

Promotional supplement  
in association with

**ClassNK**

**Ship&Offshore**

**Schiff&Hafen**

# Partnership and growth



# CONTENT



< 3 >

COMMENT

Partnership and growth

< 4 >

TOKYO IN HAMBURG

ClassNK nails its colors to the mast in Germany

< 6 >

INTERVIEW

A core research and development mission

< 8 >

OPTIMIZING PERFORMANCE

Innovative solutions set the industry standards

< 10 >

OPTIMIZING SHIPBUILDING

Meyer Werft builds on long and fruitful relationship

< 12 >

BALLAST WATER TREATMENT

Removing the ballast water bottleneck

< 14 >

SHIP DESIGN

Unrivalled service and reliability

< 15 >

GREEN SHIP RECYCLING

From cradle to grave

< 18 >

GREEN SHIP RECYCLING

PrimeShip-GREEN embraced for recycling

< 19 >

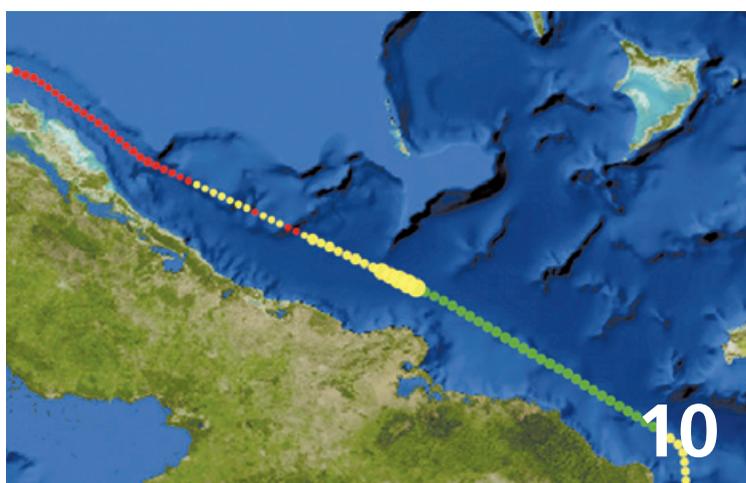
LIQUEFACTION RESEARCH

Growing relationship with HSVA

< 20 >

LNG MAKING ITS MARK

Fuelling the future



# IMPRINT

In cooperation with

**Ship&Offshore**  
**Schiff&Hafen**

Published by

DVV Media Group,  
Hamburg, Germany

Printing house

L.N. Schaffrath GmbH & Co.  
KG, Geldern

# Partnership and growth

Over the 45 years I have worked in the maritime industry, I have witnessed tremendous changes. As a former surveyor, one of the most important has been the changing role of classification societies and I am often asked about the role classification societies will play in years to come.

Many classification societies are expanding, investing their resources into new fields beyond the maritime industry and becoming global certification organizations in fields from food safety, to business assurance and beyond. At ClassNK, we continue to take a more traditional approach and believe that classification societies exist to support the maritime industry.

This commitment is reflected throughout the structure of our organization, with more than 70% of staff, including myself and my fellow executive officers, either naval architects or marine engineers. It is why, some 115 years after our founding, we continue to operate on a technical non-profit basis, committed to maritime safety, protecting the marine environment and supporting the development of the global maritime industry. Even as ClassNK has grown to become a global organization with more than 130 global offices, we have maintained that commitment.

A key element of this commitment is understanding that ship classification is about partnership. While class societies have historically played a role as regulators, creating and enforcing technical rules and regulations, we cannot just seek to regulate the industry. As rules and regulations grow ever more numerous and complex, we have to do more.

In the face of daunting technical challenges we must provide the rules and regulations, the technical know-how, advice and support to help the industry achieve compliance efficiently and effectively. We must become better partners with our stakeholders to ensure a safer and greener future.

At the same time, despite the global nature of our industry and ever-changing technology, this is still a human and personal business. For all the video conferencing and data analysis, partnerships that work best are those built on a handshake and a face-to-face meeting.

Nowhere has this been more evident than in Northern Europe where even though ClassNK's presence extends back over half a century, our presence in the industry has grown only since establishing our new Survey Headquarters in Hamburg in 2011. This was in direct response to owners in Germany and Northern Europe who told us we needed to provide better service, in local time, and face-to-face where possible. The Survey Headquarters has continued to expand and is more than a local office – indeed, an extension of our head office, which is in constant contact with clients and surveyors throughout the world.

The maritime industry in Germany and beyond has responded. Since establishing the new headquarters German owners alone have moved more than 3 million gross tons to the NK



Noboru Ueda,  
chairman and president,  
ClassNK

register. Of the vessels joining in 2013 roughly one third were transferred from other classes, with some 60% coming from European owners. Our Survey Headquarters in Hamburg has become the basis for a new, stronger partnership with the entire European maritime community.

Partnership cannot be shallow; it must be encompassing and this is why our mission is to support the entire maritime industry, including yards and owners, ship designers, equipment and machinery manufacturers, research institutes and academic institutions.

Our recent acquisition of Finland's NAPA represents one facet of this approach. By joining forces and collaborating with the leading minds and developers from around the globe, we can innovate and create new solutions and help bring the latest technology to every stage of the ship lifecycle.

Our support is not limited to services. We contribute to the growth of the industry through maritime research and development. Since 2009 we have been greatly expanding this with the establishment of our Joint R&D for Industry program, which focuses on classification or rule development related-issues and allows us to work directly with stakeholders throughout the industry to develop new tools and technology.

Our R&D investment has grown to nearly 20% of our annual revenue and we have provided funding and support to nearly 300 projects. This program has helped fund new technologies like our voyage monitoring and optimization system ClassNK-NAPA GREEN and new technology to support efficient ship recycling. Many of the projects supported by this program were based initially in Asia but we are funding more and more projects in Europe, including our first projects in Germany.

There is always more to be done to support the maritime industry but these projects represent important steps in our efforts, which we hope will form the foundation for even greater partnership in years to come. >

# ClassNK nails its colors to the mast in Germany

The 6,668 gt multi-purpose cargo ship *Bremer Fortuna* is the first German flag vessel to be registered with ClassNK



Around 190 German-owned vessels comprising approximately 3.8 million gross tons have signed on ClassNK since 2012, with a third newbuildings and the remainder transferring class.

The transfer of class (TOC) process is set to intensify as container ship owners in Germany increasingly look to the Japanese Society for their requirements.

As the largest organically grown non-profit classification society with more than 20% of the global market share, ClassNK has declared 2014 the 'Year of the Container' in Germany, as owners look beyond the society's traditional strengths in the bulk and tanker sector, and ClassNK further expands its operations.

This significant expansion has been achieved in just over two years since ClassNK established an attachment to the Hamburg office. Technical director, Akizumi Miura, was seconded to Hamburg to take a leading role in the HafenCity office, with power of on-the-spot decision-making on all matters related to the German shipping community. Jin Kinoshita, principal surveyor, was relocated from the London-based regional office to Hamburg for the same reason.

Both are authorised to clarify all class-related issues and instruct both ClassNK Tokyo head office to issue certificates and all surveyors globally. This technical decision-making capability has been made available for the first time outside Japan to maximise efficient operation.

In June 2013, ClassNK reinforced its commitment to the German market by bringing in Mr Thomas Kreissl as marketing director in Germany. He has an extensive background in classification and knowledge of specific German market requirements.

The Hamburg team is supported by Dr Volkmar Wasmandorff, senior advisor to the executive board of ClassNK. Dr Was-

mandorff worked in Asia for nearly two decades and spent five years as executive vice president of Germanischer Lloyd for Asia/Pacific. His customer-oriented focus - supported by the board of ClassNK - is one of the driving forces of ClassNK's tailor-made strategy for expansion in Germany.

The radical restructuring has seen the initial focus shift from East Asia to Europe and ClassNK's services have already been available on a large scale to customers in Germany for more than two years. One driver for this development has been the increasing commercialisation of members of the International Association of Classification Societies (IACS).

"In addition, the merging of classes due to economic reasons is another motivation for ClassNK to better serve the German market," says Dr Sergej Dalberg, general manager of Hamburg's survey office.

Unlike some other classification societies, which have diversified from merchant shipping to focus more on oil and gas and renewable energy, ClassNK remains committed to serving merchant vessels. As a non-profit organization, the society invests 15 to 20% of annual turnover into joint research and development (R&D) projects with shipowners, yards, German and international R&D institutes. ClassNK's financial support for the maritime community is three times that of other societies.

"Shipowners evaluate and know the situation and understand our message," says Dr Dalberg. "They look at ClassNK's 100% focus on their maritime business, ClassNK's highest technical capability, the corporate spirit and the service level provided in Hamburg by the Japanese society.

Quotations submitted here are particularly reasonable; they offer value for money. Everything is kept within the society and

used for the benefit of clients. A society without a profit-driven shareholder has the advantage that nobody is extracting money.”

A key element of ClassNK’s strategy in Hamburg centers on establishing and maintaining direct links with each individual customer. Customers’ overall classification cost consists of annual fees. On the other side, ClassNK generates benefits for customers when taking over responsibility to settle port state control (PSC) issues or claims from authorities on behalf of the shipowner or as a technical supporter.

ClassNK is recognised internationally and in Hamburg as well for its high levels of service and quality. The society is present on industry exhibitions and conferences such as SMM. Service for box ships and all other ship types is paramount and ClassNK’s global network guarantees timely and emergency services as and when required.

ClassNK marked its new era in Germany in September 2012 when its chairman and president Noboru Ueda presided over a special signing ceremony at the Radisson Blu Hotel in Hamburg at which leading German companies RHL Reederei Hamburger Lloyd GmbH & Co KG, BF Shipmanagement GmbH & Co KG and Johann MK Blumenthal GmbH & Co KG officially transferred a total of five container ships, three Capesize bulk carriers and one Panamax size vessel to the ClassNK register.

On this occasion, Ueda said: “It gives me great pride to say, that as we celebrate the 30th anniversary of the opening of our office here in Hamburg this year, we are also marking our greatest success in Germany to date, and it is our great pleasure to be standing here alongside some of the finest companies in the German maritime industry.

The vessels we welcome into the ClassNK register today are the strongest evidence of the success of efforts which we began here in Hamburg less than a year ago to revolutionize the way we operate.

