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CCS President Sun Licheng Delivered Speech at 2014 International Shipping (China) Summit

On November 5th, Sun Licheng, President of China Classification Society attended the 2014 International Shipping (China) Summit and delivered a speech on "Reflections on the reform of ship technology and the future shipping". In his speech, he analyzed the development trend of ship technology in the future, and proposed the idea of reducing shipping costs by improving ship energy efficiency and using new energy power. At the same time, he also described the opportunities and challenges that the development of digital and intelligent ship would face under the background of big data era.

At the summit of this year, well-known experts and scholars from the government, world authoritative analysis and prediction bodies, shipping and shipbuilding industry and other top managers gave authoritative analysis and prediction on economic development, shipping trend and other issues of general concern of the industry and provided countermeasures.

CCS Successfully Passed IMO GBS Period Audit

On October 19, 2014, China Classification Society (CCS) received the (GBS) audit opinion sent from IMO audit expert group, which fully affirmed CCS' file submitted for GBS audit. In 2010, IMO formally issued the GBS requirements on bulk carriers and oil tankers, after 5 years' research and preparation, CCS formally applied to IMO for GBS audit IMO on December 8 of last year.

The concept of GBS appeared firstly in the 89th IMO Council meeting, held in 2002, some representatives suggested that IMO should set a new standard of ship structure, which can allow various innovative ship design under the premise of ship safety and pollution prevention.

GBS only sets goals, but does not establish mandatory method to conform to standard, meanwhile it allows to use alternative ways which have been authorized by authority to achieve the objectives and goals. In the future, IMO will serve the GBS as a basic framework convention, existing conventions, and rules issued by classification societies shall comply with the principles of GBS. This will be a great change for existing conventions and rules, and this innovation is not only a change of a specific technical term, but also the updating of "standard of standard" namely standard principle. We can imagine that such change will have far-reaching effects for ship owners, shipyards, design companies, marine equipment manufacturers, classification societies, flag state and port states.

GBS has five tiers in its contents, the first tier is safety objectives, namely, to set up a series of safety goals, and the ships both in design and construction need to meet these objectives; the second tier is functional requirements, that is to set up a series of requirements related to ship structure function and meet the safety target by verification; the third tier is to meet certification standards, namely provide standard to comply with verification; the fourth tier covers technical procedures and guidelines, classification society standards and industry standards, the technical standards covered in this tier are for ship design and construction specification; the fifth tier covers the practical rules, safety and quality system and rules on ship operation, maintenance, crew training and etc

of shipbuilding industry, these rules and standards are for competent authority, classification society or shipbuilding industry and shipping industry. The related rules and guidelines of CCS bulk carriers and tankers belong to the fourth tier of GBS requirement, namely they must pass the IMO GBS and compliance verification.

The IMO 87th MSC held in May 2010 approved the MSC.290 (87) resolution. The resolution came into effect on January 1, 2012, and it requires that the construction standard for all oil tankers and bulk carriers of 150m and above which signed construction contract after July 1, 2016 should meet the requirements of international GBS standards(resolution of MSC.287 (87)). That is to say, only the rules which pass GBS and comply with certification will be used for all international oil tankers and bulk carriers of 150m and above after July 1, 2016.

In order to prepare for IMO GBS audit, CCS launched the key project "normative foundation research based on IMO GBS requirements", set up a serious of monographic study such as liquid tank sloshing load, wave loading of ultra scale ship, structure redundancy, corrosion mechanism, welding coefficient, etc. CCS arranged all technical strength, combined with Chinese academics and industry to carry out GBS research to promote the basic research of China's shipbuilding industry.

In GBS audit work, CCS is divided into two parts to cooperate action: the first is to organize research and development work of IACS HCSR. In order to support members to answer GBS audit, the International Association of Classification Societies (IACS) began to harmonize the original CSR-BC and CSR-OT rule from the beginning of 2007, and developed a common CSR rule. CCS not only actively participated in the establishment of IACS CSR-H standard, but also served as a project manager of IACS buckling group who led the research of CSR-H buckling specification. The second is to organize expert team to carry out GBS basic research work. From project approval in 2009 to submitting audit application in 2013, there are 29 documents of 950,000 words in total including GBS self-assessment form, CCS specification / guide / program files and etc. All these documents provide theoretical basis and technical guidance for CCS to successfully transform from traditional rule system to goal-based rule system.

GBS audit requires that the specifications and technical documents must be able to support and reflect the first tier and the second tier goal requirements of GBS, it also requires that a specific theoretical basis and data results should be shown to reach the requirement of GBS, and requires classification societies' continuous improvement of the specification through feedback operational data.

In November 2013, preparation of all material was completed, 211 requirements of GBS have been addressed without any omission. On December 18th, CCS formally submitted GBS documents to the IMO, fully verifying that CCS' rules and guidelines meet the assessment standard of GBS guideline. According to IMO audit plan, IMO appoint the second audit expert group to review the self-assessment form, relevant specification / guide / program file submitted by CCS, and verify whether they are in compliance with GBS requirements. The audit process is open and transparent, and all audit records are shared among different audit groups and submitted to IMO for record.

CCS Took Part in the 11th Dalian International Maritime Exhibition

The 11th Dalian International Maritime Exhibition was held on October 21st 2014 in Dalian, China. Mo Jianhui, CCS Vice President and Tian Dongming, General Manager of CCS Dalian Branch took part in the exhibition as leaders of CCS team. During the exhibition, Guo Dacheng, the President of China Shipbuilding Industry Association, Liu Yan, the Deputy Mayor of Dalian municipal people's government, Dong Qiang, Deputy General Manager of China Shipbuilding Industry Corp and leaders of other related industry visited CCS booth. CCS staff received these guests and provided answers to the enquires of the experts from the shipping, shipbuilding, ship design, product, finance and other industries.

Dalian International Maritime Exhibition started from 1992, and is held in the year of even number. The exhibition is based on the shipbuilding industry in Northeast Asia, and sets its foot in Chinese shipbuilding market. This exposition, by inviting comprehensive participation of the ports, ships and other maritime industries, organizes professional targeted technical exchanges, featuring two major themes i.e. "offshore engineering" and "ship financing", and reflecting the three major functions of "market development, technical exchange, and investment cooperation".

2014 International Tripartite Meeting of Shipbuilding, Ship Survey and Shipping was Held

From October 30 to 31, 2014 International Tripartite Meeting of Shipbuilding, Ship Survey and Shipping (hereinafter referred to as "tripartite meeting") was held successfully in Shanghai. The conference was cosponsored by China Association of the National Shipbuilding Industry, China's Society of Naval Architecture and Marine Engineering, China Shipowners' Association, and was organized by China Classification Society (CCS). Nearly one hundred delegates from the International Chamber of Shipping, INTERCARGO, INTERTANKO, BIMCO, IACS, International shipbuilding expert committee and other experts from Europe, Japan, South Korea, China shipping and shipbuilding organizations attended the meeting.

Guo Dacheng, the President of China Association of the National Shipbuilding Industry attended the meeting. Sun Licheng, the President of CCS delivered a speech. He pointed out that international tripartite meeting, which serves as a non-governmental dialogue, has become an important communication mechanism between the parties, and has played a positive and constructive role. This year's conference has witnesses the continuous increase of the number of participants and more extensive discussion topics. It is hoped that through this platform, the industry's professional wisdom and experience are shared and cooperation is enhance in order to jointly promote the international maritime industry to realize the development goals of more safety and environmental protection.

