ClassNK

MAGAZINE
63rd Edition

SPECIAL ARTICLE

Development of Guidelines on
Corrosion Resistant Steels for Cargo Oil Tanks

Technical Essays

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An Environmentally Friendly Mixed Air and High-Pressure Water Blasting System

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Topics and Events

Welcome to the 63rd edition of the ClassNK Magazine

Welcome to the 63rd edition of the ClassNK Magazine. As in previous editions, I am very pleased to introduce this edition of the Magazine.

Over more than eleven decades of service, ClassNK has come to set the standard for success as demonstrated by its having become the largest classification society in the world on a gross tonnage basis with more than 192 million gross tons or some 20% of the global commercial fleet under class. This is a testament to the commitment of the Society to quality and service in everything it does.

The maritime industry continues to change as it adapts to new realities in the global economy as well as the environment. This requires even greater flexibility than ever before to accommodate these rapid changes while at the same time meet increasingly stringent environmental, technical and operational requirements. It also offers new opportunities to find progressive solutions that not only meet these challenges but also contribute to a safer and more environmentally friendly industry. Our role as a classification society is no different. Earlier this year, the Society was reorganized into a general incorporated foundation under Japanese law, thereby allowing us to offer an even broader range of services than ever before aimed at achieving our mission of promoting ever safer, cleaner seas.

In light of such exciting and dynamic changes, this year's ClassNK Magazine takes a brief look at a broad range of "hot" topics that have been of particular interest to the maritime industry recently. This includes a Special Article that introduces the *Development of Guidelines on Corrosion Resistant Steels for Cargo Oil Tanks*. This article looks at the problem of corrosion in cargo oil tanks and the development of new guidelines by the Society on the use of corrosion resistant steel as a means of satisfying new statutory requirements put forth by the IMO for the corrosion protection of cargo oil tanks of crude oil tankers.

This is followed by a technical essay on the *Konki-Jet: An Environmentally Friendly Mixed Air & High-Pressure Water Blasting System*. This system applies new advances in water blasting technology to reduce environmental loads in preparing surfaces more efficiently for coating in line with the IMO's Performance Standard for Protective Coating (PSPC). The system is also very effective in stripping existing coatings from ship hulls for better treatment and repair.

A second technical article focuses on the introduction of the Energy Efficiency Design Index (EEDI) as a means of evaluating and improving the energy efficiency of ships. The article briefly reviews the history of the development of the index approach within the IMO, as well as introduces the appraisal service offered by ClassNK regarding actual application of the EEDI.

This year's "Story from the Sea" article is entitled *The Great East Japan Earthquake: Aftermath and Recovery*. It looks at some of the very challenging but remarkable progress being made towards recovery from the earthquake and subsequent tsunami that occurred on 11 March 2011. Although it was a devastating event that has affected countless numbers of people both in Japan and around the world, a key element in the aftermath is the message of renewal and hope that can be gleaned from the rapid recovery already being seen thanks to efforts by the Japanese themselves to rebuild and to the tremendous support provided by so many across the globe. This article is followed by "Focus on Japan", which looks at a region known as Hinase along the Seto Inland Sea. The area is known as being the home for many leading shipowners in Japan.

In addition, two internationally prominent cities that comprise essential parts of ClassNK's global network, Oslo and Jakarta, are the focus of "ClassNK Around the World". Oslo is a key maritime city that stands at the crossroads between the North Sea and Baltic Sea and is a major gateway to ClassNK's network in Scandinavia. Moreover, ClassNK was officially recognized by the Government of Norway as a Recognized Organization in November 2011 with authority to perform statutory surveys and issue certificates to Norwegian flagged vessels. Jakarta is the main office of the Society's growing network of four offices in Indonesia that also serves to enhance the presence of ClassNK in the region.

The ClassNK Magazine concludes with "Topics and Events", which highlights some of the recent activities of the Society. This section starts with a brief introduction of offices recently added to the NK global network, then describes some of the many maritime exhibitions that the Society participated in during 2011 around the world. Finally, it reviews some notable awards won by the Society during the past year, as well.

In closing, I would like to take this opportunity to thank you, our readers, and all of our clients around the world for your continued support of ClassNK and our activities. Your continued support has not only made it possible for us to achieve such great success over the past 112 years, but also spurs us to work even harder to provide you with ever better, broader services for many years to come.

Thank you again. I sincerely hope that you enjoy this edition of the ClassNK Magazine.

Chairman and President **Noboru Ueda**

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Special Article

Development of Guidelines on Corrosion Resistant Steels for Cargo Oil Tanks

Background

The growing volume of crude oil carried by the world's tanker fleet has led to rising concerns over pollution of the marine environment. The last decade in particular has brought tremendous changes to the building and survey requirements for oil tankers. In addition to a shift towards enhanced survey programs, double hull construction, and ballast tank coatings, recent efforts have focused on establishing corrosion prevention measures for the cargo tanks of oil tankers. This has included the creation of the first international statutory requirements on corrosion related problems and the performance of ballast tank coatings, which covers such areas as verification of the painter's work by coating inspectors, examination of the coating system, and the development of a Coating Technical file.

Amendments to the SOLAS Convention requiring such corrosion prevention measures were adopted at the 87th meeting of the MSC in May 2010, and from 1 January 2013, application of corrosion resistance measures will become mandatory for the cargo oil tanks of all crude oil tankers. The new requirements allow for the application of two types of corrosion protection methods. One is protection using a coating system similar to that used for protection against ballast tank corrosion. The other is protection through the use of corrosion resistant steels. A new "Performance Standard of Corrosion Resistant Steel" was also adopted along with the amendments to SOLAS.

The development of corrosion resistant steels originated in Japan in the late 1990s as the result of a joint research project conducted on cargo tank corrosion. Leading steel producers in Japan subsequently developed corrosion resistant steels taking into account the results of this project. This included the corrosion mechanism for general corrosion that occurs under the upper deck in inert gas environments in cargo oil tanks (COT) and for pitting corrosion that occurs on the inner bottom in highly acidic environments. The new steel promises to provide shipowners and shipyards with a lower cost alternative to coatings. The use of corrosion resistant steels allows shipyards to reduce the cost of the construction and coating process, while shipowners can reduce coating maintenance and reapplication costs.

Corrosion resistant steels have excellent resistance against corrosion in these cargo oil tank environments of crude oil tankers. The concept of protection through the use of corrosion resistant steels is based on the fact that such steels have been shown to better maintain their structural integrity during the target life of the ship by slowing down the rate at which corrosion occurs compared with conventional steels.

Corrosion Environment in Cargo Oil Tanks

The above multi-year joint research project revealed significant details about the corrosion mechanisms at work in cargo oil tanks (Fig. 1). It was found that inert gas in the vapor space of crude oil tanks also contains notable amounts of oxygen (O_2), carbon dioxide (CO_2), sulfur dioxide (SO_2), and hydrogen sulfide (H_2S) originating from the crude oil being transported. Field examinations of several VLCCs also detected high concentrations of H2S gas in the vapor space. This coexistence of oxygen and

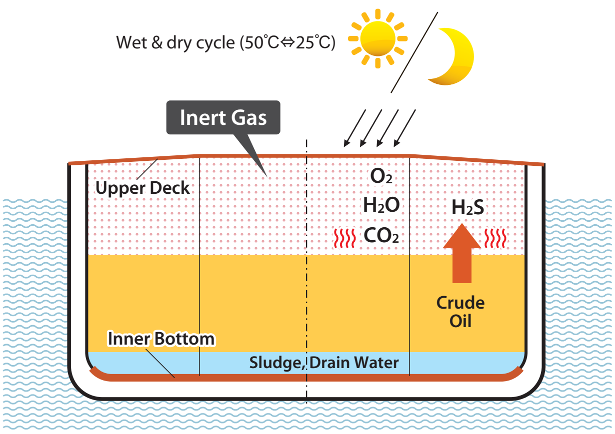


Fig. 1 Overview of corrosion mechanism in cargo oil tank.

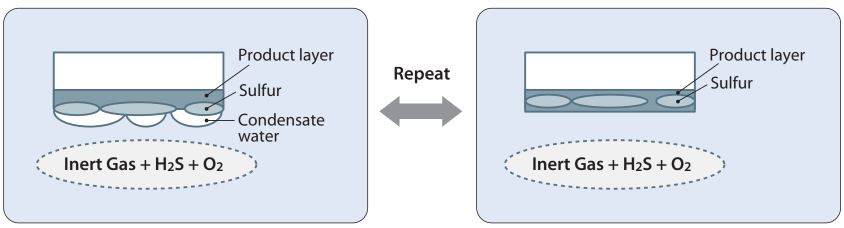


Fig. 2 Corrosion mechanism at upper deck plate.

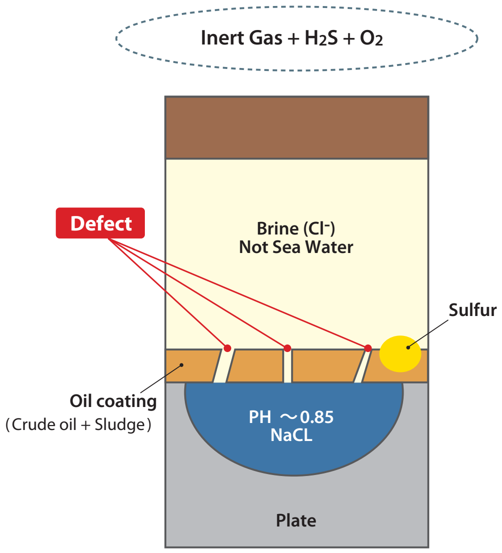


Fig. 3 Corrosion mechanism at inner bottom plate.

hydrogen sulfide is a very rare case from the corrosion science standpoint. The corrosion environment in cargo oil tanks is quite complicated and unique.