I believe that today’s signing ceremonies are an important step forward, not only here in Germany, but for our activities around the world. In turn, I think they are evidence of the strong foundation we are building for our success both now and in the years to come. We promise to continue our efforts to better support the growth and development of the maritime industry here in Europe and provide even better service to owners and operators throughout the maritime community.”

During the Nor-Shipping 2013 exhibition, ClassNK revealed further expansion plans in Europe and, in particular, the opening of a new German office in Würzburg, which has now been established. Worldwide, ClassNK opens one new office according to customers’ requirements every two months.

In June 2014 the society announced that it had earned authorisation from Germany’s Federal Maritime and Hydrographic Agency (BSH - Bundesamt für Seeschifffahrt und Hydrographie) to carry out security surveys (ISPS) on behalf of the German government for all German flag vessels. As the notified body for German flag vessels under the European Union Maritime Equipment Directive (MED 96/98/EC), BSH oversees all security aspects of the German flag.

Fifty representatives from the German maritime community

attended a reception at the prestigious Hafen-Klub to commemorate the authorisation.

The event also marked the society’s registration of its first German flag vessel, the 6,668 gt multi-purpose cargo ship *Bremer Fortuna*, owned by Kollmar-based Reederei Rörd Braren Bereederungs GmbH & Co KG.

“This recognition is an important step forward in our ongoing expansion here in Germany,” said Mr Ueda. “We are deeply honored to be able to serve on behalf of the German flag administration, and will dedicate our full resources to supporting the needs of the German maritime community in the days and years to come.”

In addition to its presence in Hamburg, which now stretches over three decades, ClassNK is well established in STG (German Society for Maritime Technology) and the Deutscher Nautischer Verein. The society has close contacts with major German ship design companies including Neptun Ship Design GmbH in Rostock, Ship Design & Consult GmbH in Hamburg and with the globally renowned ship test tank facility, Hamburg Ship Model Basin (HSVA = Hamburgische Schiffbau-Versuchsanstalt GmbH).

ClassNK is supporting joint projects with German maritime stakeholders. International or internal projects have been, or are, related to safe carriage of nickel ore, LNG as fuel, energy efficiency improvements, reduction of emissions, ballast water management systems et cetera.

The society is offering its partners in Germany both software and training for CSR-H, the harmonised version of the Common Structural Rules for the design of tankers and bulk carriers.

As German shipowners move more ships to European flags, ClassNK is looking to play a larger and greater role. The society is recognised by 111 flag states, including the Luxembourg administration for ships flying the Luxembourg flag, and is currently in negotiations with other administrations to serve all customers in the most professional manner. >



Noboru Ueda, chairman and president of ClassNK and Captain Rörd Braren, managing partner of Rörd Braren Bereederungs GmbH & Co KG mark the registration of the Bremer Fortuna at the Hafen-Klub in Hamburg

# A core research and developme



Yasushi Nakamura,  
executive vice president,  
ClassNK

## *How has ClassNK come to play such a big role in maritime research and development?*

We have always believed that contributing to maritime R&D was one of our core missions, and it is why we have maintained our independent ClassNK Research Center since the 1950s. Until recently, this research focused on class-related topics such as developing newer and more rational rules for vessel construction and operation, or addressing new regulation.

The market crisis of 2008 presented us with an opportunity to better contribute to the development of the maritime industry. Even as concern about the environment and new regulations were presenting yards and owners with daunting new challenges, the crisis meant there was a lack of financial resources and leadership to enact the R&D necessary to address these. Joint research with industry partners was one way we could contribute and we established our Joint R&D for Industry Program in 2009.

The first projects were part of a Japanese national research effort and we have since expanded our program worldwide. We

have more than doubled our investment in R&D as a share of revenue to nearly 20%, and last year we devoted more than USD 50 million into maritime R&D; the majority of which was part of the Joint R&D for Industry Program.

## *Why the focus on joint R&D as opposed to independent research?*

In part, it is because the industry faces daunting technical challenges. For an issue like greenhouse gas emission reduction, we need to find comprehensive solutions. This requires the involvement of a large number of industry stakeholders including equipment and machinery manufacturers, shipyards, owners and charterers.

As a third party it is often possible for us to organize research projects that bring even the fiercest competitors to work together for the sake of themselves and the entire industry. This is one of the best aspects of the entire program and an important achievement

Joint R&D is a great platform for tackling large or complex technical issues. The research capabilities of individual companies or organizations are limited, but by working together and pooling resources we make a much greater impact in a shorter time.

## *What does ClassNK contribute to these projects? Is it research support, funding, or organization?*

The Joint R&D for Industry Program projects are industry-driven. Our partners come to us with the vision and the objectives and we might provide a combination of research assistance and funding or serve as the secretariat for the project.

We have supported nearly 300 joint research projects. Each has been unique. Some last a few months and have budgets of a few thousand euros; others are multi-year projects with budgets reaching millions of euros. Our contribution is always tailored to the needs of each project and the vision of our partners.

## *Can you elaborate on projects in Europe, and Germany in particular?*

The objective of our R&D is to contribute to the maritime industry and to be global in scope. As we have expanded in Europe we have expanded the program in Europe. Last year we began a project with Greece's "Maria Tsakos" Foundation and we have begun projects with German universities like the Technical University of Munich (TUM), as well as German shipowners and designers.

## Executive vice president Yasushi Nakamura answers the key questions

# nt mission

### *How has the expansion of your office in Hamburg and your general expansion in Europe helped bring this about?*

ClassNK has traditionally been perceived as very much an Asian classification society even though we have maintained offices in Europe for more than 50 years. This has changed. In addition to the expansion of our Hamburg office in 2011, we opened four new offices in Northern Europe in 2013. There is a very clear and growing understanding in Europe that ClassNK understands the needs of the local owners, is making decisions locally based on local needs, and is working to support the local maritime industry.

This has also had benefits for our Joint R&D for Industry Program. As our relationship with German and other European stakeholders has grown, we have come to better understand their needs and challenges. Shipowners are not only more comfortable proposing ideas for new research to us, but as an organization we are able to propose and develop projects that directly address the needs of local shipowners and designers.

### *The use of LNG as a fuel is an important issue in Northern Europe. What is ClassNK doing in this area?*

This is a major topic in Europe and around the world. We have been one of the major proponents of the implementation of this technology in Japan and in the Far East especially, and are working to expand our contribution globally.

Even as we want to drive the industry forward, we want to focus on the practical aspects and challenges presented by any given technology. It may seem simple, but rather than develop a concept vessel that might reflect something in use 20 years from now we want to help develop and refine practical technology that could be used now or over the next several years. It is why we have been very heavily involved in R&D related to the safe operation of dual-fuel engines, as well as the practical application of LNG fuel systems to smaller vessels like tugs.

I think our research with TUM is a great example of how we can use our R&D projects to help better understand a given problem and refine existing technology with a view towards future changes in the market.

### *What do you think ClassNK specifically can contribute to the area of ship design?*

We have great respect for ship designers and their essential work and do not want to attempt to duplicate their work. We try and

help designers by feeding back our extensive knowledge and experience to help them develop new and better tools.

There are more than 8,600 vessels on our register, which we survey each year, and as many as 600 vessels that are designed and built to ClassNK rules each year. Our records reach back more than a century so we have an incredible amount of data on ship design and what happens over the course of a vessel's service life.

We constantly analyze this data and forward the insights to ship designers. Even relatively minor changes like changing the shape of the stiffeners in a vessel's holds can significantly improve the safety and efficiency of a design. While we cannot publicly discuss details of every project, we are working with a number of leading German ship designers and are honored to be able to make such a contribution to the German maritime industry. We provide this advice freely.

We want to make the design process easier for ship designers. As a classification society, we are tasked with developing new and more rational rules, but the reality is that as we develop new rules, the ship design process becomes ever more complex. New rules like the Harmonized Common Structural Rules (CSR) and the IMO's Goal-Based Standards will undoubtedly lead to safer and more robust ships, but they will also place new burdens on designers.

Wherever possible we want to find ways to reduce the burden. It is our responsibility as a classification society and is why we have worked so hard to develop and release design support and rule calculation software for the new IACS Harmonized CSR. ClassNK was the first society to publicly release design support software for the Harmonized CSR, and in line with our non-profit mission, we are providing it free of charge.

Although the rules have yet to be finalized, more than 500 users at more than 70 shipyards and design firms use our software to evaluate existing designs against the new rules and determine the effect of the rules on their new designs. While we continue to develop the software, we have been able to drastically reduce the time needed for designers to carry out the additional analyses required by the Harmonized CSR to the point where almost no additional time is required. This makes a tremendous difference in the time and cost required for ship design. )



The 26,500 gt RoPax ferry *Stena Mersey*, built in 2005 and deployed on the Belfast to Liverpool route, makes a key contribution to the group's energy saving initiatives

# Innovative solutions set the industry standards

ClassNK-NAPA GREEN, the pioneering eco efficiency and operational software optimization solution is allowing owners to move from strength to strength as it achieves hugely impressive environmental and economic benefits.

ClassNK-NAPA GREEN has generated fuel savings of 3.8% on a "K" Line (Kawasaki Kisen Kaisha Ltd) container vessel, returned impressive test results on Wan Hai Lines' 4,680 TEU *Wan Hai 516* and it is seen as a vital element of Stena Line's energy saving programme.

"K" Line tested the software solution in full scale sea trials in January 2014 aboard an 8,000+ TEU container ship operating on a standard Mediterranean/Europe route. The full ClassNK-NAPA GREEN suite of systems were utilized on the voyage, including speed, trim and voyage optimization based on the ClassNK-NAPA GREEN Dynamic Performance Model, and analyzed against the captain's voyage plan.

Despite heavy weather on a number of occasions during the voyage, speed profile and voyage optimization reduced the fuel consumption by 2.7%, while a further 1.2% savings were attributed to optimum trim, taking the total reduction in fuel consumption from the trial to 3.8%.

Trim optimization was restricted due to loading conditions though results from a full-scale trim optimization study, conducted during two Indian Ocean crossings aboard the vessel, indicated that trim optimization had the possibility of fuel savings of up to 4%.