During the two-day meeting, representatives from all parties discussed the progress of relevant international maritime regulations and rules and areas of concern during current development in light of the theme "cooperation to promote more effective international maritime legislation and reinforce efforts to promote the development of maritime technology" in an open and positive attitude. The participants reached consensus on further cooperation, and international shipbuilding, shipping and classification society will strengthen cooperation in accident investigation database, certificates issuance, verification software, experience sharing in the energy efficiency design index implementation and implementation of ballast water management convention, in order to promote technological innovation and development of new technology.

International Tripartite Meeting of Shipbuilding, Ship Survey and Shipping has been annually held since 2002, and the next meeting will be held in South Korea.

CCS and GTT Jointly Held LNG Technology Release Conference

On October 23rd, China Classification Society (CCS) and the French engineering company (GTT) jointly held the technology release conference on "CCS technology related to liquefied gas transportation industry chain and GTT multi gas transport film capsule technology".

CCS introduced and promoted the rules and technical research results achieved in recent years on risk assessment related to ships and shore facilities on the chain of liquefied gas transport industry, and GTT company introduced the latest achievements of multi gas transport film capsule technology. Experts from relevant government agencies, shipping, ship research institute, liquefied gas tankers transport enterprises, liquefied gas ship design and manufacturing enterprises, related domestic finance

and insurance institutions and other units jointly shared the latest research achievements in this field. During the meeting, China Classification Society issued the approval certificate of multi gas transport film capsule technology to GTT company.

In recent years, CCS and GTT have jointly completed ship type development and technology approval of 16000 ton and 20000 ton small-size LNG ships with thin film. In the future, the two sides will have closer cooperation in the large, middle and small membrane type LNG fuel tank technology, large liquefied gas carriers and other areas, and provide more technically reliable liquefied gas transport solutions with good economy to the industry.

CCS Zhejiang Branch Signed Cooperation Agreement with MSA Zhejiang

On November 5, CCS Zhejiang branch and MSA Zhejiang signed the "cooperation agreement on serving Zhejiang marine economy and promoting the safe development of shipping" in Hangzhou, Zhejiang Province. Yang Yong, Party Secretary of CCS, Wang Zhixiong, General Manager of CCS Zhejiang Branch, Gao Jun, Director of MSA Zhejiang Branch and other leaders attended the signing ceremony.

In his speech, Yang Yong thanked MSA Zhejiang Branch for their long term support for CCS Zhejiang Branch. He said that there are solid foundations and good conditions for bilateral cooperation, he hoped that the form and content of cooperation between CCS Zhejiang Branch and MSA Zhejiang could be enriched consistently, giving full play to the advantages and characteristics of both sides, to jointly serve the development of marine economy in Zhejiang and to safeguard the safety at sea.

Gao Jun fully recognized the cooperation after the establishment of CCS Zhejiang Branch, he specifically expressed his appreciation to the closer cooperation between the two sides in the process of MSA Zhejiang actively exploring innovative maritime surveillance service mode and implementing in an all-round way the work mode of "inspecting ship safety in an open manner" . He said that MSA Zhejiang and CCS Zhejiang Branch will cooperate in wider and more intensive area to serve the development of Zhejiang economy.

Wang Zhixiong and Gao Jun signed the agreement on behalf of the two sides. According to the agreement, the two sides will play to the full their respective professional leading role in establishing the safe, convenient, efficient and green modern shipping system with Zhejiang characteristics and in the transformation and upgrade of ships in Zhejiang, establish the mechanism of resources sharing and exchanges and cooperation, realize open exchange in an all-round way on scientific research information, business technology, professional personnel and other aspects, shape the model of cooperation between maritime organizations and ship survey bodies, and strive to provide more comprehensive, more standardized service for the marine economic development of Zhejiang.

Chongming Ship Survey Dept. of CCS Shanghai Branch Inaugurated

On October 16, Chongming ship survey dept. of CCS Shanghai branch was inaugurated. Yang Yong, Party secretary of CCS, Li Hua, General Manager of Shanghai branch of CCS, Jiang Rong, secretary of discipline inspection committee of Shanghai Urban Construction and Communications Commission, Xu Guoyi, director of Shanghai Maritime Safety Administration attended the inauguration ceremony and together unveiled the nameplate for Chongming Survey Dept. of CCS Shanghai branch.

Jiang Rong congratulated the establishment of Chongming ship survey dept. of CCS Shanghai branch. She hopes that CCS Shanghai branch, by taking the establishment of Chongming ship survey dept. as an opportunity, brings the survey service closer to the customer and extends it to the production line, in order to further promote the development of the shipping, shipbuilding and its supporting industries in Chongming area, and promote the influence of "Shanghai shipbuilding" in the world.

Xu Guoyi said that Shanghai Maritime Safety Administration would strengthen cooperation with CCS Shanghai branch, deepen cooperation and content, complement each other's advantages, expand the resource sharing, and work together to promote ship safety technology and management level, and maintain water safety stable situation of Chongming and the whole Shanghai area.

Zou Yuanjing, deputy general manager of Jiangnan Shipyard Group Co., Ltd, pointed out that Jiangnan group has maintained good cooperation relation with CCS Shanghai branch. After Chongming ship survey dept. of CCS Shanghai branch is founded, it will greatly facilitate the shipbuilding and shipping enterprises in Chongming area, and also elevate the bilateral strategic partnership to a higher level.

Li Hua, on behalf of CCS Shanghai branch, extended warm welcome and heartfelt gratitude to the guests attending the ceremony. He said, the establishment of Chongming ship survey dept. of CCS Shanghai branch is to serve Shanghai shipping industry transformation strategy, further give full play to the area advantage of Chongming in offshore equipment industry, and bring CCS survey services closer to the market and the customer.

Chongming ship survey dept., as a dispatched unit of CCS Shanghai branch, mainly undertakes newbuildings survey, offshore engineering construction survey, ships in service survey, audit and marine product inspection business of three islands, i.e., Chongming, Changxing and Hengsha. CCS Shanghai branch is committed to promoting the site survey service ability of Chongming ship survey dept., providing local customers with high-quality, high efficient and timely service, and making positive contribution to promotion of rapid, healthy and sustainable development of Chongming marine equipment industry.

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Exceptions Allowed to Sailors' Rest Time

By Luo Linjun

Recent audits to ships found that shipping companies, ship owners, chief officers and other senior officers are still confused about the sailors' rest time, i.e. under what conditions are exceptions allowed? How to handle exceeded records? Though by Nov. 30, 2014, PARIS MOU and TOKYO MOU have finished CIC focus inspection of sailors' rest time, the PSC inspection of sailors' rest time will not come to an end. On the contrary, this CIC focus inspection will definitely promote the inspection level of PSCO of the rest time. Through analysis of different exceptional situations, this article helps captains to get familiar with and accurately grasp exceptions.

Exceptions allowed by Flag States

According to STCW, contracting states can allow exceptions to "rest time should not be less than 77 hours during any 7 days" and "number of rest periods should not be more than 2". However, such exceptions should not be more than 2 consecutive weeks. The interval between two adjacent exceptions should not be less than twice as much as the duration of the exception, and "the shortest rest time that should not be less than 10 hours can be divided into not more than 3 periods, one of which should be at least 6 hours and any one of the other two should be not less than 1 hour. The interval between two consecutive rests should not be more than 14 hours, and the exception should not be longer than 2 days during any 7 days."