General corrosion occurs under the upper deck. The backside of the upper deck is exposed to cyclically wet and dry conditions that are affected by the temperature changes that take place through the day and night, in which the condensation of water takes place. In addition, elemental sulfur is generated by the oxidation of hydrogen sulfide into water (Fig. 2). The general corrosion of the upper deck plate is thus enhanced by the condensate. Most of the flaky products that appear on the upper deck are not due directly to corrosion. About 60wt% of these deposits consists of elemental sulfur.

On the other hand, pitting corrosion occurs on the inner bottom of the tank. Drain water is present at the inner bottom of cargo oil tanks that includes high concentrations of chloride ions and hydrogen sulfide which originates from the crude oil cargo. As shown in Fig. 3 the bottom plate is covered with drain water that includes an oil coating layer containing sludge and crude oil. In general, an oil coating decreases the corrosion rate. However, partial defects in the oil coating would be caused by crude oil washing and water drops from above the structure that are also present. Then the inner bottom plate is exposed to a severe corrosion environment with concentrated chloride ions and hydrogen sulfide. The acidity of solutions within the pits can reach a pH lower than 1.5. Pits originate from these defects in the oil coating and grow through the creation of a corrosion electric cell between the defect (anode) and the steel surface under the oil coating around the defect (cathode) in a severe corrosion environment with concentrated chloride ions mixed with hydrogen sulfide. This condition both causes and enhances the pitting corrosion of the inner bottom plate at locations where there are defects in the oil coating.

IMO Standards for Corrosion Resistant Steels for Cargo Oil Tanks

IMO standards for coating systems specify a target coating life of 15 years. In order to achieve this target, concrete requirements, limit values and control mechanisms during construction are specified. Accordingly, the coating standards indicate clearly defined limit values for the surface preparation with respect to cleanliness, surface profile, salt level, dust grade, dry film thickness, and other factors. Precepts are also given with respect to the selection of an appropriate coating system, application methods, required qualification tests of coating systems, verification by a qualified coating inspector, and a recording system for technical data and work records.

On the other hand, the aim of the corrosion resistant steels standards is to maintain required structural integrity for 25 years in the corrosion environments of crude oil cargo tanks. This target life is specified in the Global Based Standard (GBS). The mechanism of corrosion protection by corrosion resistant steels is quite different from that for coating systems, and the effectiveness depends on the properties of the steels and the welded joints. Therefore, the IMO standards focus on qualification tests, without specifying detailed work specifications. Any corrosion resistant steels with a combination of welding consumable have to be pre-qualified in a laboratory test prior to being used onboard ship.

IMO Standards and ClassNK Guidelines on Corrosion Resistant Steels

IMO standards do not specify limitations on the additional chemical composition of a material that improves corrosion resistant properties. However, the use of corrosion resistant steels containing a lot of alloy elements is not realistic, as weldability would be significantly affected and the welding procedure specifications that have already been established in various shipyards would have to be newly developed. For this reason, the scope of the developed guidelines is limited to corrosion resistance properties that satisfy the following:

a. Chemical composition and mechanical properties of the subject steel satisfy the requirements of hull structural steels specified by classification societies.

b. Elements to be added to improve corrosion resistance and for which the content is not specified in the above are to be generally within 1%, in order to ensure sufficient weldability of the material as hull structural steel.

c. The steel does not initiate problematic galvanic corrosion with conventional steels in the COT environment.

Application

It is thought that, in actual application, several combinations of different types of corrosion protection methods apply from the viewpoint of the efficiency of construction. Table 1 shows a possible combination of painting and corrosion resistant steels or a case of applying different corrosion resistant steels. Further, the guidelines specify cases where corrosion resistant steels of a different brand are used in the same structural member.

Protection methods using corrosion resistant steels are considered as a cost effective means of corrosion protection with a small negative environmental impact as there is generally no need for coating when such material is used. Wide use of the material in shipbuilding is expected to grow in the future. Although the IMO has developed performance standards on the areas of application and verification tests for corrosion resistant steels, more detailed guidelines are needed regarding their actual application, e.g. combination of coating system and corrosion resistant steels, product tests to ensure the corrosion resistant properties of each product, application of work or quality standards which have been developed for conventional steels. It is against this background that ClassNK developed new guidelines on the use of corrosion resistant steel for COT that focus on various matters relevant to the actual application of such steels.

ClassNK's new guidelines, the first of their kind in the world, describe the procedures for application of the new steel in great detail, including area of application, construction work and inspection procedures during construction, as well as the required contents of the technical file. Since the new guidelines also cover the requirements for type approval of corrosion resistant steels based on the amendments to SOLAS, the guidelines are expected to be of great benefit to steel manufacturers, as well. Accordingly, the Society also granted the first class approval for systems to test the corrosion performance of such steel in the spring of 2011.

With the demand for these new steels expected to increase rapidly in the near future, ClassNK is working with manufacturers, shipyards, and owners to ensure that the new steels can be manufactured, applied, and maintained to the highest standards possible. It is expected that the application of the new guidelines will contribute to improving tanker safety while at the same time reducing costs for yards and owners by facilitating the application of corrosion resistant steel in COT and thereby contribute to greater ship safety and the prevention of pollution of the sea.

Table 1 Combination of Corrosion Protection Methods

Member		Lower surface of strength deck (a)	Upper surface of inner bottom plating (b)
Corrosion protection method	Case 1	Corrosion resistant steel (Brand A)	Corrosion resistant steel (Brand A)
	Case 2	Coating	Corrosion resistant steel (Brand B)
	Case 3	Corrosion resistant steel (Brand C)	Coating
	Case 4	Corrosion resistant steel (Brand D)	Corrosion resistant steel (Brand E)

Note : "Brand" refers to the name of the corrosion resistant steel indicated on the Type Approval Certificate.

Technical Essays

The Konki-Jet

An Environmentally Friendly Mixed Air and High-Pressure Water Blasting System

Background

Coating requirements for ballast water tanks as well as cargo oil tanks and other enclosed ship spaces have become increasingly stringent in recent years. This has led to growing demand for sophisticated marine coatings and surface treatment methods that comply with the IMO's "Performance Standard for Protective Coatings for dedicated seawater ballast tanks in all types of ships and double-side skin spaces of bulk carriers". Conventional systems, such as sand blasting, which are used for surface preparation to remove contaminants, produce large amounts of dust and dust scattering that deteriorate not only working conditions but the environment, as well. Moreover, the abrasive media used in the process must also be disposed of as industrial waste.

To help address these problems without compromising the quality of surface treatment for even more stringent standards required by the PSPC, JSTRA and ClassNK have joined together in cooperation with a special project team including IHI Amtec and other industry leaders* to develop and introduce a mixed air and high-pressure water blasting system known as the *"Konki-jet"*. This environmentally-friendly system uses high-pressure (75 MPa) water washing to clean intact zinc silicate shop primer surfaces as well as water blasting with abrasive media at a pressure of 35MPa to obtain a surface cleanness of Sa 2.5 (a measure of surface cleanliness equivalent to very thorough blast cleaning) with a surface roughness profile of 30-75 microns on weld beams and butts as well as in rusted areas required by the PSPC. The *Konki-jet* system has also been further developed to strip coatings from outer hull surfaces as part of the treatment of such surfaces to facilitate the effective repair, maintenance and recoating of these surfaces in existing ships.

*This project is has been carried out jointly by ClassNK and JSTRA in cooperation with the following project members as part of ClassNK's ongoing practical R&D development program, which provides research support for cutting edge R&D projects that address the needs of the maritime industry.

Members

IHI Amtec Co., Ltd.
Naikai Shipbuilding Co., Ltd.
Mikami Marine Engineering Co., Ltd.
Chugoku Marine Paints Co., Ltd.
Shibuya Machinery Co., Ltd.
Japan Ship Technology Research Association (JSTRA)
Nippon Kaiji Kyokai (ClassNK)

Note : The original version of this article appeared as part of a presentation made to the National Association of Corrosion Engineers (NACE International) in March of 2011 by members of the Japan Ship Technology Research Association (JSTRA), IHI Amtec Co. Ltd., and Nippon Kaiji Kyokai (ClassNK).

Introduction

The 82nd session of the IMO's Maritime Safety Committee (MSC) adopted the PSPC which sets forth specific standards for the coating of seawater ballast tanks and double sided skin voids to achieve effective means of surface preparation, paint application and inspection of these surfaces. The requirements apply to ships contracted on and after 1 July 2008. The PSPC also allows for the retention of intact shop primer on the condition that it is cleaned by sand sweeping or high-pressure water washing. A shop primer can be sweep blasted using conventional sandblasting equipment as a tool for secondary surface preparation. However, the dust treatment and cleaning operations required under the PSPC would require considerable man-hours of work in an inevitably poor working environment.

The shipbuilding industry faces a number of technical challenges to overcome these problems while maintaining high levels of productivity and effective use of human resources. Therefore, this research and development project has aimed to integrate both derusting and cleaning work, including weld bead treatment, by developing an efficient high-pressure water washing and water blasting technology with less environmental load.

The *Konki-jet* system consists of four components: a high-pressure pump unit, an abrasive media tank, a control panel, and a wide range of nozzles for different tasks. The *Konki-jet* system combines water, compressed air, and abrasives (media) for effective application in secondary surface preparation in the shipbuilding industry as well as in the removal of coatings and surface treatment in the ship repair industry. Although the term "Konki" originally means "mixed air" in Japanese, a homonym of the term also means "patient", "perseverance" or "not to give up". The term was coined by the Project Team as a shorter way of saying "environmentally-friendly mixed air and high-pressure water blasting system", because the project itself is patient and is the result of long and hard work lasting several years to achieve the goals of the project.