It was also found that the accuracy of Dynamic Performance Model – the self-learning component of ClassNK-NAPA GREEN – was extremely high. In terms of fuel consumption prediction the

accuracy was as high as 99.6%, which is unprecedented in the industry.

Commenting on the results, ClassNK's executive vice president Yasushi Nakamura says: "The fuel savings revealed through the "K" Line ClassNK-NAPA GREEN sea trials demonstrate the incredible environmental and economic benefits that ship designers, operators and charterers can achieve with innovative software solutions like ClassNK-NAPA GREEN. After 18 months of development, to have achieved this amount of savings at this stage in the project is an exciting milestone of particular significance to the container sector, which operates at higher speeds and is therefore more sensitive to speed and trim optimization than slower vessels.

"K" Line is one of many operators realizing greater efficiency in operation through the application of ClassNK-NAPA GREEN, including container owners and operators such as Wan Hai Lines and Shoei Kisen. The Finnish shipping operator Bore is also currently installing the system to its fleet of RoRo vessels, following successful trials on board the 2,863 lane meter (lm) RoFlex vessels *Bore Sea* and *Bore Song*. On these two vessels the system has proven savings between 4% and 6%."

NAPA's executive vice president Esa Henttinen adds: "The results of ClassNK-NAPA GREEN's full-scale voyage optimization trials mark a landmark in the development of operational efficiency software. If "K" Line can save 4% in fuel costs for one vessel alone, then the potential savings across its entire fleet is significant. Although software solutions to optimize fuel consumption are nothing new, the differentiating factor for

ClassNK-NAPA GREEN is the software's Dynamic Performance Model. It tunes the ship specific performance model on a continuous basis to give very accurate, transparent and true performance statistics to improve voyage optimization, trim optimization and performance reporting with payback on investment realized within months."

Wan Hai Lines, the leading Taiwanese carrier, was the first commercial operator to install ClassNK-NAPA GREEN ship efficiency software on board *Wan Hai 516*, a 4,680-TEU vessel, delivered by China Shipbuilding Company (CSBC) in April 2013.

How and why did Wan Hai Lines become the first commercial operator to install the system?

"At Wan Hai Lines, we are always striving to offer our customers a competitive and comprehensive service, which means operating at the highest levels of efficiency," says Sanders Jong, vice president of the Marine Division at Wan Hai Lines.

"It is our mission to provide the best possible service, and we are constantly seeking ways to improve our business," he adds. "The early adoption of innovative technological solutions such as ClassNK-NAPA GREEN has seen us take a leading position in the Asian container market.

"With 72 vessels operating on an extensive range of routes stretching across Asia, fuel efficiency presents both our greatest challenge and greatest opportunity," Jong continues. "In order to take advantage of this, we chose to install ClassNK-NAPA GREEN on the 4,680-TEU container ship *Wan Hai 516*, delivered by China Shipbuilding Company (CSBC) in April 2013, to see if we could improve our fuel efficiency.

"Results to date have been most favorable and this has certainly given us an edge over the competition. The carrier examined a variety of technologies before ultimately choosing ClassNK-NAPA GREEN. Many new efficiency systems make various claims of great savings," Jong further explains. "However, few of these are actually backed up by proven results. ClassNK-NAPA GREEN on the other hand was already installed on an operating vessel as part of verification testing and the claims made by the system are backed up with proven results.

The trim optimization and voyage planning features combined with weather routing has just been conducted and we hope this will allow us to achieve highly efficient and economical operations.

In addition, the ability to create a performance model based on both a generic hull form and actual hull allowed us to carry out propulsion resistance management, which is vital for both efficient operations including speed optimization for just-on-time arrival."

Wan Hai Lines chose to deploy *Wan Hai 516* in the tests because the vessel was one year old with everything on board in particularly good order and because the company considered its voyage pattern to be most beneficial.

Asked about the operator convenience of the software Jong says: "ClassNK-NAPA GREEN is both comprehensive and user-friendly. With its intuitive design it is easy to analyze and track the vessel's performance and fuel saving activities, which can be used for reports for future actions.

As the system can be used to plan, monitor, and follow-up operations, we are able to increase eco-efficiency and reduce fuel consumption. The data collected automatically from voyages can then effortlessly be used to create reports as well as graphs for easy analysis.

Our main hope for the system was to optimize our fuel efficiency and fulfill Ship Energy Efficiency Management Plan (SEEMP) regulations," he continues. "While various new indexes such as the Energy Efficiency Operational Indicator (EEOI) are good indicators of energy efficiency, they generally lack other important parameters such as the ability to take weather conditions into account.

Stena Line, which operates 39 modern and flexible RoRo, RoPax, combi and high-speed ferries on 23 routes covering Sweden, Denmark, Norway, Latvia, Poland, Germany, the Netherlands, France, the United Kingdom and Republic of Ireland, sees ClassNK-NAPA GREEN to become a vital element of its energy saving initiatives.

The company, which carries 1.9 million freight units, 3 million cars and 14.5 million passengers annually, plans to install the system on the RoPax vessels *Stena Ask* and *Stena Urd*, operating between Travemünde and Leipaja in the Baltic and the *Stena Mersey*, deployed on the Belfast to Liverpool run.

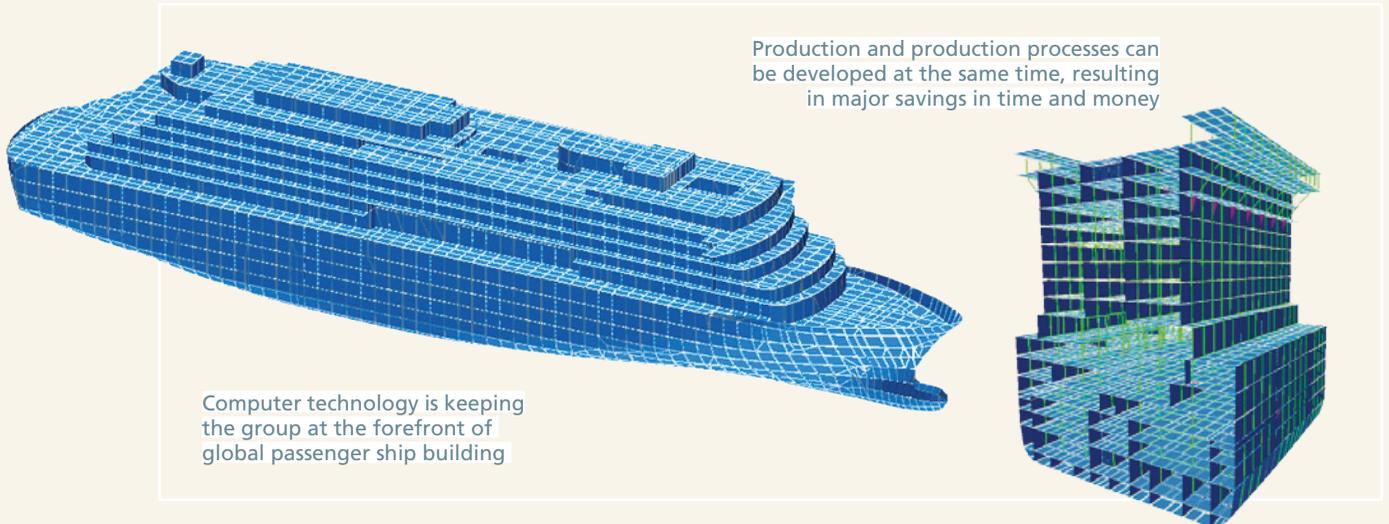
"As one of the largest ferry operators in the world, we realize that it is our social responsibility to do everything possible to protect the environment through energy conservation techniques," says Lars-Erik Hellingring, project manager of Stena's Energy Saving Programme.

Hellingring joined Stena in 2004 after working with Wallenius Lines for 16 years and has been responsible for the Energy Saving Programme introduced with the intention of realizing 5% savings in fuel volume between 2005 and 2007 and 2.5% savings thereafter. >



Lars-Erik Hellingring,  
project manager of  
Stena's Energy Saving  
Programme

# Meyer Werft builds on long and fruitful relationship



Papenburg-headquartered Meyer Werft has achieved a global reputation for constructing and building special-purpose ships. It employs more than 3,000 people and, in addition to building ships, the family-owned company provides training to about 300 apprentices.

Meyer Werft is particularly well-known for the construction of large, modern and sophisticated cruise ships, having built 37 luxury cruise vessels for discerning customers from all over the world, highlighted recently by the delivery of the Norwegian Getaway in January 2014. A new prototype for Royal Caribbean International – *Quantum of the Seas* – is under construction and will be delivered in the autumn of 2014. Eight additional cruise ships for RCI, NCL and Star Cruises will follow with the last one due for completion in 2019.

Meyer Werft holds the distinction of being the first non-Nordic company to work with NAPA. The contact began in 1985 when Meyer Werft managers went to the Wärtsilä yard in Helsinki and enjoyed an impressive presentation.

“A close partnership developed and to this day every get together is filled by fruitful and friendly discussions,” says Carsten Lindt, senior engineer, responsible for NAPA Steel and Global Classification Drawings, who has been working at Meyer Werft since 2004.

Explaining how the company uses NAPA Steel software to streamline its working processes, he says: “A NAPA Steel model starts with an import of information from a 2D general arrangement in the CAD system CATIA. The interface creates the 3D model based on an extraction of a 2D general arrangement plan. The program imports the positions of internal bulkheads, the boundary and reduction curves for decks and the positions

for doors and pillars. With customized rules the first dimensions are directly distributed to the surfaces. This interface cuts the time for preparing geometry by two thirds. Beside the speed the improved degree of detail of the model is another benefit of the import routine. A big challenge is to deal with the information that is not shown in the general arrangement. The double bottom makes up a relatively large fraction of the total steel weight. This is why a customized manager was developed to define parametric double bottom structures in a few steps. With these and other tools of NAPA a first FE Model can be created in two weeks and a weight estimation of a 140,000gt vessel after four weeks.”

Asked which particular benefits are accrued from using the 3D structural model, Lindt says: “The NAPA Steel model is actually the backbone of our structural design process in the early design phase. It collects all the necessary results from the FE and classification calculations. With a powerful visualization in structural drawings and reports, the model gives us all necessary data to find the optimum for the workshop, weight and material demands.”

