

ClassNK

MAGAZINE

67TH EDITION

- *ClassNK expands in North America*
- *Safety Management Systems - one year on*
- *The MALS revolution*
- *Extending the LNG frontiers*



Class of our own

Welcome to the 67th edition of ClassNK Magazine.

These past several years have marked a period of incredible growth for ClassNK. Our position as one of the world's leading classification societies, with more than 220 million gross tons, was reinforced by the addition of 859 vessels totalling more than 20.5 million gross tons to our register in 2013. This marked the third year in a row that ClassNK has registered an annual total of more than 20 million gross tons.

This incredible growth mirrors the expansion of our service network, and increasing ability to support shipowners around the world. Significantly, in 2013, transfers accounted for nearly 33% of vessels and more than 25% of all tonnage registered. Owners, particularly in Europe and America, are increasingly recognizing ClassNK's key strengths and enduring commitment to serving markets and to supporting key research and development initiatives across the entire spectrum of the maritime industry, from health and safety to vessel design, construction and surveys and the environment.

“ *Owners are increasingly recognizing ClassNK's key strengths and enduring commitment* ”

On the research side, we have not only provided support for new technology to help improve fuel efficiency and reduce GHG emissions like the Mitsubishi Air Lubrication System, but we have also signed with the “Maria Tsakos” Foundation-International Centre for Maritime Research and Tradition in Greece to further maritime research, protect the environment, and ensure the health and safety of seafarers.

On the service side, we have worked to improve our service network and to provide shipowners, operators, and shipyards with the full range of services that is essential to ensure safe and efficient vessel design,



construction, and operation. Perhaps nowhere has this commitment been made clearer than in our activities in North America. In 2013, we not only earned expanded authorization to carry out surveys on behalf of the US Coast Guard, but we also announced the acquisition of Portland, Maine-based safety management consulting firm Safety Management Systems LLC, the first acquisition in our history and major step towards providing a fuller range of services to owners and operators throughout the North American shipping industry.

Now, just one year later, the very first US flagged vessel is joining the ClassNK register, and we are further working to strengthen our survey services and operations all across North America. The articles in this edition of ClassNK Magazine cover just a small portion of our approach to improving our activities, both in North America and around the world, but I believe they showcase our commitment to becoming a classification society that is ever better, more efficient, and more committed to excellence.

Noboru Ueda
Chairman and President of ClassNK

ClassNK

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ClassNK

ClassNK news

NEW GAS FUELLED SHIPS GUIDELINES

ClassNK has released a second version of the *Guidelines for Gas Fuelled Ships*. This reflects the requirements for the design of natural gas fuelled ships based on the outcome of discussions at the International Maritime Organization on the International Code of Safety for ships using gases or other low flash point fuels. With the maritime industry turning to natural gas as potentially a cleaner alternative to liquid fuel oil and gas prices expected to fall due to the development of non-conventional energy resources such as shale gas, discussions on the IGF Code have been accelerated. A draft of the Code, which has been in place since 2009, is set to be finalized this year.

CLASSNK SETS NEW TONNAGE RECORDS

A total of 859 vessels totalling more than 20.5 million gross tons were added to the ClassNK register in 2013, marking the third straight year that ClassNK has registered an annual total of more than 20 million gross tons. New-buildings accounted for 588 ships of more than 15.3 million gross tons and ClassNK's growth in Europe, in particular, was reflected by transfers accounting for nearly 33% of vessels and more than 25% of all tonnage registered in 2013. The figures cap a decade of growth which has seen the Society's register increase by more than 100 million gross tons since 2003. In November 2013 the register topped 220 million gross tons for the first time.

NEW GUIDELINES ON WELDING OF DUPLEX STAINLESS STEELS

ClassNK has released new *Guidelines on the Welding of Duplex Stainless Steels* to help shipyards safely and effectively make use of new materials increasingly being used in the construction of cargo tanks for chemical carriers. The vast majority of chemical tankers with stainless steel cargo tanks are built at Japanese shipyards which have traditionally used austenitic steels for cargo tank construction. However, the shipyards are increasingly using Duplex stainless steels as an alternative for their corrosion resistance and high strength properties.

CLASSNK JOINS RESEARCH PROJECT ON NEW SO_x SCRUBBER TECHNOLOGY

ClassNK is to participate in a project to install and verify the effectiveness of new sulfur oxide (SO_x) scrubber technology onboard a 7,500 unit pure car carrier under construction for Kawasaki Kisen Kaisha (K-Line) at Japan Marine United Corporation and due for delivery in 2016. K-Line will install a new hybrid SO_x scrubber system developed by Mitsubishi Heavy Industries and Mitsubishi Kakoki Kaisha as part of the Drive Green Project and the vessel will be the flagship of a series of eight new pure car carriers on order to K-line.

NOBORU UEDA HONORED FOR LIFETIME ACHIEVEMENT

ClassNK Chairman and President Noboru Ueda has been honored with the Global Lifetime Achievement Award at the Shipping Marine and Ports 2014 Leadership and Excellence Awards at the Lalit Hotel in Mumbai. "This award symbolizes the recognition of the industry for the work we are carrying out at ClassNK, and for that I am truly grateful," Mr Ueda said.



CLASSNK AND “MARIA TSAKOS” FOUNDATION IN MARITIME RESEARCH COOPERATION

ClassNK and the “Maria Tsakos” Foundation-International Centre for Maritime Research and Tradition have signed a memorandum of understanding to further maritime research and environmental protection. The Chios-based foundation is recognized as one of the leading maritime non-governmental and philanthropic organizations in Greece. The memorandum was signed by ClassNK Chairman and President Noboru Ueda and Efthymios Mitropoulos, the Foundation’s Chairman and International Maritime Organization Secretary-General Emeritus. They were joined by Panagiotis Tsakos, founder of the Tsakos Group of Companies, Vassilis Papageorgiou, Vice President of the Group, Stamatis Krimizis, Chairman of the Foundation’s Scientific Council, and many distinguished guests. The first project under the cooperation scheme, *Study on the Health Impact of air-Pollution in Ships (SHIPS)* will assess levels

of exposure to ambient particles to establish whether they constitute a health hazard for ship crews, particularly those working in engine rooms and to quantify any associated potential health risks.



Noboru Ueda and Efthymios Mitropoulos welcome the cooperation

CLASSNK ISSUES RECYCLING ‘FIRST’ IN JAPAN

ClassNK has issued the first Statement of Compliance for a ship recycling facility in Japan to Miyaji Salvage Co Ltd. It certifies that the facility and recycling procedures comply with the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, 2009. Miyaji Salvage is the third company to be awarded a statement of compliance by the Society. The first was Jiangmen Zhongxin Shipbreaking & Steel, in December 2012, followed in September 2013 by Dalian Shipbuilding Industry Marine Service Co Ltd.

NOBORU UEDA APPOINTED ACS CHAIRMAN

Noboru Ueda assumed the role of Chairman of the Association of Asian Classification Societies (ACS) on January 1 2014. ACS comprises Biro Klasifikasi Indonesia, China Classification Society, Indian Register of Shipping, Korean Register of Shipping, Vietnam Register and ClassNK. Mr Ueda said that under his chairmanship ACS would work to more proactively contribute to the development of balanced global regulations at the International Maritime Organization and other regulatory bodies by consolidating the opinions of ACS members.

CLASSNK RELEASES FIRST HARMONIZED CSR COMPLIANT SHIP DESIGN SUPPORT SOFTWARE

ClassNK has released a new version of its PrimeShip-HULL (HCSR) ship design support software, the first to fully support the new Common Structural Rules (CSR) adopted by the International Association of Classification Societies (IACS). The new IACS CSR unify and harmonize the technical requirements of the existing CSR for tankers and bulk carriers and incorporate new requirements for more comprehensive structural analysis at the design stage, including finite element analysis covering the entire range of cargo hold structures and new formulae for buckling, fatigue, and residual strength criteria to enhance safety and reliability.