Firstly, exceptions are only allowed when the Flag States have express prescriptions. Therefore, captains should be familiar with and safely keep the documents of Flag States allowing exceptions in case of inspections, e.g. flags like Chinese flag, HongKong flag and Singapore flat can be found in DMLC PART I, and Panama can be found in its circular MMC-187. Detentions may be caused when exceptions exceed the requirements of flag States in case of non-emergencies or abnormal situations. Therefore, only accurate understanding and grasp can allow easy handling.

"Exception of not be less than 70 hours during any 7 days should not exceed 2 consecutive weeks, and the interval between two adjacent exceptions should not be less than twice as much as the exception time". How to understand that each exception should not be more than 2 weeks? If the exceptions permitted by Flag States happened, the rest time is about 70 to 76 hours during any 7 days, the first exception happened during the 1st day to the 7th,then in the next week, it can be from the 2nd day to the 8th, or the 3rd day to the 9th …… the 8th day to the 14th . How to understand that the "interval between two adjacent exceptions should not be less than twice as much as the exception time"? If the first exception to rest time is about 70 to 76 hours happened during the 1st day to the 7th,then the next exception should be after 14 days, that is the next earliest time that the exception can happen from the 22nd day to the 28th. For another example, the first two exceptions of 70-76 rest time happened during the 1st day to the 7th or the 3rd day to the 9th, then the next should be after 18 days, from the 28th day to the later 7th day. Consequently, once such exception happened, "flag State exception" should be recorded in the relevant column of the rest time record.

"The shortest rest time should not be less than 10 hours, which can be divided into 3 periods at the most, as least one rest period should not be less than 6 hours, either of the other two rest periods should not be less than 1 hour, the interval between two rest times should not be more than 14 hours, the exception should not be longer than 2 days during any 7 days." It should be noted that the shortest rest time of 10 hours can be divided into 3 periods, but that the rest time can be less than 10 hours during past 24 hours is not mentioned. This is different from STCW78/95, in which it can be reduced to 6 hours. Therefore, resting time of 6+1+1 or 6+2+1 can not meet the flag State requirements for exceptions. But for any 7 day rest time, 2 days at the most and the 3 longest three periods could be regarded as the rest time for each day and each week, it should be marked in the column of the corresponding rest time record.

Exceptions to convention and Flag State exceptions

STCW stipulates that in emergency or other abnormal situations, requirements about rest time are not bound to be met. In addition, MLC and STCW stipulate that captains have right to ask any sailor to stay at work at any time for safety of ships, sailors and cargoes, or help other ships or people in distress at sea. To this end, a captain has the power to stop scheduling work or rest time, until everything returns to normal.

Emergency or abnormal situations can be interpreted as captain power beyond the convention requirements. STCW provides an explanation of abnormal work in part B: "work can not be delayed, which are related to safety, security or environment, or unforeseeable work". However, there is no detailed description, which leaves large extent of discretion to captains. The captain should be able to make right decisions. Wether sailing into or out of ports, berthing and departing, dropping anchor and refueling that easily cause irregularities should be classified as abnormal or emergency situations? There are still different ideas. People classified these works as normal situations because these works are foreseeable. However, these kinds of works are easily changed but can not be delayed. Unfixed working times can be interpreted as abnormal situations. The key point is that once everything returns to normal, captain should arrange rests for sailors who have worked during their rest time.

There are different ideas about whether sea exercises or sailors standby being assigned to work can be classified as abnormal situations. MLC and STCW stipulate that: "emergency muster exercise, fire drill, life-saving drill, and other exercises regulated by state or international laws and regulations should be carried out with the least impact and fatigue. Once the rest time of a sailor is disturbed, it should be made up". MLC stipulates that: "if without collective agreement or arbitral award, or authorities confirm that there is not detailed regulation related to clause 7th (exercise) or 8th (sailor standby), the rest time of sailors should be ensured." Thus it can be seen that the convention allows that the regulations may be not sufficiently detailed and leave rights to authorities. Therefore, when there is no flag State requirement, it can be accepted if sufficient rest or make-up has been given to certain sailors who have overworked due to the drill, or to the sailors standby who have been summoned to work and exceeded work time is caused.

Future tendency

Captains, chief officers and chief engineers should be completely familiar with regulations about sailor rest time, especially when different kinds of exceptions are permitted. They should also supervise sailors to faithfully make rest records. Once exceptions permitted by flag States or exceptions to convention exceptions and flag State exceptions happened, it should be recorded in the revelant column. Sailors' rest time should be ensured and made up. In this way, PSCO will respect and approve the exceptions. For the exceeded rest time caused by unreasonable work arrangement, it should be dealt with through company system documents.

Experience about AMSA rest time CIC inspection from a chief engineer may bring reference to the industry. He pointed that there are some clear key points about correctly filling in rest time record to meet requirements of STCW and avoid problems during PSC inspection. It is necessary to faithfully record rest and work time of sailors. In abnormal situations, it should be convincing. At the same time, deferred rest is necessary to avoid over fatigue. Captain has the right to adjust rest and work time of sailor to meet requirements of convention. In short conversations with PSCO, it is necessary to make good impression that the captain knows well about the regulations. Some issues are to a large extent caused by unfamiliarality with the STCW regulations. Non-compliance has once been issued when the third officer is taking rest during exercise, chief engineer is taking rest during refueling and chief officer is having rest when the ship is dropping anchor. These are all against the rules. However, with reasonable explanations, everything is OK. The captain will never refuse sailing into or out of port or refueling just to meet the requirements for sailors' rest time and as a result the normal operation of ships would be affected.

At present, IMO is planning to introduce "fatigue risk management system". IMO indicates that: "though STCW and MLC have already regulated about work and rest time, as well as the guideline MSC/Circ.1014 to relieve fatigue, absence of fatigue management is still the main culprit of marine accidents." At the same time, AMSA presents a theory frame of Fatigue Risk Management System based on the five aspects of the guideline of fatigue risk management, fatigue risk management education and training, time arrangement optimization of maritime working and resting, fatigue evaluation and feedback, suitable working and living environments.

Interpretation of New Performance Standard for Coatings (PSPC - COT)

By Xin Jicheng

In recent years, inspection of new type of double hull oil tankers meeting the requirement of MARPOL Annex I has constantly found severe corrosion phenomenon at the top and the bottom of the tank, and this has caused the great concern of the international shipping industry. According to the report and the proposal of European Union on the serious corrosion of the top and the bottom of cargo hold of crude oil tanker, the International Maritime Organization (IMO) Maritime Safety Committee in May 2010 adopted the amendment to SOLAS of MSC. 291(87), which states new requirement for tanker cargo oil tank coating protection and anti-corrosion measures in article II-1/3-9, Cargo Oil Tank Coating Performance Standard (MSC. 288 (87)), as one of the measures to improve navigation safety of oil tankers has been incorporated in the compulsory requirements of IMO.

