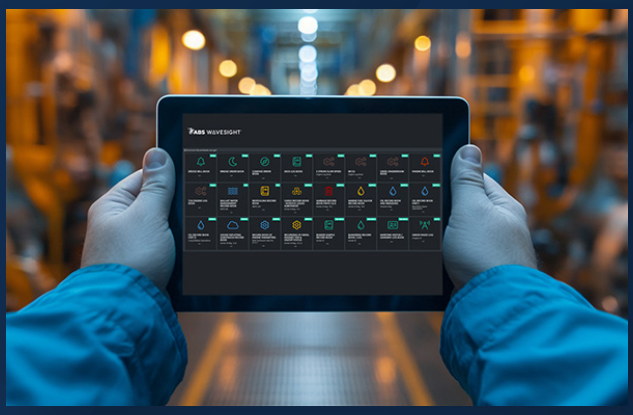
SPOTLIGHT

Noble Selects eLogs to Revolutionize Global Drilling Fleet Recordkeeping

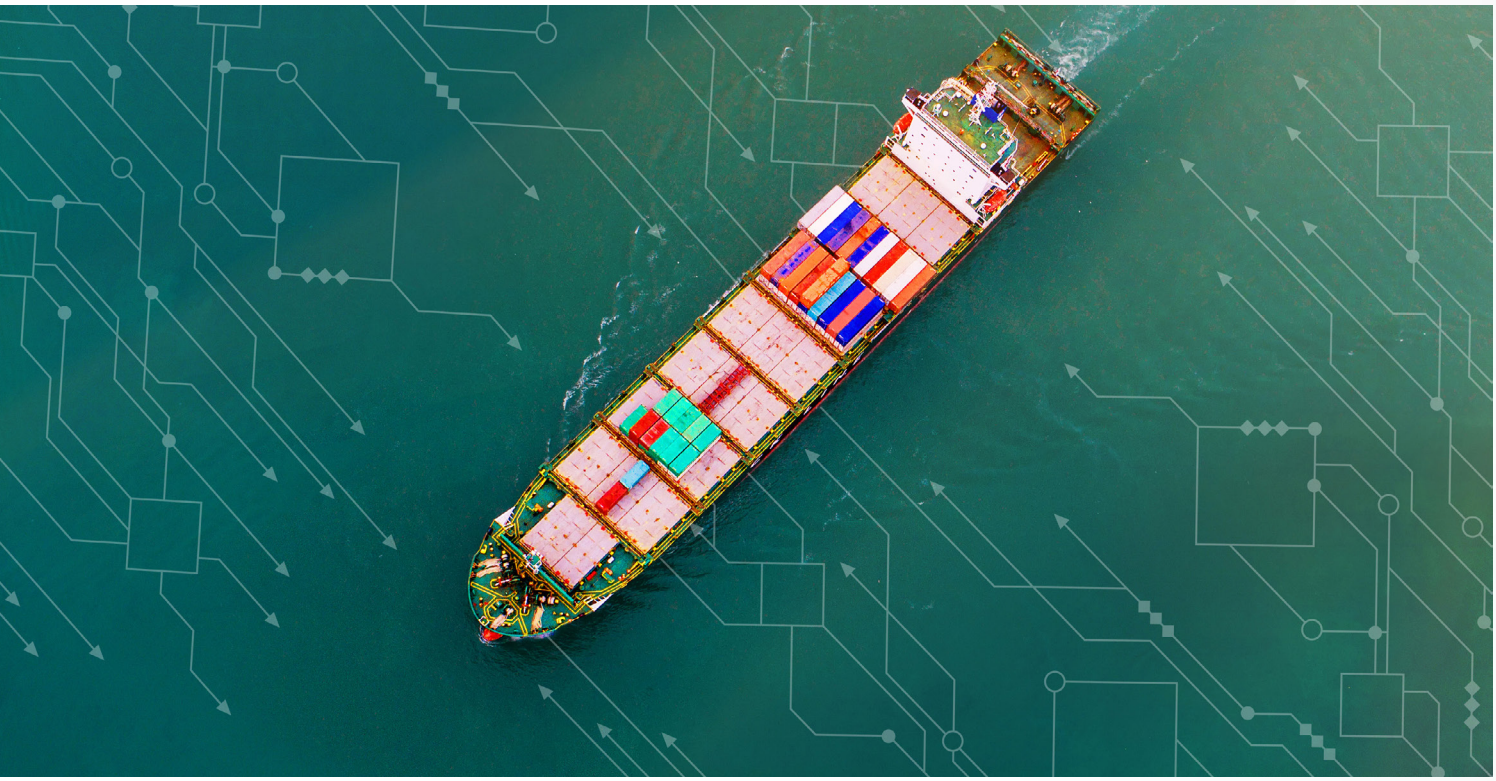
A ship's logbook is more than a mandatory safety requirement; it is key to understanding any sequence of events on a voyage, including operational status and decision-making processes on board at critical times. Digital versions of the traditional paper log (electronic logbooks or eLogs) are not new to maritime world, as IMO endorsed their use under MARPOL in October 2020, but their adoption has been fairly slow — until a breakthrough agreement in 2024 between ABS Wavesight and Noble Corporation.