CLASSNK IN RIO TINTO IRON ORE PACT

ClassNK and Rio Tinto Iron Ore have signed a collaborative agreement focusing on the safe carriage of iron ore. ClassNK Executive Vice President Yasushi Nakamura said: “Both Rio Tinto and ClassNK have decades of specialized knowledge and expertise related to the maritime transport of solid bulk cargoes. By signing this agreement we hope to share this rich history and knowledge to benefit the entire maritime community.” Warwick Smith, Managing Director, Sales and Marketing for Rio Tinto Iron Ore added: “This agreement realizes mutually beneficial collaboration with one of the leading classification societies, and I hope it will expand into a wider cooperation.”

Expanding in North America



SLNC Pax is the first US flag vessel to join the ClassNK register

With a history in North America spanning more than half a century, ClassNK is working to make its services even better.

When ClassNK opened its first office in North America more than 50 years ago, it was a different era for the Society and the entire maritime industry. ClassNK's New York office, which opened in 1962, was only the second office the Society had opened outside of Japan, and was meant to serve the growing needs and increasingly international routes of its primarily Japanese clients. Today, ClassNK has grown to become a truly global organization with some 130 offices worldwide, and its North American operations are growing

ever more important as they serve a rapidly growing number of North American and international clients.

Much of ClassNK's rapid growth in the region is due to the commitment of its current Chairman and President, Noboru Ueda, who has made expansion in North America a key focal point for the Society's operations. A substantial increase in the number of surveys carried out, expansion of the North American Committee, expanded authorization

from the US Coast Guard, the first acquisition in the Society's history and addition of the first US flag vessel to its register this year, the oil/chemical tanker *SLNC Pax*, bear testimony to Mr Ueda's vision.

In the intervening years, ClassNK has demonstrated its commitment to serving the North American maritime communities by establishing a network of nine offices in the region beginning with New Orleans in January 1978. In 1980, Mr Ueda, at the time working in Head Office in the Development Department, established the Society's first west coast office in Seattle, where he served as General Manager until 1985. Mr Ueda's tenure in Seattle was marked by the distinction of being one of the youngest staff to be given such great responsibility.

ClassNK has continued to expand its service network throughout North America, establishing new offices in Los Angeles in March 1981, Houston in April 1982, Vancouver in December 1995, Norfolk in October 2000, Montreal in June 2001, Miami in May 2005 and, most recently, in Portland in February 2013 with the acquisition of US safety management consultancy, Safety Management Systems, LLC.

Initially ClassNK's offices in North America served vessels owned primarily by Japan's major shipping lines, in time growing to include owners with strong ties to Japanese shipyards and trading houses. ClassNK's presence continued to grow as it developed strong connections with local owners, including both domestic operators and owners with Asian roots. In recent years, ClassNK's operations in the region have surged as the newbuilding boom of the mid 2000s helped propel ClassNK to become the world's largest classification society.

Over the years, the number of staff employed by ClassNK in North America has risen to more than 40 in number. In line with the Society's streamlined management policy some 80% are surveyors, auditors, or safety management consultants.

Over this period, the number of surveys and audits conducted by ClassNK in North America has grown steadily, especially in the past few years. Last year, for example, North American offices carried out a total of 1,744 surveys, a 20% increase on 2012 and a substantial 36% increase on 2011, underscoring Mr Ueda's stated intention on becoming Chairman and President in 2008 to make the US market a key focus.

In 2010, ClassNK established its North American Committee under the Chairmanship of Eagle Shipping International, and today the Committee has grown to include some 16 companies from throughout the region. The Committee, in common with all ClassNK committees, is a regional group of key stakeholders who serve in an advisory capacity and help the Society better understand clients, their needs, and how to better to serve each local market. While the North American Committee is comprised primarily of bulker, tanker and container carrier owners, it is expanding to bring together owners and operators of all kinds of vessels from throughout the North American community.

Of course, even as ClassNK has continued its historical focus on ocean-going vessels, Mr Ueda has also worked to provide better support for the domestic and inland shipping industries. At the end of 2012, the Society was granted expanded authorization from the United States Coast Guard (USCG) to carry out a full range of surveys for the SOLAS, MARPOL and AFS conventions, as well as ISM Audits on behalf of the United States flag administration.

ClassNK Executive Vice President Takuya Yoneya signed the agreement early in January 2013 at USCG Headquarters in Washington DC. Dr Yoneya expressed ClassNK's appreciation for the recognition and exchanged signed copies of the authorization agreement with USCG Rear Admiral Joseph A. Servidio.

Having earned USCG authorization to carry out certification for the Load Line and Tonnage Measurement Conventions (TM69) in 2011, the agreement allowed ClassNK to build



on its traditional focus on the international shipping or 'blue water' sector of the American shipping industry and address growing demand for high quality certification services from domestic shipping lines.

The expansion of recognition by the USCG to cover SOLAS, MARPOL, and ISM among other conventions made it possi-

ble for ClassNK to issue a wide range of certifications for US flagged vessels in every part of the industry.

Following the announcement Mr Ueda stressed the importance of the US maritime industry and restated ClassNK's commitment to it. "America is among the world's top nations in terms of both vessel numbers and tonnage, and

CLASSNK IN NORTH AMERICA: KEY DATES

1962: New York office established.

1980: Noboru Ueda establishes the Society's first west coast office in Seattle in September.

2010: ClassNK North American Committee is established.

2011: ClassNK receives authorization from US Coast Guard for Load Line, TM 69 conventions.

2012: US Coast Guard expands ClassNK's authorization. Executive Vice President Takuya Yoneya is pictured (below) with Rear Admiral Joseph A. Servido.



2013: ClassNK acquires Safety Management Systems LLC (SMSLLC). Noboru Ueda and Bill Mahoney (pictured above) sealed the agreement at the CMA meeting in March.

2014:

- ◆ Schuyler Line Navigation Company's 7,985 dwt oil/chemical tanker SLNC Pax becomes the first US flag vessel to join the ClassNK register.
- ◆ ClassNK establishes a new management team in North America.
- ◆ The North American Committee is expanded to 16 member companies.



the industry here is incredibly dynamic, including not only major charterers but also an incredibly diverse shipping community that includes not only blue water shipowners but also inland brown water shipping, coastal shipping, and the offshore sector.

“At ClassNK we have served the American blue water shipping community for more than 50 years now, but with this authorization from the USCG we will now be able to greatly expand our operations to include coastal, gulf, and inland shipping, as well as the growing offshore energy and wind sectors.”

“Both blue and brown water shipowners and operators face a number of new challenges related to new environmental and safety regulations, and with this recognition from the USCG, we will now be making significant additions to our survey network and human resources in America in order to better support the maritime industry throughout the United States.”

As part of a broader expansion into the US domestic and brown water shipping industries ClassNK completed the acquisition of safety management consultancy, Safety Management Systems, LLC (SMSLLC) in March 2013. The acquisition marked the first time in its 113-year history that ClassNK had acquired another company.

Portland, Maine-headquartered SMSLLC was recognized as one of the top safety management consulting firms in the US, having been chosen by the New York Department of Transportation to assist the operator of the Staten Island ferry to develop a world class safety management system following a fatal accident in 2003.

Mr Ueda announced the acquisition at the Connecticut Maritime Association’s Shipping 2013 Conference and Exhibition where he said: “Until now, ClassNK has focused primarily on the certification of safety management systems, but it is the development and implementation of safety management systems where owners face the most

challenges and can secure the greatest benefits. With the acquisition of SMSLLC, we can now offer inland, coastal, offshore, and ocean-going vessel owners full support throughout the safety management process.”

Bill Mahoney, Director of SMSLLC, said his company had worked alongside ClassNK for many years and both greatly respected each other as leaders in their respective fields. “With this new partnership we will be able to combine our expertise and reputation in the US shipping industry with the resources and support of the world’s largest classification society. This is a partnership that will allow us to expand our services, not just for the benefit of our clients, but for the benefit of the entire US maritime sector.”

Those words have rung true for ClassNK, which has moved from success to success in the region. In 2014, not only has the ClassNK North American Committee been expanded, but ClassNK has registered its first US flagged vessel, the *SLNC Pax*, a 7,985 dwt oil/chemical tanker owned by Schuyler Line Navigation Company.