Performance standard for cargo oil tank coating (PSPC - COT) is another compulsory requirement for ship structure corrosion resistance after the performance standards for all types of ship dedicated seawater ballast tanks and double side of bulk carrier 150 m above coating (PSPC - DSBT) issued by IMO. It is the compulsory requirement which has the greatest influence on crude oil tanker after IMO MARPOL. The main compound of crude oil is paraffin, which belongs to organic liquid compounds, there is no electrolyte, the shipping industry in the past generally believed that crude oil would not cause hull structure corrosion. When the tanker sails without loading, the residues of the crude oil in cargo tanks can also protect cargo hold structure like anticorrosive coatings. Based on this consideration, tanker's cargo oil hold usually does not take anti-corrosion measures. However, after a long period of study, the international shipping industry gradually realize that a quite different cargo exist between the true state of inside oil hold and the traditional understanding of the operation process of tanker. When crude oil is loaded in cargo tanks, and cargo tanks have three distinct layers from bottom to top, the corrosion environment corresponding to the position of cargo tanks is also different. The bottom of tanker cargo often has acidic water and mixture which is made of sludge containing anaerobic bacteria, the electrolyte and bacteria in the mixture are the main cause of the oil corrosion occurring in the bilge. The main components in the cargo tank are paraffin in crude oil, this kind of organic liquid does not usually cause corrosion to the hull structure. The position with no cargo at the top of cargo oil tank is occupied by various steam such as H_2S, CO_2, SO_2, water vapor and mixed gas from inert gas system. Once the

Figure 1 The serious corrosion at the top of aging oil tank

Figure 2 Pitting corrosion at the bottom of oil hold of two-year-old tanker

water vapour congeals in the deck, H_2S, CO_2 and SO_2 can be dissolved in water and form a kind of acid liquid, and this is the main cause of the corrosion occurring at the top of the tank. When tanker ship ballast sails, the middle of cargo hold will be affected by this kind of mixed gas.

The inherent characteristics of crude oil tanker itself has is another cause of serious corrosion at the top and bottom of cargo hold. In order to facilitate loading and unloading of cargo, oil tank bottom is usually equipped with steam heating coils. During loading and unloading of cargo, the temperature of the bottom of the hold is high, this will lead to more serious corrosion at the bottom of cargo hold.

Similar to the PSPC – DSBT, PSPC - COT also requires the targeted service life of anti-corrosion system of cargo hold reaches more than 15 years, and its coating technology standard is also based on the PSPC - DSBT, and developed after revision according to the characteristics of the cargo oil tank. In addition to using traditional anti-corrosion coatings for corrosion protection measures, PSPC - COT also allows for other equivalent measures adopted for the protection of the hull structure in cargo hold.

When the corrosion protective coating in the cargo hold is adopted to protect the structure, The requirement of PSPC - COT on coatings and coating technology is similar to PSPC - DSBT. The difference is mainly manifested in the scope of the coating, coating approval test requirements, as well as handling of completion coating treatment destroyed in closed phase, etc.

The biggest advantage of adopting anti-corrosion coatings for cargo oil tank structure protection measures is that it is easier for shipyard to get accustomed, because the PSPC - COT on anticorrosion coating construction technical requirements is very similar to PSPC - DSBT. Using paint to protect cargo oil tank will significantly increase the coating workload in tanker construction phase, the multiple surface treatment and coating application inevitably lead to ship construction cycle extend obviously. Therefore, IMO in the PSPC - COT provisions specially allows to adopt other equivalent measures to protect the hull structure of cargo hold. In the corresponding location, adopting corrosion resistant steel for construction is the only equivalent measures approved by IMO for cargo oil tank corrosion protection.

At the same time when IMO adopted MSC. 288 (87), it approved the performance standard for alternative means of corrosion protection for cargo oil tanks of crude oil tankers (MSC. 289 (87)) stipulating that corrosion resistant steel can be used as a crude oil cargo tank anti-corrosion alternative measures. Corrosion resistant steel is a kind of special material which can be used for structure construction at the top or the bottom of crude oil tank, in addition to complying with classification requirements for ship structure material, strength and construction, the corrosion resistant steel must also meet the requirements of MSC. 289 (87) on corrosion resistance test and the approval procedure. According to its location, the corrosion resistant steel can be divided into three types:

RCU: steel apply to deck area in oil hold

RCB: steel apply to the floor area in oil hold

RCW: steel apply to both the deck and the floor area in oil hold

The smallest range of corrosion resistant steel used on the ship is in accordance with the smallest scope of coating of cargo hold described above. The corrosion resistance of steel should match location used. Adopting steel corrosion resistance could exempt from complex surface treatment and painting work in ship construction stage, shorten the shipbuilding period. At the same time, based on MSC. 289 (87), the targeted service life of corrosion resistant steel should reach more than 25 years. Because of corrosion resistant steel target service life is accordance with the service life of oil tanker design of IACS CSR require, using corrosion resistant steel can reduce coating system maintenance and repair work in the ship target life cycle, reduce costs, improve the service efficiency of ship. However, corrosion resistance of steel used will cause steel, welding material and welding technology adopted in the process of ship construction more complex, to a certain extent, increase the difficulty of ship construction management and quality inspection work.

The coming into force of PSPC - DSBT in 2008 has brought huge

impact on the development of China's shipbuilding industry, and at the same time, has also played a huge role in promoting ship companies coating production management and inspection model. From the point of current situation, most of the domestic ship companies' coating equipment have already been put in place, experience of management and inspection in coating has also been accumulated. As a result, the industry put much less importance for the PSPC - COT than the PSPC - DSBT. However, no matter what kind of anti-corrosion protection measures are adopted, it will lead to the rising cost of oil tanker building, for a large oil tankers such as VLCC, it will be more obvious. At the same time, the corrosion resistance of steel belongs to the new materials, ship companies need to prepare in advance in construction technology. It is needed special attention that no matter adopt anticorrosion coating or corrosion resistant steel to protect cargo oil tank, can lead to the raw materials management more complex in the process of ship construction, and this is precisely the weak link what most domestic shipbuilding enterprises have in the production management.

When anti-corrosion coatings are used as cargo oil tank corrosion protection measures, the PSPC - COT executable program is similar to PSPC – DSBT. The shipyard can consult PSPC - DSBT management requirements when constructing this type of ship. It is recommended that different positions on ship such as plate, ballast tanks, top deck, cargo hold top and cargo hold bottom have as far as possible different coating colors, in order to avoid using wrong coating in the coating phase. Most of the oil tankers need to comply with PSPC DSBT and PSPC - COT, these standards are very similar, so that during the formulation of the tripartite agreement and the CTF file and review process, special attention should be paid to the difference between the two technical standards. When corrosion resistant steel is used for cargo oil tank corrosion protection, special attention should be paid to the management problem of raw material, welding material and welding process in the process of ship construction. Due to the three types of RCU, RCB, RCW for corrosion resistance of steel itself; plus the combination of the steel with different strength and resilience rating, this kind of oil tanker as the raw materials involved in the process of the entire building at least 2-3 times that of traditional oil tankers, correspond to the raw material, the welding material and welding process will be very complicated. In the process of ship construction, shall take effective measures to manage raw materials, welding material and welding process, to prevent misuse and mixed phenomenon occurred during actual production. Because of different types of corrosion resistant steel adopted in different positions, so in the process of shipbuilding, inevitably have connections between various types of steel. Due to between different steel, potential difference may have, to avoid in the connection position occur steel corrosion, anti-corrosion coatings protection should be taken in connection weld position between different types of materials. Coating construction can reference to PSPC-COT - about the technical requirements for protective coating. Meanwhile, tooling structure in the bowels of the cargo hold, if can not thoroughly remove after completion, it shall also adopt anti-corrosion coatings for protection according to the requirement of PSPC - COT, unless these facilities adopting the same corrosion resistant steel for manufacturing as cargo hold structure adopted.

It is significant for surface state of the corrosion-resistant steel to maintain its corrosion resistance. Shipyard in construction process can make reference to the stainless steel welding management method, take concrete and effective measures to prevent the welding spatter, arc, flame cutting and fire correction from having adverse effect on corrosion resistant steel. At the same time mechanical damage of steel and weld bead surface should be avoided as far as possible so that the corrosion resistance performance of steel will not be affected.

