2002 54th Edition

ClassNK

MAGAZINE

Technical Essay

ClassNK: Strong on Strength

Special Article

MS *Chikyu*: At the Cutting Edge of Drilling Ship Technology

Story From the Sea

OD21: Home of the MS *Chikyu*

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Cover Photo: Launching of the MS *Chikyu* prior to final fit out (courtesy of JAMSTEC)

CHAIRMAN'S MESSAGE: CLASSNK MAGAZINE 2002

KENJI OGAWA
CHAIRMAN AND PRESIDENT

Welcome to the 2002 edition of the ClassNK Magazine, which now reaches over 4,000 NK clients and associates around the world. As many of you know, this is my first message for the ClassNK Magazine since becoming Chairman and President in February this year.

ClassNK produces three major publications every year, the Annual Report, the Technical Bulletin and the ClassNK Magazine. The Annual Report is necessarily formal, albeit informative, while the Technical Bulletin is naturally very technical, somewhat limiting its readership. The ClassNK Magazine aims for a balance, being both informative and interesting, and it is our best opportunity to reach the broadest readership possible among all our clients and friends around the globe. That is why, of all our publications, it is my personal favorite, and I am very pleased to have this opportunity to introduce it to you personally. As usual, this year's edition offers a mix of features that cut across the breadth of what ClassNK is and what we do.

Since becoming Chairman and President, I have endeavored at every opportunity to reinforce the message that I, and we at ClassNK, believe that one key to the future success of Classification Societies is to maintain and enhance our reputation for quality. Of course, this mantra applies to every aspect of our business, but we must always remember that we are a technical organization and that quality in the technical foundation of our activities is paramount. This year's Technical Essay, "ClassNK: Strong on Strength", describes in simplified technical terms our latest efforts to bring improved transparency and rationality to the Class rule development process. It describes the background to, and development of the new *Guidelines for Tanker Structures*, which incorporate new strength and fatigue guidelines. This effort to bring improved transparency and rationality to the Class rule development process is just one way that we are working to build even greater understanding and trust in our role as a technical organization.

"Focus on Japan" this year visits the new ClassNK Kobe office, the product of a merger between the former Osaka and Kobe offices. The port of Kobe is probably Japan's oldest major trading port, reigning as the country's top port for many years before the Great Hanshin Earthquake of 1995. The city and port were devastated by the quake, but have made a stunning recovery. This profile paints a picture of a city that is well and truly back on the map. I have no doubt that Kobe will one day reign again as the King of Japanese ports.

For obvious reasons, Japan more than most countries, has a particular interest in researching and understanding the generation and activity of earthquakes. This year's feature article looks at the OD21 deep-sea ocean-drilling project, which investigates the areas where earthquakes are generated, kilometers below the sea floor, kilometers below the sea surface. Undoubtedly, the key to this program will be a new deep-sea ocean-drilling vessel being constructed to NK class for the Japan Marine Science and Technology (JAMSTEC) organization. When completed, the vessel, the MS *Chikyu*, will be the most advanced deep-sea ocean-drilling vessel of its kind in the world.

The ClassNK global office network continues to expand, and this year's regular overseas office profiles feature two offices. The ClassNK Jakarta office, in Indonesia, is one of our fastest growing offices and now has three sub-offices throughout the country. The second profile is of the ClassNK Marseilles office, one of our smaller, but certainly one of our most picturesque port locations. I have only passed through both offices briefly in the past, and look forward to visiting them again in the near future.

With these stories and more on offer, I hope you enjoy reading this year's magazine as much as I have.

Kenji Ogawa
Chairman and President

CLASSNK: STRONG ON STRENGTH

With ever-greater concerns about ship safety and marine pollution being expressed by a range of maritime community members, the role of classification societies as technical arbiters, playing the pivotal role in setting and verifying technical standards for safety at sea and protection of the marine environment, is also coming under greater scrutiny.

Although classification rules usually incorporate the latest technologies in their coverage, they are also expected to reflect the practical needs of those in the maritime communities that they affect. Accordingly, the basis of the rules should be clear and the rules and the rule formulation process itself should be open to the public to ensure understanding for all concerned. This, however, has not traditionally been the case.

In fairness to the societies, ships are subject to a wide range of factors in the harsh environments of the world's unpredictable oceans. This has made it very difficult to develop rules on a theoretical basis only. The present structural rules of classification societies are therefore mostly based on the results of technical research and development, but also include a large dose of intuitive prediction based on past experiences accumulated over a long period. Consequently, the technical background for the rules is not easily understood by those outside the past process of rule development. Within this context, ClassNK is currently reviewing the basic requirements related to ship structural strength to improve the existing rules. This move is aimed at offering better transparency and rationality in the Rules, based on the latest technologies and accumulated technical expertise.

In order to undertake this review, ClassNK has over the past few years, been undertaking a comprehensive research and development project, called RuleC100. This is aimed at establishing a rational and transparent assessment method for the safe design of hull structures. The research covers all aspects related to the safe design of ship structures: design sea state, design wave, dynamic analysis of wave loads and structural responses, strength assessment of yielding, buckling, fatigue and collapse, and corrosion. The final objective of the project has been to develop novel structural rules and guidance for hull structures together with sophisticated software for analysis and assessment in accordance with the rules and guidance.

The first major outcome from implementing the findings from this research project was the publication in 1999 of the *Technical Guide Regarding the Strength Evaluation of Hull Structures* (Nippon Kaiji Kyokai, 1999). This document neatly brings together all the technical background for all the aspects listed above, that should commonly be the basis used to develop new structural rules and guidance for the logical and rational design of hull structures.

Wave loads are one of the key factors affecting the safety of a ship navigating at sea. The wave loads acting on a ship are extremely complex and include a variety of uncertainties. Moreover, human factors inevitably involved in the operation of the ship cause more difficulties in accurately estimating wave loads needed for rational evaluation of the safety of a navigating ship.

When estimating the wave loads acting on a ship, it is necessary first of all to accurately estimate the wave conditions being encountered by the ship. Numerous studies into the height and frequency of waves occurring at sea have been carried out, and some useful statistical wave data has been compiled and published. At the same time, however, the masters of most commercial vessels select their route based on weather forecasts and their experience regarding the route up to that time. Consequently, the wave conditions actually encountered by the ship along its route may be considerably different from the statistically defined wave conditions deemed to be occurring in the natural environment. Therefore, in order to estimate the wave conditions that an average ship actually encounters, necessary when determining design loads, ClassNK conducted a study into the impact on ship response, of maneuvering and ship operations under various wave conditions. The results obtained from the study have shown that actual wave conditions encountered by an ocean-going ship could, under certain criteria related to navigation, be significantly different to the wave conditions originally calculated from the wave data. The self-evident conclusion is that the effect of navigation must be incorporated into research when setting design wave loads.

Under severe sea conditions, or in the extreme waves that have the lowest probability of occurrence, there is significant nonlinearity of wave loads, meaning linear theory is not applicable in these cases. Accordingly, it is essential that experimental studies and/or onboard measurements are conducted to ascertain a reasonable estimation of extreme wave loads. ClassNK has been carrying out extensive studies on wave loads by tank tests for a large containership, a VLCC and a large bulk carrier (e.g., Miyake at al., 2001a). These tests are backed up by theoretical research using more precise methods of hydrodynamic analysis (e.g., Miyake at al., 2001b). **Figure 1** shows a typical example of the non-linearity of wave loads, which has been found in wave bending moment in higher waves.

An enormous number of finite element analyses (FEAs) were carried out on entire-ship structures for a double hull tanker, containership, and bulk carrier applying dynamic loads in the time domain under various sea conditions in order to clarify the effect of dominant sea conditions on the stress response of each structural part. More than 200 areas of transverse and longitudinal strength members were examined over a whole ship. Results showed that only a limited number of sea conditions contribute the loads which greatly affect the principal strength of the hull structures. These few sea conditions, can be defined as design sea states, with which ship designers, as well as ship operators and others concerned, can more readily understand the load conditions used for structural design and analysis of ships.

A look at ship casualties that have occurred up until now shows that in a majority of cases, the deterioration of strength due to corrosion and wastage was a significant factor. In order to ensure sufficient strength throughout the service life of a ship in a more rational manner, it is necessary to set corrosion margins that are more suited to the corrosive environment, based on the actual levels of corrosion experienced by the ship. To this end, ClassNK has developed a new statistical model for corrosion progress that is capable of accurately simulating the complex corrosion process. Thousands of thickness measurement data from of a number of existing oil tankers and bulk carriers were analyzed in order to develop a probabilistic model simulating the corrosion process under actual operating conditions (Yamamoto & Ikegami, 1998, and Yamamoto & Yao, 2001). This has made it possible to rationally grasp trends in the corrosion of hull structures (**Figure 2**).

At present, the technical rules of the Society seek to ensure that a minimum level of collapse strength is maintained for hull structures through the verification of yield strength and buckling strength, for ships with ordinary hull constructions. However, when evaluating the structural strength of ships with new types of hull construction, or the critical strength with less redundancy, such as the ship longitudinal strength, it becomes necessary to accurately evaluate the collapse strength of the structure.