As important as importing data for model generation is the export of data for an effective engineering process. How does NAPA Steel facilitate Meyer Werft’s work in producing structural drawings, weight and material lists?

“The structural drawings show the steel structure in the traditional way,” says Lindt. “For cruise ships the traditional way of showing the steel structure is showing the deck section and a section with bulkheads below. The goal is to have a ‘preplan approval drawing’ without any correction needed on CAD. Therefore, we use for example a set of legends to mark the

most used scantlings in a specified area. These legends decrease the amount of text in the drawing and the overlapping of text. For in-house communication we use a set of special attribute drawings. These drawings are especially for a visualization of one attribute e.g. plate thickness, watertight areas or profile scantlings.

Since 2003 we have been producing the steel weight estimation, and since 2006 we have also been using a detailed material bill for each building block from NAPA Steel. Nowadays, we also produce a report for the workshop planning. This report includes lists for welding lengths, material lists, block dimensions and visualisation in a 3D view.

All these are arranged in a NAPA Output Manager. This is a simplified user interface, which collects only necessary inputs from the user and defines the workflow. There is no NAPA knowledge needed for the usage and with predefined inputs the user can define more than 400 drawings for the model documentation by one click."

Additional improvements in the design process have been achieved by creating FEM models and the FEM program ANSYS interacts with NAPA Steel.

"The global FE model and exceptional local models are created in NAPA Steel. For the transfer to ANSYS, NAPA provides a basic export for nodes, beams and elements," Lindt continues. "We also include the plate thicknesses and profile sections to the export macro and add some tools for a model setup. Enclosed in this exported setup are the profile definitions and also frame systems. A further interaction is under development for the FEM results. NAPA is able to read ANSYS backup files and we developed a conversion macro that produces seams for the NAPA Steel model. The first productive test produces 600 seams within two hours and this development reduces the time for seam creation by 75%."

Asked how information from NAPA Steel to the detail design is secured, Lindt says: "Nowadays, this transfer is a major topic because of the huge amount of detail that is discussed in

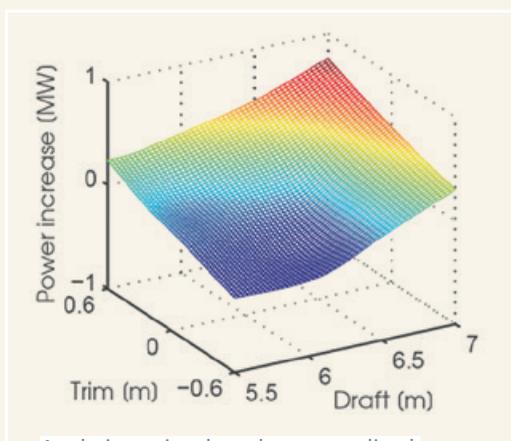
the early design phase. To integrate the NAPA Steel model into the yard process the first step is usually to import the 2D drawings with a DXF file to the CAD systems.

However, for a detailed interior design it is also useful to import a 3D geometry. Therefore we export IGES files from NAPA. A batch process changes layer and color for a better visualization. This simple surface geometry without attributes is used for clash models in the machinery and interior department. For an ongoing model from NAPA Steel to the detail design and the workshop models we use a XML file to export the topology of the steel model. This topology file exports the references between the surfaces. Special support or limit surfaces are linked to the XML file in an IGES format. The XML format for the export is developed together with IBM and Dassault Systems."

Meyer Werft and NAPA have enjoyed a long relationship and the global industry will be watching closely as NAPA Steel is integrated even further into the company's ship design processes.

Lindt anticipates many improvements on modeling techniques over the course of the next few years. "At Meyer Werft we like to reduce the manual work and to implement more rule-based designs. These designs will use components with attributes that are defined with rules. An example could be a bracket on a watertight bulkhead that is placed by the user, but the size of the bracket is calculated based on the connected stiffeners and further boundary conditions.

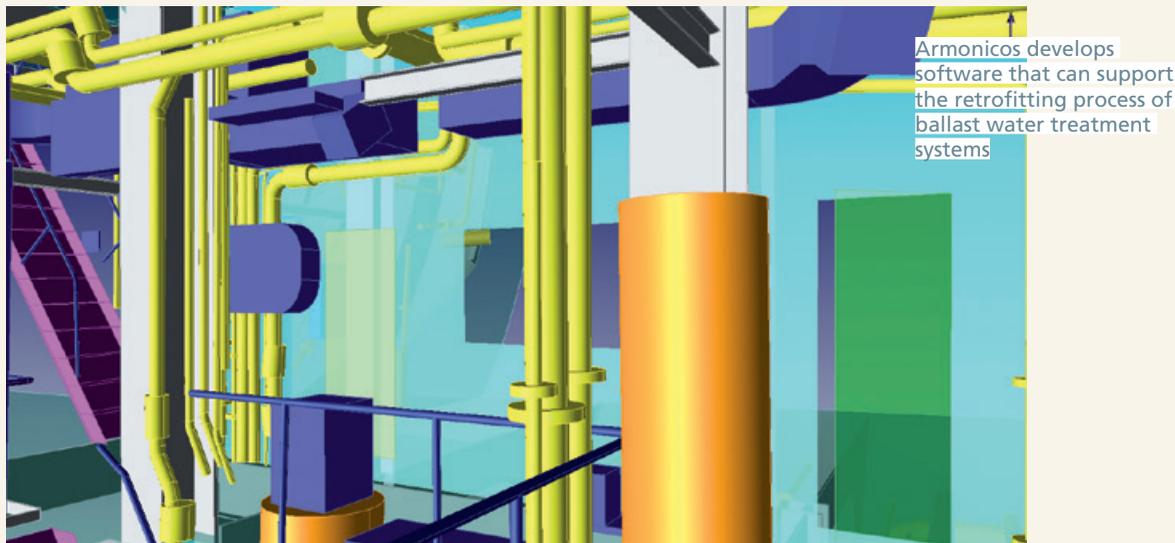
And due to the upcoming eco design idea the pressure will raise on weight saving because steel weight has a high ratio at the light weight and therefore a direct effect to fuel consumption. In fact NAPA can cover not only the design process but also ship monitoring. I expect space for the optimizations and improvements for the steel design." }



Analysis services based on normalized performance figures



# Removing the ballast water bottleneck



In early 2013 Mitsui O.S.K. Lines (MOL) announced that it had acquired approval in concept for installation of a packaged container ballast water treatment system that could be installed in a vessel's cargo hold. The announcement marked the world's first approval of such a system.

The technology, developed with Mitsubishi Heavy Industries (MHI) and packaged in a 40-foot container, offered much faster installation and ease of maintenance and accessibility on an existing vessel compared with systems installed in the vessel's engine room.

MOL and MHI installed an experimental system with a capacity of 750m<sup>3</sup>/h on an 8,000 TEU container ship during the spring of 2013.

The container-type ballast water treatment system shortens the work required for installation because the system is containerized, allowing for a great reduction of detailed pipe fitting and adjustment at the installation stage.

Installation time was reduced by an estimated seven days, compared with installing a system in the engine room and it is seen as an effective solution for vessels with limited engine room space. This revolutionary technology is just one of many technologies that ClassNK is working to develop to help owners address the requirements of the International Maritime Organization's (IMO) Ballast Water Management Convention.

The IMO adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments in February 2004 with the requirement that it be ratified by more than 30 countries and by 35% of shipping tonnage. As of the end of May 2014, 40 countries and 30.25% of tonnage had

ratified the convention.

Some 40,000 vessels will need to be retrofitted with ballast water treatment systems, including over 6,500 listed on the ClassNK register. The society has made a priority of bringing the industry's latest technology to commercial viability for retrofit installations, notably with regard to the development of 3D scanners in the design and installation of ballast water management systems (BWMS).

In May 2012, as part of its wide-ranging research and development program, ClassNK linked up with The University of Tokyo, Monohakobi Technology Institute, NYK, MOL, "K" Line, Sasebo Heavy Industries, Sanwa Dock, SEA Systems and Armonicos to further the use of this new technology.

ClassNK believes the use of 3D scanners in the design and installation of BWMS retrofits is commercially essential in that owners benefit from time savings and crews suffer minimal disturbance during the retrofit process. A 360-degree 3D scan of the entire engine room produces three-dimensional images, allowing the shipyard to plan and troubleshoot the installation process, and carry out BWMS retrofits as efficiently as possible.

The versatility of 3D laser scanning allows it to collect high-density 3D data to create digital models of engine rooms and other structures for which there may be no digital data. The precision of 3D scanning makes it possible to develop 3D CAD blueprints directly from engine room measurements, ClassNK says.

According to ClassNK's executive vice president Yasushi Nakamura, the 3D scanner has greater potential for increasing efficiency during the retrofit process. "Carrying out highly

accurate measurements in advance with 3D scanners makes it possible for shipyards to develop better, quicker methods for repair and retrofit work. In older vessels, especially, 2D plans are often not available, and the 3D scanners allow us to not only bridge that gap, but leapfrog from 2D drawings to highly detailed and accurate 3D CAD data, which is perfect for the advanced engineering work required for retrofits.”

Improving the speed and efficiency of the retrofits, however, means going beyond just effective measurement methods. In order to improve the speed and accuracy of the conversion of 3D CAD data, ClassNK has also helped develop a specialized software package to turn the point data generated by laser scanners directly into CAD data for use by shipyards and designers.

In order to develop this technology, ClassNK turned to Japanese technology company, Armonicos Co Ltd. Armonicos, which has about 50 staff, has been developing software involving 3D models for computer-aided design (CAD) since March 1984 when it started work on the CAD framework and data translator.

The company’s main products are spGauge, released in May 1999, spGate, unveiled in November 2001, and spScan, introduced in April 2007. spGate is a multi-data exchange platform that allows every CAD user to translate a variety of 3D-CAD models and formats.

spGauge enables accurate inspection to find errors of detail in products by 3D pattern matching between point cloud data, which is imported from the 3D scanner and 3D CAD data.

spScan is reverse engineering software that can make a high-quality non-uniform rational B-spline (NURBS) surface – NURBS is a mathematical model commonly used in computer graphics for generating and representing curves and surfaces – from point cloud data, which is imported from the 3D scanner.