The registration marks another important step forward for ClassNK, which even today is moving to increase its support for domestic and regional owners. In April, ClassNK will introduce a new management team in North America, with Stewart Lee taking the role of Regional Manager, and Seiichi Gyobu taking the newly established role of Survey Department General Manager resident in North America. This will mark the first time that ClassNK has placed high level survey management functions in North America.

It is a bold move, one that is best reflected in the words of Mr Ueda: “Supporting the North American maritime industry has long been one of our key goals, and with this new management team we are better able to achieve that goal than ever before. At ClassNK we remain dedicated to providing the best possible service to our clients, and by strengthening our human and survey resources in North America, we are making that promise a reality.”



Meeting the safety challenge

ClassNK's first major acquisition of another company in March 2013 signalled a broader expansion into the challenging US domestic and brown water shipping industries.



*Bill Mahoney,
SMSLLC Director*

The US brown water industry is a vital component of both domestic and national trade, as ClassNK recognized through the acquisition of US safety management consultancy Safety Management Systems LLC (SMSLLC), whose clients include a diverse range of US commercial and public operators managing domestic and foreign flagged vessels.

Tugs and barges on the Mississippi and other US rivers transport 20% of the nation's coal exports and 60% of its grain, making the sector an important component of international maritime trade. ClassNK classifies in excess of 35% of the world's bulk carriers and significant volumes of US grain and coal cargoes are transported on Society-classed vessels.

Portland, Maine-based SMSLLC was founded in 1996 to provide regulatory compliance assistance to ship managers. The company is recognized as one of the United States' top safety management consulting firms, having been selected by the New York City Department of Transportation to assist the operator of the Staten Island Ferry in developing a world class safety management system. This assignment followed the accident in October 2003 when eleven people were killed and 71 injured as the *Andrew J. Barberi* crashed full-speed into a concrete pier at the St George ferry terminal.

SMSLLC has paid particular attention to assisting ship managers to develop and implement safety management systems as part of International Safety Management (ISM) Code requirements. ClassNK helped develop the ISM Code and, as the world's leading provider of ISM certification, its experience with ISM globally will contribute to the safety of the brown water industry.

ClassNK recognized the need to adapt ISM systems used internationally to the specific scope and needs of the brown water industry. Working with SMSLLC, ClassNK is seeking to

utilize its experience and the expertise of SMSLLC to tailor safety management systems that are specific to the needs of inland and brown water operators and jointly provide high-quality and cost-effective solutions to the industry.

ClassNK had focused primarily on the certification of safety management systems. "But it is in the development and implementation of safety management systems where owners face the most challenges and can secure the greatest benefits," ClassNK Chairman and President Noboru Ueda told the Connecticut Maritime Association a year ago.

"With the acquisition of SMSLLC, we can now offer inland, coastal, offshore, and ocean-going vessel owners full support throughout the safety management process."

SMSLLC works with clients to develop sustainable systems that focus on the end-users as well as management, customers and other stakeholders. Clients benefit by implementing management systems that are unique to their organization and function on a practical basis. Management systems may be developed to target particular outcomes including those described by various management system standards.

Planned, predictable and proactive services to support compliance measures around the clock are available in support of a variety of systems and programs relating to the ISM Code, ISPS Code, *Maritime Transportation Security Act*, ISO 9001, ISO 14001 and other standards. SMSLLC provides dedicated resources on a fixed-basis and comprehensive compliance support arrangements tailored to unique client needs and staffing arrangements.

SMSLLC had worked alongside ClassNK for a number of years prior to the acquisition. As a leader in its field, why did the company take a further step and opt to join forces

with ClassNK? What has the formal link with the Japanese Society brought to the venture?

“Integrity,” says Bill Mahoney, SMSLLC Director. “ClassNK and SMSLLC have enjoyed a long relationship and shared commitment to provide value to clients by focusing on specific areas of subject matter expertise and delivering results. In our view, ClassNK exemplifies the role of a classification society and the fit was the most natural one for both parties.

“I’m not sure there has ever been a seamless venture in any industry, but ClassNK continues to make commitments to time and other resources to provide SMSLLC with ongoing access to vital systems and information. I think the marketplace has reacted in a very positive manner. Those who know us understand that we focus quite a bit on establishing a close working relationship with our clients and treat them as individuals with unique requirements and expectations.

“ClassNK has respected this focus – as we knew they would – and we believe the marketplace bases its opinion on results. I would say the results have been very positive to date. We have added some substantial clients to our organization since January 2013.”

Was the venture borne of a desire to expand or to take advantage of a relaxation in US government legislation to allow others than ABS to provide safety management certificates to vessels operating within the Great Lakes region and on US waterways?

“Naturally we have a keen interest in seeing ClassNK succeed as class in the domestic market,” says Mr Mahoney. “While we are an autonomous and separate entity, ClassNK benefits from having a domestic partner that is familiar with the landscape in the US. I fully expect our cross synergies to multiply and result in greater opportunities for both entities over the coming years.

“The interrelation between our companies on a day-to-day basis has become part of our operational routine. We have ongoing and informal communications regularly between Tokyo and Portland, Maine, as well as with our leadership in NK’s Long Beach office. All operational decisions are left to our areas of expertise.”

Can the scale and importance of the US brown water market be under or overstated?

“Well, it is my personal opinion that it may have been overstated early on – but that is not atypical for emerging market opportunities,” says Mr Mahoney. “I believe there will be opportunities for those who can demonstrate that they have the respect of the industry, have demonstrable experience that brings value, and that they offer appropriately tailored services. We have reasonable expectations for the brown water market and also expect growth in our blue water market as well.

“We offer professional services. The greatest challenge for us is always in finding the right people to staff our operations. As in any business, the balance between keeping everyone productive while pursuing growth is elusive.

“Our continued intent is to build client referrals, strengthen relationships, and gain industry recognition primarily through customer satisfaction - the results of our client work. We have never been big supporters of display advertising as a means to promote our brand. That may change in the future, but we have always treated each engagement as an opportunity to build a successful *résumé* and list of referrals.”

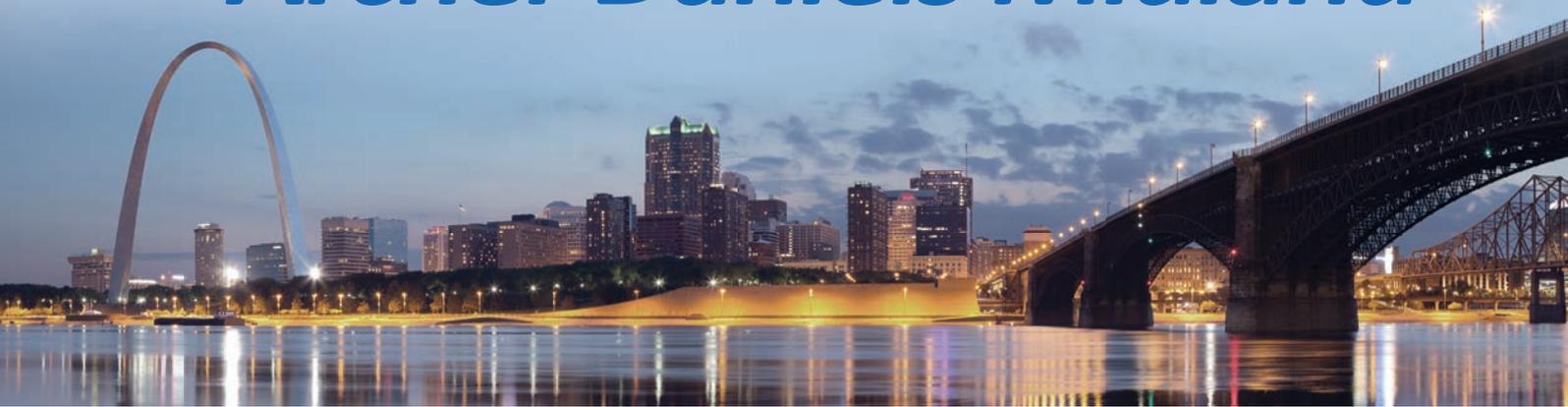
SMSLLC, according to Mr Mahoney, has pinpointed aggressive growth targets that will require a well-coordinated marketing strategy. “I would like to think that we can scale growth organically in much the same way that we have for years, though I have enough awareness to realize that this approach will need to be modified,” he says.