Research & Development

Until recently, it has been difficult to achieve the PSPC requirements for secondary surface preparation without using a special painting shed for coating ship blocks. In addition, shipbuilding companies have had to invest in expensive sand blasting plants to comply with the PSPC. Dry blasting is used primarily to remove rust or mill scale so as to achieve a suitable surface profile for coatings, but it is not optimal as a cleaning/

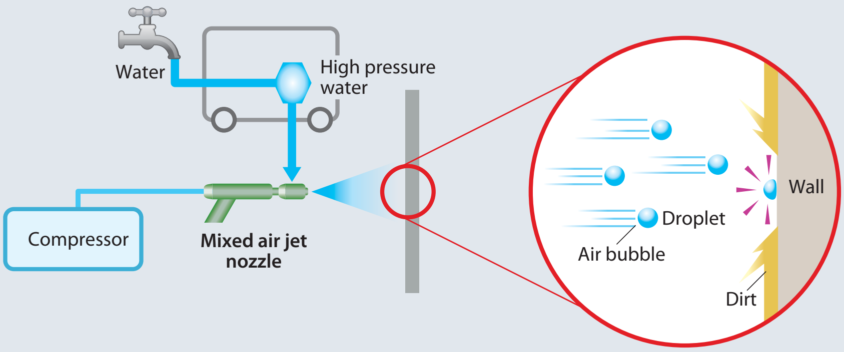


Fig. 1 Principle concept of *Konki-jet* system.

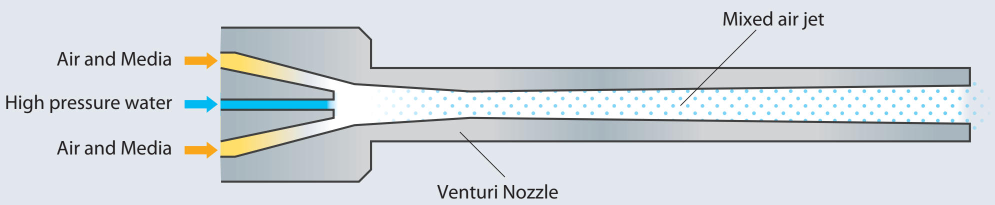


Fig. 2 Schematic cross-section of *Konki-jet* nozzle.

washing tool when the amount of dust scattering that results is taken into account. On the other hand, high-pressure water blasting has been used as a more effective cleaning/washing tool, but even ultra high-pressure water blasting has not been able to produce the required surface profile. Sponge blasting, soda blasting and other techniques have been considered as alternatives to eliminating dust during surface preparation, but their production rates are too low to satisfy shipbuilding industry requirements.

The principle of the *Konki-jet*, as shown in Figure 1, consists of the spraying of a high-pressure water jet from the center of a nozzle that is mixed with compressed air jetted from around the nozzle tip to accelerate the conversion of water into droplets and produce an air-mixed jet. The mixture of the water droplets and air shoots out from the nozzle and collides with the surface of the object being treated to let the droplets splash creating a hammering effect, thus increasing the ability of the spray to remove contaminants from the surface of the object being treated. In addition, the media is pressure-fed to the nozzle through a separate line and the speed is accelerated through a Venturi nozzle to project the jet, thus providing a smoother profile to the surface of the steel material with greater kinetic energy (see Figure 2).

Development Goals for the *Konki-jet* system

Development of the functional components of the *Konki-jet* system has focused on combining existing high-pressure water washing and sand blasting technologies in a more effective system as a superior alternative to traditional dry sand blasting. The resulting *Konki-jet* system achieves the following target characteristics:

- Blasts to a cleanliness grade of Sa 2.5 with a surface profile between 30-75 microns stipulated in PSPC;
- Removes dust, weld fumes, and water soluble salts stipulated in PSPC;
- Avoids flash rusting after water blasting through the use of a special patented media;
- Minimizes media consumption;
- Minimizes dust problems, and even allows blasting in open air environments;
- Minimizes plant and equipment investment; and
- Streamlines quality control through work environment improvement.

The *Konki-jet* system is not only environmentally friendly by

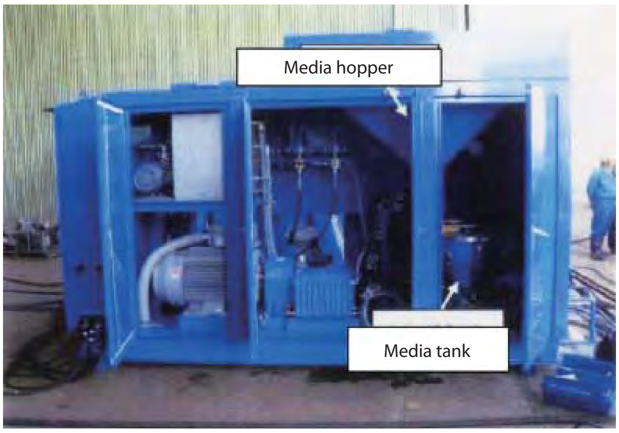


Fig. 3 Main unit of *Konki-jet* system.

Fig. 4 Collecting unit of *Konki-jet* system.

Fig. 5 High-pressure water washing of an actual block.

avoiding dust, but it also uses the effects of water cleansing, which is particularly effective in removing salt soluble contaminants, which in turn improves the adhesion properties of the treated surface. Further, it is possible to carry out water cleansing without removing or damaging the zinc silicate shop primer, which is an additional benefit for long-term corrosion protection.

Specifications of the *Konki-Jet*

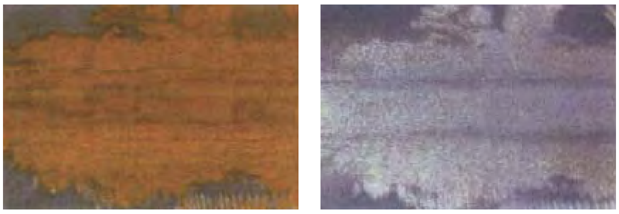
The main unit of the *Konki-jet* system consists of three modules: a high-pressure water washing module, a mixed compressed air and high pressure water blasting (water, media, and air) module, and a low-pressure water washing module. The combination of these modules achieves very effective cleaning and stripping characteristics. The system also includes a wet vacuuming based collecting unit that collects water and residual media during the work processes. Figure 3 shows the *Konki-jet* main unit while Figure 4 shows the collecting unit.

The major components of the *Konki-jet* also consist of a fresh water filter, a plunger pump (75 MPa), and an abrasive media tank. Hoses lead to hand-held guns fitted with a rotary nozzle for high-pressure water washing and a straight nozzle for water blasting. The compact size of the system makes it ideal for use in locations and applications where it is difficult to secure space for a larger scale blasting factory.

Practical Application Test

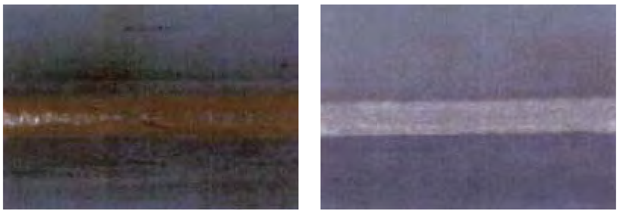
In developing the practical system capable of preparing extensive surface for coating, the project team paid particular attention to the workability and production rate of the system in the shipbuilding process. The project also placed much importance on preventing flash rust (essential for avoiding the need to re-work the surface) with respect to water blasting, and carefully examined flash rust prevention technology. In addition to developing the *Konki-jet* system itself, the project team conducted various tests on such factors as preventing flash rust with the application of a patented media developed in conjunction with the *Konki-jet* system as well as conducted tests to verify compatibility of the media with the top coat.

The project team confirmed that the *Konki-jet* system fully meets the PSPC requirements for a surface preparation blast cleaning grade of Sa 2.5 with a surface profile of 30 to 75 µm, and removal of contaminants such as dust, fumes, and soluble salts. In addition, trials on actual newbuilding blocks confirmed that each of the *Konki-jet* functions operate well without any problems. Thus, the system can be used for abrasive cleaning, low pressure water cleaning, and weld fume cleaning for new ships, as well as for the removal of paint and other surface contaminants such as rust for the maintenance and repair of the hull surfaces of existing ships.
All in all, the *Konki-jet* is proving to be a truly outstanding system that both satisfies PSPC requirements while meeting the needs of shipbuilders and ship repair yards for a cost-effective and efficient alternative solution to efficient surface treatment and stripping.



(a) Automatic weld bead (butt) before treatment
(b) Automatic weld bead (butt) after treatment

Fig. 6 Butt weld.

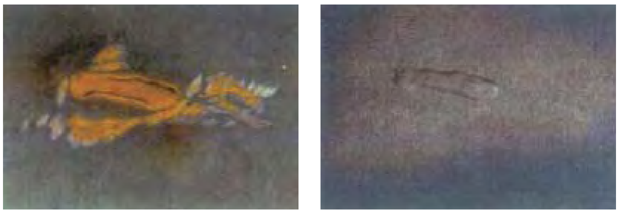


(a) Automatic weld bead (fillet) before treatment
(b) Automatic weld bead (fillet) after treatment

Fig. 7 Fillet weld.

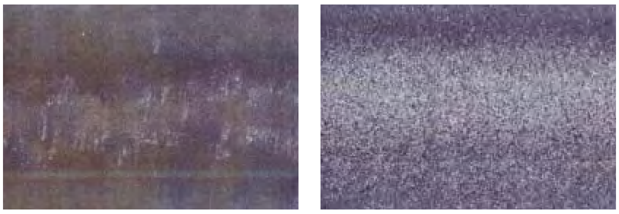
(a) Weld bead (internal corner) before treatment
(b) Weld bead (internal corner) after treatment

Fig. 8 Corner part.



(a) Damaged part before treatment
(b) Damaged part after treatment

Fig. 9 Damaged part.



(a) Back burn before treatment
(b) Back burn after treatment

Fig. 10 Back burn.

Photographic Examples of Secondary Surface Preparation

Several examples of photos taken before and after steel material surface preparation using the *Konki-jet* system are shown below.