A point cloud is a set of data points that may be created by 3D scanners. These devices measure points on the surface of an object and the point cloud represents the set of points that the device has measured.

As the result of a 3D-scanning process point clouds can be used to create 3D CAD models for manufactured parts and they are usually converted to polygon mesh or triangle mesh models, NURBS surface models, or CAD models.

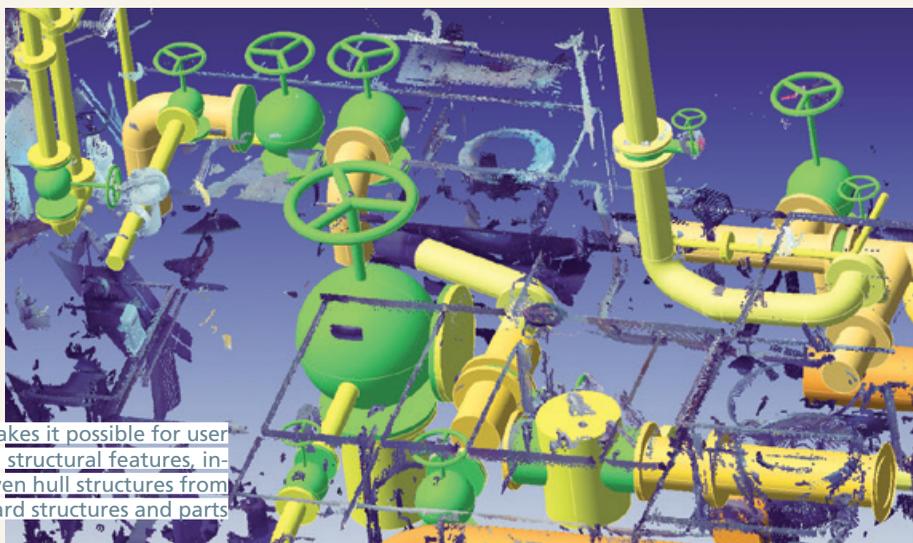
In the BWMS retrofit project carried out by ClassNK and Armonicos as part of the society’s Joint R&D for Industry Program, Armonicos has helped ClassNK develop technology for a faster design scheme for BWMS retrofitting and enhanced knowledge of shipbuilding by contributing software technology on point cloud processing and other necessary technology for transforming that data to 3D shapes.

The result of that collaboration is ClassNK-PEERLESS, a software which greatly speeds the process of transferring point cloud data to 3D CAD. ClassNK-PEERLESS makes it possible for users to quickly and easily select piping and structural features, including valves and even hull structures from libraries of standard structures and parts. The result is that engineers can produce 3D CAD data from cloud in a greatly reduced time.

The achievements through ClassNK-PEERLESS are, according to Shugo Usami, project supervisor at Armonicos, drastic reductions to the 3D modelling process, reducing it to some two days, instead of the roughly two weeks that were previously required.

“Retrofitting of BWMS is inevitable, and design time – modeling the current ship – is a bottleneck. The main problem is a lack of actual CAD data but the 3D laser scanner and professional software are solutions,” says Usami. “Thanks to the support of ClassNK, we are now bringing this incredible new technology to market – and we believe it will have tremendous benefits for engineering firms, and shipyards foremost, but will also lead to reduced costs for shipowners and operators.

“Once the bottleneck for installing BWMS is removed every builder will be ready for the BWMS treaty, and we can make the entire retrofit process easier for everyone in the entire maritime industry.” >



ClassNK-PEERLESS makes it possible for user to select piping and structural features, including valves and even hull structures from libraries of standard structures and parts

# Unrivalled service and reliability

SDC Ship Design & Consult GmbH was launched in 1997 by the Hamburg Ship Model Basin (HSVA), the German classification society Germanischer Lloyd and Dr Harald Jensen with the intention of joining forces and competences in ship design and other naval architectural services.

Michael Waechter, SDC's managing director, says the company started operations with two naval architects and after a sustained period of growth now employs a team of 18 full-time staff plus freelancers and naval architectural students from various universities. Germanischer Lloyd (now DNV GL) is no longer a shareholder and SDC's intention is to grow steadily and fulfil customer requirements without jeopardising flexibility.

Asked to comment on the most important and/or complex technical issues, challenges and solutions SDC has been involved with and is developing, Waechter says that SDC has participated in European Union-funded research projects, investigated casualties at sea and solved complex tasks using sophisticated tools.

"SDC has not specialized in particular ship types and this has proved beneficial in various ways. We have designed pontoons, inland waterway push boats, ferries, chemical and gas tankers, container ships, cruise vessels and mega yachts. Each vessel design has presented its own special challenge. We are currently supporting the Alfred Wegener Institute in Bremerhaven in the design of a new highly specialized polar research vessel and this requires unconventional solutions."

How has SDC's relationship with ClassNK developed? Does it differ markedly to relations with those enjoyed with DNV GL and other societies?

"One founder of our company was a classification society and the co-operation between us was close and excellent," says Waechter. "These days we are independent of any classification society even though other societies have recognised that designers have certain influence. ClassNK today is more open to the European market and is a society that has realized that good early cooperation with a designer is beneficial to all parties."

ClassNK's acquisition of the Finnish software house NAPA in March took the existing, long relationship between the society and the company to another business level. ClassNK –NAPA GREEN has long been regarded as the most sought-after solution for owners looking to reduce fuel costs and the NAPA Steel software is unrivalled in terms of ship design.

SDC has enjoyed a fruitful relationship with NAPA and this is certain to continue. In fact, NAPA's was the first software acquired by SDC.

SDC was one of the first European users, developing many tools for and within the system. "Nowadays NAPA is the leading software for initial and concept design and statutory calculation and we could not possibly imagine our daily work programme without it," says Waechter.

"It is the most sophisticated naval architectural software available, giving the user the freedom to develop any kind of customized tools one may imagine. NAPA works very closely with the International Maritime Organization (IMO) and follows developments carefully. It means users can be assured that the software is able to calculate new methods years before regulations come into force. This is crucial for ship designers and this will continue as ClassNK has made clear it will not change NAPA's strategy."

"The flexibility of the system allows users to handle arbitrary rules on arbitrary floating objects and does not restrict users to building ships the software can handle. This will be needed more and more in the future as it makes innovation possible. We can calculate anything that floats using NAPA from simulation of the process of the uprighting of structures to damage, casualties and other items."

How essential does SDC consider it to arrange the early involvement of all interested parties from designer, to owner/charterer, flag state and classification society. What is achieved?

"The times a ship design was developed internally without the involvement of major partners including classification societies and customers are long gone. The ships we work on are 100% custom-built and adapted to the customer's trade demands and, as such, they are prototypes," says Waechter. "Reliable planning is crucial during the construction phase as the delivery time is fixed. Changes born of issues to be revised after construction has started are fatal. Accordingly, all team members need to be on board from the beginning so that challenges are identified as early as possible."

"It is important for us to integrate all aspects in each of these steps from weight and stability to speed power/ energy, cargo handling, class and statutory aspects."

"In using the same main tool, NAPA, data exchange, agreement on boundary conditions and final approval is effective and quick, especially for new and uncommon designs and projects," Waechter concludes. >



Michael Waechter,  
managing director of SDC

Henning Gramann considers the crucial issues and answers the key questions on the way ahead for green ship recycling



Henning Gramann,  
managing director  
of GSR

# From cradle to grave

The International Maritime Organization's (IMO) Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships could still be a number of years from ratification, but the German company Green Ship Recycling Services (GSR) is in prime position to ensure the industry is ready to react positively to the requirements and implications of the far-reaching statute.

GSR provides comprehensive services for implementing the Hong Kong Convention, focusing on the entire life-cycle of ships, encompassing the work of suppliers, shipyards, ship-owners, brokers, buyers, ship recycling facilities and hinterland waste management, flag states and classification societies.

GSR's managing director Henning Gramann, a graduate in Environmental Engineering, is recognized globally as an expert on ship recycling. Alongside his role at GSR, he is technical advisor to the German Federal Ministry of Transport, Building and Town Development, representing Germany at the IMO Maritime Environmental Protection Committee (MEPC), chairman and treasurer of the International HazMat Association, guest lecturer at the World Maritime University and national expert on ship recycling for the ISO/DIN Committee.

*Would you please elaborate on your background in ship recycling and your work with Green Ship Recycling Services?*

I started my career with GAUSS mbH in Bremen, a research institute for environmental protection and safety in shipping, in 2000, as an environmental engineer specializing in waste management. I subsequently went to sea as an environmental officer on board a cruise vessel and implemented a comprehensive corporate environmental management system.

From the outset I had been keenly interested in all the issues involving ships reaching the end of their working lives and recycling, and I joined the classification society Germanischer Lloyd in 2005 as global head of Practice-Ship Recycling, with responsibility for developing and establishing the society's ship recycling services in line with the Hong Kong Convention.

Many new environmental requirements have emerged and in the main have been solved, but ship recycling is a complex business and sustainability has not been developed to its full potential. These are issues that attracted me to the industry in the first place, and in January 2011 I branched out and established GSR so that I could act more directly where my expertise was needed most, to make ship recycling a truly sustainable industry.

## GREEN SHIP RECYCLING

*You have been working very actively to help the industry prepare for the ratification of the Hong Kong Convention. How do you see the convention affecting the recycling sector, as well as the entire maritime industry?*

During discussions on the convention at the IMO in London we paid a lot of attention to practicality and how best to achieve the goals. It was not always easy because we encountered problems that had not been seen before. Having said that, the convention is a very good instrument if applied correctly, because it works as a global standard for those who want to improve the way in which they go about their business.

Far too few countries have ratified the convention, adopted in 2009, so it will be many years before it enters into force and truly changes the industry. However, thanks to the European Union Regulation on Ship Recycling (EU-SRR), which entered into force at the end of 2013, the main aims of the convention will be achieved through the Inventory of Hazardous Materials (IHM) for all EU-flagged and EU-visiting ships in excess of 500 gross tons. The EU-SRR sets clear deadlines and pushes for early implementation.

However, the importance of an IHM for allowing safe and environmentally sound ship recycling is highly underestimated and unfortunately some IHMs are cheap - financially and in terms of quality.