“We intend to adopt co-marketing opportunities with other entities and to support more active involvement with key industry groups and potential clients.”

As to where Mr Mahoney expects SMSLLC to be in five years from now, he says: “I would like to think that you would see a very similar company – only with more staff and a greater diversity and volume of clients and services. I expect to develop additional competencies in-house to address increasing regulatory demands and client expectations. I expect to integrate beneficial technologies that enhance the end-user experience of our services wherever we can.

“As far as physical presence is concerned, I can easily imagine the addition of one and possibly more office locations in the US to bring us closer to our clients in key markets. Technology is great, but in our business it is essential to have face time with shipboard and shore-based personnel on a regular basis.”

Green leadership: Archer Daniels Midland



ClassNK supports Archer Daniels Midland's 'super eco' Post-Panamax new-building program and its crucial US brown water operations.

Archer Daniels Midland (ADM) began its operations over 105 years ago as a small Midwestern US grain and processing operation but has grown to become a top 50 company on the highly influential *Fortune 500* annual listing of America's largest corporations. While perhaps best known in the maritime industry as one of the world's largest charterers of ocean-going vessels, ADM also has a long history of owning and operating vessels, especially in the US domestic market.

The group's US barge operation, American River Transportation Company (ARTCo), was established in 1968 as the inland waterways transportation unit for ADM's dry bulk cargoes including grains, oilseeds and other agricultural products. Over the years, ARTCo has grown from an 80-barge strong operation to one with over 2,100 barges and 85 tug boats, a U.S. Gulf stevedoring operation, a liquid terminal/pipe-line operation and 12 inland harbor operations serving customers located on the U.S. inland waterways.

Building on this foundation of success in the US, ADM made a decision to purchase and operate a fleet of ocean going vessels in 2010, a decision which introduced the company to ClassNK. Just as ADM's ocean going fleet has grown over the years, so too has its relationship with ClassNK.

ADM subsidiary Harvest Shipping now owns a fleet of eight bulk carriers as well as three Post-Panamax ships under construction at Oshima Shipbuilding in Japan, all of which are registered with ClassNK, and through its affiliate

SMSLLC, ClassNK is now also working with ADM to establish new compliance procedures for its inland US operations, as well.

The man responsible for developing ADM's inland and ocean-going ship technical and construction program is ARTCo President Royce Wilken, former President of the American Waterways Operators, and currently a member of ClassNK's North American Committee.

Mr Wilken says there are natural synergies between the brown water and blue water sides of ADM's shipping business which have helped ADM establish its new foothold in the ocean-going vessel market.

"The ADM Harvest Shipping and ARTCo teams have the expertise to manage both ADM-owned ARTCo and Harvest Shipping companies," says Mr Wilken. "Interestingly, both marine operations have similarities in their operations. Vessel personnel are relatively the same in demeanor and technical skills. Most mariners view their day-to-day tasks not as a job but a lifestyle.

Bridge management responsibilities for both disciplines are separated by the implementation of the ISM system. Brown water operations in the US are taking a turn towards an inspected vessel regime which will align both disciplines even closer.

“Technically, river and ocean going vessels are very similar with size of equipment being the main difference. A main engine power plant, turbo chargers and generators serve as the heartbeat of the ship. Bridge equipment overlaps with the use of electronic charts, radars, cellular and satellite phone technology.”

Mr Wilken emphasizes that it is ClassNK’s ability to provide high quality service and support ADM’s activities both internationally and domestically that has helped cement the relationship between the two companies.

“ClassNK’s organization has been responsive from the beginning of our relationship, providing resource support in surveying and later on a global network of offices, staffed with qualified and trained personnel that are consistent in their standards and fair in their pricing for services. The ClassNK con-

sistency of excellence has driven our fleet to higher standards than were in place upon vessel acquisition.

“The ClassNK contribution has greatly supported our company, which now monitors performance of critical areas of operation in lieu of reacting to situations that may arise. ClassNK has provided engineering services for major repairs, as well as inspection services, and now the relationship includes the development of an ARTCo towing management system for our brown water operation through the ClassNK affiliate, SMSLLC. All these contributions add value to the marine operations of ADM.”

This relationship between the companies has also been made stronger by ClassNK’s support for ADM’s new-building program at Japan’s renowned bulk carrier builder, Oshima Shipbuilding. Mr Wilken says ADM was keen to build in Japan because it had received immense support for the project from Japan’s shipbuilding community, its suppliers and ClassNK, with all parties working together to ensure the success of the project.

“It is no secret that Japanese shipbuilders have constructed sound and long

lasting bulk carriers for many years,” he says. “The Japanese shipbuilding industry has displayed a willingness to employ technology into its long-standing quality construction process to produce a better ship. Clearly, these Japanese shipbuilding companies are investing well into the future by introducing the most environmentally supportive and economically operating dry bulk carriers.”

Delivery of Harvest Shipping’s new ADM MAX Post-Panamax vessels will coincide with the expansion of the Panama Canal and offer more direct routes to markets. The ‘super eco-ships’ will be powered by Mitsubishi 6 UEC 60 LSE- Eco-A2 electronic engines and incorporate new green technology including Mitsubishi’s MALS system (see page 14), which will greatly reduce the amount of CO₂ emissions per ton shipped.

“The new ADM MAX vessels will make it possible for us to transport cargoes more efficiently and with less emission than ever before,” says Mr Wilken. “ClassNK, as an advisor and classification society, has delivered a complete package for the successful delivery of these vessels, and we look forward to working with the Society for many years to come.”

FACT FILE: HARVEST SHIPPING AND ARTCO

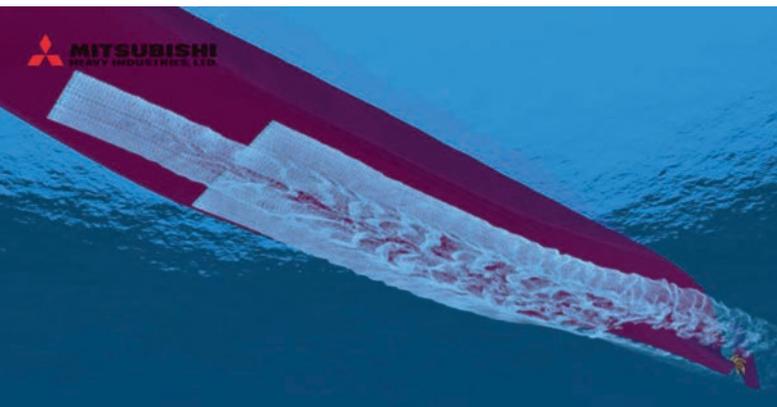
Decatur, Illinois-based **Harvest Shipping** owns and manages one handy, two handy-max, two supramax and three Panamax dry bulk carriers, which operate internationally. Harvest Shipping also owns three Post-Panamax bulk carriers currently on order at Oshima Shipbuilding in Japan. The vessels are the first of a new ADM MAX design that employ new GHG emission reducing technology including the MALS air lubrication system. All of Harvest Shipping’s vessels are classed and registered with ClassNK.

St. Louis, Missouri-based **ARTCo** operates 28 line haul tug boats designed to transport barges on the U.S. inland river system and 57 harbor tugs which operate in ARTCo’s 12 harbor services. The company also owns and operates 2,000 dry cargo hopper barges each capable of carrying 1,600 to 2,400 short tons, and 100 liquid tank barges with a capacity of 10,000 to 13,000 barrels per barge. ARTCo transports barges along the Upper Mississippi River north of St Louis using a fleet of 15 small line haul vessels.

Each of the vessels has a complement of nine mariners and pushes 15 barge tows, ranging between 24,000 and 30,000 tons per cargo convoy, a capacity roughly equivalent to a handysize bulk carrier. Along the Lower Mississippi River from St Louis to New Orleans, ARTCo operates 13 line haul vessels. Each can push 46 barges, transporting between 92,000 and 100,000 tons of cargo per shipment convoy, a capacity roughly equivalent to a Kamsarmax or Capesize bulk carrier.