Figure 1: Non-linearity of wave bending moment

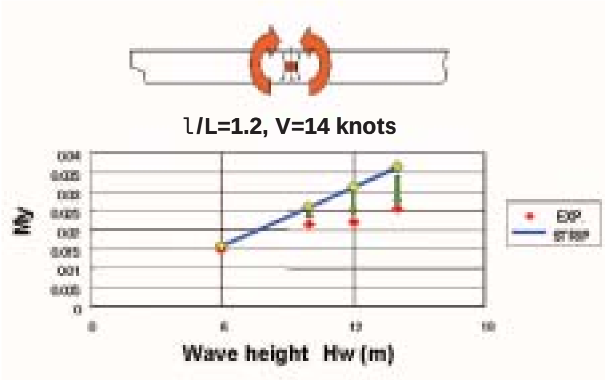


Figure 2: Simulated corrosion progress

As it is not practical to directly analyze the buckling strength of the vast number of stiffened plates used in the construction of complex ship structures, ClassNK has developed a simplified formula for estimating buckling stress which can be used to effectively and accurately calculate buckling strength (Harada & Fujikubo, 2001). In this simplified formula, particular attention has been given to the effect of openings in the stiffened plates, the effect of the stiffeners, as well as the effect of lateral pressure on the structure. This enables the accurate estimation of buckling strength, when the hull structure is under complex stress distribution (**Figure 3**).

Until now, the technical rules of the Society detailed requirements concerning the standard shape and configurations of local structures at principal locations in the hull structure, with respect to fatigue strength. This was aimed at preventing damage in areas where there was a fear that such damage might result in a major casualty. The Society published its *Guidance for Fatigue Design* in 1995, based on the results of extensive experience and research. Recent progress in structural analysis methods has made it easier to calculate hotspot stresses and perform direct calculations of fatigue strength. As a result, ClassNK has also been studying practical, direct calculation methods in determining fatigue strength.

When calculating fatigue strength, long-term repetition of loads is the main item of concern, rather than maximum loads, as is the case with buckling strength and ultimate strength. Two different approaches to estimating fatigue strength were compared in order to check their suitability and applicability. One method is Miner's Rule, which focuses on crack initiation, while the other method uses Paris' Law, which places primary emphasis on crack propagation. The comparison showed that there was no significant difference between the two methods (**Figure 4**).

GUIDELINES FOR THE STRUCTURAL STRENGTH OF DOUBLE HULL TANKERS

Based on the technical guide, the *Guidelines for Double Hull Tankers* have been newly developed as practical standards for the structural strength of tankers, making full use of the results of this ongoing research (Nippon Kaiji Kyokai, 2001a). The guidelines consist of the following three components:

- *Guidelines for Direct Strength Analysis*
- *Guidelines for Fatigue Strength Assessment*
- *Guidelines for Ultimate Hull Girder Strength*

Of these, the *Guidelines for Direct Strength Analysis* is for evaluating the yielding strength and buckling strength of primary structural members of tankers, using direct strength analysis. The guidelines include procedures for setting design loads, not only by simplified formulae, but also by direct load analysis. In the guidelines, four different design waves and design loads are prescribed in a simplified form for practical and logical direct strength analysis. See **Figure 5** (Zhu & Shigemi, 2001).

The *Guidelines for Fatigue Strength Assessment* have been newly developed for assessing the fatigue strength of primary members of tankers. In the guidelines, two

Figure 3: Example of buckling interaction curve

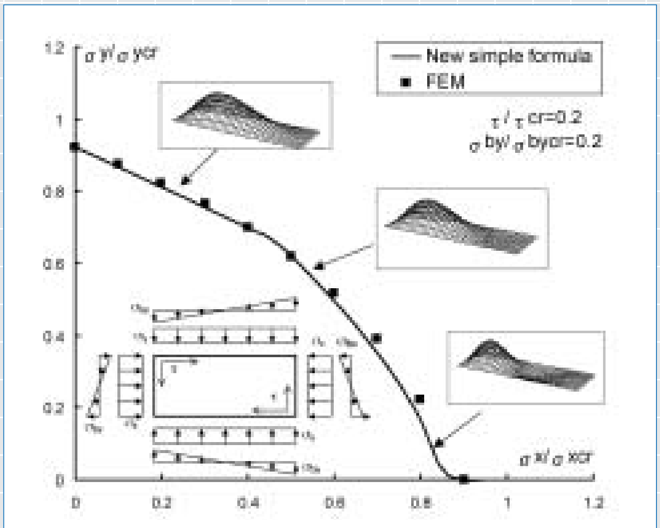
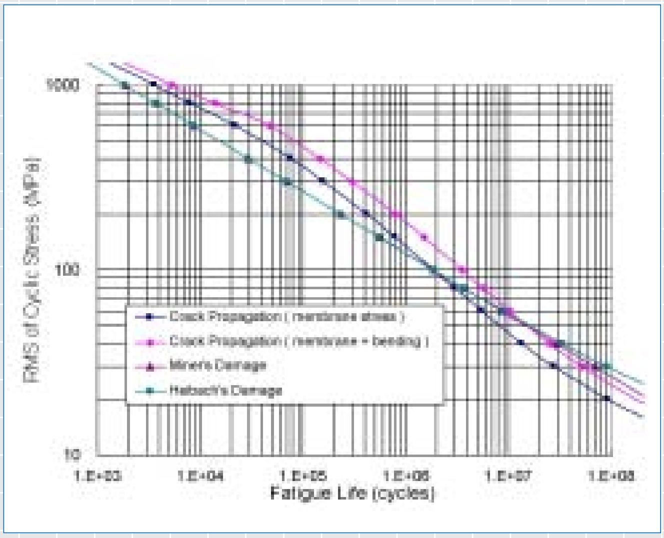


Figure 4: Comparison of fatigue strength by Miner's Rule and Paris' Law



design S-N curves have been adopted for welded parts and non-welded parts, based on the UK-DOE curves (**Figure 6**). The effect of structural mean stress on fatigue strength is taken into account in a practical and rational manner, based on calibration with fatigue damage experience in side longitudinals of oil tankers (Yamamoto & Matsuoka, 2001). Design loads and structural analysis methods generally conform to the *Guidelines for Direct Strength Analysis.*

The *Guidelines for Ultimate Hull Girder Strength* have been developed with the aim of preventing hull girder fractures (jack-knife casualties) of ships. The guidelines can be used to confirm whether or not a ship in a corroded condition has sufficient hull girder strength to withstand the severe sea conditions that it encounters during its service life. The hull girder strength is confirmed by assessing the hull girder moment capacity of transverse sections of the hull applying ultimate strength assessment considering post-buckling (ISSC, 2000, and Yao & Nikolov, 1991).

These guidelines will be incorporated henceforth into the Rules for the Survey and Construction of Steel Ships, after undergoing technical discussions and necessary revisions. Hence, these guidelines are to be used flexibly as optional standards at this stage. ClassNK has recently developed similar guidelines for bulk carriers and is developing them for container carriers.

Since 1995, ClassNK has been offering a range of advanced technological products and services under one umbrella called “PrimeShip”. PrimeShip is a fully comprehensive package covering all elements of a ship over its lifetime, from design through construction and operation, to management and maintenance. The technical services for newbuildings are classified into two groups

Figure 5: Example of four different kinds of design loads

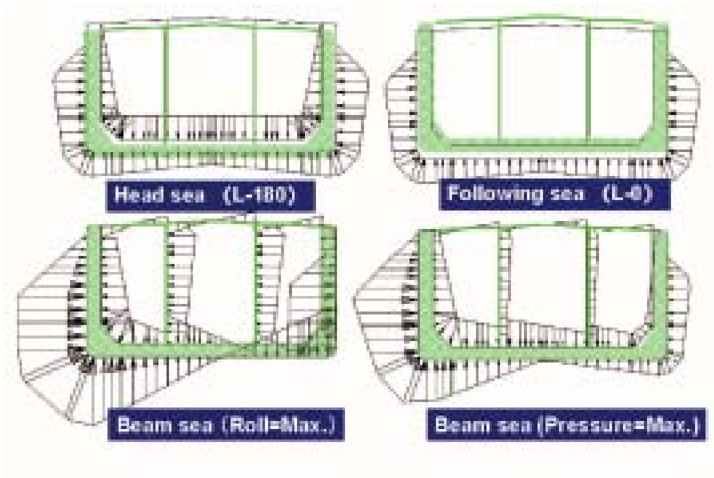
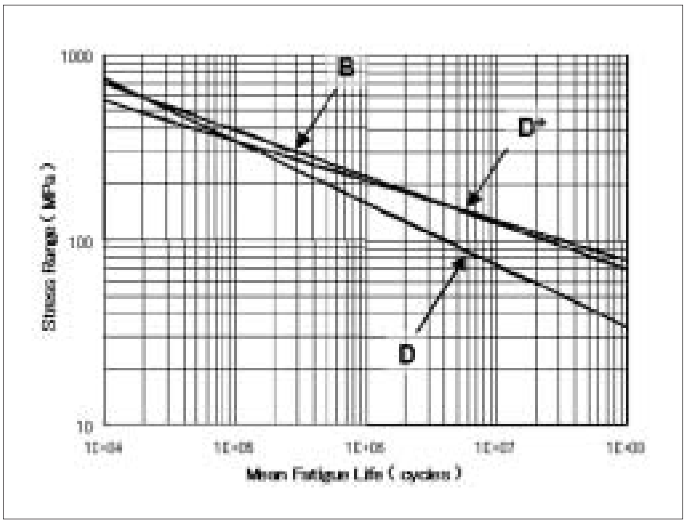


Figure 6: Modified design S-N curves for considering the effect of structural mean stress together with residual welding stress



B ; base metal
D ; butt joint
nominal stress base (SCF=1)
incl. effect of residual stress
D* ; butt joint (adopted)
hotspot stress base
exclude effect of residual stress

	m		C	
	$N<10^7$	$N\geq10^7$	$N<10^7$	$N\geq10^7$
B curve (non-weld)	4	7	2.34×10[illegible]	4.44×10[illegible]
D* curve (weld)	4.63	8.25	5.46×10[illegible]	2.35×10[illegible]

related to the design of hull structures and machinery installations.