The other important aspect of EU-SRR is the authorization of ship recycling facilities (SRF). The scope is not restricted to Europe, and Asian SRFs are actively working towards their EU-authorization and compliance with the Hong Kong Convention, which has triggered a change in the industry.

Ship recycling is a complex business and sustainability has not been developed to its full potential



*In addition to the Hong Kong Convention, the EU has been very aggressively moving to implement new regulations for green recycling. What are some of the outcomes you foresee from the implementation of these new regulations?*

EU-SRR has set deadlines and it forces the shipping industry to comply. As shipowners decide when and where to send their ships for recycling, a new type of demand is created and SRFs will have to cover the upcoming green recycling niche market. This niche will grow but I am sure a diversionary, conventional, recycling market reflecting current practices will decline in parallel.

*How big an impact do you think these regulations will have?*

In coming years EU-SRR will have a direct impact as the industry starts to realize the implications and act. The Hong Kong Convention is in a "waiting position" and will eventually have a wider impact as a truly international instrument. But during this phase we can only hope that the EU will not add too many bits and pieces that create a different set of requirements and might negatively impact willingness to ratify the convention or even to comply with EU-SRR if these are too complicated. If this happens nothing will have been gained as the industry has many options to circumvent EU-SRR and the Hong Kong Convention when it comes to a vessel's last voyage. And where a specific ship recycling demand exists, it will be served.

*How prepared is the industry for the new regulations – and what steps are you seeing stakeholders take to ready themselves for new regulations?*

GSR is actively supporting all stakeholders and has a good overview of the roles, responsibilities and difficulties as far EU-SRR and the Hong Kong Convention are concerned. It starts with manufacturers and suppliers who have to fill in Suppliers Declaration of Conformity (SDoC) and more importantly, a Material Declaration (MD). The MD consists of two tables with hazardous materials that have to be documented, but the problem currently is that supply chains and manufacturers are not aware of, or in a position to provide the information for which they are liable.

Shipyards today have to prepare IHMs for newbuildings without having a full set of SDoCs and MDs due to lack of information from their suppliers; in essence they are preparing IHMs with a few "holes" and hoping for a willing classification society that has to certify the work.

Shipowners will have to get IHMs prepared by so-called IHM professionals based on sampling and analysis. This will be quicker and much cheaper than for newbuilds and clearer, too, compared with paperwork gathered from various sources. But once the IHMs are prepared, they will have to be maintained by the owners but there will be problems if the issues with SDoCs and MDs mentioned earlier have not been resolved.

The problem ship recyclers face is that many of their competitors are not making the improvements necessary to become compliant with the new rules as demand for green recycling is growing very slowly. It means a low number of SRFs are actively working towards compliance with EU-SRR and the Hong Kong

Convention but, as I have said, this is a growing market and we will see more to come.

What I see as a show-stopper is the continuing discussion about acceptance of beaching methods for ship recycling, including more or less free interpretation of EU-SRR. The criticism is by no means related to beaching itself; it addresses general management and surrounding aspects, which cannot be linked directly to beaching, one of four ways to get access to a ship during recycling.

Even worse, it puts a question mark behind three quarters of existing recycling capacity and makes those operating SRFs think more than twice before starting improvement schemes as these might not be accepted and they might lose the very business they are looking for. Key aspects such as the provision of employment for hundreds of thousands of workers in very poor countries are not mentioned at all by those who keep criticizing beaching.

In the event that quicker change towards the better is desired, the decision-makers creating specific demand – in this case top-dollar versus good ship recycling – should shoulder the blame instead of supporting indirectly termination of the majority of the capacity which is required, particularly given the huge volumes of recycled tonnage over the last couple of years, with 2012 by far being the busiest recycling year ever.

Classification societies are differently aware of the “more-complex-than-it-seems issue”. Some do not properly follow the IMO’s IHM guidelines (currently Res. MEPC 197(62)), work according to the outdated and incompatible standard for “Green Passports” (Res. A. 962(23)), prepare and certify IHMs by themselves against fundamentals of certification or stretch the IHM guidelines too far and, for example, accept a new-build IHM with only 150 MDs or just 25 samples for existing ships. Starting with a bad performance makes it difficult or impossible to raise standards in the years to come.

#### *What role do classification societies play in this process?*

The role of classification societies is to make sure that agreed standards are met. This is seldom the case and may cause problems for shipowners who want to buy their certificates cheaply. This demand is met and some owners do not realize that an IHM is a technical file belonging to their ship so that the next owner or recycler can claim incorrect information about the ship and this will become expensive. A look at legal disclaimers on the certificates of different classification societies gives a good first impression as to how much they trust their own activities.

#### *What do you think of ClassNK’s activities in the field of ship recycling?*

ClassNK is from my point of view the most experienced classification society offering comprehensive and correct services in all areas and in compliance with the Hong Kong Convention and EU-SRR. I am more than happy to work with ClassNK on improving SRFs and preparing IHMs for existing ships.

#### *One key aspect of both the Hong Kong Convention and the EU regulations is the need for ships to maintain an Inventory of Hazardous Materials (IHM). What are some of the key challenges in IHM development and maintenance?*

A key challenge will be the huge number of ships affected by the Hong Kong Convention in years to come and by EU-SRR from today. Approximately 30,000 existing ships will have to get an IHM by the end of 2020 but the resources for preparing so many vessels in the remaining six and a half years do not exist and will hardly be available in a timely manner. Too few IHMs have been prepared and it is not only prices that will go up. I fear that quality will go down and increase risks for shipowners.

After relinquishing my board position at the International Ship Recyclers Association (ISRA) in March 2012 I worked to establish the International Hazardous Material Association (IHMA), creating a global network of individuals offering high-quality IHMs. The intention is also to provide training to those working to narrow the upcoming gap between IHM supply and demand, even though it seems virtually impossible to serve the whole market in time.

I believe the exchange of experience established under IHMA will allow industry professionals to further improve their working practices and provide classification societies with external references on which they can base parts of their certification.

Shipowners today would be wise to warn their suppliers about their upcoming demand for MDs and SDoCs for IHM maintenance. Suppliers need time to complete their own tasks and in the event that the required documents are not available, maintenance of IHMs in the manner demanded by the IMO and EU will be impossible.

#### *What do you think of ClassNK’s efforts to make IHM management simpler and more efficient by using tools like PrimeShip-GREEN/SRM?*

This is the correct approach. We have to recognize the efforts required for IHM preparation for new ships and maintenance during their entire operational life. When the time required for requesting, exchanging and utilizing documents can be reduced and automated, it affects the running administrative costs for suppliers, shipyards, shipowners and certifiers.

Such software has to reflect the scope of different stakeholders and ensure they can fulfil their tasks comfortably. If not, IHM maintenance will not be done properly and the resulting IHM will not be useful for planning the safe and environmentally sound recycling process by a SRF which, essentially, is the main aim of the Hong Kong Convention and EU-SRR. >

# PrimeShip-GREEN embraced for recycling

Hirofumi Takano, operating officer and team leader of ClassNK's Ship Recycling Team answers key questions on PrimeShip-GREEN/SRM (Ship Recycling Management)

## *When did ClassNK decide to develop PrimeShip-GREEN/SRM?*

ClassNK has been actively involved with ship recycling and Inventory of Hazardous Materials (IHM) regulations since the first discussions of the Hong Kong Convention commenced at the International Maritime Organization (IMO). In addition to helping establish guidelines for IHM development and maintenance, the society has also been proactively working with recycling yards to help prepare them for the requirements of both the Hong Kong Convention and the new European Union regulations.

During our work on IHM-related regulations, we very quickly realized that the Material Declarations (MD) and correspondence necessary to develop an IHM could easily amount to several thousand pages for a single vessel. Given that this information would need to be shared not only between the manufacturers and shipyards, but also with the classification society and multiple owners throughout the life of the vessel, we recognized that these documents would need to be created and maintained electronically.

In cooperation with Japanese shipyards and ship equipment manufacturers, we began to develop a software-based system for developing IHM's based on submission of MD's via email and using our own servers, and this system was quickly embraced by yards in South Korea, China, and throughout the Asian ship-building sector.

Given the truly global nature of the industry, and the great differences in IT levels between countries and sectors of the industry, as well as for usability and security reasons, we decided to redevelop the software as a cloud-based system. Through a partnership with IBM, this new cloud-based version of the system was released in 2011 and has quickly become the de facto industry standard for IHM development and maintenance.

## *Why did ClassNK turn to IBM to help develop the system?*

At ClassNK our core mission is classification and certification, not software development. But we wanted to make a system that would be easy to use for the entire industry, while ensuring security and accessibility for the users. IBM, with its

incredible expertise with global infrastructure, data security and cloud-based systems, was really the perfect partner to develop this system. Thanks to their assistance, as well as the support of the numerous shipbuilders and manufacturers who have helped us develop and streamline the system, PrimeShip-GREEN/SRM is making it possible and practical to comply with new recycling regulations. We believe we have succeeded in helping create an essential piece of infrastructure for our global industry, a fact evidenced by incredible growth in user companies.

## *How many companies use PrimeShip-GREEN/SRM?*

As of the middle of 2014, more than 2,000 companies are using PrimeShip-GREEN/SRM, and users span every sector and segment of the industry. There are users from manufacturers, shipyards, and owners making use of the software on a daily basis. Recycling facilities will join soon as key users. No other software provides the same combination of usability and security – and it is why so many groups from throughout the industry are using this system.

## *How much does using PrimeShip-GREEN/SRM cost?*

PrimeShip-GREEN/SRM is currently free to use for everyone in the maritime industry, including manufacturers, shipyards, owners, and recycling yards. As a classification society, we feel it is our duty to make the IHM development and certification process as easy and pain-free as possible. Providing this software free of charge is one way we can help achieve that goal.

## *Can this system be used for all vessels or just those registered with ClassNK?*

Using PrimeShip-GREEN/SRM, IHM's can be created, maintained, and certified for any vessel, not just those classified by ClassNK. We think it best for the maritime industry if software systems such as this are universal and global in scope and not limited to one segment of the market or geographic region. We have consciously developed the system as a platform for the entire maritime industry and are really proud to see it embraced by stakeholders from throughout the industry. )

# Growing relationship with HSVA

The privately owned and independent Hamburgische Schiffbau-Versuchsanstalt GmbH (Hamburg Ship Model Basin, HSVA), founded in 1913, has been at the forefront of hydrodynamic research for just over a century.