Air bubbles: The path to least resistance

Concepts for air lubrication systems have been on the global maritime agenda for over half a century but Japan's Mitsubishi Heavy Industries (MHI) has become the first company to transform air lubrication from a concept into a practical new technology applicable to a variety of vessels. With successful application of the systems on module carriers and a ferry complete, MHI is now expanding the technology to other ship types.

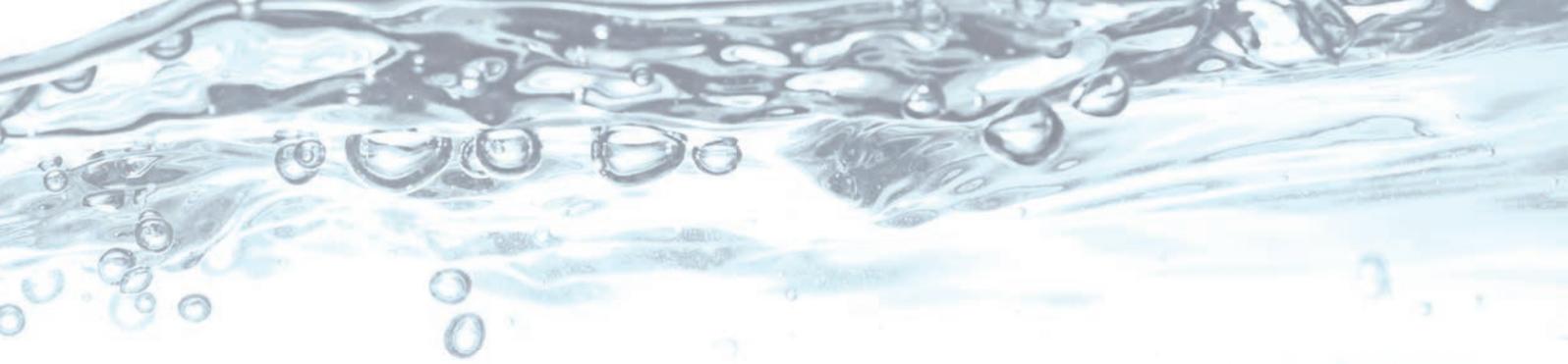


Mitsubishi Heavy Industries (MHI), one of Japan's largest shipbuilders and a leader in eco-ship technology, estimates that as much as 50-70% of the resistance experienced by vessels is caused by frictional resistance created between the skin of the hull and the surrounding water. This fact, and the great potential for possible fuel savings a reduction in friction could provide, served as the catalyst for MHI's efforts to develop an air lubrication system for use on commercial vessels.

The result of MHI's effort is the Mitsubishi Air Lubrication System or MALS, a system that uses specialized blowers to create a layer of bubbles that flow along the vessel's hull. A prototype was installed on a newbuilding in 2010, as part of a joint research project between MHI, ClassNK, NYK and MTI. This first vessel to be equipped with MALS, the module carrier *Yamatai*, was constructed by MHI at its Nagasaki Shipyard & Machinery Works and delivered in March 2010.

Research had shown that the MALS system would be most effective on slow moving vessels, with large flat areas on the hull, but that as the draught of a vessel increased, a greater amount of energy would be needed to supply sufficient air to the system at the higher pressure necessary, making it more difficult to increase the vessel's total efficiency.





The *Yamatai*, with a length of 162m and a beam of 38m, was considered the best type of vessel for the experiment by virtue of its wide, shallow-draught hull generating relatively little water pressure and accordingly minimizing the electric energy required for the air-blower to supply air to the vessel's bottom. It was in many ways the perfect test case for the innovative new technology, and the MALS was subsequently installed on a sistership, the *Yamato*, delivered in December 2010.

Results from the sea trials with the *Yamatai* and *Yamato* revealed substantial improvements in the vessels' fuel consumption: a 20% reduction in main engine power. However, the extra energy required to power the air blowers meant 7% of this saving was lost, and net energy savings were of 13% achieved during the trials.

These results were particularly impressive, says ClassNK Executive Vice President Yasushi Nakamura. "A 13% reduction, even given the calm conditions of a sea trial is a major breakthrough, and the system has proven effective in regular operations, as well."

Following on from this success, MHI looked to develop the system for application on other vessels, as well. While the MALS system itself is a relatively simple, according to Shuji Mizokami of MHI engineering the system for application to a variety of ships requires significant expertise: "One major obstacle is that it is not possible to adjust the size of the bubbles to the scale of standard ship models and so it is not possible to estimate the fuel efficiency benefits during model basin testing," he says. "As a result, estimating the effectiveness of the systems required complex calculations that require a high level of technical expertise."

"Moreover, the requirements of each ship type and operating conditions differ and the requirements in terms of air blower and pressure required will also differ. However, we believe that MALS can be developed for every type of ship."

To date MHI has produced a number of concept designs for MALS vessels, including the "ADM MAX" Post-Panamax bulkers on order by ADM at compatriot ship builder

Ferry Naminoue - blueprint for tests on other vessel types





“
The beauty of this program is that we are supporting the development of new technologies
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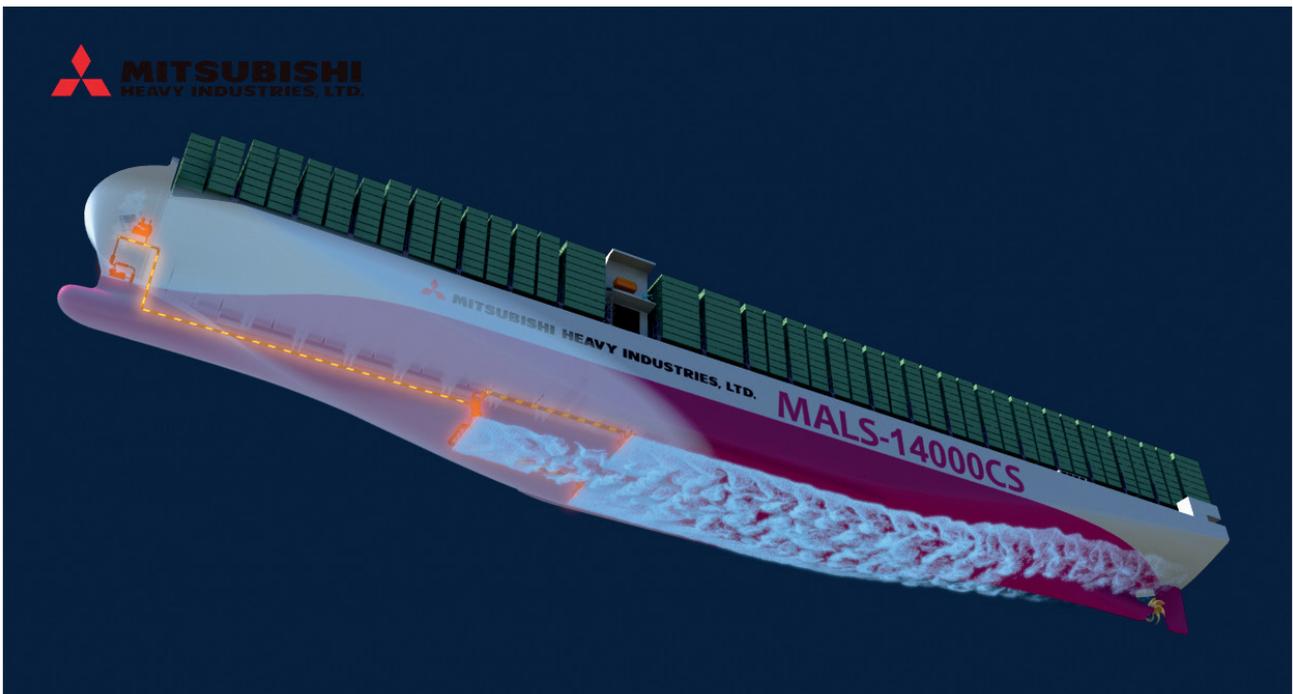
Noboru Ueda

Oshima, and MALS-14000CS, a new Panamax size 14,000 teu containership, which is designed to realize a 10% reduction in CO₂ emissions through application of the MALS system.