A comprehensive hull strength assessment service, called PrimeShip-HULL, has been developed to assist ship designers in the design of efficient, cost-effective and safe ship structures. It has been fully revised, incorporating the new guidelines for tanker structures.

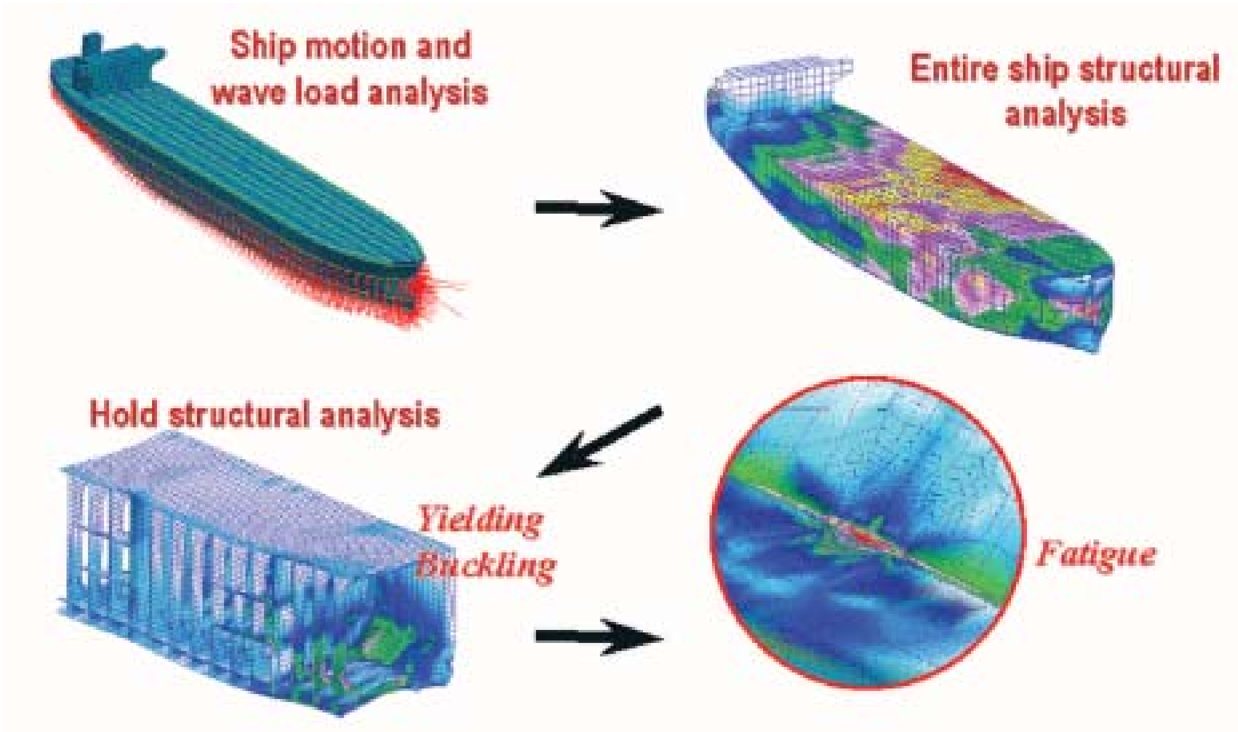
PrimeShip-HULL supports three levels of ship structural design and assessment: Design by Rules at a basic level; Design by Direct Strength Assessment (PS-DA) and by Fatigue Strength Assessment (PS-FA) at an advanced level, for conventional ships with a long history; and Design by Total Strength Assessment (PS-TA) at the highest level, for innovative ship structures with little or no history.

The NK Advanced Structural Analysis Support System, NASTASS, has been used for many years for direct strength assessment of primary members of larger ships by the application of hold structural analysis using design wave loads. NASTASS provides powerful functions for time-saving modeling of single or double hull tankers, bulk carriers, containerships and chip carriers, as well as for efficient setting of design wave loads and evaluating yielding and buckling strength of the primary members in accordance with the ClassNK Rules and Guidance (Tsutsui et al., 1996).

In addition to NASTASS, a flexible and powerful system for direct strength assessment of double hull tankers was launched in April 2002 (Kobayashi, 2002). This system offers practical and rational design assessment with PrimeShip-HULL through the implementation of requirements in the new guidelines. The new assessment software has adopted MSC.Patran and MSC.Nastran, which are two of the most widely-used general purpose FEA (Finite Element Analysis) packages. It also offers open connectivity to other commercial CAE software such as I-DEAS, and ship CAD systems such as Tribon Basic Design, widely used by ship designers and analysts.

As the highest level of design and assessment in PrimeShip-HULL, the Advanced

Figure 7: Total analysis flow by PrimeShip-ASSAS



Structural Analysis and Validation System, ASSAS, supports PrimeShip Total Strength Assessment. This is the most rational design and assessment of hull structures, based on the total analysis concept for each ship, and based on direct calculation of wave-induced dynamic loads, global and local structural analysis and strength assessment against yielding, buckling and fatigue (Yoneya et al., 2001).

ClassNK will continue to address the many remaining and future technical issues that need to be investigated to ensure ship safety and the protection of the marine environment. It will also continue to improve and develop further technical services for rational and efficient design, operation and maintenance of a ship. To this end, it will be essential to collect all the relevant information from the maritime community and to listen to the voices of all those concerned. To respond to all demands, however, will require tremendous resources and time.

Future technical research or service development will be focused on those items that are critical or cost-effective and that are most requested by the maritime community, taking into account their level of importance. Furthermore, competition in the development of technology may accelerate progress, however, it must not happen that excessive competition threatens the widely accepted safety standards. And, in order to respond to the demands of the maritime community, classification societies should enhance cooperation with each other, as well as compete with each other on improving their technologies and services.

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KANSAI: OSAKA AND KOBE

KANSAI

New Kobe branch office handles all of Kansai region

For the uninitiated, catching a train from Osaka to Kobe is a bit of a blur. On a semi express it can be done in 18 minutes, and it is difficult, if not impossible, to determine where Osaka ends and Kobe starts. To be fair, when established in 1914 and 1916 respectively, the ClassNK Osaka and Kobe branch offices probably seemed worlds apart. But in today's world of modern transportation and communications, it has become increasingly difficult for the Society to justify such a duplication of facilities and resources so close to each other. It is not surprising therefore, that from the first of July this year, the two offices were merged and moved to a new site, positioned strategically between the two cities. This new Kobe office is the subject of this year's "Focus on Japan" feature.

Although less than two months old at the time of our visit, the office was already running smoothly and was obviously very busy. The General Manager, Mr. Okabe, is an affable character whose previous posting was as General Manager of the ClassNK office in Taipei. He proudly showed us around the spacious, new four-story building and introduced many of the 30 plus staff. The office is very functional and conveniently located just five minutes from the nearest train station—if you take the right exit—and 10 minutes if you take the wrong one!

Although Yokohama is technically the second largest city in Japan by population, there is no doubt that Osaka is popularly considered Japan's "second city" after Tokyo, and it is unquestionably the industrial heart of Japanese manufacturing. So in addition to newbuilding and in-service ship surveys, material and equipment surveys make up a large part of the business of the new office. The staff at the new office had arranged for us to visit two manufacturers and one shipyard during our two-day stay. Add in the two port museums for some historical perspective and it was a very full two days.

The Deputy General Manager, Mr. Oikawa, took us on our first site visit to YANMAR CO. LTD., manufacturers of diesel engines, explaining that more than 70% of NK class ships have Yanmar engines for the generators installed onboard. This is hardly surprising when one learns that Yanmar was also the first diesel engine manufacturer to gain ClassNK approval for mass production, way back in 1977. After being met by the Factory Manager, Mr. Mukaigaito, and the General Manager of the Quality Control Dept., Mr. Ogawa, they and their team gave a detailed presentation on the 90 year history of the company, as well as a factory tour explaining the process of building diesel engines. As usual, I was amazed at how orderly and clean the factory was, nothing like my image of a traditional diesel engine factory. Mr. Mukaigaito explained that it was all part and parcel of their ISO 14001 environmental accreditation, which was attained by Yanmar in 1997, the first diesel engine manufacturer in Japan to do so. Nor does the Yanmar commitment to the environment stop at the factory door. Yanmar was in fact, in 1998, also the first diesel engine manufacturer, to gain a ClassNK "Statement of Compliance for Engine Air Pollution", based on IMO NOx emission limits. The Yanmar focus on balancing ecology and economy is best realized in the new "EcoDiesel SAVETEN" range of engines that incorporate the newly patented "ASSIGN" combustion system. As impressed as I was with the cleanliness and efficiency of the factory, I was even more impressed to learn that despite the image and the use of the term "mass production", in fact every engine produced in the factory is, in effect, a custom-made engine, built to individual customer specifications. Of course there is a basic core that is common to all the engines, but as an indication of the degree of customization, it was explained that up to 40% of the "parts level" may contribute directly to customizing each engine to the customer's specifications. This approach is no doubt contributing to the popularity of the product on NK class newbuilds.