At present, there is still a big gap between China's current tanker construction management level and PSPC-COT requirements. According to the newly revised SOLAS convention, all the ship delivered after January 1, 2016 must meet the requirement of PSPC – COT, it is suggested that China's shipbuilding industry should prepare in no time for raw material use, welding process preparation and production management improvement, improve fundamentally the level of ship design, construction and inspection level and be fully prepared for the coming into force of PSPC - COT.

Coating Maintenance and Repair for Ships Complying With PSPC Requirements

By Xin Jicheng

IMO Performance Standard for Protective Coatings (PSPC) formally went into effect on July 1st of 2008. With more and more PSPC standard-based ships being put into operation, how to prolong ship coating operation life through effective maintenance, how to fix already failed ballast tank coating, and how to coat renewed steel structure due to marine casualties are becoming new problems shipping industry must confront with.

According to requirements of PSPC, specialized protective coating used in ballast tank should be in operation for at least 15 years. Coating maintenance and repair during operation are of prime importance to ensure its target lifetime. To this end, IMO maritime safety committee released guidance for ballast tank coating maintenance and repair that meets PSPC requirements in the form of No. 1330 circular (MSC.1/Circ.1330) on the 86th Maritime Safety Conference. MSC.1/Circ.1330 is based on ballast tank coating maintenance and repair guideline for oil tanker and liquid cargo ships (and hereinafter referred to as IACS REC87), which is suitable for the specialized ballast tank coating mentioned in clause 3-2.1.1 of SOLAS convention part II-1, not suitable for void tank, oil hold or other places. Based on IACS REC87 and PSPC ship coating requirements, MSC.1/Circ.1330 is more detailed, which covers three aspects of coating checking and condition assessment, coating maintenance and coating repairing.

Coating checking and condition assessment. According to MSC.1/Circ.1330, ships under renewal survey and ships older than 5 years should be checked and assessed, generally through visual detection. Ballast tank coating assessment result is the main basis of coating maintenance and repairing. By making reference to IMO A.744(18)), MSC.1/Circ.1330 divided coating conditions into three levels, “GOOD”, “FAIR”, and “POOR”, and provided more details based on A.744(18)). For example, it clearly specifies assessment requirements about part corrosion on edge and the weld bead, as well as the area of damaged coating. Specific assessment requirements are as shown in table 1.

Coating system maintenance refers to the ballast tank coating periodic inspection and temporary repairing by sailors, with the purpose of keeping normal condition of coating system. According to MSC.1/Circ.1330, ballast tank coating on ships older than 6 years should have to be checked and repaired annually. Coating system maintenance should be classified as one part of ship structure maintenance.

Table 1 MSC.1/Circ.1330 assessment standard related to coating condition

	GOOD[1]	FAIR	POOR
Part corrosion and coating dropping off [2]	< 3%	3 -20%	> 20%
Area of rigid [2]	--	< 10%	≥ 10%
Part corrosion near edge or weld, area of paint dropped [3]	< 20%	20 . 50%	> 50%

Footnotes: 1. Punctiform rusty stain, no visible failure; 2. Area percentage based on assessment area or “critical structure area”; 3. Area percentage based on assessment area or “critical structure area”

Table 2 MSC.1/Circ.1330 cabin coating maintenance requirements

Purpose	Surface treatment	New coating system	Coating system operation
Keep GOOD or FAIR condition	• Wipe out pollutant on surface; • Wash down with fresh water; • Drying; • Clean to St3 with power tool, or clean according to advices from paint supplier; • Environment control	• Coating system certified by MSC.215 (82 is preferred; or; • original coating system; or; • Coating system that is compatible with original coating, approved by paint supplier.	Operating according to suppliers' advices, no specific requirements about coating thickness

Table 3 MSC.1/Circ.1330 requirements related to ballast coating requiring

Purpose	Surface treatment	New coating system		Coating system operation
Keep GOOD or FAIR condition	• Wipe out mud, oil and fats; • Wash down with fresh water; • Drying; • Clean to St3 with power tool, or blast to Sa2.5; • POOR condition should be blasted to Sa2.5; • Soluble salt should be cleaned to supplier advised level, no more than 80 mg/m2; • Environment control.	Mid term repairing[1]	Same to coating maintenance standards	• At least two pre-coating and 2 spaying; • DFT is at least 250 μm
		Long term repairing [2]	Coating system should be approved by MSC.215(82)	• At least two pre-coating and 2 sparing; • DFT is at least 320 μm

Footnotes: 1. Coating life is expected to be 10 years after repairing; 2. Coating life is expected to be more than 10 years after repairing.

Technological processes and requirements are as shown in table 2.

Coating repairing refers to re-coating ballast tank, ship coating is badly damaged (assessment result is POOR or FAIR), with the purpose of renewing the coating system to GOOD condition. As for ships with FAIR condition, the coating system can be maintained or repaired. Ships with POOR condition, ballast tank coating system is necessarily to be repaired. PSPC standard-based ships should be repaired under supervision of inspector with PSPC qualifications, all the maintenance process should also be recorded in CTF according to PSPC requirements. MSC.1/Circ.1330 requirements related to coating repairing is as shown in table 3.

IACS REC87 is a coating maintenance and repairing technical guide rule related to oil tanker ballast tank or dual-purposed liquid cargo/ballast tank, introduced in 2006 by IACS. There is no substantial difference between IACS REC87 and MSC.1/Circ.1330 about assessing tank coating system. Main difference focuses on interior coating repairing technical standards. Compared with IACS REC87, MSC.1/Circ.1330 differs in surface treatment, coating system selection and coating quality, For details, see table 4:

Seemingly, IACS REC87 is stricter with coating system maintenance, such as operation procedures and quality requirements than MSC.1/Circ.1330. Because IACS REC87 is aimed at maintenance and repairing of oil tanker ballast tank coating system, corrosion is more serious than other ships, due to the ballast tank is generally set near the oil tank. However, oil is generally heated during loading and unloading processes. But IACS REC87 is sometimes hard on coating technical requirements (such as soluble salt content on surface to be coated.), which can not be achieved in reality. However, MSC.1/Circ.1330 requirements related to ballast tank internal surface coating is more feasible. MSC.1/Circ.1330 requires more on coating system selection and coating workers' qualifications. It is thus clear that MSC.1/Circ.1330 focuses on the whole quality management system of coating operation and inspection, rather than coating technology.

Ships have to be confronted with coating system repairing when coating systems are disabled or the ships are damaged. With more and more requirements form international convention and flag states'

Table 4 Differences between MSC.1/Circ.1330 and IACS REC87 related to tank coating technical requirements

	MSC.1/Circ.1330	IACS REC87
Maximal apparent salinity	80 mg/m^2	30 mg/m^2
Tank surface processing demands under FAIR condition	Power tools can be used to clean to St3 during maintenance and repairing;	Damaged area should be sand blasted to Sa2 in short-term maintenance; Sa2.5 Damaged area should be sand blasted to Sa2.5 in medium-term maintenance;
Coating system selection	Coating system approved by MSC.215(82) can be selected	Coating system approved by paint supplier, in addition, it should be equivalent or compatible with original coating system
The way of coating repairing	At least two pre-coating and 2 spaying;	GOOD: all kinds of maintenances: at least 1 pre-coating, and 1 spraying FAIR or POOR: Short-term or medium-term maintenance: at least 2 pre-coating, and 2 spraying; Long-term maintenance: at least 3 pre-coating, and 3 spraying;
Dry Film thickness	Mid-term repairing: 250μm Long-term repairing: 320μm	Short-term maintenance: 200μm; Medium-term maintenance: 300μm; Long-term maintenance: 350μm;
Inspector qualification	Supervised by inspector with PSPC qualification;	No specific qualification requirements;
Technical documents	Coating technical files affirmed by inspector	No specific qualification requirements, shipyard maintenance report is just needed

shipping management departments, maintenance, and repairing of ballast tank coating system are becoming key issues shipping industry have to be confronted with. Due to a lack of coating system repairing standards, there were two extreme conditions. On one hand, shipyards and repairing yards make little of coating system maintenance and small-scale coating repairing. Generally, damaged area is simply treated, even no surface treatment before coating. Coating system quality can not be guaranteed. On the other hand, tanks needed to be fully coated are generally hardly sand-blasted. In this way, ship owners get a perfect surface coating, at a significant cost of energy, materials and man hours. In addition, environment and operating personals' health are badly affected.