In November 2024, Noble Corporation announced it had changed record-keeping practices across its global fleet of offshore drilling rigs and drillships through adoption of electronic logbooks. Use of ABS Wavesight's eLogs platform aboard Noble's global fleet of drillships, semisubmersibles and jackup rigs to replace paper logbooks will, according to the client, improve regulatory compliance and management of its offshore assets.

This marks a major milestone for offshore adoption of ABS Wavesight eLogs, and recognition within the sector that eLogs provides a comprehensive and streamlined approach to recordkeeping. By



leveraging advanced technologies such as cloud computing, ABS Wavesight eLogs enables accurate and real-time data capture and helps overcome risks associated with inaccurate and incomplete data and lost logbooks. The benefits of using eLogs are already shaping up to be significant, according to Noble's Supervisor for Marine Compliance and Inspection, Ben Sherwood. "We adopted ABS Wavesight eLogs to help us further digitalize record keeping on our assets," he said during the announcement. "This has been a welcomed change for the crews offshore, providing an increase in efficiency and accuracy. We are estimating a possible reduction in error rate of 46 percent in just a single logbook using this platform."



SPOTLIGHT

New CEO Leads Evolution of ABS Wavesight

In 2024, ABS Wavesight brought on board a new CEO, Staci Satterwhite, to bring the organization into its future as an industry-leading SaaS provider. Formerly the chief operating officer of Khoros, a Texas-based provider of digital customer engagement solutions, she is an electrical engineer by training and has extensive experience in both SaaS and digital transformation, having served as a core member on various executive teams throughout her career.

Describing the philosophy behind her approach as CEO, Satterwhite recently told the press "As the marine and offshore industries continue to be shaped by demands to decarbonize, they have entered a transformative period of digitalization which is creating opportunities and new demands for more efficient ways of operating. One important component in this is the ability to demonstrate compliance with increasingly rigorous regulations. As the pressure for higher performance and regulatory compliance grows, we have been listening to our clients and figuring out how to help them adopt a platform that addresses both challenges.

"ABS Wavesight was founded to bring together the deep industry knowledge of a class leader with excellence in software products; as such, we have been able to help customers gather the quality data that creates visibility on their fleets and drives decisions for compliance and daily shipping operations, through a web-based architecture that provides reliable access to the data along with high-value insights to support better decision-making. As regulation moves from prescriptive rules toward financial incentives and penalties, operators need to understand where the risks lie and how to manage them. The tools that fleet operators need cover a laundry list of data and technologies, but the important part is the ability to transform disparate pieces of information into actionable insights to support better business decisions."

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