With no time for lunch, we headed to our next site through the 32-degree heat and 80% humidity that is Osaka in the summer. As my suit quickly became wet through for the third time that day, I grew oddly envious of Oikawa-san's recent six year posting in Dubai that seemed to have left him miraculously immune to the heat. But since Oikawa-san had another survey to attend, we were met on the way to our next site by the Principal Hull Surveyor, Mr. Kojima, who was to introduce us to the well-known rope manufacturer Tesac.

The Tesac site is large, clean and a typically well organized Japanese manufacturing plant. In fact, it is so well organized that it is hard to tell that it is actually two separate entities, the Tesac fiber rope manufacturer and the Tesac wire rope manufacturer. Although separate businesses, the two entities of course work closely together, and we were met by representatives of both. After presentations on the manufacturing process by both groups, we began a tour of the fiber rope making plant. I must confess that I had been really looking forward to this ever since I found out we would be visiting a rope maker. As a boy scout, I had twisted and braided ropes by hand and, in fact, had been quite proficient. And in recent years, my job with ClassNK had also periodically put me in shipyards and on docks, where I was always fascinated and impressed by the giant coils of rope as thick as my leg. I could clearly envisage machines making the giant twisted ropes. This was not a complex concept, but I could not imagine how machines could

OSAKA

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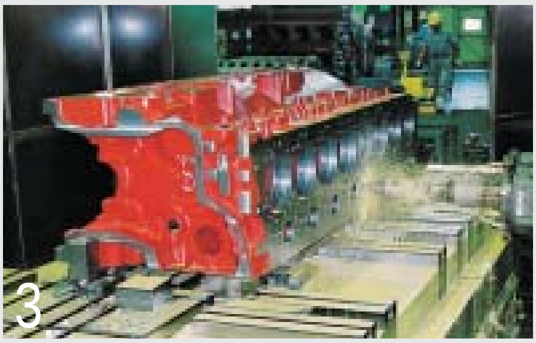
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1 Yanmar Amagasaki Plant

2 (From right) Mr. H. Oikawa, Deputy G. M. of NKKB, Mr. A. Mukaigaito, Factory Manager, Mr. T. Ogawa, General Manager, Quality Control Dept., Mr. M. Agemura, Project Specialist, Quality Control Dept., Mr. W. Imahori, Quality Control Dept.

3 NC machine tools and specialized machines efficiently and accurately process major engine parts.

make the giant braided type ropes. Well, I am sorry to say, I am still none the wiser. Despite having a science degree, a good pair of eyes with 20:20 vision and totally unfettered access to study the machinery in action, I was stumped. The machinery is a huge and complex array of rotating, counter-rotating and twisting spindles operating at mesmerizing speeds. They look like the result of a futuristic gyroscope cross-breeding program. As I tried to follow the path of just one strand entering the process, I lost track after about 5 seconds. I couldn't hope to follow 10, 20 or often more strands. Despite some frustration at not really being able to follow the process, it was strangely satisfying to witness the final product emerging from the process. Mr. Kuraki, Manager of the quality assurance section, was a friendly and helpful host, proudly explaining the latest development from the fiber rope area, known as "Dynamics Rope", a fiber rope which, diameter for diameter, has the same strength as wire rope, but only weighs one seventh the weight of the wire rope equivalent. Although more expensive, the product has great benefits in terms of occupational health and safety, particularly in areas where ropes still need to be handled by hand. Similarly, the new, patented rope covers that assist buoyancy, are a great boon to rope handlers at the practical work face. Our final activity before moving onto the wire rope area was to observe an actual breaking strength test in action. The ClassNK strength specification for the 55mm, 8 strand nylon rope is a breaking strength of 466kN. As the huge hydraulic machine stretched the rope beyond 650kN, we were warned that the break would generate a loud crack. Despite the warning, we were shocked by the deafening bang that finally occurred at 660kN, almost 200kN beyond the required strength.

Although similar in many ways, there are key differences in the wire rope manufacturing process, as explained by Mr. Okahata, General Manager, Engineering Dept. At the actual manufacturing stage, the machinery looks remarkably similar to the untrained eye, but the difference is largely in the preparation of the raw materials or component strands, which need to be chemically and heat treated, or patented (not legally, think leather!!). The factory produces a variety of standard wire ropes but is perhaps most proud of its patented (yes legally!) "sun" ropes, which were the first of their kind in the world. The individual wires which constitute a strand, have plane contact and the rope surface is smooth,

4 Tesac Nishikinohama Plant

5 (From left) Mr. A. Ishihara, Works Manager, Synthetic Fiber Ropes Division, Mr. T. Kojima, NKKB Principal Surveyor, Mr. T. Kuraki, Manager, Quality Assurance Sect., Mr. K. Hosono, Assist. Manager, Engineering Sect.

6 (From right) Mr. T. Morino, Manager, Quality Assurance Sect., Tesac Wire Rope Co., Ltd., Mr. S. Okahata, G. M., Engineering Dept., Mr. Y. Higashikawa, Manager, Quality Assurance Sect.

7 A breaking strength test for a fiber rope.

resulting in higher breaking strength and excellent resistance to abrasion, fatigue, corrosion and deformation. As if our ears hadn't suffered enough, we were also invited to witness a wire rope strength test. In this test, a 40mm wire rope with a ClassNK required breaking point of 782kN, snapped at 884kN. Fortunately our ears were spared from the even louder crack by the safety cover required for the wire rope, which muffled the sound.

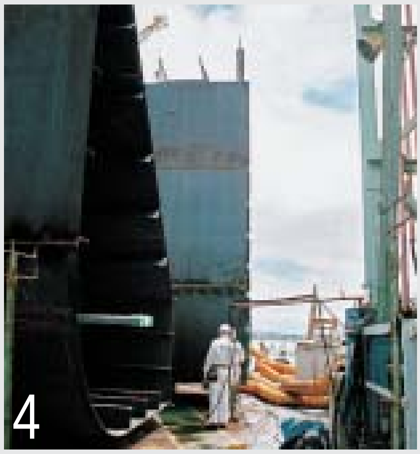
Our final task for day one was a flying visit to the Osaka Maritime Museum, located right on the edge of Osaka Bay. It has four floors of exhibition space, each with a separate theme: Invitation to the Sea, Ships, Prosperity of Osaka Port and Transoceanic Exchanges. The museum is covered by a stunning 1,200 tonne dome that was actually fabricated on land, crane-lifted onto a barge, towed 33km across Osaka Bay to the site, and placed in position over the internal building. The museum was actually constructed on reclaimed land and has a submerged tunnel entrance that connects the giant dome to the shore. It is well worth a visit, not only for educational purposes, but also for the great views of Osaka Bay that its position affords.


The Osaka Maritime Museum

On January 17, 1995, a huge earthquake, now known as The Great Hanshin Earthquake, devastated the Kobe area. Such was the magnitude of the quake that more than 4,500 people were killed, and over 14,600 injured. More than 67,400 structures were totally destroyed and over 55,000 structures were partially damaged, including almost all of the Kobe port facilities. Due to the determination of the people of Kobe, few signs of the devastation are obvious today and the city seems to have recovered remarkably. One of the facilities that felt the full effect of the quake was the Kawasaki Heavy Industries' shipbuilding site on Kobe Bay, the target of our day two site visit. The nature and location of the Kobe Works, right on the bay, meant it suffered major damage. Nevertheless, a determined reconstruction program allowed new shipbuilding to restart