During that time HSVA has influenced and led developments of testing technology, methods, standardization and numerical procedures to solve complex problems. HSVA is also a service and consulting company for industrial customers worldwide and its facilities include the unique HYKAT, the large cavitation tunnel. Other unique HSVA features are the Computerized Planar Motion Carriage (CPMC), which guarantees unsurpassed precision in model maneuvering and the large ice tank.

HSVA can accommodate large models up to 10m in length. Some 80% of HSVA's work is dedicated to commercial orders, 70% of which are international and the remainder comprise projects supported partially by the European Union and by the Federal Ministry of Education Research German Ministry of Research.

HSVA's links with NAPA go back to the 1990s when it considered replacing an in-house Computer-Aided Design (CAD) system with NAPA software. Since then HSVA has used the naval architecture package and there has been, and remains, constant exchange between NAPA and HSVA," says Dr Jochen Marzi, director, Computational Fluid Dynamics and Research.

The direct cooperation with ClassNK is more recent, dating to the end of 2013, and covering the complex issue of cargo liquefaction of ore cargoes on board bulk carriers.

ClassNK updated its guidelines for the carriage of nickel ore in 2012 after liquefaction of the cargo had led to four casualties and the deaths of nearly 70 seafarers in the previous 17 months. HSVA had been coordinating a multinational (European) research project on cargo liquefaction on bulk carriers at sea together with French and other German partners when, during the initial phase of the project it became clear there were similar interests to those of ClassNK in the investigation of the liquefaction phenomena.

"Hence it was natural to join forces and address the problem of liquefaction and analyse typical accident scenarios with a long



Dr Jochen Marzi, director of Computational Fluid Dynamics and Research

term goal of devising appropriate measures which can be implemented in the future to improve ship safety," says Dr Marzi.

"ClassNK and HSVA work closely together and exchange knowledge and experience gained within the liquefaction research. We strengthen the communication through regular meetings and information exchange within the projects."

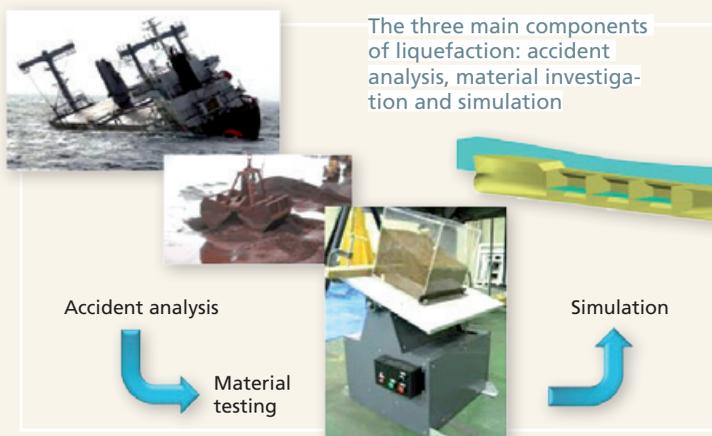
To date, ClassNK and HSVA have analyzed accident scenarios and performed the first systematic material experiments. These are required to define the parameters required to model the liquefaction process. Final results of the project are expected in two years' time when the planned liquefaction model is completed and complete simulations for ship motions including liquefying cargo behavior have been accomplished.

"The goal of the research project is to better understand the liquefaction phenomena and address it in a holistic manner," says Dr Marzi. "We want to take into account all three parameters that trigger it. These are the material property of the ores, which is influenced mainly by the moisture content, the sea state that the vessel encounters during the voyage and the vessel characteristics.

"We hope to give recommendations about critical combinations of the above parameters to avoid further incidents. Furthermore, we hope to help improve the testing procedures for the ores. In addition, we would like to end up with recommendations for the master and the vessel's crew on the behavior after cargo liquefaction occurred.

"The project is still in an early stage and besides a better insight into past accidents there are no specific findings yet, but we are making good progress with the research."

Asked whether HSVA expects to work with ClassNK on other projects, Dr Marzi says: "There are a number of areas of joint interest, e.g. energy efficiency of ships in which both organizations play a strong role. It is of course of interest to us to collaborate further with relevant parties on this highly relevant issue. We consider ClassNK to be an important partner in the future."



# Fuelling the future



Campus of the TUM

## Professor Koji Takasaki

After completing undergraduate studies in mechanical engineering in 1977 at Kyushu University, Koji Takasaki began his career at Mitsubishi Heavy Industries Co Ltd (MHI) as an engineer working with low-speed two-stroke marine engines. After five years with MHI he started his research work at Kyushu University and he has been a full professor at the University since 1998. Professor Takasaki's research work focuses on visualizing and analyzing engine combustion, from diesel combustion burning heavy fuel oil to natural gas lean-burn and GI combustion, applying some large scale visual combustion apparatus. He was committee leader for the national project to promote LNG-fuelled ships in 2012 and is technical adviser to ClassNK.

The coming enforcement of stricter SOx emission regulations in the ECA (Emission Control Areas) regions from 1 January 2015, as well the increase in fuel and operating costs that such enforcement will bring, mean the use of LNG (liquefied natural gas) as a fuel is increasingly a hot topic in Northern Europe.

While much of the development of LNG fuel-related technology has been centered in Europe, ClassNK's executive vice president Yasushi Nakamura says the interest in LNG as fuel has been spreading worldwide over the past several years. "Since 2010, ClassNK has supported more than 30 practical R&D projects related to LNG as a fuel, including not only technology development but safety assessments for LNG fuelling and bunkering. In all, ClassNK has spent more than USD 10 million supporting these projects."

The results, he says, are beginning to make the use of LNG look like a concrete reality, not just in Europe, but in Asia as well. "We're now at the point where the technical challeng-

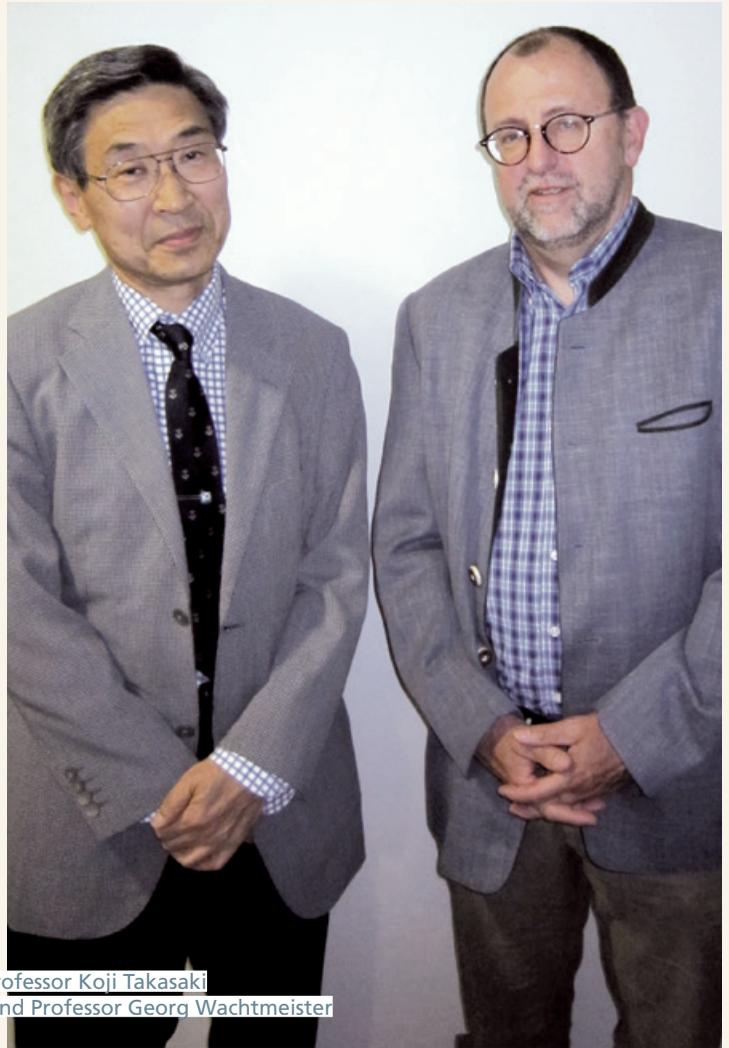
es are finally being addressed, and the use of LNG as a fuel has the potential to spread worldwide. At ClassNK we are always focused very much on the very practical side of innovations such as use of LNG as a marine fuel, but we feel it is also important to keep trying to push technology forward at the same time. That's why we are excited about our research with the Technical University of Munich (TUM)."

Working with TUM, ClassNK's extensive R&D program is funding an innovative new research project based on solving gas power issues by using renewable energy in combination with carbon dioxide emissions.

Titled "Hydrogen-Admixture to Natural Gas for gas engines (Limits on Knocking/Misfiring)", the research project is being led by Professor Koji Takasaki of the Laboratory of Engine and Combustion, Kyushu University, Japan, and by Professor Georg Wachtmeister from the Lehrstuhl für Verbrennungskraftmaschinen (Institute of Combustion Engines) at

### Professor Georg Wachtmeister

After completing undergraduate studies in general mechanical engineering in 1984 and a doctorate 1988 at the Technical University of Munich, Georg Wachtmeister began his career at MAN B&W Diesel AG, starting out as technical manager for thermodynamics. He then became team leader for material strength (four-cycle engines) and manager of the Turbo-charger Engineering Department. He was ultimately named senior vice president for four-cycle engine technology, and he has been a full professor at the University since 2004. Professor Wachtmeister's research work focuses on reducing emissions and boosting the efficiency of internal combustion engines. In addition to gas and diesel engines, the research encompasses natural gas engines. By using a test bed engine developed at the Institute, the frictional forces acting between the piston and piston rings and the cylinder liner can be determined experimentally in a running engine, at high precision and resolution across the crank angle range.



Professor Koji Takasaki  
and Professor Georg Wachtmeister

the Technische Universität München (Technical University of Munich).

Professor Takasaki, who also serves as a technical advisor to ClassNK's research initiative, is very proud that the classification society has decided to back the project. "ClassNK supports an incredible number of research projects each year, but this is one of the first times that we are combining the research capabilities of both Japan and Germany to address the new technical challenges in the maritime industry," he says.