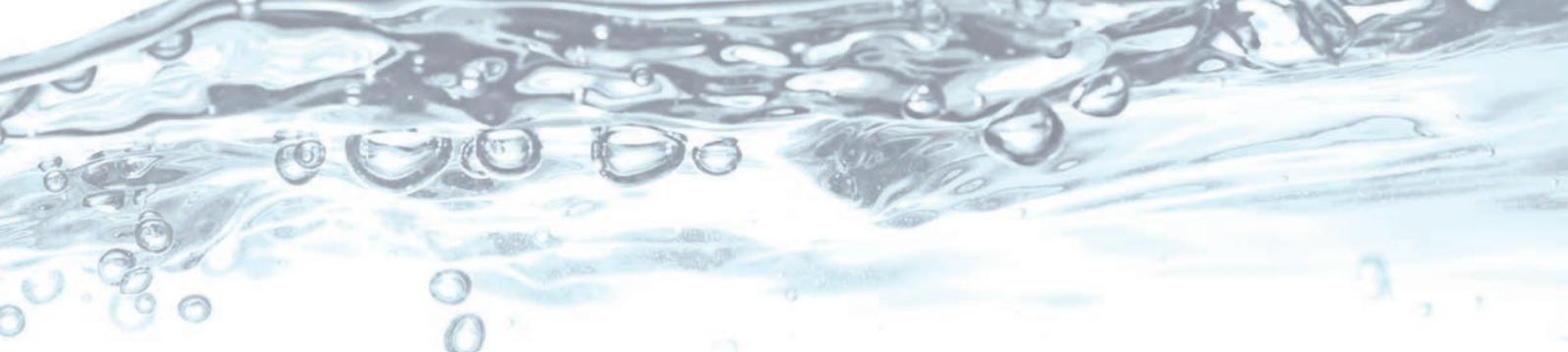
For large, flat bottomed vessels such as bulk carriers and tankers, MHI decided on a design that uses a single large blower outlet placed longitudinally near the bow, while more slender vessels like ferries and container vessels use a multiple outlet system, with outlets near the bow and down the vessel hull towards the stern.

Due to their large flat bottoms, bulkers and tankers were considered to be an easy target for application, but high speed vessels like ferries and container vessels were considered to be a more difficult challenge. Nevertheless, MHI carried out intensive studies to determine how to best apply the system to these vessels, and installed MALS on a newly built domestic ro-ro passenger vessel, A-Line's 3,380 dwt *Ferry Naminoue* in 2012.

Tests on the *Ferry Naminoue*, revealed that the MALS could be effective on small sized, slender vessels as well,



How the MALS would work on a large containership



although to a lesser extent than on the module carriers. Initial results from the project showed that the system had achieved 5% savings on the vessel, an impressive result, especially considering the high fuel consumption of high speed ferries.

The successful application of the MALS to the *Ferry Naminoue* also created another surprise according to Mr Mizokami. The use of the bubble system reduced the amount of vibration noise on the vessel and was, he says, "a completely unexpected, but very valuable benefit."

While efficiency gains on *Ferry Naminoue* were lower than on the two module carriers MHI is confident that modifications to the system will achieve positive results on other vessel types including PCTCs, bulk carriers, ferries, cruise and passenger vessels and container ships. MHI already has orders for a number of vessels that will make use of the system, including three bulk carriers for ADM, two passenger vessels for Aida Cruises, and two PCTCs for NYK.

With the first MALS equipped bulk carrier expected to be delivered in 2014, the first MALS equipped passenger vessel in 2015, it will not be long before the benefits of the MALS will be apparent for almost every type of vessel.

According to ClassNK Chairman and President, Noboru Ueda, the success of the projects is a direct product of the vast technical knowledge developed by the Japanese maritime industry over the course of the last few decades.

"For us at ClassNK, the important thing is that we find ways to use this vast knowledge and experience to develop revolutionary new technologies that will benefit the entire maritime industry, and we feel that MALS is one such key technology."

According to Mr Ueda, the Society has seen a tremendous surge in interest from shipowners around the world since releasing the first results from these projects, with inquiries from owners of all types of vessel seeking advice on using air lubrication systems on their ships.

"Our research has verified that MALS can greatly reduce green house gas emissions and improve fuel efficiency, now MHI is making this technology available for owners and vessels around the world," says Mr Ueda.

"We are still only in the first steps of using this technology, but the results so far have been impressive, and we are excited about its potential for the future."



ADM's 'super eco-ships' will be powered by Mitsubishi 6 UEC 60 LSE- Eco-A2 electronic engines and incorporate Mitsubishi's MALS system which will reduce CO₂ emissions

Interview: Hayato Suga

Taking a proactive role

Hayato Suga (right), General Manager of ClassNK's Natural Resources and Energy Department and the Chairman of the Tanker Structure Co-operative Forum, joined ClassNK In 1986 after graduating from Hiroshima University with a degree in naval architecture.



Initially he worked in plan approval and became a surveyor with almost all his work related to oil, gas, and chemical tankers. As a specialist in hull structures, his subsequent work with the specialized features of tankers has helped to greatly expand his knowledge and understanding of ship safety.

it gave me an incredible understanding and appreciation of the global tanker industry, which continues to inform my work to this day."

Though the majority of membrane LNG carriers are now produced in South Korea, the first LNG carrier to use Technigaz's Mark 3 (MIII) membrane tank technology was built to NK class in 1993 and Mr Suga was in charge of plan approval for the vessel. The MIII system comprised a variety of specialized materials relatively new to shipbuilding at the time, and in addition to reviewing the vessel's plans he was heavily involved in developing the survey and quality management processes necessary for the vessel's construction.

The majority of LNG vessels registered with ClassNK are MOSS type vessels. This is in no small part because Japan's three major shipbuilders all chose to use the MOSS type design for their own LNG vessels designs and NK's relationship with LNG carrier design and construction reaches back to the 1970s.

Mr Suga's direct superior was Noboru Ueda, now ClassNK Chairman & President. "Mr Ueda entrusted the project to me even though I was still in my 20s," says Mr Suga. "I am still extremely thankful that he gave me the opportunity because it was not a project where you could just do what you were told to do. I had instead to think about every aspect of the project and figure out for myself how to handle the approval and survey process, and that really fostered a comprehensive approach to problems that I continue to use to this day.

"At that time, international regulations for gas carriers did not exist, but experts in Japan, including specialists from NK, had been working for many years in an attempt to establish them. That work became the basis for the IGC code, which was applied to all gas vessels constructed from July 1986, and the technical core of these rules remain in effect to this today."

Much of the technological and technical development that served as the foundation for these new rules was carried out by an independent committee in Japan that drew its members from the top specialists in related industries. Experts from NK's staff were part of this committee and played an important role in establishing the technical and safety standards that would be applied to LNG vessels. This committee looked at every type of containment system available, including MOSS type tanks, membrane technology and IHI's SPB tank design.

"I became very involved in the development and implementation of the Condition Assessment Program (CAP) for oil tankers which the oil majors began to implement around 2000. As part of the development process we had to develop a method for assessing fatigue strength using hull structural damage and corrosion conditions from actual vessels. As part of the process I travelled back and forth to meet oil majors and shipowners. It was hard work but

While both MOSS and membrane tank technology had been developed overseas and licensed by Japanese builders, Japanese shipyards very much believed in the idea of the 'Manufacturer's Warranty', and in order to ensure

the quality of these advanced vessels they carried out extremely detailed analysis of production methods and processes.

“Builders at that time had nothing like the tools we had today, and their analysis tools and software were still extremely limited, but in spite of that they carried out incredibly comprehensive and time-consuming calculations. Looking back it is incredible to see the amount they accomplished,” says Mr Suga.

“Our contribution to that process is really the basis for all of our work in the LNG field, and our work today to contribute to the maintenance analysis, improve safety, and support the development of new LNG carrier concepts draws directly from that lineage.

“Given the increasingly high environmental standards with which the industry has to comply I think it is almost inevitable that the industry will turn to using LNG as a fuel. But thanks to a variety of complicated factors I think it is very hard to say just when the use of LNG as a fuel will become an industry standard. At ClassNK we have supported a number of projects to develop designs, technology, and prototypes of LNG fuelled vessels.