KOBE



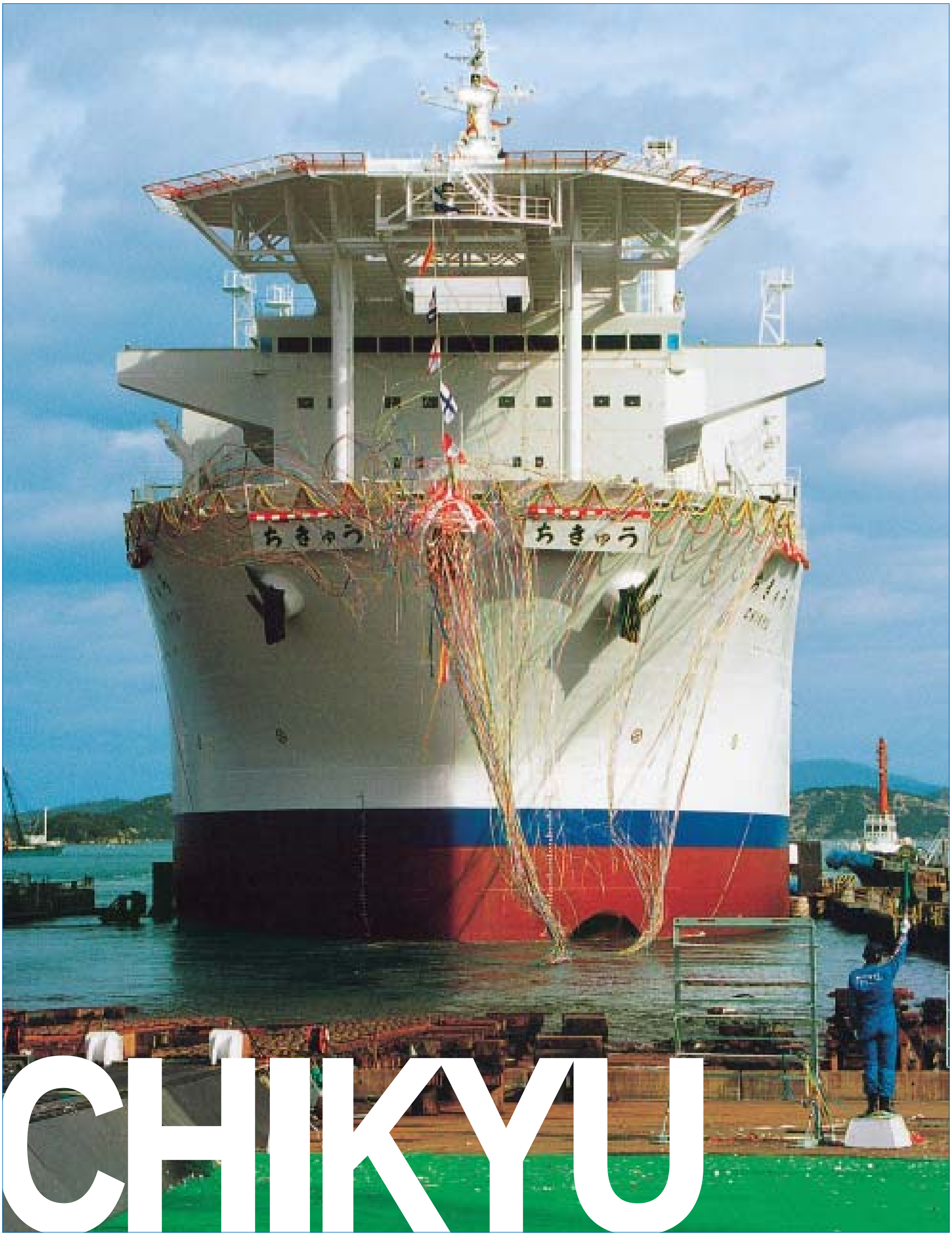




1 Kawasaki Heavy Industries, Kobe Works
2 (From right) Mr. H. Oikawa, Deputy G.M. of NKKB, Mr. S. Kawaguchi, Manager, Inspection Sect., Quality Assurance Dept., Mr. S. Amasaki, Assistant Manager, Inspection Sect., Mr. T. Kawabata, Inspection Sect.
3 (From right) Mr. T. Imai, Senior Manager, Quality Assurance Dept., Machinery Division, Mr. O. Hamawaki, Inspection Section, Quality Assurance Dept.
4 Block inspection
5 Propeller shaft survey

by September 1998. The Kobe shipyard builds all manner of vessels, from LPG Carriers to Passenger JETFOILS, and even Submarines for the Japanese Self Defense Forces. In addition to two newbuilding berths, it has four repair docks (2 dry, 2 floating) and can handle vessels up to 59,000gt. It also produces a range of diesel and gas turbine engines. Happily, the first merchant vessel built after reconstruction was built to NK class, and so far, five vessels have been delivered, with five more currently under construction or slated for construction to NK class. ClassNK Kobe deputy General Manager, Mr. Oikawa, once again generously accommodated our interests and invited us to observe two surveys in action; a propeller survey on the 50,300gt bulk carrier hull no. 1533, under construction to NK class, and a block survey for another similar vessel. Along the way, Mr. Takehiko Imai, Senior Manager of the Quality Assurance Dept., Machinery Div., Gas Turbine and Machinery Company, and Mr. Shuji Kawaguchi, Manager of the Inspection Section, Quality Assurance Dept. of Kobe Shipyard, Shipbuilding Company, introduced and explained the various parts of the facility. One of the most impressive areas was the engine building area where some of the world's largest marine engines are produced, not only for the Kobe shipyard, but for outside customers as well. Having completed the survey components, we climbed the seemingly endless stairs to the ship's bridge to enjoy the breeze, admire the magnificent views of the port of Kobe and snap the ritual group photos. In a welcome change from day one, we had time to enjoy a delicious lunch at the yard, before heading to the Kobe Port Earthquake Memorial Park and Kobe Maritime Museum. The Kobe Port Earthquake Memorial Park is located just east of the Kobe Maritime Museum, close to the Meriken Pier. A variety of exhibits and displays highlight the devastation and tragedy of the earthquake, but the one exhibit that has the most impact on visitors is a small area of the port that has been preserved in its damaged state. The museum has a number of exhibits complimenting the park, but also deals extensively with the history and ongoing development of the port of Kobe, as well as general maritime issues.

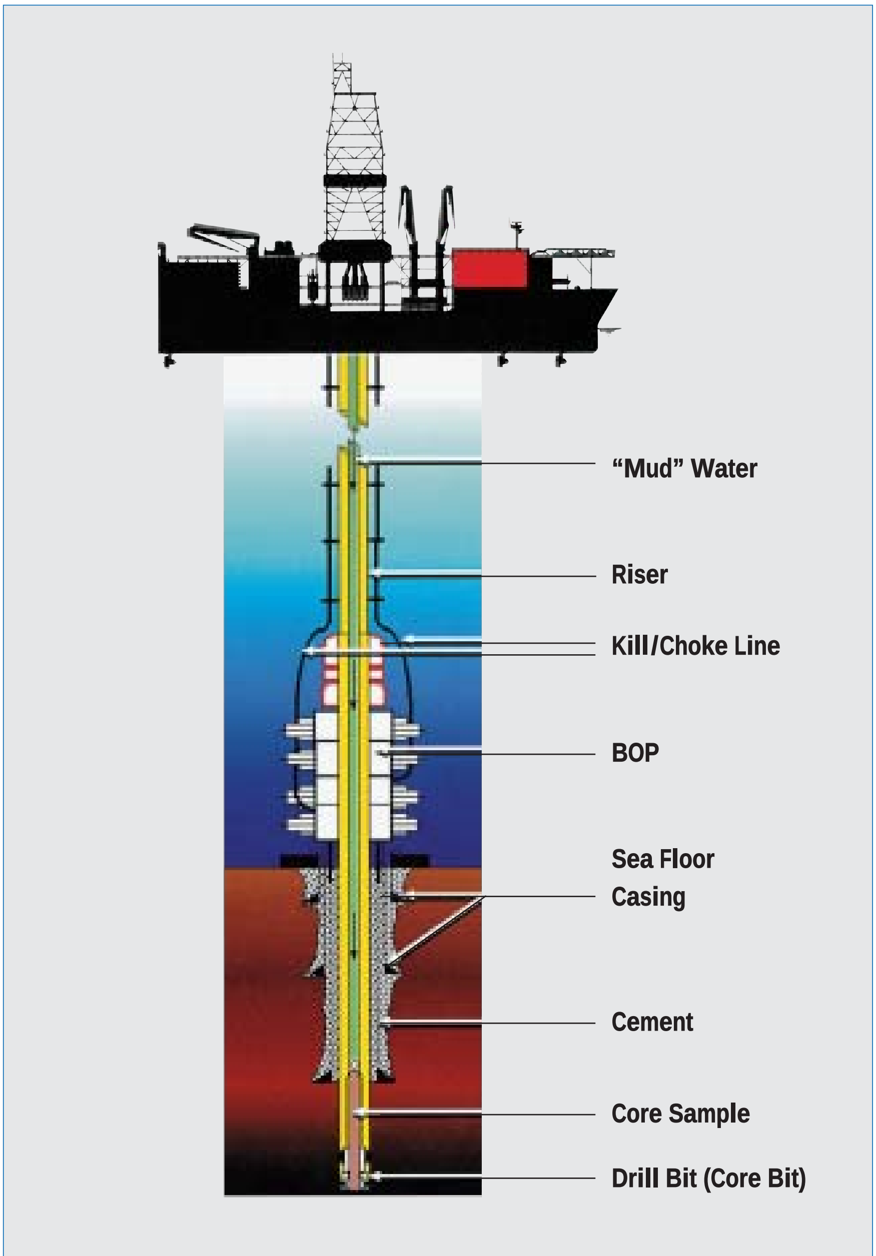
6 Earthquake Memorial Park, Kobe Port
7 The new ClassNK Kobe Office
8 Mr. Y. Okabe, G. M. of NKKB

MS *CHIKYU*: AT THE CUTTING EDGE OF DRILLING SHIP TECHNOLOGY



The MS *Chikyu* launching ceremony, prior to final fit out (courtesy of JAMSTEC)

Elsewhere in this year's magazine, you will read about OD21, the deep-sea scientific drilling program being undertaken by the Japan Marine Science & Technology Center (JAMSTEC).



The Riser system (courtesy of JAMSTEC)

Currently, there is only one purpose-built scientific ocean drilling ship in the world, the *JOIDES Resolution*. This vessel was originally built in 1978 as a mobile offshore drilling unit for commercial offshore drilling, and later renamed and commissioned for scientific ocean drilling in 1985, under the auspices of the Ocean Drilling Program (ODP), an international scientific research project. As a part of its own research project, Japan decided to build a new state of the art deep-sea scientific drilling ship. Ordered by JAMSTEC, and being built to NK class, construction of the MS *Chikyu* commenced in 1999. Construction of the vessel is expected to be completed around the middle of 2005. The ship will be the most advanced, deep-sea scientific drilling ship in the world, with a safe and reliable riser drilling system and state of the art dynamic positioning system.