Periodical coating system maintenance is important to PSPC standard-based ships. An integrated, reasonable coating maintenance system based on ship's actual conditions is necessary to find and solve ballast tank coating system flaws. In addition, on board checkout results and maintenance status should be recoded in CTF files. A POOR ballast tank coating ship should have to be repaired, according to MSC.1/Circ.1330. Coating maintenance of PSPC standard-based ships should be supervised by inspectors with PSPC qualifications. The whole process is supposed to be recorded in CTF. If there is any special requirement form flag state, ship owners should submit maintenance methods and results, be supervised by relative authorities.

After sea damages, steel structure may be repaired or renewed. However, IMO still does not make specific technical demands. Without coating protection, these renewed steel structures with only shop primer are generally classified as POOR level. According to MSC.1/Circ.1330, it should be repaired. If the tank it located is just needed to be repaired, it is a fairly cost-effective way. On the contrary, if tank condition is relatively good, the renewed steel structure should be pre-coated in workshops or shelters with good conditions, then to be installed. In this way, man hours can be reduced, and coating quality can be ensured to great extent.

It is noted that MSC.1/Circ.1330 is not a mandatory requirement of the International Maritime Organization. Generally, a good coating base can be achieved through traditional sand blast, power tools, wet sand blasting and high pressure water spray system. Therefore, renewed coating system with expected life of 15 years is acceptable. Surface treatment and coating technological upgrading is main direction of ship management, inspection and repairing industries in our country.

“Big Data” Management of Marine Product Noise

By Wen Yukui & Zhang Lei & Huang Yanrui

As international community pays more and more attention to the health protection of ship crew, IMO approved the amendment of ship noise protection to SOLAS II -1/3-12 and the “Code of noise levels onboard ships” in November, 2012 (hereinafter referred to as the Code), which entered into force and was mandatorily implemented on July 1, 2014. The objective of the Code is to limit the levels of the cabin noise of merchant ships of 1600 tons and above.

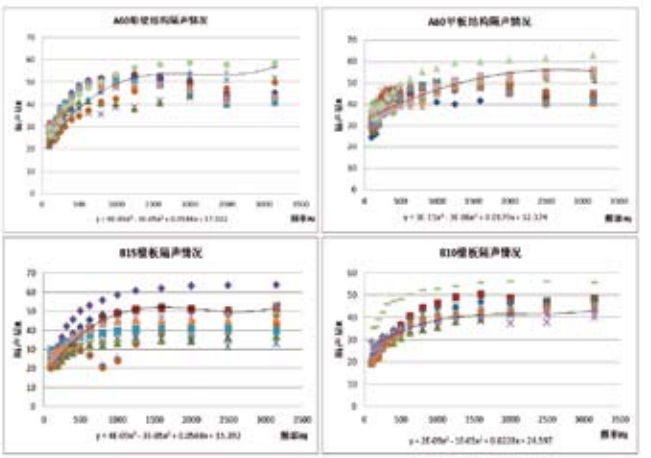
The Code specified that the sound insulation between the residential premises should be considered, so that the ship crew can get rest and recreation even when activities such as music, talk, cargo handling and etc. are taking place in adjacent premises. The characteristics of air sound insulation properties between bulkheads and decks in accommodation area should at least meet the requirements of the weighted sound insulation index (Rw) (dB) according to the first part of ISO717-1:1996 as amended:

- From accommodation to accommodation Rw=35
- Dining room, recreation room, public spaces and from entertainment region to accommodation and medical room Rw=45
- From the corridor to the accommodation Rw=30
- From accommodation to the accommodation with traffic door Rw=30

The air sound insulation characteristics of the insulation structure above should be based on the requirements of ISO 10140-2:2010, and be tested by laboratory recognized by competent authorities. The Rule specifies clearly the weighted sound insulation index between ship cabin rooms, and puts forward the laboratory test method for sound insulation situation of ship insulation structure.

In view of the above, CCS launched the "Guideline for Inspection of Marine Product Noise" to the industry (hereinafter referred to as the Guideline) in July, 2013, and provided corresponding services to the industry one year before the coming into force of the convention.

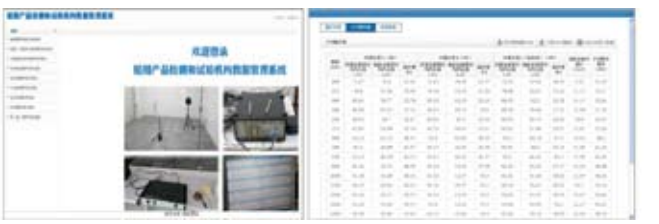
Meanwhile, in order to promote the awareness of the domestic related product plants of the effects of the new convention on the national ship equipment industry, and the deep understanding of the status quo of the sound insulation level of related products, CCS has completed sound insulation laboratory test of 102 different types of insulation structure. By analyzing the existing test data, the analysis of insulation effect of different sound insulation structures under different frequency is as follows:



By analyzing the laboratory test data on the above typical ship insulation structure, it can be learned that the separation structure of the same fireproofing level would have great difference in terms of sound insulation capability under different frequency due to different distribution of the thickness direction structure.

Based on the mass experiment data, it can be basically understood that the weighted sound insulation of the existing ship insulation products in China Rw (dB): A60 bulkhead structure Rw=42-47, A60 deck structure Rw=45-50, B15 wall panel Rw=35-41, B0 B15 wall panel Rw=36-40, can fundamentally meet the relevant requirements of the rule through choosing different product insulation structure.

In order to meet the needs of the industry, namely establishing standardized database of acoustic characteristics of marine noise source products and insulation structure, China Classification Society (CCS) has now successfully completed the development of the "management system of the testing data of marine product inspection and test bodies" (noise subsystem) upon study and research and has promoted to related testing bodies. The system is part of CCS' "management system of the testing data of marine product inspection and test bodies", customers can log on the official website of CCS home page (http://www.ccs.org.cn) to transmit testing data. CCS will deeply analyze these testing data, and provide the basis for the development of rules and guidelines later on.



2014 is the first year of the coming into force of the Rule, by adhering to the concept of serving customers, CCS has basically completed the laboratory test of domestic marine insulation products, and has completed approval and inspection work of different types of isolation product to ensure in the first place the quality of vibration reduction and noise isolation products to be installed on board.

With the Rule entering into force, more and more ships need to meet the requirements. CCS will strengthen communication and deepen cooperation with relevant parties in the industry to jointly cope with the challenges brought by the new requirements to ship noise insulation material and equipment industry in China.