At the same time, LNG has been used safely as a fuel by LNG carriers for decades, and with the rapid pace of development in the past few years I think there are no real technical challenges to using LNG as a fuel. Today it is really market-based challenges, including infrastructure development, supply, and port restrictions, as well as the safety concerns related to bunkering flammable liquid gases that are the key to the widespread use of LNG as a fuel.

“These are areas which have traditionally been outside of the purview of classification societies, but as global technical organizations, we are increasingly being called upon to help address the challenges, and at ClassNK we are dedicated to taking a much more proactive role.”

Compared to ships, where there is a history of technical development and success reaching back thousands of years, the offshore field is still very new. Because of this there is still an incredible amount of development and invention that can be done. This, says Mr Suga, is the new frontier.

“At the same time, there is no standard format for offshore structures, so one has to evaluate the safety of each facility independently based on its individual concept, specification, and design architecture. With FPSOs and FSOs,

we are steadily developing construction and operational experience, but as an industry we still have no real experience with FLNG, and our experience with FLPG is still extremely limited.

“With FLNG in particular however, we are just entering the stage where these facilities are actually being constructed and I think that these technologies will rapidly enter common use. At ClassNK our goal is to promote this, and our joint research on new offshore concepts, providing our expertise to support designers, updating our rules to reflect new technology, and creating new more practical rules for offshore facilities designers are how we hope to do that.

“When people ask about the role of classification, I think the most common answer to questions about the role of class societies is that they exist to ensure the safety of ships and offshore facilities and protect the marine environment.

“I think our most important role is to use our long history and expertise in the maritime field, combined with our third party, independent position, to solve the problems of the maritime industry,” says Mr Suga. “At ClassNK we are constantly talking to stakeholders in the industry, asking questions about what needs to be done. From these conversations and idea exchanges we get a glimpse of the problems and aspects that the industry is really grappling with, and then try to develop new standards, frameworks or services to achieve these. It is that act of recognizing and responding to the industry’s needs that I think is our most important role.

The Tanker Structure Co-operative Forum (TSCF), which Mr Suga has chaired since the beginning of this year, is a platform for sharing experience and expertise related to tanker structures which feeds this knowledge back to ship designers and builders. Regular meetings include participants from the oil majors, shipowners and classification societies and the Forum also holds a special conference called the ‘Shipbuilders Meeting’ and invites shipbuilders and designers to attend.

“I think everyone who attends the ‘Shipbuilders Meeting’ comes away having learned an incredible amount that will be beneficial not to just to them, but to the entire industry,” says Mr Suga. “It is these gatherings, where we are able to express our views and exchange ideas with all related industry stakeholders and relate our concrete experiences and expertise, and in turn benefit the industry, that I hope to promote as Chairman.”

Extending frontiers for LNG

ClassNK has long experience with the transportation of liquefied natural gas and its support for LNG as a fuel and for floating liquefied natural gas (FLNG) technology is at the forefront of a global revolution

Emissions controls introduced by the International Maritime Organization's (IMO) Marine Environment Protection Committee and the introduction of Emission Control Areas in European, US and Canadian water, will have a profound impact on international shipping over the next several years.

Norwegian ferries and offshore support vessels in the North Sea are among those powered by liquefied natural gas (LNG). Increasingly this is being advanced as an attractive alternative to conventional marine fuels as longstanding concerns diminish over supply, bunkering and vessel design, aided immeasurably by the ISO draft standard complete with 24 performance objectives which addresses issues of design and operation relevant to LNG bunkering.

A particular attraction in using LNG is that it reduces sulfur oxide (SO_x) emissions by between 90 and 95% and nitrogen oxide (NO_x) emissions in order to comply with IMO Tier III limits.

Its lower carbon content leads to a reduction of carbon dioxide emissions by 20 to 25% and the fact that it could be offered at prices comparable to heavy fuel oil is another major plus.

However, there are key concerns in realizing gas fuelled vessels, notably in terms of storage and supply. LNG has roughly same calorific value as heavy oil but when loaded as fuel the required volume is twice the volume needed for heavy oil. For large ocean-going ships this means sacrificing space for fuel tank installation at the expense of cargo space.

Supply by fixed injector line from an onshore LNG storage tank is safe, but with the exception of a few specific areas where LNG fuelled ships are in service, the required infrastructures maintenance is insufficient. Questions also remain over the use of flexible hoses to supply fuel from a tanker truck placed alongside a ship docked at a wharf.

On the other side of the coin, supply by bunker ship, commonly termed Ship to Ship (STS) could compensate for the insufficient maintenance of infrastructure.

ClassNK guidelines governing the safety aspects of the application of natural gas for propulsion and auxiliary purposes, published in 2012, are based on the IMO's draft-status International Code of Safety for ships using gases or other low flash-point fuels (IGF Code). The guidelines provide comprehensive information on key design features including bunkering, hull structure, fire safety and explosion prevention measures.

"One of our most important missions as a classification society is to help ensure the safety of shipping as the industry looks to ways in which it can reduce its carbon footprint," says ClassNK Chairman and President Noboru Ueda. "These new guidelines have been compiled based on our vast array of technical expertise and experience. We hope to provide practical guidance for shipyards, manufacturers, owners, managers, and operators looking to prepare their fleets for a safer, greener future."

In December last year ClassNK released its second version of the *Guidelines for Gas Fuelled Ships* reflecting the requirements for the design of natural gas fuelled ships based on the outcome of discussions held at the IMO regarding the IGF Code.



Floating liquefied natural gas (FLNG) is revolutionizing the LNG industry and posing huge challenges for shipyards, equipment manufacturers, class societies and others as operators look to develop fleets of vessels capable of extracting and converting gas to LNG and offloading it to tankers for onward shipment.

The vast majority of LNG developments are taking place onshore but FLNG is expected to be a cheaper option and issues of land rights and environmental concerns could be avoided if FLNG systems are implemented.

ClassNK's *Guidelines for Floating Offshore Facilities for LNG/LPG Production, Storage and Offloading* address the wide variety of construction and survey requirements for FLNG and FLPG facilities including LNG/LPG Floating Production, Storage and Offloading facilities (FPSO), Floating Production and Offloading facilities (FPO), and Floating Storage and Offloading facilities (FSO).

"Ongoing environmental and logistical concerns related to onshore gas production have helped spur new interest in offshore LNG and LPG projects," says ClassNK Natural Resource and Energy Department General Manager Hayato Suga. "With this new team, we have brought together ClassNK's top experts from both the LNG and the offshore sectors, and these guidelines are the first result of our increased commitment to this growing sector."

Due to their highly sophisticated nature, offshore gas facilities have been evaluated primarily on a project-by-project basis and the guidelines address uncertainties about lack of clarity in applying particular class rules. "For example," says Toshiyuki Shigemi,

General Manager of the ClassNK Development Department, "LNG FPSOs fall under both the scope of our rules for FPSOs developed in 2009, as well as our rules for vessels carrying gas in bulk. With these new guidelines we have created a single reference for all the rules that apply to floating gas facilities.

The guidelines incorporate a number of requirements exclusive to offshore gas facilities including information on analysis of environmental conditions and mooring systems and hull structural requirements. They cover the wide range of requirements that apply to such structures, including rules for production machinery, piping arrangements and other equipment to be outfitted.

ClassNK is addressing key issues including the lack of a real track record for natural gas production on marine floating structures directly exposed to waves, unproven reliability of new off-loading systems, increased difficulty responding to incidents at sea due to limited accessibility to offshore production sites and limited access for maintenance compared to on-shore facilities.

The Society is working with manufacturers, shipyards and operators on a number of projects including the development of a highly advanced strength and mooring analysis tool and new inspection and survey schemes which make use of simple sensors to improve maintenance activities throughout the vessel's life.

With much of the world's undeveloped offshore gas reserves in small and mid-size gas fields, oil companies are looking for new solutions to expand the frontiers such as the LiBro® FLNG, a new floating LNG system designed

specifically as an economical solution for the development of small to mid-size gas fields.