The various Ocean Drilling Programs have several goals. These include studying earthquake generation and plate tectonics and exploring potential new energy resources, among other topics. These programs will require drilling in deeper water and further into the earth than ever before. Because of this, the MS *Chikyu* will incorporate the most advanced drill ship technology available, in two key areas; drilling and positioning.

Current scientific drilling uses a bare drilling pipe system, with seawater pumped down the drill pipe to sweep out cuttings from the drill hole (non-riser system). The advantage of this system is that numerous shallow holes can be drilled in a short period. The disadvantage of this system, however, is that while drilling, the wall of the borehole can collapse, thereby limiting drilling depth. Another problem is the absence of any protection against the risk of hitting oil resources by accident, or similarly, hitting frozen methane or CO_2 gas hydrate pools, causing a potential "blowout" type event. These factors limit the operational area of the current deep-sea scientific drilling ship.

The drilling system being installed on the MS *Chikyu* is an advanced version of the system currently being used in offshore fields. One of the key features of this system is that the cuttings-sweeping system utilizes so-called "Mud" instead of seawater and is a closed circulation system instead of the current open-ended system. The "Mud" is a special fluid, the density, viscosity and chemical composition of which can be adjusted according to the conditions of the formation being drilled. This "Mud" is circulated from the ship, down through the drillpipe, returning up through the annulus of the borehole and the riser, and then back to the vessel. There are multiple benefits from drilling with "Mud", the major one being borehole stability, allowing safer, deeper drilling.

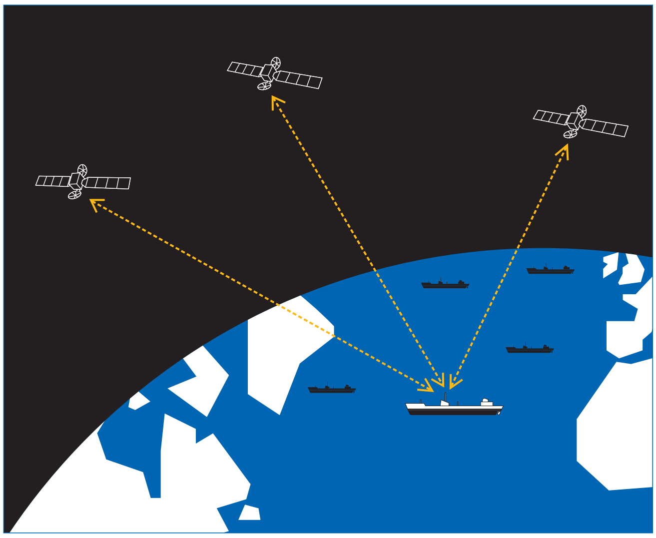
Also important is the use of the riser, which provides the borehole with mechanical protection and helps adequately control pressure. The riser is a pipe surrounding the drilling pipe. Within the drilling pipe, the drill bit cuts the core sample pile, which is kept in the sampling barrel in the middle. The space between the barrel and the drilling pipe is used to circulate the "Mud", bringing with it cuttings through the space between the drill pipe and the riser. Thus, in the underground section of the drilling operation, the riser mechanically protects the borehole walls from being eroded with the "cleaning" fluid, the "Mud", by removing the cuttings. This process has lent its name to the drilling method— "Riser Drilling".

Further protection for the drill holes is provided by the casing pipe, as permanent protection for the borehole. Once the core samples are collected and recovered on board, the core is like a history book, allowing us to observe our planet's past, much like the rings of trees. The continuous protection afforded the drill holes also greatly extends their research potential as historical "observatories".

Another feature that gives the ship greater freedom in choosing drilling areas is the Blow Out Preventer (BOP), a 300 ton piece of equipment positioned at the wellhead, the entry to the borehole, to prevent potential blowouts triggered by, for example, pockets of crude oil or gas hit by the drill. The existing "non-riser" drilling ship is not fitted with this BOP equipment and is therefore not suitable for drilling operations in areas where these fuel resources may be found. The MS *Chikyu*, in its specifications, has a total length of 10,000 meters of drill piping. As a result, with the riser system, the safe drilling depth of the ship will be increased to a possible 7,000 meters from the ocean bottom in sea depths of 2,500 meters. Plans are also on the table to increase potential operating sea depths to 4,000 meters.

The second key technology is the vessel's dynamic positioning system. To ensure secure, safe and steady drilling, the ship positioned above the wellhead must be kept within a restricted area to prevent excessive stress on the drill string and riser. The MS *Chikyu* is intended for initial operation in areas with a maximum sea depth of 2.5 kilometers, so conventional mooring would be useless in fixing the vessel's position. MS *Chikyu* is therefore being equipped with the

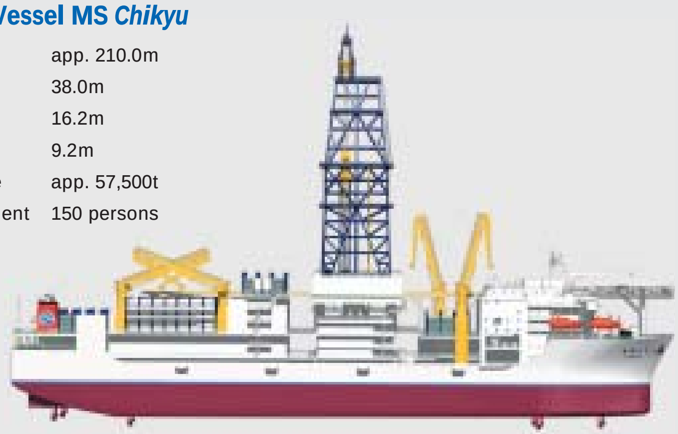
Position of the Azimuth Thrusters (courtesy of JAMSTEC)



A Global Positioning System illustration

OD21 Riser Vessel MS *Chikyu*

Length Overall	app. 210.0m
Breadth	38.0m
Depth	16.2m
Draught	9.2m
Gross Tonnage	app. 57,500t
Max. Complement	150 persons



MS *JOIDES Resolution*

Length Overall	app. 143.0m
Breadth	21.3m
Depth	9.8m
Draught	7.5m
Gross Tonnage	app. 7,500t
Max. Complement	122 persons

Comparison of key specifications of the MS *Chikyu* and the MS *JOIDES Resolution* (courtesy of JAMSTEC)

most advanced Global Positioning Systems and a Dynamic Positioning System.

Once the position of the wellhead has been identified, the position of the ship has to be accurately fixed in order to drill a hole. Similarly, during drilling operations, the position of the ship has to be fixed within a specified area so drilling can progress without stressing or endangering the system.

To achieve the precise positioning required, the ship has been fitted with two D-GPS (Differential Global Positioning System) units and two hybrid GPS-GLONASS (Global Navigation Satellite System) units. D-GPS, which is in common use in marine navigation, is a more sophisticated version of standard GPS equipment with an improved theoretical tolerance of less than 1 meter, but in practice, of less than 16 meters. GLONASS is a Russian version of GPS, based on the same theory and working on its own set of satellites.

Having established the desired position of the ship, as well as its current position, the next task is to get the ship to the correct position and keep it there. This task is performed by the Dynamic Positioning System, linked to 6 azimuth thrusters and 1 side thruster at the bow section. The system is designed to continually monitor ship position, velocity and heading, together with wind and current, and use its thrusters to maintain optimum position.

As a backup to the GPS, an Acoustic Positioning System is also employed. The ship's relative position can be checked using acoustic signals transmitted by transponders deployed on the seafloor. Another key element in the whole system is the system for monitoring the riser inclination angle at both surface and wellhead positions. This data is also fed into the DPS to help avoid excessive stress on the riser.

The effectiveness of the DPS depends, of course, on the capacity of the ship's propulsion system to respond and keep the ship where the positioning systems says it should be. The ship's 6 azimuth thrusters of 4,100kw each, which are computer controlled and capable of 360-degree free rotation, perform this role. Of these, 4 are located in the flat bottom area (3 forward 1 aft). As they are primarily for maneuvering, they are retractable to improve ocean going efficiency. The remaining 2 are located at the stern and are used for both maneuvering and basic propulsion. Using these two thrusters alone, the ship can achieve 10 knots. Each azimuth thruster has a 3.8m diameter screw propeller. Each is driven by an electric motor powered by six diesel engine-driven main generators.

With all these features, the vessel will be able to conduct deep-sea drilling in challenging weather conditions—maximum wind speeds of 23m/sec, wave heights of 4.5m, wave periods of up to 8.2sec and a surface current of 1.5kt. This set-up is variable, so MS *Chikyu* will be able, for example, to conduct ocean drilling in areas with faster surface currents than 1.5kt, like those found in the Pacific Ocean trough along the Japanese coast, as long as there are mild weather conditions.

The ship is expected to be completed by around mid-2005. After various tests and sea trials, including a familiarization operation to ensure fine-tuning of the ship's systems, the vessel will be ready for full service by 2007, and will lead Japan and the world into a new era of deep-sea ocean drilling and scientific exploration.