Konki-Jet (blast cleaning grade Sa 2.5)

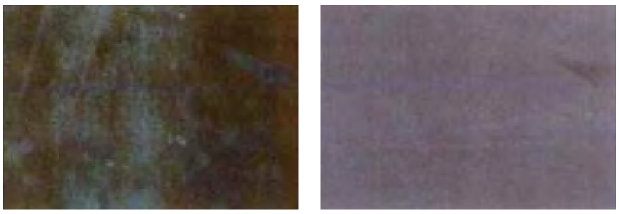
The PSPC requires the achievement of a blast cleaning grade of Sa 2.5 for weld beads with a surface roughness of 30 to 75 μm. Figures 6 to 8 show the state of surfaces before and after the treatment of butts, fillets and internal corner parts using the *Konki-jet* system. Figures 9 and 10 show similar samples for a damaged part and back burn.

High-pressure Water Washing

Removal of white rust and fixed fume can be achieved through high-pressure water washing using a rotary nozzle without using any media. Figures 11 and 12 show before and after examples of treatment by high-pressure water washing of fume and white rust.

Acknowledgements

This project has been carried out jointly by ClassNK and Japan Ship Technology Research Association in cooperation with the project team as part of ClassNK's ongoing practical R&D development program, which provides research support for cutting edge R&D projects that address the needs of the maritime industry. The project team consists of IHI Amtec Co., Ltd., Naikai Shipbuilding Co., Ltd., Mikami Marine Engineering Co., Ltd., Chugoku Marine Paints, Ltd., Shibuya Machinery Co., Ltd., Nippon Kaiji Kyokai, and Japan Ship Technology Research Association. The project team would like to express thanks for all the enthusiastic efforts and cooperation of those who have participated in this project.



(a) Fixed fume before treatment
(b) Fixed fume after treatment

Fig. 11 Fume.

(a) White rust before treatment
(b) White rust after treatment

Fig. 12 White rust.

EEDI and Reducing Greenhouse Gas Emissions in Shipping

Introduction

Concern about global warming and its effects on the environment have grown rapidly in recent years. This has included a heightening awareness of the need for greater energy conservation and reduction of CO_2 emissions. Against such a social context, it has become imperative to accurately grasp the amount of greenhouse gases discharged from various sources, including international shipping. Third-party verification of the evaluated results of emission measurements also plays an important role in this process.

Even though international shipping is responsible for moving some 90% of global trade, it is also the most environmentally-friendly and energy efficient mode of mass transport in the world. As such, it is only a modest contributor to the total volume of atmospheric emissions of greenhouse gases (GHG) generated each year at less than 3%. Nevertheless, as sea transport continues to grow in line with ever expanding world trade, this figure is projected to increase in the future. Thus, a global approach will need to be taken to realize further improvements in energy efficiency and emission reduction.

After many years of work, mandatory measures to reduce GHG emissions from international shipping were adopted as part of amendments to MARPOL Annex VI during the 62nd session of the IMO's Marine Environment Protection Committee (MEPC) held from 11 to 15 July 2011. This marked the first time ever that a global GHG reduction regime has been mandated for an entire international industry sector.

The amendments added a new chapter 4 to Annex VI on energy efficiency requirements for ships that make application of an Energy Efficiency Design Index (EEDI) mandatory for new ships and a Ship Energy Efficiency Management Plan (SEEMP) mandatory for all ships. Other amendments to Annex VI add new definitions as well as new survey and certification requirements, including the format for the International Energy Efficiency Certificate. The regulations apply to all ships of 400 gross tons and above, and are expected to enter into force internationally on 1 January 2013.

The EEDI requires a minimum energy efficiency level (as measured in terms of CO_2 emissions) per capacity mile (e.g. ton mile) for different ship types and size segments. As the level becomes more stringent over time, the EEDI is expected to stimulate continued technical development of all the components that affect the energy efficiency of a ship. Reduction factors are set to come into effect in progressive stages or phases until 2025 when a 30% reduction in energy output will be mandated compared with the average efficiency measured for ships built between 1999 and 2009. Said in another way, ships designed in 2025 will be expected to be at least 30% more energy efficient than their counterparts built between 1999 and 2009.

The EEDI has been developed for the largest and most energy intensive segments of the global merchant fleet and will embrace about 70% of emissions from new oil and gas tankers, bulk carriers, general cargo, refrigerated cargo, and container ships as well as combination (wet/dry bulk) carriers. It is expected that suitable EEDI formulas will be developed in the future for ship types not covered by the current formula, in line with a work plan also agreed upon at MEPC 62.

The SEEMP establishes a mechanism for shipping companies and ships in service to improve the energy efficiency of ship operations. The SEEMP provides an approach for monitoring ship and fleet efficiency performance over time using, for example, the Energy Efficiency Operational Indicator (EEOI) as a monitoring tool. The SEEMP urges ship owners and operators to review and consider operational practices and technology upgrades at each stage of ship operation in order to optimize the energy efficiency performance of the ship.

IMO deliberations on reducing CO_2 emissions

The basic concept of regulating CO_2 emissions being advocated by the IMO focuses on improving the energy efficiency of ships. Three methods were studied with a view to realizing this concept: technical measures, operational measures, and market based measures. Both the technical and operational measures mentioned here are direct measures for improving energy efficiency. The former are implemented by improving ship hardware, while the latter are implemented by improvements and innovations in ship operation. In contrast, market based measures are not meant to directly reduce CO_2 emissions; instead, they are designed to promote implementation of the above technical measures and operational measures through various economic incentives.

The regulatory framework includes two main steps. The first step involves the introduction of technical and operational measures including the application of the EEDI to new ships above a certain size that also satisfy an IMO limit value as well as the mandatory possession onboard of the SEEMP for all ships. These new requirements are key elements in the amendments to MARPOL Annex VI noted above and are expected to become applicable from 1 January 2013. The second regulatory step involves the introduction of market based measures aimed at further promoting the implementation of step 1. These measures are to be introduced in the future. Studies are currently underway regarding what kinds of market based measures would be best suited for this second regulatory step.

Overview of EEDI verification process

The EEDI is used as an index to assess the energy efficiency of a new ship. It is a factor of a new ship's design specifications which indicates the maximum energy efficiency that the ship can potentially achieve. Expressed numerically, it is calculated using a single equation, shown in simplified form below.

EEDI (g/ton mile)

$$= \frac{CO_2\ \text{conversion factor} \times SFC\ (g/kWh) \times \text{Engine output}\ (kW)}{DWT\ (tons) \times \text{Ship speed}\ (mile/hour)} \qquad \textbf{(1)}$$

The actual equation used for calculation is somewhat more complex since deduction items for emissions due to energy saving equipment onboard and so on, are also included in the equation.

The speed in the above equation is the value of the ship's speed in the fully loaded condition (70% deadweight condition in the case of container ships) under calm sea and calm weather conditions at 75% maximum continuous rating (MCR). The specific fuel consumption (SFC) is the value indicated in the NOx Technical File required by MARPOL Annex VI.

Since new ships will be required to comply with standard EEDI values beginning in 2013, verification will be necessary in order to determine whether ships are in compliance. Thus, Interim Guidelines for Voluntary Verification of the Energy Efficiency Design Index were adopted by the IMO at MEPC 59. Shortly afterwards, Guidelines on the Survey and Certification of the Energy Efficiency Design Index based on the interim guidelines were agreed upon in principle at MEPC 61. The aim of these verification guidelines is to assist shipowners, shipbuilders, manufacturers, and other interested parties concerned with the energy efficiency of a ship understand the survey and certification procedures necessary to verify the EEDI of the new ship. Verification is to be carried out by a Verifier, either the Administration or an organization duly authorized by it to carry out such verification work, such as a classification society.

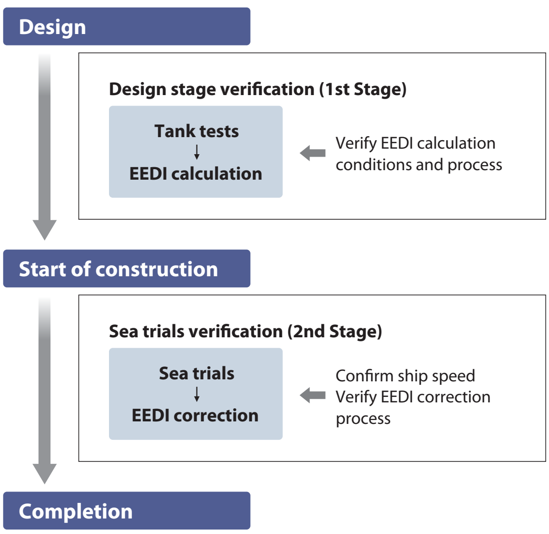


Fig. 1 EEDI verification procedure.

EEDI verification is done in two stages: the design stage pre-verification and sea trial stage final verification. The design stage pre-verification consists of

- reviewing the particulars of the new ship,
- conducting tank tests under fully loaded and sea trial conditions,
- determining power curves (the relationship between ship speed and main engine horsepower) for the ship under each of the above load conditions,
- verifying the calculation process used to determine the power curves for the ship obtained from tank test results, and
- verifying the estimated EEDI calculated from the main particulars and power curve of the ship under the fully loaded condition using equation (1) above.

The process also includes preparation of an EEDI technical file and additional information by the applicant (usually the shipbuilder) which describes all the relevant particulars of the ship. These documents are also submitted to the Verifier as part of the verification process. Construction of the ship can begin only if the results of this pre-verification show that the EEDI calculated for the ship satisfies the IMO limit value.

The sea trial stage verification consists of measuring the speed and other parameters of the ship during actual operation. It includes a check of the propulsion system, power supply system, engine particulars, and other relevant items described in the EEDI Technical File and additional information, as well as a check of the hull condition (draft and trim) at the time of the speed trials. In addition, the various values measured during the speed trials necessary for preparing the power curve are also confirmed.

The power curve for the ship is then determined based on the measured results. Differences between the power curves determined for both stages are ascertained and then used to adjust the EEDI calculated during the pre-verification stage. The final EEDI is then calculated based on the above results and equation (1) using the speed determined by the procedure set forth in the verification guidelines described above.