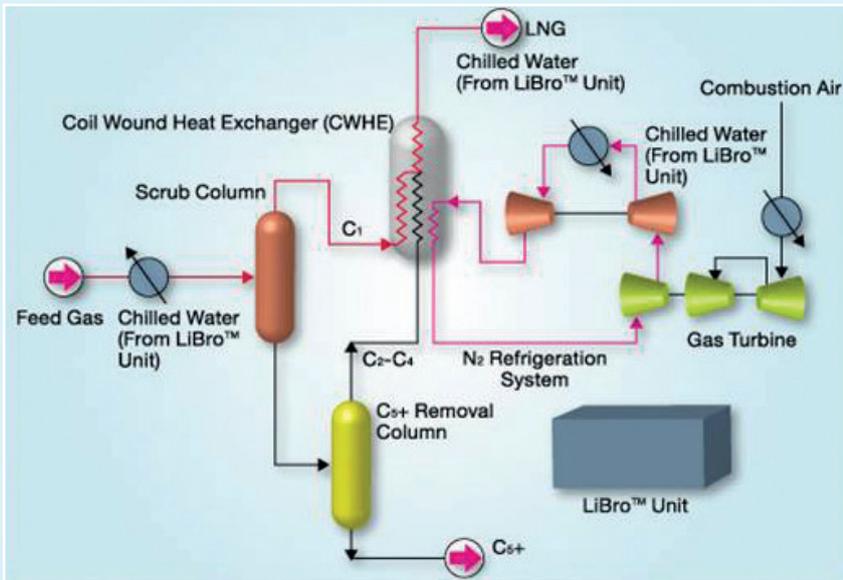
The concept combines Japanese innovation and American technology developed as part of a joint research and development project by Tokyo-based MODEC, one of the largest Floating Production, Storage and Offloading (FPSO) suppliers/operators, leading plant manufacturer Toyo Engineering, with major support from ClassNK.

The LiBro® FLNG system offers safety, reliability, operability, and efficiency and, combined with its small Capex requirements and ease of deployment, it has attracted attention from national oil companies and the technology being used in the Front End Engineering Design (FEED) of FLNG projects under development.

"As a design which has the potential to greatly increase the scope of offshore gas development, especially for small and mid-size fields, we were particularly excited about the LiBro® system and began a joint research and development project with MODEC/TEC for 10 months from September 2011 to June 2012," says Mr Suga.

"During this time, we had weekly meetings concerning the marine and topside design; we also witnessed the LiBro® absorption chiller dynamic motion testing and were very impressed by the result.

"One of our main contributions to the project was risk and safety assessment of the LiBro® FLNG design as a third party. As part of this process we carried out the hazard identification (HAZID) meetings to identify risks and potential areas for improvement. Through such whole process, we confirmed satisfac-



tory integrity, feasibility and safety of the LiBro® FLNG design and eventually issued Approval in Principle (AIP) to the design.”

The LiBro® FLNG has been developed specifically for deployment offshore, implementing cutting-edge technology with a conventional ship form, expanding the range of yards capable of building the system, and even making conversions of existing vessels a practical possibility. Its core technology is a combination of MODEC’s LiBro® technology with Air Products’ Triple N2 Expander Liquefaction technology (Air Products® AP-N LNG Process).

While the safety of N2 refrigerants is widely accepted, the limited efficiency of such systems has prevented their widespread use in FLNG systems. MODEC’s LiBro® technology addresses these concerns by using Lithium Bromide absorption refrigeration technology that produces chilled water using waste heat from gas turbine exhaust. Such systems are already used in centralized mega air conditioning systems onshore and to date in excess of 10,000 such units have been delivered, with the largest in operation for over five years.

The flow process integrates the LiBro® unit with Air Products® AP-N LNG Process so that the chilled water produced in the unit pre-cools the natural gas and N2 refrigerant, resulting in improved LNG train efficiency. Chilled water is also used for cooling the gas turbine combustion air and thereby maximizes output of the gas turbine driver. This integration improves the overall efficiency of the LNG train, makes available greater gas turbine power and achieves increased LNG capacity with the selected gas turbines.

The cooling system is another of the key elements which sets LiBro® FLNG aside from traditional LNG systems. Most FLNG systems use flammable hydrocarbons such as methane, ethane or propane to cool and liquefy the gas, increasing both environmental and safety concerns. Equally, as the crew’s accommodation space must be kept a safe distance from these flammable chemicals, the hull and topside of traditional FLNG systems must be large enough to ensure that sufficient space is available between the cooling system and the accommodation area.

LiBro® FLNG’s cooling system, however, uses non-flammable nitrogen

instead of hydrocarbons, eliminating these safety and environmental concerns, while also reducing the space required for the entire FLNG system. As a result, the LiBro® system offers a compact alternative to other systems, requiring less overall topside space, and as a result, a smaller hull structure.

Another key difference in the LiBro® FLNG is the choice of storage tank systems. The LiBro® FLNG uses IHI-SPB (Self-supporting Prismatic-shape IMO Type B) Tank developed by Japan’s IHI in the 1980s. SPB tanks have been used previously in gas carriers, but are increasingly being chosen for use in FLNG designs thanks to their resistance to sloshing and the flat, open deck space that use of the tanks allows.

At the same time, because the SPB tank is available as an independent tank design it can even be retro-fit onto existing hulls. This not only allows for the tank system to be built separately from the hull (conceivably even by different shipyards), but also opens the door to converting existing merchant vessels to FLNG systems. This represents a major step towards reducing the overall capital expense necessary to construct FLNG systems, and allowing greater development of offshore gas reserves.

According to Mr. Suga, it is this kind of support for new technology that drives ClassNK dedication to the offshore sector: “By providing guidelines for new technology, and proactively supporting the development of new, revolutionary new systems for use in the offshore sector, we hope to help promote innovation and safety for our entire industry. LiBro® and other systems are a major step forward for our industry, and at ClassNK we believe this is only the start of many more innovations to come.”

ClassNK events in 2014

- ◆ **GST, OSLO, 18TH MARCH**

Delivering proven savings through cooperative thinking - a landmark in trim optimization
by *K. Nagata, ClassNK Marine & Industrial Services Division*
& *Esa Henttinen, Executive Vice President, NAPA for Operations*

- ◆ **ASIA PACIFIC MARITIME, SINGAPORE, 19TH - 21ST MARCH**

- ◆ **GASTECH, SEOUL, 24TH - 27TH MARCH**

- ◆ **SEA JAPAN, TOKYO, 9TH - 11TH APRIL**

Introduction to the IACS Harmonized CSR compliant software “PrimeShip-HULL(HCSR)” - Aiming for a total design support tool
by *Y. Sasaki, ClassNK Hull Rules Development Department*

Proven savings through performance monitoring and optimization, ClassNK-NAPA GREEN”
by *K. Nagata, ClassNK Marine & Industrial Services Division*
& *Naoki Mizutani, President, NAPA Japan*

- ◆ **CHINA INTERNATIONAL DIESEL ENGINE SUMMIT - MARINE FOCUS, SHANGHAI, 23RD - 24TH APRIL**

GHG Emission Reduction
by *H. Hara, ClassNK Machinery Department*

- ◆ **GREEN SHIPTECH CHINA CONGRESS, SHANGHAI, 24TH - 25TH APRIL**

EEDI Verification on Minimum Propulsion Power and Speed Trial
by *R. Miyake, ClassNK EEDI Division*

Optimizing Ship Operations with ClassNK-NAPA GREEN
by *K. Nagata, ClassNK Marine & Industrial Services Division*

- ◆ **OTC, HOUSTON, 5TH - 8TH MAY**

- ◆ **PROPULSION & EMISSIONS CONFERENCE, HAMBURG, 21ST - 22ND MAY**

Delivering proven savings through cooperative thinking - a landmark optimizing ship operation
by *K. Nagata, ClassNK Marine & Industrial Services Division*
& *Esa Henttinen, Executive Vice President, NAPA for Operations*

- ◆ **POSIDONIA, ATHENS, 2ND - 6TH JUNE**



As maritime needs grow, ClassNK has solutions.

As the world's economy grows and changes, the maritime industry is faced with ever greater challenges. With roughly 20% of the world's merchant fleet under class, we understand the requirements for the future of safe shipping, and we're working to develop new tools and technologies to meet the changing needs of the maritime industry. Learn more about our efforts to advance maritime safety and protect the marine environment at www.classnk.or.jp



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