OD21: HOME OF THE MS *CHIKYU*

As one of the world's leading ship classification societies, ClassNK classes a huge range of types and sizes of sea-going vessels, from simple barges, to VLCCs and LNG carriers. In the previous article, you read about one of the more interesting vessels the Society is classing, the deep-sea drilling ship, the MS *Chikyu*.

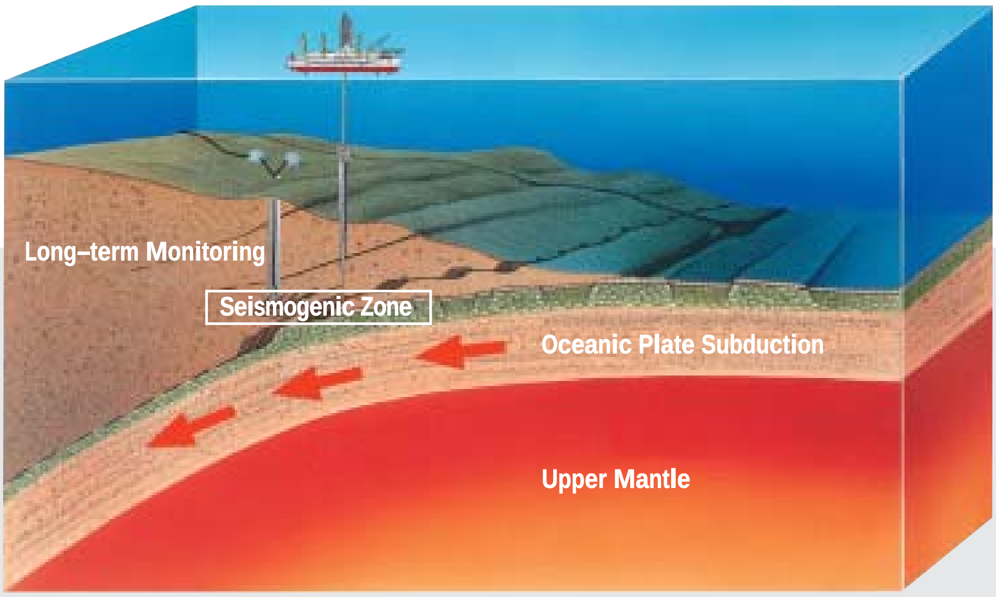
This is without doubt the most advanced and sophisticated ship of its kind in the world, and the technology associated with the ship is truly impressive. The ship is being built to NK class for the Japan Marine Science & Technology Center (JAMSTEC). In order to better understand the background to why the ship is being built and its purpose, staff from the Society's Business Department visited the JAMSTEC headquarters in Yokosuka, just a couple of hours from Tokyo.

We met with Dr. Asahiko Taira, who, as Executive Director, is an eloquent and enthusiastic advocate of what is known as the OD21 project (Ocean Drilling in the 21st Century). The OD21 project is driven by a "Total Earth" philosophy, and has a number of short, medium and long term objectives.

Not surprisingly, given how vulnerable Japan is to earthquakes, researching the mechanism of earthquake generation is one of the key objectives of the OD21 project. It is generally well understood that earthquakes occur largely as a result of the release of energy at the point where two sections or "plates" of the earth's crust clash. The interface between the colliding plates is known as the seismogenic zone, and it is here that the friction between the two plates builds. However, the detailed reasons for, and mechanism of, the friction buildup, as well as the release of this stress, are not yet

The Seismogenic Zone

The seismogenic zone, where severe earthquakes most often occur, extends from several kilometers to 10s of kilometers into the lithosphere.



Most earthquakes occur at the boundaries of oceanic plates, known as the seismogenic zone (courtesy of JAMSTEC) fully understood. Therefore one of the tasks of the MS *Chikyu* will be to drill down into this interface to research the physical, chemical and structural conditions that exist there. Current scientific ocean drilling is capable of reaching depths of around 2,000m below the sea floor. The MS *Chikyu*, fitted with a riser drilling system, will initially be able to operate in water 2,500m deep and drill a further 7,000m below the sea floor. Plans are also on the table to increase the ship's operating sea depth to 4,000m in the future. Dr. Taira freely admits that there are some risks associated with drilling into the interface of the seismogenic zone, as it is not known whether drilling could trigger unpredictable movements. Equally possible, is that the drilling could release some pressure and effectively lubricate the interface, reducing the risk of future earthquakes. Japanese researchers have developed possibly the world's most sophisticated computer models for earthquake analysis and prediction. But even the most advanced computer models have a basic need for raw data, and it is the job of JAMSTEC to gather this data. Naturally, while acknowledging the risks associated with the project, the team puts safety first. And it is for this reason that it has carefully chosen the first drill site in the "Nankai Trough" off the south west coast of Japan. At a water depth of 2,500m and a crust depth of 6,000m, the site will fully benefit from the technological advances offered by the new drill ship MS *Chikyu*, but not stretch safety limits. The site has other benefits in that JAMSTEC already possesses the best acoustic imaging available on the area, and the area has an extremely well established earthquake period and history. In addition to the initial data, another benefit of the project will be the establishment of improved long-term monitoring systems.

As mentioned earlier, the OD21 project is driven by a "Total Earth" philosophy. This means that the technology developed and used in the earthquake research is applied to study a range of other "Total Earth" issues. At the heart of this thinking is the use of the "core", a long tube of the earth that is extracted through the drilling process. Just like the rings of a tree, the core provides scientists with a data bank of changes in the earth's environment. The sediments of the deep-sea floor paint a picture of climate change, bioactivity and earth dynamics. For example, recent results from related projects have provided strong support for the idea that an asteroid impact caused the extinction of the dinosaurs about 65 million years ago. The new depths to which the MS *Chikyu* will be able to delve, will enable access to previously unreachable research areas and help further elucidate the mysteries trapped deep in the earth's crust. Similarly, the study of micro organisms surviving in the extremely high temperature and pressure environment of the deep crust, known as extremophiles, may offer clues to the origins of life, or even present potential biotechnological opportunities in new medicines and materials.

The OD21 project, incorporating the MS *Chikyu* as the world's most advanced deep ocean drilling vessel, will be integrated into the international program known as IODP (Integrated Ocean Drilling Program). Japan can be proud that it is not just playing its part, but also truly leading the way in this international program.

Dr. Asahiko Taira,
Executive Director for OD21

MARSEILLE AND JAKARTA

Marseille

The magnificent view from "Basilique Notre-Dame de la Garde"
Photo by Kunihiko Matsui

Marseille, facing the "Golfe du Lion" (Gulf of Lyon) on the Mediterranean Sea, is a key port in the Provence region of southern France. Continuous comings and goings from all over Europe and Africa fill Marseille with an exotic atmosphere and the air of excitement found in any successful, international commercial city.

Originating from the oldest French city "Massalia" founded by Greek sailors in 600 B.C., Marseille has developed into a major commercial city around its natural convenient port facing the Mediterranean Sea. Since then, its position as an international commercial city has never waned.

Although the government of the city fell to the Roman Empire (or Emporium Romanum) after the invasion of Caesar's legions in 49 B.C., and was also a short-lived republic before returning to France in 1481, the people of the city have always retained their independent nature.

In the 19th century, the completion of large infrastructure projects, such as the expansion of port facilities on the western side of the harbor and the opening of the Suez Canal, transformed the city into a modern industrial urban center, mainly involved in processing raw materials.

As you walk the streets, even now, at many spots, you can get a strong sense that the city is rooted firmly in its 2,600 year history. The very famous scenic spot, Vieu Port, or old port, for example, which flourished as a center of trade until the 19th century, is symbolic of Marseille's rich trading history. Today though, it is mostly sailboats that are anchored here, which can often be seen setting sail on the Mediterranean on weekends.

If the Mistral, the strong wind blowing from the north and a characteristic of the

1 The building where NK MS is located

2 (Front) Mr. Fernand Van den Brande, G.M. of NK Marseille

(Back, from left) Ms. Marie-Hélène Picandet, Secretary, Mr. Richard Bidegaray, Surveyor, Ms. Christel Lliedo, Secretary

city's location, doesn't keep you from taking a boat, you can visit Chateau D'If, famous as a state prison since the 17th century and only a 20-minute ride from the old port. This castle is best known as the setting for the famous novel "*The Count of Monte Cristo*" written by Alexandre Dumas.

Walking to the top of the hill in the east of the city, you will reach a Romanesque-Byzantine-style basilica "Basilique Notre-Dame de la Garde", built in the middle of 18th century on the site of a chapel first built in the 12th century.

On the terrace, you can experience a breathtaking panorama of blue sea and red roofs, shining under the famous, blue, cloudless sky. You can also easily make out the modern Marseille-Fos port spreading along the back of the panorama, on the west side of the old port.

The modern port view reminds us that Marseille is actually the second largest city in France after Paris, and plays a major role in trade, commerce and the manufacturing industry in the south of France. Based on statistics for 2000, the port moved the third largest number of containers (726,000TEU) in Europe after Rotterdam and Antwerp.

Since the introduction of the unified European currency, the "euro", Marseille's role as a southern distribution base for the euro zone is expected to increase greatly.

The ClassNK Marseille office was established in 1981 as part of a necessary expansion of the Society's international network to meet the needs of our clients. The current General Manager of the office, Mr. F. Van den Brande, is originally from Belgium and has been managing the office for 4 years. He had been managing this busy office alone, but was recently joined by surveyor Mr. Richard Bidegaray. They are ably assisted by secretaries, Ms. Marie-Hélène Picandet and Ms. Christel Lliedo.