Final EEDI verification includes confirming both the measured results and the basis of the calculations in order to assess each EEDI parameter given in equation (1) above. Although parameters other than ship speed are generally confirmed at the time of the newbuilding class survey, ship speed is a parameter that up until now has only been confirmed in commercial

Musanah

Type of ship:	LPG Carrier
Gross tonnage:	47,985 GT
Sea trial:	2009/9/30-10/2

Shin Koryu

Type of ship:	Bulk Carrier
Gross tonnage:	106,367 GT
Sea trial:	2009/10/4-6

agreements between shipowner and shipbuilder. This parameter will now need to be verified for the first time by a third party as part of the EEDI verification process.

Actual trials were carried out by the Japanese government for both stages on two ships in line with the new IMO interim EEDI verification guidelines during their development in order to validate the verification procedure. The guidelines were revised in part based on the results of the trials. These two vessels, an LPG carrier, the Musanah, and a bulk carrier, the Shin Koryu, were the first ships to undergo the EEDI verification procedure. ClassNK was actively involved in the process providing technical support and expertise to the Japanese government and IMO.

EEDI and ClassNK

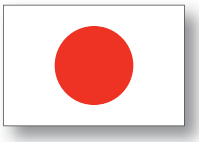
Third-party verification is an important part of the above procedure. This includes reviewing the ship's design specifications, witnessing tank tests, reviewing the EEDI Technical File and any related additional information, as well as issuing a Report of Pre-verification summarizing the above results. It also includes final verification, which consists of the Verifier witnessing sea trials, verifying ship speed, and reviewing revisions to the EEDI Technical File. Once each of these steps has been found to satisfy the IMO Guidelines and Annex VI requirements, the Verifier will issue an IEE (International Energy Efficiency) certificate together with the approved EEDI Technical File.

For its part, the International Association of Classification Societies (IACS) has established a joint working group with industry, including shipowners' and shipbuilders' associations around the globe, with the goal of developing industry guidelines that offer support from a practical perspective on the above EEDI verification procedures as well as to help industry address the technical and safety challenges raised by the need to reduce GHG emissions. ClassNK has been very actively involved in these efforts from the start, including when it was the chairing Society of IACS. The society has also been proactively studying ways to enhance shipboard energy efficiency and has already started to offer a new EEDI appraisal service as well as an EEOI calculation and analysis service in the form of its PrimeShip-GREEN/EEOI environmental efficiency analysis software system with the aim of helping improve the efficiency of international shipping.

In conclusion

The EEDI is an important technical measure for requiring a minimum energy efficiency level per capacity mile (e.g., ton mile) for different ship types and size segments. As required levels of energy efficiency become increasingly more stringent every two to five years, the EEDI will stimulate continued technical development of all the components affecting the fuel efficiency of a ship. It is a robust step-wise mechanism that is expected to increase the energy efficiency of ships for many decades to come. The EEDI is a non-prescriptive, performance based mechanism that leaves the choice of technologies to be used in a specific ship design to the industry. So long as the required energy efficiency level is attained, ship designers and builders are free to use the most cost-efficient solutions for the ship that comply with the regulations. In this way, the EEDI will offer new opportunities for companies throughout the industry.

View of top page of ClassNK's PrimeShip-GREEN/EEOI.



The Great East Japan Earthquake Aftermath and Recovery

The Great East Japan Earthquake occurred at about 2:46 pm on 11 March 2011 and lasted for well over a minute. The epicenter was located about 130 km off the coast of Miyagi Prefecture in the northeastern part of the main island of Honshu known as Tohoku. The temblor occurred as the result of a 290 kilometer long rupture in a fault about 32 kilometers under the seafloor. In addition to being reported as the largest in Japan's history, the 9.0 magnitude earthquake was the fourth largest in the world in the past century. In fact, the earthquake was so powerful that it caused the earth to rotate slightly faster, shortening the length of the day by about 1.8 microseconds. It even shifted the position of the axis around which the earth's mass is balanced by about 17 centimeters and moved Japan's main island of Honshu about 2.4 meters.

The earthquake was soon afterwards followed by a massive tsunami, or tidal wave, and numerous aftershocks. The tsunami caused extensive damage in many areas and accounted for more than 90% of the fatalities that occurred as a result of the disaster. Although the event caused massive damage and dislocation in the lives of hundreds of thousands of people in the affected region, recovery efforts have proceeded remarkably well with numerous businesses already back in operation in many areas and local communities well on their way to recovery.

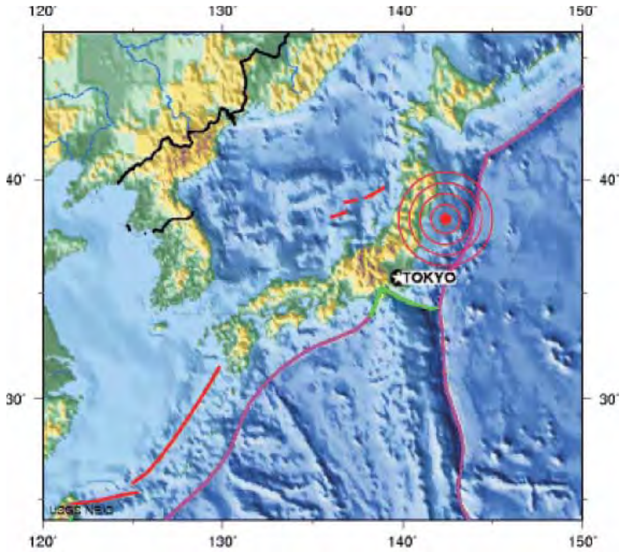
Rapid Recovery of Infrastructure – the Lifeline to the Region

Usable infrastructure is essential to the efficient movement of emergency supplies and materials necessary for effective recovery efforts. It is also the life blood for any community. Thus, great emphasis was placed on recovering the transport infrastructure in the Tohoku region as quickly as possible. Significant progress was made in this regard thanks to a concerted effort by government at all levels in cooperation with a host of public, private, local, domestic, and international organizations. A notable example is the tremendously rapid repair and recovery of operations at Sendai Airport, which was badly damaged by the tsunami. The U.S. military cooperated with Japanese Self Defense Forces to restore the entire runway within just three weeks making it usable on 29 March. Passenger flights resumed between Sendai and both Tokyo and Osaka two weeks later on 13 April. Moreover, domestic flight operations returned to normal on July 25, less than four and a half months after the airport sustained such massive damage.

Another prime example is the repair of the Tohoku Expressway, a key commercial artery that connects northern Japan with Tokyo and surrounding regions. Although more than half of the 675 km of the expressway was damaged on 11 March, traffic restrictions were lifted just two weeks later on 24 March, after completion of emergency restoration measures. Japan's renowned shinkansen "bullet" train also underwent a similar yet no less remarkable recovery, thanks in large part to the prior installation of an early earthquake warning system on all carriages of the Tohoku Shinkansen as part of earthquake disaster prevention measures. Within seconds, the system automatically halted electric power to the overhead wiring supplied to all trains and applied emergency braking 1 minute and 10 seconds before the largest tremor hit. As a result, all 27 trains in operation at the time in the affected area were stopped without any derailments and without any injuries or loss of life.

It goes without saying that many of the sea ports and harbors in the region struck by the tsunami were particularly hard hit, although to varying degrees. Consequently, recovery work still proceeds as ports damaged by the tsunami gradually recover function. Even so, quays at all of the major ports on the Pacific coast from Aomori Prefecture in the north to Ibaraki Prefecture further south above Tokyo became usable again within just two weeks. In addition, operations at more than half of the

A streamer saying "Gambaroo Nippon" as part of the encouragement and recovery support campaign in Japan. The text means "We can do it, Japan!".



NEAR EAST COAST OF HONSHU, JAPAN
2011 03 11 03:46:24 UTC 38.29N 142.37E Depth: 30.0 km
Earthquake Location

Source: USCG website.

Continuing Earthquakes

Main shock

• Magnitude: 9.0 (11 March 2011)

Aftershocks

• Magnitude 7 or greater:	6 times
• Magnitude 6 or greater:	96 times
• Magnitude 5 or greater:	580 times

(As of 21 Oct. 2011)

Port of Oarai eight months after tsunami.

21 ports in this same area have already been restored. This has greatly helped to facilitate the provision of much needed supplies to the affected region and now greatly aids in helping local businesses re-establish logistic and distribution lines that were disrupted by the earthquake and subsequent tsunami. Great strides have also been made in the building of temporary housing. This has made it possible to close evacuation centers in Iwate Prefecture within half a year after the disaster.

While the shipbuilding and shipping industry in Japan suffered sizable damage, it was mostly limited to the affected coastal areas of Tohoku. The companies most affected were primarily small and medium sized shipyards. Numerous smaller ships were badly damaged, as well. Fortunately, Japan's major shipyards suffered negligible damage in large part because the larger yards are located in parts of Japan outside the main disaster-hit area. Although some yards in the region were badly affected and suffered extensive damage as a result of the tsunami in particular, most have already returned to full operation, while a remaining few are looking to restart normal operations soon. One yard, in fact, has recently celebrated their first new ship delivery following the disaster. Fortunately, there was no major damage to any of the offices of ClassNK in the region or elsewhere and no loss of life or major injuries among any of the NK staff.

As of the end of September 2011, all of the damaged reactor units at the Fukushima Daiichi nuclear power plant were cooled down to less than 100ºC. At present, it is unlikely that these units will go uncontrolled again. Moreover, it should also be noted that while radiation levels in Tokyo did rise slightly above normal levels recorded in 2010, for example, the radiation levels in the city are less than half of those reported in London or Paris. Hence, radiation levels in Tokyo are quite safe.

Kitanihon Shipbuilding Kuji works seven months after tsunami.