"This project with TUM will help increase our understanding of combustion of hydrogen admixtures in internal combustion engines like those used onboard ships. It's a tremendous way to drive the industry and technology forward, while still supporting a very practical approach to technology development."

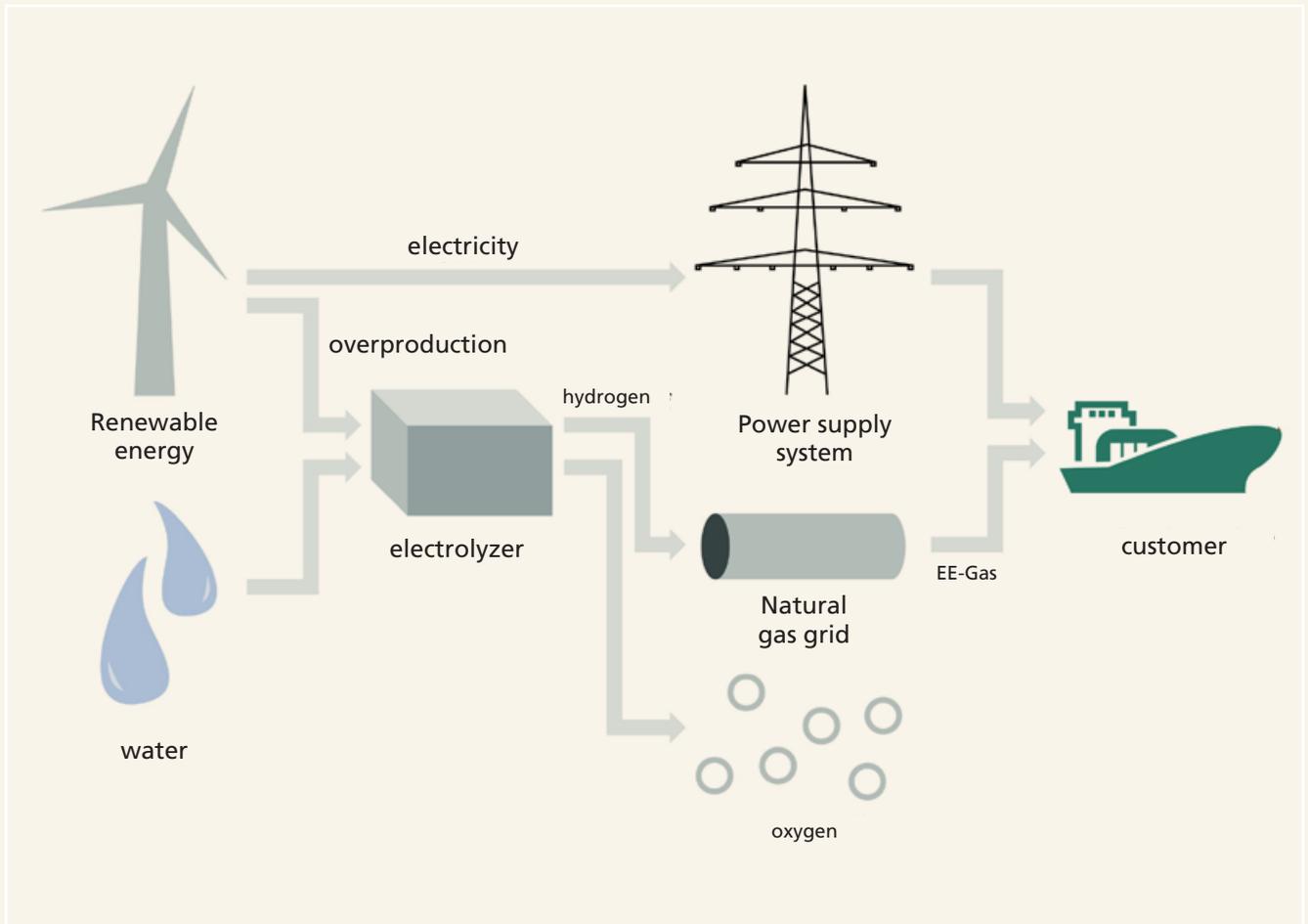
The intention of the preliminary research project, which started at the beginning of July this year and is scheduled to run until the end of May 2015, is to detect relevant topics for future

research into the use of natural gas (NG) and possibly hydrogen (H<sub>2</sub>) admixtures in internal combustion engines. Attention will focus on the operational range of internal combustion engines and the quality of gas where knocking and misfiring occurs.

In addition, the intention is to prioritize future exercises thereby adding to the knowledge and understanding of practices that have to be solved for combusting NG with H<sub>2</sub> admixture in internal combustion engines for ship propulsion and also for supplying energy. The overall goal of the research project is to demonstrate the first limits of combustion in internal combustion engines fuelled with NG containing certain quantities of H<sub>2</sub>.

Professor Takasaki and Professor Wachtmeister believe the project will yield crucial information on the variation in gas composition concerning H<sub>2</sub> in NG and the limits and parameters for its use in internal combustion engines.

The team is making use of a written study produced by the



Forschungsvereinigung Verbrennungskraftmaschinen e.V. (Research Association for Combustion Engines), which focused on how Germany and the European Union has addressed combining H<sub>2</sub> admixture to NG for roads and stationary power supply and other published information on hydrogen and natural gas thinned with hydrogen.

The issues were then addressed at the institute in Munich and results showed that internal combustion engines had to be adapted in order to combust the hydrogen content gas.

Significantly, the parties involved in the research project have been able to generate basic knowledge of the so-called operational behavior of emissions.

Another key element of the research is focusing on, and investigating, the availability of H<sub>2</sub> for ship propulsion, its distribution and its availability in and close to the world's leading ports.

Available data and information, particularly from the European Union, Japan, China and South Korea, will be analyzed for information and guidance on particular problems and for suggestions for better practice when combusting H<sub>2</sub> and mixtures.

Another area the research will focus on is the possible quantity of H<sub>2</sub> and the gas quality of NG diluted with H<sub>2</sub> from renewable sources.

In addition, experimental work will be carried out on a

medium-speed range research single cylinder engine with spark plug ignition and pre-chamber with different amounts of H<sub>2</sub> ranging from H<sub>2</sub> 0%, 5%, 10%, 15%, 20% of NG in order to ascertain information on combustion limits on a real engine. The NG quality has to be defined.

“The Institute of Combustion Engines at the Technical University of Munich has in excess of 15 years’ experience of working on stationary gas engines and it has been involved in more than 10 research projects dealing with high and medium speed engines,” says Professor Wachtmeister.

“The work has also investigated combustion systems for high-speed engines with pure hydrogen as well as medium-speed engines with different gas compositions and with different ignition systems. It means we have a huge knowledge of gas engines at the Institute, knowledge of the factors that influence combustion systems and knowledge of the problems that occur in real engine operation.

“This new global focus is on fuelling huge diesel engines with NG so that shipbuilders and those developing and building ship propulsion systems will be able to deliver new fuel possibilities using renewable energy sources and significantly reduce carbon dioxide emissions in the years to come.” ⟩

# About ClassNK

Founded in 1899, ClassNK creates sustainable value for our clients; delivering solutions and providing classification and certification services to some 8,700 vessels totaling more than 226 million gross tons.

With more than 20% of the world market share, we support shipowners, operators, and shipyards throughout Europe and around the globe.

The vessels on our register span every kind of ship, and ClassNK classes a large share of every major type of merchant vessel, from workboats and offshore support vessels to bulk carriers, tankers, and container vessels,

Recognized by more than 110 flag states, we provide services on behalf of every major maritime administration.

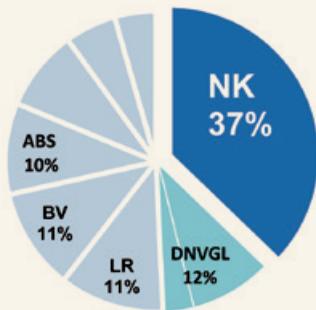
ClassNK is a non-profit society, maintaining the original spirit of ship classification, and is dedicated to supporting the safe growth and development of the shipping & shipbuilding industries.

Our staff are experts in their fields – highly trained naval architects, marine engineers, and skilled surveyors who take great pride in their technical competence, long-term commitment and employment, and responding quickly to client needs.

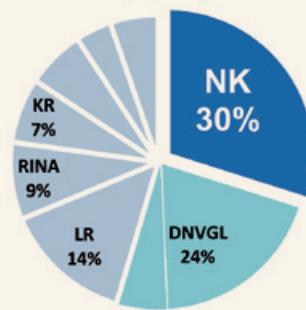
From Hamburg, to our global network of more than 130 survey offices in major ports and maritime cities, we work 24/7 to ensure the safe operations of your vessels around the world. >

## Share of merchant vessel types by IACS classification society:

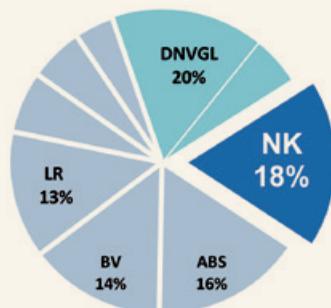
Bulk Carriers (Ship No.)



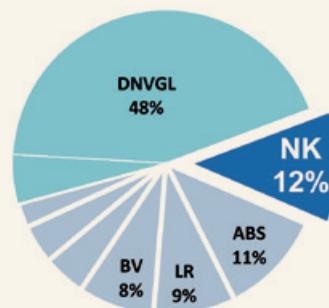
RoRo/PCC (Ship No.)



Tankers [Oil, Gas, Chem.] (Ship No.)



Container Ships (Ship No.)



# Fast, Non-Profit, Ship Classification.

Decisions for shipowners made locally  
and supported globally - around the clock.

ClassNK, Sumatrakontor (Deck 9),  
Überseeallee 1, 20457 Hamburg  
Tel: (+49) 040-233032

ClassNK Survey Operations Headquarters (Europe):  
svdge@classnk.or.jp

ClassNK Business Development:  
kreissl@classnk.or.jp

**Global Authority in Maritime Standards**

**ClassNK**  
[www.classnk.com](http://www.classnk.com)