The "Security Guard" of Ship Financing

By Cao Jian

In recent years, the shipping financial institutions in Europe affected by the debt crisis and other areas have cut the ship financing scale or withdraw funds to avoid risks, while Chinese financial institutions have seized the opportunity, completed the leap-forward development of ship financing business in just a few years.

However, ship financing has always been a financial service sector characterized by specialization, high-risk and long cycle. With the continuous downturn of shipping market, ship prices fluctuate significantly, and a lot of shipbuilding and shipping enterprises get into trouble or even go bankrupt. All kinds of high risk factors related to shipping financing of China financial institutions have also been gradually exposed. In the current circumstances where there is a lack of policy and related laws and regulations, and a lack a large number of versatile shipping financial talents, how to effectively deal with and resolve these high risk factors has become a problem to be solved facing domestic financial institutions.

In view of the above situation, China Classification Society (CCS) summarized earnestly the experience gained from the cooperation with financial institutions such as banks and financial leasing companies over a long period, fully exerted its own unique position in the information integration and professional and technical advantages, unveiled a new service product for CCS classed ships --"assessment and monitoring of technical risk of ship financing" on the basis of "financing classification clause" and in the form of "customized information service" and "specialized technical risk analysis".

The service completely covers the main technical risk factors that financial institutions are concerned with when making ship financing decisions. Based on the qualitative and quantitative analysis of all kinds of technical risk factors, evaluation is made to the risk probability levels and the possible negative effects, so as to determine the priorities of risk reduction and control, and timely send out the risk warnings to financial institutions and assist them to develop the dynamic monitoring plan of risk information, thereby providing comprehensive and effective professional technical support for financial institutions to make investment decisions on ship financing project.

After the service was launched, because it can effectively meet the demand of customers for risk prevention and control of ship financing business, it has quickly drawn the attention and recognition of domestic financial institutions. As the nation's largest financial leasing company, ICBC Financial Leasing Co., Ltd has signed with CCS the agreement on

monitoring, evaluation and consultancy of technical risks related to ships and offshore engineering equipment in real assets. According to the agreement, CCS will provide ICBC leasing with a series of technology services including risk monitoring and report, technical performance analysis of ship and offshore engineering equipment at the stage of due diligence for new projects, quality assurance ability analysis of construction shipyard, on-site inspection of ship leasing assets, professional consulting services, and examination and evaluation of safety management ability of ship management company. In addition, CCS also gradually provides the related technical service for Export-import Bank of China and other financial institutions.

CCS "assessment and monitoring of technical risk of ship financing" now can provide the customers with the following technical services:

Technical performance analysis of ship and offshore engineering equipment at the stage of due diligence for new projects

To avoid the risk of future asset disposal and realize the preservation and appreciation of the value of customers' ship/offshore engineering equipment asset, by relying on technical advantage of all kinds of ship type/offshore engineering equipment specialists of CSS and according to technical information of the ship/offshore leasing projects provided by customer, technical performance analysis is carried out to new ship/offshore engineering equipment and the analysis report is submitted.

Quality assurance ability analysis of construction shipyard at stage of due diligence for new projects

To circumvent the risk of new ship construction period, and avoid the situation of delivery delay due to deficiency in shipyard construction capabilities, which could affect company's rights. CCS will conduct objective evaluation and provide analysis report on construction capacity and quality guarantee system for the ship type of the new construction project through assessment of shipyard's infrastructure, management ability, quality system and other aspects at stage of due diligence for new projects.

Monitoring and reporting of risk information of newbuildings

During the construction period of ship financing, CCS conducts dynamic monitoring of all kinds of technical risks and timely provides analysis report to the customer during the process of shipbuilding, to confirm construction progress and related risks, such as main construction nodes and some serious accidents.

Monitoring and reporting of risk information of ships in service

In order to meet the requirements of customers for ship assets monitoring so that customers can timely obtain fleet operating status information and know the risk events or potential risks that may affect the interests of the company, so as to take measures against risks, CCS will provide the CCS classed vessels which belong to the customer with important risk information monitoring and reporting services in ship operating period. When CCS learns this kind of risk information, it will timely analyze the impact on the assets of the ship or company, and provide customers with technical analysis report.

Regular monitoring and summarization of the overall operating conditions of CCS classed fleet which belongs to the customer, such as vessel inspection status, the PSC/FSC inspection and detention and serious events, etc., and to provide customers with fleet analysis report every month.

Regularly collecting the updated information of the international maritime conventions and related laws and regulations, carrying technology analysis to information which is likely have important impact on the assets or the company, and providing customers with relevant analysis report.

Fifthly, professional consultation and on-site inspection at the stage of asset transfer during ship on hire and off hire.

Relying on CCS technology advantage, in order to avoid the disputes and loss caused by assets transfer agreement which is not clear in the future during off hire, CCS will provide customers with professional consultation and on-site inspection services at the stage of asset transfer during ship on hire and off hire.

A periodical on-site inspection during ship leasing

According to the customer's ship assets check requirement, it is intended to provide periodical on-site inspection service for ships in service during leasing period, at the same time according to the result

to divide the corresponding risk level of the ship.

Safety management ability examination and assessment of the ship management company

To keep customers' ship assets under good management, so as to realize the value preservation and appreciation of ship's assets, CCS will conduct site inspection for the ship management company according to customer demand for safety management capacity assessment of ship management company, and through the analysis of inspection results, realize the effective evaluation and validation of safety management level of the ship management company.

The technical service product provided by CCS, which serves financial institutions customer, mainly has the following characteristics and advantages:

Professionalism--CCS is a professional and technical institution engaged in ship survey. Its core survey technology and the most abundant technical experience are the ship's safety risk assessment and management. The specialty in this professional field helps financial institutions make up the shortage in the cross-industry interdisciplinary knowledge, skills and experience, and at the same time, it also enables CCS to conduct the most professional analysis and interpretation on various kinds of risk factors of ship financing projects.

Fairness--China's shipping industry and its related industries and enterprises in the world within the scope of the technology need the help and guide of CCS with its unique position in the shipping industry, and thus CCS is an institution that assumes the industry technology development responsibility such as technology resource integration, technology development, technology promotion and application. Due to its state-owned property and unique social responsibility, it has become the most suitable and fair third party that conducts technical risk assessment of ship financing project.

Operability--CCS has very close business ties with ship industry related companies, and has a profound understanding of enterprise's production and business operation activities. On the basis of such professional experience, this service product develops detailed, specific, practical evaluation and monitoring method for every technical risk factor of ship financing project, which can ensure that each service has strong operability.

Systematicness--CCS summarized earnestly experience of cooperation with ship financing institutions such as banks and financial leasing companies over a long period, and at the same time carried out detailed researches on all kinds of ship financing business of financial institutions, based on which the service product is launched, which can comprehensively and systematically cover the main technical risk factors when financial institutions make financing decisions, and carry out professional and effective assessment and monitoring to each kind of risk factors.

Timeliness--as a ship survey unit, CCS has very close business relations with all the shipbuilding/shipping industry's upstream and downstream enterprises, and has the inherently unique superiority in information integration, so CCS often can firstly get changes of all kinds of risk factors in the process of ship construction or operation, and timely send risk early warning tips to customers and assist them develop the dynamic monitoring plan of risk information, reduce the decision risk to a maximum extent, and provide customers with timely and effective decision-making reference.

Flexibility--the service product "assessment and monitoring of technical risk of ship financing" is committed to meeting customer demand to a maximum extent. In the concrete implementation process, due consideration will be given to the actual situation of the customer, in order to flexibly make use of method for assessment and monitoring of all kinds of technical risk factors.