Guidelines on Reconstruction

In order to deal more effectively with the immense challenges to recovery including disaster relief to longer-term reconstruction and renewal, the Japanese government developed basic guidelines for reconstruction from the Great East Japan Earthquake. Spanning a ten year time frame, the guidelines incorporate initiatives from the following four perspectives: (a) building disaster resistant and resilient regions, (b) restoration of life in communities, (c) revival of local economic activities, and (d) nation-building that incorporates lessons learned from the disaster. The Guidelines also include initiatives for reconstruction from the Fukushima Daiichi nuclear power plant accident as well as initiatives aimed at supporting and activating the private sector to the maximum extent possible. Moreover, the Japanese government also passed a supplementary budget in November 2011 that earmarks more than 11.7 trillion yen (US$150 billion) to cover the various costs involved with the reconstruction efforts. While much work remains to be done, these basic concepts for reconstruction and measures for recovery are expected to help facilitate recovery efforts and highlight the resilience of all concerned in Japan and around the world in making these efforts a success.

This rapid recovery is a testament to the extensive support provided to the recovery efforts by so many around the world on all levels from the most personal to the national and international level. While we deeply mourn the passing of so many who lost their lives in this devastating natural disaster, we also remember with the most heartfelt gratitude the outpouring of support provided by the millions in Japan and around the world whose generosity is making such a recovery possible.

Sidebar: Major Earthquakes of the Past Century

At magnitude 9.0, the March 11th earthquake in Japan was the fourth largest since 1900. These four largest events are listed by magnitude below.

22 May 1960
Valdivia, Chile
Magnitude 9.5

28 March 1964
Prince William Sound, Alaska
Magnitude 9.2

26 December 2004
Sumatra, Indonesia
Magnitude 9.1

11 March 2011
Sendai, Japan
Magnitude 9.0

Focus on Japan

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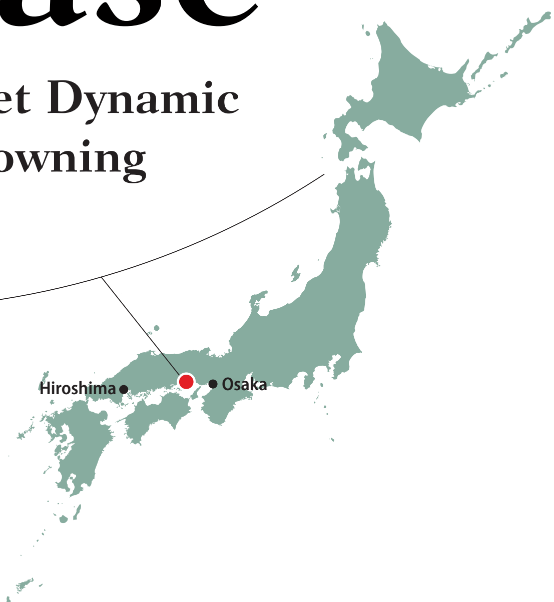
Hinase

A Traditional yet Dynamic Center of Shipowning in Japan



Hinase is a local region of Japan in the eastern part of Okayama Prefecture. It has a long history as the home for many Japanese shipowners. Located almost half way between Osaka to the east and Hiroshima to the west, it sits on the edge of the Seto Inland Sea, a major shipping and maritime area of Japan. The area has been long known for its excellent fishing, as well. In fact, towards the end of the Edo period, the Hinase fishing fleet consisted of some 300 vessels whose catch was highly prized in the fish markets of Osaka and elsewhere in Western Japan.

Hinase also refers to a group of more than a dozen islands by that name, situated in the southeast corner of Okayama Prefecture. The island of Kakui includes a national wildlife preserve that covers more than half of the island. The very well maintained natural environment makes it a perfect home for the many wild deer that inhabit the island. Another of the islands, Otabu Island, once flourished as a port town used for stopovers by ships awaiting better sailing conditions. Today, it boasts numerous scenic hiking routes, historic sites, and other points of interest.

A local town known as Hinase was formerly located in the Wake District of Okayama, Japan. On 22 March 2005 the town was formerly merged with the town of Yoshinaga, also in the same district, and incorporated in the expanded city of Bizen, also home to many shipowners. At that time, the town had an estimated population of 8,400 living in an area encompassing some 36 km^2. The town, which now exists as a part of Bizen, overlooks a bay with a huge hill on the other side set in the Seto Inland Sea.

Oyster farming in Hinase.

In addition to fabulous fishing and many scenic sights, Hinase is also well known for its oyster farming. The oyster business here is one of the largest in the country. The waters in the area contain many oyster rafts and are quite picturesque when viewed from local hilltops, especially at sunset. The oyster season generally lasts from December to February and many people come from other towns to buy oysters from the local fish market. In mid-February, Hinase hosts an annual Oyster Festival to celebrate the end of the season. A key feature of the festival is that oysters can be purchased fresh and cooked in public barbecue areas for all to enjoy. Local delicacies such as oyster "okonomiyaki", a pancake-like dish made with cabbage, vegetables, oysters and a tasty sauce, are proudly served up to visitors and locals alike. Fried oysters are also a renowned delicacy that is often served with a specially prepared sauce.

Hinase: A Special Home for Maritime Shipping

Maritime transport has been an important part of life in the Seto Inland Sea since ancient times and remains a predominant business to this day. Not only has the area around Hinase long been known for its excellent fishing and large fishing fleets, it also has a long history as the home to many shipowners. In fact, the region has one of the largest concentrations of shipowners in Japan and has the largest fleet in Okayama Prefecture. These owners are not only very active in domestic shipping trade, but are also increasingly active in international shipping, as well. These new shipowners traded in cooperation with merchants in major ports nearby as well as sailors in the towns located in the coastal region of Seto Inland Sea.

There is story told of a local legendary maritime trader known as Tabuchiya Jinkuro who owned a fleet of 48 large-sized specialized wooden cargo ships known as "sengokubune" (because they were large enough to carry 1,000 "koku" or some 278,000 liters or 150 tons of rice; at the time ships of very large size). These vessels reportedly plied routes ranging from Hokkaido to Kyushu and from China to the Philippines. In more recent times, the shipowning business in Hinase flourished even more with the fleet becoming the largest in Okayama during the Meiji Era (1868-1912). In the ensuing years, ever growing numbers of passenger ferries and other types of vessels transported passengers and cargo among the many ports and islands of the Seto Inland Sea as well as to other parts of Japan and even overseas. By the first half of the 1970s, the number of owners peaked at some 260 in Hinase. However, changes in market conditions, including a lack of people to carry on the business, caused many of these firms to either merge with others or go out of business. Even so, today, there are still some 70 owners operating more than 100 ships in the region.

Some of these companies have survived by expanding the focus of their operations from purely coastal service to taking advantage of growing opportunities in international markets. This shift started gathering momentum in the 1990s and picked up even more during the shipping boom that took place after

Onaruto Bridge

2005. At present, there are nearly two dozen owners in the Hinase region alone who own and operate ships on routes outside Japan. While the size of the individual fleets of these companies may vary, as a group they sail a wide range of vessels, including capesize bulk carriers, chemical carriers and other types of ships.

At present, there are about twenty owners who operate ships in routes overseas. So, while Hinase is one of the main concentrations of owners in Japan operating ships overseas, the fleet itself is limited in size, since, with exception of a few local majors, the number of ships owned by each shipowner is comparatively small. Thus, more and more shipowners in the region have been seeking to leverage their broadening international experience to grow their fleets steadily on their own and rapidly expand the international scope of their activities. To this end, many younger shipowners have joined together to form a group to help better deal with the many challenges of operating overseas. Their activities include earnest study of many topics of mutual concern and working closely together to exchange information with the aim of not only helping their own firms, but also contribute to the stable management and continued development of the shipowning business in Hinase.

ClassNK Presence and Support in the Region

ClassNK strives to provide high quality service through its Kobe Branch Office, which has jurisdiction over the Hinase region, as well as across the Society in support of the development of shipowning and maritime activities throughout the region. This includes the ClassNK Chairman and President visiting Hinase regularly for face-to-face meetings with local shipowners to exchange views on a host of topics of mutual interest. This makes it possible to quickly grasp important needs from the feedback gained during these exchanges. Local owners also obtain valuable support and assistance from a technical manager of the Survey Department stationed at the ClassNK Hiroshima Branch Office in dealing with more routine matters, as well. In addition, the ClassNK Kobe Branch Office holds special study sessions every three months on a wide range of topics that are frequently attended by shipowners from the Hinase and surrounding areas. The Society always takes particular care to listen to the views and feedback of its clients. The straight talking and broad range of views offered by the shipowners of Hinase time and again are of great benefit to both the shipowners themselves and to ClassNK.

Port of Hinase.

ClassNK

Around The World

Oslo, Norway

NORWAY ——

A Major Seafaring Nation and Gateway to the North

The long and narrow country of Norway with its 5 million inhabitants has the longest shoreline in Europe, measuring 83,281 km. The Gulf Stream makes the climate milder than many other areas at the same latitude.

Rock carvings and archaeological diggings show that coastal transport has been an key element of life for millennia. Until the first railway was built in about 1850, ships were almost exclusively the only way used to transport people and goods over any distances.

The well known Viking period (800–1066) is the first available written history of seafarers in the region. While the Vikings are often known for both robbing and plundering, they were also very active in trading and colonizing across a large region of Northern Europe and beyond. Viking ships were made of wood and were a combination of rowing and sailing vessels, called long ships. They sailed south to the Mediterranean and west to Scotland and Ireland. Following inland Russian rivers, they even reached Istanbul. In fact, Leiv Eriksson and his men sailed across the Atlantic Ocean and reached America some 500 years before Columbus.

After sailing ships became the main mode of sea transport, Norway continued to be a great nation of seafarers. Today, it is a major exporter of fish and timber to other countries around the world. And even though the country had gone through difficult periods of war over its long history, Norway has always been a powerful shipping nation. The first steam ships gradually replaced sailing ships, and in the beginning of the 1800s, Norwegian shipping became more and more international.

When oil was found in the North Sea in 1969, a new age began for Norway and both the market and industry became increasingly focused on the oil industry. Today, Norway has a very highly competent and well established offshore market.