Taking advantage of good road, rail and air links to various survey sites, the office is responsible for France and other coastal countries on the western Mediterranean, excluding Spain.

Recently, the office moved to an area facing the famous intersection, "Place Sadi Carnot", just five minutes' walk from the old port and near an old-fashioned area called "Le Panier", where buildings with stucco walls stand along narrow streets. It is also an area where busy ClassNK staff can indulge in wonderful dishes such as pizza, bouillabaisse, apple pie with ice cream and pastis de Marseille, offered by the many fine restaurants in the area.

Borobudur in Jakarta

Indonesia is a country made up of over 15,000 islands of varying sizes. It spans 5,000km from east to west along the equator, and is located to the North of Australia between the Indian and Pacific Oceans. The name "Indonesia" in fact originates from a translation of "Indian islands", from the syllable "Nesia", the plural of the word for island in Greek, and the English word "India".

Indonesia's population exceeds 200 million, 90% of whom are Muslim, mostly living on the main island of Java. The five largest islands are Java, Kalimantan (Borneo), Sumatra, Sulawesi and Irian. Although Bahasa (Malay) is used as a common language, Indonesia is a multiracial nation in which many individual languages and traditional cultures coexist. Indonesia has a rich cultural history, at least as old as other Southeast Asian countries, typified for example by the Borobudur ruins in Java.

For centuries, the islands of Indonesia have been famously prosperous for the production and trade of fine spices and aromatics such as clove and nutmeg. These days however, the bulk of the country's trade is based on natural resources such as petroleum, gas, and lumber.

Encouraged by the country's long history as a trading nation, many foreign companies entered Indonesia in response to industrialization promotion policies from the 1970s onward. Consequently, vessel traffic has increased year after year as trade in industrial and commercial products such as apparel and electronic/electric parts has increased, in addition to the staple exports of lumber, petroleum and gas. Accordingly, demand for ship surveys has increased, and ClassNK first established a Representative Office in Jakarta in 1984.

Jakarta is the political and economic center of the country and, with a population of more than 10 million people, is the biggest city in Southeast Asia. Originally known as Batavia, it has always been the most important trading area in the country. Today, huge volumes of trade in industrial products still pass through the port of Jakarta (Tanjung Priok port) making it, as in the past, the single most important trading port in the country.

The ClassNK Jakarta Representative Office traditionally carried out surveys under the auspices of the Indonesian class society (BKI). In July 2000, when the ClassNK Jakarta office status was changed, Jakarta became a full survey office and sub-offices

NK Surabaya sub-office staff

Mr. K. Yasuda, G. M. (far right) and NK Jakarta Office staff

ClassNK Batam sub-office staff

were established in Surabaya, Batam and Balikpapan in order to expand the survey system to cover this huge country. The Jakarta office now carries out surveys mainly in Jakarta port, Merak and Cilacape in western Java, as well as the southern Sumatra region.

Surabaya, with a population of 3 million, is the second-largest city after Jakarta. It also boasts the country's second-largest port. Surabaya is home to the largest shipyard in Indonesia, PT PAL, a national shipyard, and many other shipyards. These facilities carry out both new shipbuilding and ship repairs. The ClassNK Surabaya sub-office is located in the center of Surabaya, and carries out surveys in Surabaya, Eastern Java and on Sulawesi Island.

The Island of Batam is strategically located just 20km south of Singapore, leading to a great deal of tourism from Singapore. In recent years, investment incentives offered through the tax system, such as the exemption from VAT, have also encouraged many foreign electronic parts manufacturers, as well as shipbuilders, to locate on Batam Island and its neighbor Karimun Island. Both have now developed into major industrial areas. On Batam Island in particular, over 20 shipyards have mushroomed, mainly at Tanjung and Uncang, where the repair of many vessels and also new shipbuilding is being carried out. The ClassNK Batam office is located in Nagoya in the center of Batam Island, and is responsible for Batam Island and Karimun Island as well as Dumai and Medan in northern Sumatra.

ClassNK Balikpapan sub-office staff

The ClassNK Balikpapan sub-office is located on Kalimantan, an island blessed with vast natural resources such as petroleum, natural gas and coal. From here, huge amounts of petroleum, natural gas and coal are sent to countries of the Far East, such as Japan, resulting in substantial oil tanker and LNG carrier traffic. ClassNK Balikpapan, located in the eastern part of the island, has developed around the national oil refinery of PERTAMINA. Surveys are carried out across Kalimantan Island, including oil tankers at Balikpapan and LNG carriers using the LNG base at the nearby port of Bontan.

TOPICS AND EVENTS

01 APPOINTMENT OF NEW BOARD MEMBERS

In February this year, the Society announced changes to its Board of Directors. The Chairman and President, Mr. T. Mano, and the Executive Vice President, Mr. M. Hidaka, both retired, resulting in two new appointments. The changes to the Board are as follows:

New Board

Chairman and President	Mr. Kenji Ogawa (previously Executive Vice President)*
Executive Vice President	Mr. Masahiro Murakami (previously Managing Director)
Executive Vice President	Mr. Yukio Tsudo (previously Managing Director)
Managing Director	Dr. Minoru Oka (unchanged)
Managing Director	Mr. Tsunetoshi Takano (unchanged)
Managing Director	Mr. Noboru Ueda (newly appointed)
Managing Director	Mr. Teruo Akahori (newly appointed)

Mr. Mano will remain with the Society in the role of Honorary Chairman and Mr. Hidaka will also stay on as Senior Advisor to the Society.

Clockwise from lower right:
Chairman and President K. Ogawa, Executive Vice President M. Murakami, Executive Vice President Y. Tsudo, Managing Director Dr. M. Oka, Managing Director T. Takano, Managing Director N. Ueda, Managing Director T. Akahori

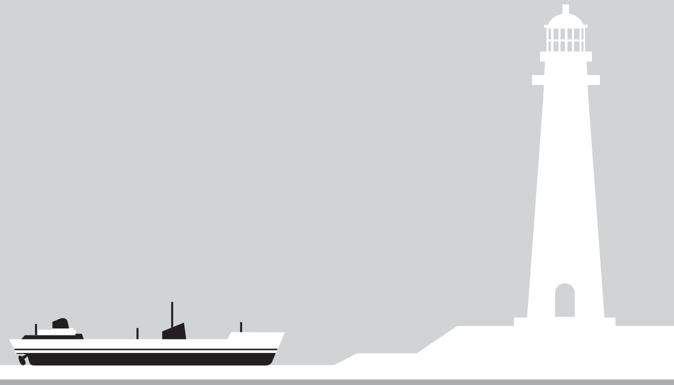
* Biographical Note:
Mr. Ogawa, newly appointed to the position of Chairman and President, graduated from the University of Tokyo (Naval Architecture) in 1963. He then joined the Maritime Technology and Safety Bureau (MTSB) in the Ministry of Transport. He held a number of senior positions in the Ministry of Transport including:
Director, Shipbuilding Division
Director General, Tohoku District Transport Bureau
Ship Inspector General, MTSB
Director General, MTSB
In 1996, he became Chairman of Nippon Hakuyouhin Kentei Kyokai (The Ship Equipment Inspection Society of Japan), and a Senior Advisor to Nippon Kaiji Kyokai. He was appointed to the position of Executive Vice President of Nippon Kaiji Kyokai in February 1999.

02 SEA JAPAN AND POSIDONIA

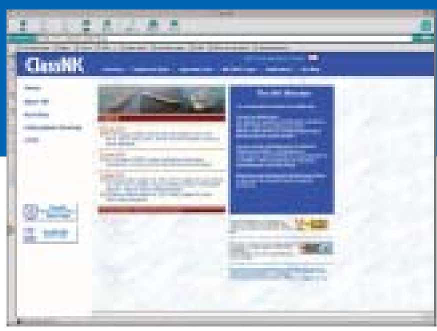
The Society exhibited at several major international maritime fairs this year, including Sea Japan (Tokyo, Japan) in April, and Posidonia (Piraeus, Greece) in June.

Sea Japan

Posidonia



03 NEW NK WEBSITES



In April this year, the Society launched its new website in both English and Japanese. The new site includes many new features such as the full Register of Ships (searchable) and approvals list. The NK-SHIPS site has also been upgraded with two new functions to complement the existing free-of-charge services for owners and ship management companies. These new functions allow users to peruse certificates and survey records in the archives and view graphic displays of survey schedules for the entire fleet of a user.

During the year, the Society also announced the launch of its new Safety Management System online information service, which became operational in March 2002. The new service is called NK-SMART (Safety Management Audit Report.)

Using NK-SMART, a management company can obtain the current status of DOCs and SMCs for ships under their management. Users can also view details of DOCs and SMCs, the due dates of upcoming audits, a history of past audits, and descriptions of non-conformities and observations detailed in previous audits. The NK-SMART service is available free of charge via the Internet at URL http://sms.classnk.or.jp, although registration is required. The service is offered exclusively to ClassNK clients registered for ISM audits and certified with the Society. Information will only be available for those ships under their ownership or management.

04 HEAD OFFICE REORGANIZATION

Following the completion of the new NK Information Center in Chiba, ClassNK carried out a major restructuring of its activities, with several departmental changes and relocations. This also included a reorganization of the Head Office Administration Center which was refurbished at the same time.

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