CCS "assessment and monitoring of technical risk of ship financing" service product will always focus on customer needs and continuously optimize the service process from the perspective of customer and in the interest of customer, so as to ensure the quality of service and provide customers with professional and effective solutions for prevention and control of technical risk of ship financing.

Construction Control of Thick Plate Area in Large Container Ship

By Hu Chaoran

Up to 2012, the total number of large container ships with single ship capacity of more than 10000TEU ordered globally was above 170, and the total capacity was roughly equivalent to 30% of the total global container ship capacity. Although the design and construction technology of large container ships of ten thousand TEU have been mature, the three words "structure, strength and safety" have also been raised to another level along with the trend of the large-scale container ship. According to the statistics of global accidents of container ships of ten thousand TEU in recent years, hull structure damage has become the leading cause of container ship perils.

It is well known that large container ship is a typical large opening ship in terms of the structure. The opening width reaches 85% or even more of the breadth of the ship, resulting in a series of new strength problems which have become the gap that designers need to firstly bridge, and strength problem of container ships above ten thousand TEU has been more prominent. The longitudinal strength is the important goal which needs to be first checked, and the use of thickening plate can increase the longitudinal strength and local strength of container ships in order to avoid hull structure fracture.

It is a gruesome reminder of accident of container ship "MOL Comfort" of 8000 TEU built by Mitsubishi Heavy Industries in 2013 which occurred 200 miles off the coast of Yemen. The ship broke into two pieces from the middle, and immediately sank. Japan's transport ministry released the periodic report and said that the accident is caused mainly by the hull hogging deformation, the bottom plate fractured first, and then the fracture gradually spread, eventually leading to the whole ship broken into two pieces.

Through the above investigation report, the author speculates that ship fracture accident is likely to be caused by the longitudinal bending. The insufficient longitudinal strength is caused by two possibilities; one is that the size of the plate and stiffeners is not enough; the second is that the local buckling strength is not enough, which means that the strength of the local structure under the large load cannot meet the design value. The author thinks that the second possibility is bigger, because the ships designed by Japan are famous for thin shell, light weight, more loading and fast speed, and the material utilization ratio is very high. It is very possible that buckling design is not considered comprehensively. When local strength is insufficient, local buckling is likely to occur, and in the case of compression, when the local component is unstable, it loses the ability of withstand tension and begins to fracture. The speculation of the author is based on the hull of MOL Comfort which used the latest high strength steel HTS47 developed by Japan's Mitsubishi Heavy Industries and Nippon Steel in 2007. The advantage of the latest high strength steel compared with HTS40 steel widely used by shipbuilding industry before is that it is lighter and thinner.

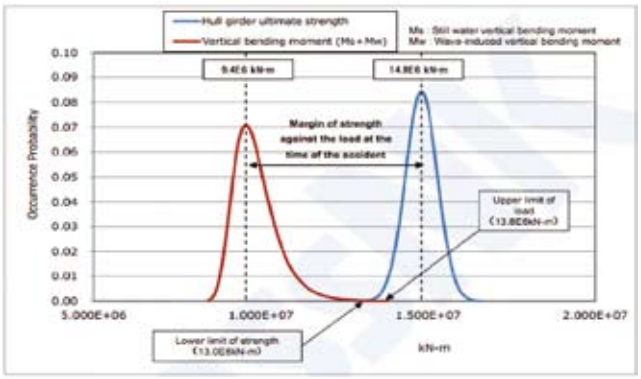
According to the overall evaluation of the staff of Japanese ship design institute, for the large ship using HTS47 steel plate, the steel weight reduction equals to the weight of a small light cargo ship, which can increase fuel efficiency and reduce operating cost. Although in theory, the thinner the steel is, the buckling strength tends to fall, and thus increasing the possibility of cracks or flaws. It is said that Japanese steel finds a balance point between the two difficulties, i.e. strengthening steel plate strength and buckling cracks with a special production technology, skillfully solving the above problems. The secret is materials engineer has found a kind of new material as necessities of increasing

steel plate buckling strength, which reduces the thickness of steel plate and at the same time enhances the strength, so that the steel plate used in shipbuilding can increase the safety and stability of the hull.

However, it is unknown whether this new material can increase the safety and stability of the hull and at the same time thinning the steel as promoted by the Japanese propaganda, or whether NK had validated the related links of the new material formula, but it is important to note that the first application of HTS47 steel around the global shipbuilding is MOL Comfort container ship of 8000 TEU.

At the same time, the preliminary investigation of MOL Comfort issued by NK showed that cracks appeared in the bottom of the middle of the ship. According to the investigation of MOL Comfort sister ship, the bottom shell plating near the mid-ship section has a buckling deformation of 20 mm in height, though at present it cannot be established whether the deformation has led to the accident.

Strengthening preventive safety measures to enhance the strength of ship hull for the sister ship have been taken, and the strength is twice that as required in NK rules. Soon, NK new investigation pointed out that when the accident happened, longitudinal bending moment load probably exceeded the hull girder ultimate strength, and the uncertain factors such as sea state deviation and yield stress should also be considered, and the report pointed out that overlap between its strength and loading is very narrow, as shown in the figure below.



In addition, another factor may be the cause of the accident: when using HTS reinforcement steel for the hull structure, the strength of the steel plate is increased and at the same time steel plate welding success rate is decreased, and thus when HTS47 steel plate is thinning, it also puts forward higher requirements on welding technology: more precise welding technology, lower fault tolerance rate, which is bound to improve the welding difficulty. In response to HTS47 welding problem, Mitsubishi Heavy Industries worked with Sumikin welding company, and completed the gas arc welding machine of double electrode vibration electric version which can make HTS47 steel plate bending.

Although HTS47 has already had the complete set of welding technology, whether the welding technique can really match required the test of time. HTS47 thin steel plate was used in hull construction when it was launched in the first year, and in addition it was also the first time to use the new equipment, technology and program management, and as a result it is difficult to guarantee no defect in hull welding part.

In summary, the author thinks that when the high strength steel is used in large container ship in large scale, we need to pay attention to two points: the design should not go too far to pursue the operating costs while thinning the hull structure, buckling strength of the local component should be particularly valued; The use of high strength steel and thick steel plate increases the difficulty of welding, and put forward higher requirements for the welding process and welding technology of welders.

In view of the above two points, the author thinks that the construction control of thick plate area is a link which needs great attention in the survey of the ship with ten thousand TEU, because this link has a large risk, is related to the longitudinal strength and local strength of the vessel, and based on the past experience thick plate welding area is likely to produce crack spread and lead to hull structure fracture, bringing huge hidden danger to the ship quality.

The accident occurred when the container ship conducted the initial stage of block inspection, and CCS has carried out the publicity and implementation in a timely manner to the shipyard, and shipyard technical department attached great importance to this, recognizing potential risks faced by the ship of ten thousand TEU during construction. Meanwhile, CCS suggests the shipyard technical department should focus on a container ship thick plate area, the high stress area, the weak area structure of the buckling strength, formulate standardized construction technology aimed at its structure characteristics, and meanwhile strengthening the on-site management of the welder for the above area.

Then, based on CCS suggestion shipyard technology department, in view of the thick plate structure area formulated the technical documents to instruct site construction (including the thick plate cutting process, thick plate welding process, thick plate preheating technology and management measures, etc.). The above technical documents have strong guiding significance for the construction in thick plate area so that the construction team attaches more importance to the thick plate area. Fine management is conducted through the provisions in technical documents for strict control of each program of the thick plate construction.