Shipbuilding in Norway has a long tradition and has been very important to the country. Up to 1970 Norwegian yards built mainly dry cargo vessels, tankers, as well as fishing vessels and trawlers. After 1970 some yards closed down due to overcapacity, while other yards gradually converted to offshore construction, such as drilling rigs, modules for the production of offshore platforms, and offshore vessels.

The greatest activity up to now has been the building of offshore construction vessels (supply, anchor handling, and special construction vessels) as well as vessels used for local trading. The hulls used in the production of offshore vessels are mostly built in former Eastern European countries and then outfitted and completed in Norway.

More than 80 percent of the contracts at Norwegian yards are for offshore vessels. Norway has the world's largest fleet of offshore vessels. Today, more than 500 offshore vessels are owned by Norwegian companies. The largest concentration of yards and owners of offshore vessels are on the west coast of Norway.

Karl Johans Gate

The Royal Palace

The Vigeland Sculpture Park

OSLO

The capital of Norway is Oslo. The city proper has nearly 600,000 inhabitants covering an area of some 450 km^2 of which only one-third of the land area is developed. The city center is surrounded by woods, lakes and forty islands, giving it a blue-green image.

The metropolitan area as a whole has a population of about 1.4 million people. The capital lies at the inlet of the Oslo Fjord, which is 180 km long. The Oslo Fjord also has the greatest share of ship visits of any location in Norway.

The first town settlement in Oslo was built about 1,000 years ago. The first name of the town was Oslo, but from 1624 until 1924, it was known by the name Christiania (Kristiania). In 1925 it was changed back to the original name, Oslo

The city is an important center of maritime history, maritime trade and development. Few cities in the world can offer a concentration of maritime environments like Oslo. With the fifth largest merchant fleet in the world, the Norwegian maritime sector offers a wide range of specialized maritime services including equipment supply, maritime insurance, ship brokering, and two of the leading shipping banks in the industry. Many of the largest shipowners in the world have their offices in Oslo.

One of the world's largest maritime exhibitions, Nor-Shipping, is held in Oslo every other year. The event is attended by more than 1,110 exhibitors and 17,000 visitors from across the maritime sector around the world.

The area around Oslo also offers a wide variety of sporting activities such as skiing in the winter time as well as bathing, sailing, and hiking in the summer time. A new opera house was opened in 2008 and is located in the old harbor area of Oslo. It was designed by the Norwegian architects Snoehetta and is the only opera house in the world where one can walk on the roof.

There are also a number of maritime museums on the Bygdoey Peninsula close to the city. The city itself also boasts the famous Holmenkollen Ski Jump and a large park, Frognerparken, with Vigeland sculptures. The Fram is the strongest wood ship ever built and was used by Fridtjof Nansen and Roald Amundsen in their voyages to the North and South Poles.

Cross country skiing

The New Holmenkollen Ski Jump

Akershus Fortress

ClassNK OSLO OFFICE

ClassNK Oslo office was established in 1995 with one surveyor and one secretary. The office was since expanded in 2004 to support two surveyors in addition to one secretary. The office has continued to be located near the city hall in Oslo with a fine view of the sea.

The jurisdiction of the office covers Norway and Norwegian ports for ships in service and for the inspection of marine equipment. In addition, ClassNK has surveyors in Bergen and Ålesund on the west coast who handle marine equipment related matters. Distances are long in Norway and travelling to some harbors in the western and northern part of the country can take much time.

ClassNK was officially recognized by the Government of Norway as its newest Recognized Organization at a special signing ceremony held at the Royal Norwegian Embassy in Tokyo on 8 November 2011. Deputy Minister Rikke Lind of Norway's Ministry of Trade and Industry, and ClassNK Chairman & President Noboru Ueda signed the agreement, which grants the Tokyo-based classification society the authority to perform surveys and issue certificates for Norwegian flagged vessels.

Signing ceremony between Deputy Minister Rikke Lind of Norway's Ministry of Trade and Industry (left) and ClassNK Chairman & President Noboru Ueda (right).

Jakarta,
Indonesia

Tugu Monas (National Monument)

Jakarta History Museum

INDONESIA ——
A Gem of Southeast Asia

The Republic of Indonesia is a large country comprised of more than 17,500 islands in Southeast Asia. With a land area of about 2 million square kilometers, a maritime area almost four times that of 7.9 million square kilometers, and a population of more than 240 million people, Indonesia is the fourth most populous country in the world. The island of Java alone has a population of some 124 million people, making it the most populous island in the world and one of the most densely populated areas in the world. Approximately 90% of the population is Muslim, most of whom live on the main island of Java.

The name Indonesia is derived from the Latin “Indo” for “India/Indian” and the Greek term “nesia” meaning “islands”. It was first used in 1850 by British anthropologist J. R. Logan to refer to islands commonly known at the time as the "Indian Archipelago". Originally, "Indonesia" designated a cultural zone that also included the Philippine islands rather than any political unit. Archeological evidence, including the presence of *homo erectus*, popularly known as Java Man, suggests that the Indonesian archipelago was inhabited two million to 500,000 years ago. *Homo sapiens* reached this region by around 45,000 years ago when the waters were lower and a land bridge existed with the main Asian land mass.

The area that was to become modern day Indonesia has been involved in maritime trade for more than 1,000 years. As a key crossroads between China, India, and Arabia, the islands of Java and Sumatra in particular were exposed to a dynamic range of religious, cultural, and ethnic influences. The Chinese were among the first to trade with the islands in the Indonesian archipelago. They were followed in the eighth century AD by Hindu and Buddhist merchants from India. During the 7th to 14th centuries, the Buddhist kingdom of Srivijaya flourished on Sumatra. At its peak, the Srivijaya Empire spanned from central Java to the Malay Peninsula. Also by the 14th century, the Hindu Kingdom of Majapahit had risen in eastern Java. Gadjah Mada, chief minister of the empire from 1331 to 1364, succeeded in forming alliances with most of what is now modern day Indonesia as well as with much of the Malay Archipelago. Legacies from his time include a codification of law and an epic poem. These empires were later supplanted in the 13th century by Islamic influences brought by Arab and Malay seafarers.

Although the English and Portuguese were the first Europeans

Bali

to arrive in the area in the 16th century, the Dutch East India Company took control of trade in the area in 1595. The country had been subject to colonial rule until it gained independence in 1949. Today, Indonesia encompasses a diverse variety of cultural and religious traditions.

Indonesia is one of the world's most geologically active regions with numerous volcanoes that have contributed to the formation of the archipelago. The islands lie along the equator and enjoy a tropical climate with only two seasons of wet and dry, with warm weather throughout the year. The islands are also covered with forest surrounded by a bountiful tropical sea. The national flower of Indonesia is Melati (*Jasminum sambac*) together with Anggrek Bulan (*Phalaenopsis amabilis*) and Padma Raksasa (*Rafflesia arnoldii*), which is the largest blooming flower in the world. All were chosen in 1990.

Indonesia has about 300 different ethnic groups, many indigenous to the different islands, and though sometimes related, each group maintains its own identity, including language. Nearly all have been affected to some degree by Indian, Arabic, Chinese, and European influences. In addition, while Indonesian cuisines vary by region, chili, coconut milk, seafood, and chicken are fundamental ingredients with rice being a main staple of the diet across the country.

Indonesia has a mixed market economy in which both the private sector and government play significant roles. The country has the largest economy in Southeast Asia and is a member of the G-20 group of major economies. Indonesia's main export markets are Japan, Singapore, the United States, and China. The major sources of imports to Indonesia are Singapore, China, and Japan. The main industries of Indonesia are mining (oil, LNG, aluminum, tin), agriculture (rice, rubber, palm oil), and production (wooden products, cement, and fertilizer). Tourism is a major industry, as well. Although the country has faced a number of political and economic challenges over the years, Indonesia has been enjoying a steadily expanding economy for the past decade that promises even further growth and improved living standards in the future.

Within the shipping industry, new cabotage requirements have also been introduced step-by-step since November 2005. Under the new requirements, all types of vessels, other than special purpose vessels, that trade in two or more ports in Indonesia are required to be Indonesian flagged ships. According to the new regulations, from January 2011 onwards, such vessels are required to be managed by an Indonesian company and operated by an Indonesian crew. This new policy is expected be a particular boon to the domestic shipping industry, both in terms of encouraging further growth and providing greater employment opportunities for all.

ClassNK in Indonesia

ClassNK currently has four offices in Indonesia, located in Jakarta, Surabaya, Batam, and Balikpapan. Combined, these offices cover all areas of Indonesia and provide ever expanding support to the growing number of NK clients in the country. Originally founded in 1984, the ClassNK Jakarta Representative Office traditionally carried out surveys under the auspices of the Indonesian classification society, Biro Klasifikasi Indonesia (BKI). In June 2000, the status of the ClassNK Jakarta Office changed, when it became a fully independent exclusive survey office. Sub-offices were established in Surabaya, Batam, and Balikpapan in April the following year in order to enhance the survey network to better cover client needs across this expansive country. ClassNK has also an agreement with BKI on the conduct of classification surveys for dual BKI/NK classed ships. In April 2011, the Surabaya Sub-office was upgraded to become the Surabaya Office.

» Jakarta Office

Jakarta is the capital and largest city of Indonesia. It is located on the northwest coast of Java, and has a population of nearly 10 million people. It is the most populous city in Indonesia as well as in Southeast Asia, and is the tenth largest city in the world. Jakarta was originally founded in the 4th century and became an important trading port of the Kingdom of Sunda. The city has been known by many names over the centuries including Sunda Kelapa, Jayakarta, Batavia, and Djakarta.

Jakarta Office Staff

Surabaya Office Staff

City view of Balikpapan

Batam Sub-Office Staff

Shipyards in Batam

The Jakarta Office carries out surveys in the western Java and southern Sumatra region. The two sub-offices of Batam and Balikpapan are also under the jurisdiction of the Jakarta Office. Although the majority of surveys carried out by the Jakarta Office are for ships in service in port or in dry-dock, a newbuilding project has been underway with the participation of the Jakarta Office since 2010.

» Surabaya Office

Surabaya is the second largest city in Indonesia with a population over 2.7 million. It is also the capital of the province of East Java. A monument of a shark and crocodile can be seen in the city center. This is because the name "Surabaya" is believed to come from the words "suro" (shark) and "bayo" (crocodile), which reflects the most powerful and strongest of animals. The ClassNK Surabaya Office is located in the center of Surabaya and covers East Java Province. There are many shipyards in the area that are engaged in both new shipbuilding and ship repair work.

» Batam Sub-Office

Batam is the name for both the island and city in the Riau Islands Province of Indonesia. The island is known for its free trade zone (exemption from VAT), and is located just 20 km from Singapore. It has a population of approximately 1 million. Beginning in 1970, the island underwent a major transformation from being a predominantly forest area to an industrial zone. The island has a strong relationship with Singapore and there are many Singaporean companies including shipyards located on the island. The ClassNK Batam Sub-office is located in Nagoya in the center of Batam Island. Six surveyors cover Batam Island, Karimun Island, as well as the cities of Dumai and Medan in northern Sumatra.

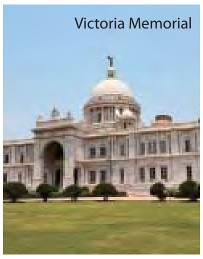
» Balikpapan Sub-Office

The ClassNK Balikpapan Sub-office is located on the eastern coast of Kalimantan Island. The island is a resource-rich region well known for its timber, mining and petroleum. Natural gas and coal are exported from the island to other countries, including Japan. The island is particularly rich in coal reserves. The coal is mined inland and then is carried by tug and barge downriver, where it is then transported from barges to bulk carriers at the estuary of the river and exported overseas. The ClassNK Balikpapan Sub-office is located in the eastern part of the island, and covers Kalimantan Island. The office carries out surveys for LNG carriers, bulk carriers, tug boats, barges, and other types of ships.

Newly Established Offices

Ever since ClassNK opened its first international exclusive surveyor office in 1962, the Society has grown to have a truly global presence. The Society has been especially active in expanding its global network over the past few years, opening numerous new exclusive surveyor offices across the globe. It has continued this network expansion with the opening of four new offices during the twelve months from December 2010 to November 2011. The establishment of these new offices brings the total number of offices in the ClassNK global survey network to 119, with 21 offices in Japan and 98 offices elsewhere across the world.

Kolkata, India 1


Victoria Memorial

A ClassNK Local Area Representative office was established in Kolkata, India on 15 December 2010. Kolkata is a major commercial and industrial city in India and is the economic, academic and cultural center of the country. It is also the oldest major port in the country. The port of Kolkata, which includes the Kolkata Dock System and Haldia Dock Complex, handles more than 50 million tons of cargo each year, making it one of the largest and busiest ports in India. The new office joins the offices of Kochi, Dahej, Chennai, Visakhapatnam, and Mumbai in dispatching exclusive surveyors of the Society to service clients in the country.

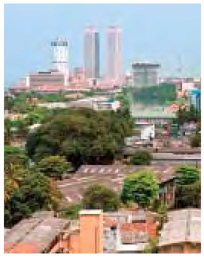
St. Petersburg, Russia 2

A new ClassNK Local Area Representative office was opened in St. Petersburg, Russia on 30 December 2010. The city is the industrial and maritime capital of Russia, and the Port of St. Petersburg is the European gateway of the country to the rest of the world. Shipbuilding is the key industry of St. Petersburg. The local harbor also has a repair dock, making the port a convenient location for ships to undergo surveys. The opening up of a local office in St. Petersburg makes it easier for surveys of NK classed ships to be carried out more quickly and effectively by NK exclusive surveyors in the region.


Catherine Palace

Colombo, Sri Lanka 3

A new ClassNK Local Area Representative office was established in Colombo, Sri Lanka also on 30 December 2010. Colombo is the economic heart of Sri Lanka and is home to the largest port in the country. Container carriers call at the port and repairs are also undertaken at local shipyards. Until now, surveyors have been dispatched from other offices in India and elsewhere to handle surveys in the country.



The establishment of new LAR offices in new areas helps to enhance the survey system in each region and provides a means of improving service to local clients by being able to dispatch surveyors that much more quickly to meet client needs on a more timely basis.

Shenzhen, China 4

A new Local Area Representative Office was opened in Shenzhen, China on 1 April 2011. The ClassNK Shenzhen Office becomes the ninth office opened by the Society in mainland China, marking the continued growth of ClassNK's presence in the Chinese market. Shenzhen is also a special economic zone. Major industries in the area include service industries such as finance and logistics. It is also a center for the high-tech industry. The local major Port of Shenzhen has been the world's fourth largest container port hub for the last seven years. Moreover, the number of NK surveys at the port has been increasing recently, as well.

In addition to offices in Hong Kong, Taipei, and Kaohsiung, the Society also already has offices in Shanghai, Dalian, Guangzhou, Nantong, Qingdao, Tianjin, and Zhoushan, making the new office at Shenzhen the eighth office in the Nippon Kaiji Kyokai (China) survey network. The prompt assignment of surveyors to the new office has further enhanced the Society's ability to provide even better service to clients in the region.


St. Petersburg
RUSSIA
Tianjin
Dalian
Qingdao
CHINA
Nantong
Shanghai
Zhoushan
Taipei
Guangzhou
Hong Kong
Kaohsiung
Shenzhen
1
2
3
4
INDIA
Dhaka
Dahej
Kolkata
Mumbai
Visakhapatnam
Chennai
Kochi
SRI LANKA
Colombo

Exhibitions

ClassNK has become a regular fixture at an ever greater number of international maritime exhibitions around the world. Below is a brief overview of just a sample of the seventeen exhibitions the Society has attended during 2011.

Sea Asia

The Sea Asia 2011 exhibition, organized by Seatrade, was held in Singapore from 12 to 14 April 2011. This was the third time that ClassNK attended the event, which is held every other year. More than 340 companies from 60 different countries exhibited at the event. A total of 12,167 visitors registered at the event, as well, with hundreds visiting the NK booth, including top dignitaries.

A conference was also held in conjunction with the exhibition. Chairman and President N. Ueda spoke as IACS Chairman on the topic of "IACS Contributions to Regulations, Rules and Legislation" during the technical session held on April 13th, at which he outlined the various efforts being undertaken by IACS in this key area.

Nor-Shipping

The Nor-Shipping 2011 maritime exhibition and conference was held from 24 to 27 May in Lillestrom, Norway, near Oslo. Held every other year, this year marked the twenty-third time that the exhibition has been held. A total of some 1,100 exhibitors attended the event, representing shipowners, shipbuilders, marine equipment and engine manufacturers, and a broad range of other companies and organizations from around the world. Some 17,000 visitors attended the event over the four days it was held.

More than 400 visitors came by the ClassNK booth. The event provided the Society with an excellent opportunity to deepen relations with many visitors and companies exhibiting at the exhibition.

Europort Istanbul

The Europort Istanbul 2011 exhibition was held from 23 to 26 March 2011 at the Istanbul Expo Center in Istanbul, Turkey.

Held every other year, this was the eleventh time that the event has been held. Some 230 companies and organizations including leading Turkish shipbuilders and equipment makers attended the exhibition. Some 6,000 people visited the event with more than 300 visitors coming by the NK booth. The ClassNK booth was well located near the entrance to the passageway that leads to the central hall. Two banners also hung from the ceiling which, combined with the good location, helped to give good exposure and draw the attention of many visitors to the NK stand.

CMA Shipping

CMA Shipping 2011 was held from 21 to 23 March in Stamford, Connecticut, in the U.S. The combined conference and exhibition is organized by the Connecticut Maritime Association (CMA) each year. This was the sixth time that the Society exhibited at the event. Around 2,500 people visited the 150 or so ship owning and other maritime related firms that exhibited at the event. The NK booth was located in the main hall leading from the main entrance to the site. ClassNK Chairman and President N. Ueda also gave a presentation at the conference held concurrently with the exhibition. Speaking on "Creating Balanced Environmental Regulations", he spoke as IACS chairman about recent trends in GHG requirements and the contributions being made by IACS in this important area.

Awards

ClassNK was also recognized for various achievements by the maritime industry in 2011.

ClassNK Chairman and President Noboru Ueda Named "Personality of the Year" Award at 5th Marine Biz TV International Maritime Awards

The 5th Marine Biz TV International Maritime Awards presentation ceremony was held at the Hotel Crowne Plaza in Dubai, the United Arab Emirates on 19 April 2011. ClassNK Chairman and President Noboru Ueda was named "Personality of the Year" at the event for his contributions to the maritime industry during the past year.

Since assuming the role of IACS chairman in July of 2010, Mr. Ueda has actively worked to promote proposals at the International Maritime Organization (IMO) on the reduction of greenhouse gas emissions and smooth implementation of the IMO's new Energy Efficiency Design Index (EEDI) for newbuildings. He has also assumed a leading role in having the views of the entire maritime industry, including those of Asia, reflected in international regulations. In addition, as Chairman and President of ClassNK, the Society became the first classification in the world to have 180 million gross tons on its register. The award was presented in recognition of the contribution of these many notable achievements.

NK Shines at Seatrade Asia Awards 2011

ClassNK received the "Classification Society Award" at the Seatrade Asia Awards held on 17 June 2011 in Hong Kong. Organized by the London-based maritime media company Seatrade Communications, the Seatrade Asia Awards recognize excellence in such fields as innovation, safety, and education in the Asian maritime industry. The "Classification Society Award" is awarded to the classification society showing the greatest commitment to innovation and activities in the greater Asian maritime industry over the past year. The award is a testament to ClassNK's commitment to innovation and activities in the greater Asian maritime industry over the past year. It was the second time that ClassNK has been named the best classification society at the Seatrade Asia Awards since the event was established in 2008.

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