Partnership

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Content

Sino-Greece Maritime Seminar was Held Successfully

On June 5, the "Sino-Greece maritime seminar" was successfully held in Greek Poseidon Maritime Exhibition hall. The seminar was sponsored by CCS and co-organized by the National Development Bank, the Export Import Bank of China, Chinese Society of Naval Architecture and Marine Engineering, and Greek XRTC commercial consulting company. More than 300 representatives from the shipping, finance, ship design, shipbuilding and ship broker industry attended the grand meeting.

The Greek shipping minister Miltiadis Varvitsiotis and Chinese ambassador to Greece Zou Xiaoli attended and delivered speeches at the seminar. On behalf of both sponsors and co-organizers, CCS President Sun Licheng delivered welcoming speech at the seminar.

At the meeting, CCS representatives introduced CCS latest development and service solutions to the industry. Representatives from China National Development Bank, the Export Import Bank of China, Minsheng financial leasing Limited, and BOCOM Financial Leasing Co., Ltd. made subject speeches on ship financing policy, ship financing lease and other issues. The technical experts from Shanghai Merchant Ship Design and Research Institute (SDARI), China Ship Design & Research Center Co., Ltd. and Shanghai Bestway Marine Engineering Tsukito Design Inc's introduced the latest energy saving green ships, representatives from AVIC international Shipping Development (China) Co., Ltd. also delivered subject speeches.

CCS was Awarded with the "Offshore Engineering Technology and Training" Prize by Seatrade Group

On April 7, the seventh awarding ceremony of Seatrade Asia Award 2014 sponsored by Seatrade Group was held in Intercontinental Hotel, Singapore. More than 400 people in total from Singapore maritime and port authority, banks, shipping companies, offshore oil companies, shipyards, service providers, classification societies, port companies, research bodies, education and training institutions in the Asian region attended the grand ceremony.

CCS was honored with the "Offshore Engineering Technology and Training" prize due to its outstanding contributions to the offshore engineering technical R & D and the offshore engineering manufacturing training in China in recent years. On behalf of CCS, Tian Xiaoping, the General Manager of South-East Asia center of CCS accepted the trophy presented by Chris Hayman, the President of Seatrade Group.

As an important annual award, Seatrade Award is launched by British Sea trade Group, aiming to encourage innovation in shipping industry by rewarding organizations and people who had made significant contributions to improving marine safety, protecting ocean environment and innovation. The award started from 1988 and is well-known in the industry.

CCS Signed MOU with Chinese Navigation Museum

Recently, China Classification Society (CCS) signed memorandum of understanding (MOU) with the Chinese Navigation Museum in Beijing. Sun Licheng, CCS President and Nian Jiye, Party Secretary and Deputy Director of Chinese Navigation Museum signed the MOU on behalf of CCS and the Chinese Navigation Museum. According to the MOU, the two sides will cooperate in scientific research, collection of exhibits, exhibition and publicity of maritime culture, information resource sharing and etc.

Xu Zuyuan, curator of Chinese Navigation Museum introduced the construction of the museum. He said that Chinese Navigation Museum will strive to be an important exhibition platform of Chinese navigation culture and the bases for navigational historic research, navigational cultural exchanges and patriotic education. He hoped that both sides would learn

from each other and support each other to jointly promote the development of Chinese navigational culture via cooperation.

CCS President Sun Licheng said that culture plays an important role in the development. As an important platform, Chinese Navigation Museum raises the national awareness of oceans, passes on and inherits maritime culture and promotes maritime civilization through exhibiting navigational culture and the development history of China ship survey. CCS is willing to do its best to make contributions to the development of the museum.

CCS Signed a Strategic Cooperation Agreement With Hudong-Zhonghua Shipbuilding Group

On April 29, China Classification Society (CCS) in Shanghai signed a strategic cooperation agreement with Hudong-Zhonghua Shipbuilding Group. Sun Feng, the Vice President of CCS and Wang Yong, the general manager of Hudong- Zhonghua Shipbuilding Group representing both sides signed the agreement.

Sun Feng, in his speech, thanked Hudong-Zhonghua Shipbuilding Group for making positive contributions to the training of professional technical personnel for CCS, and he said both parties will take this agreement as an opportunity to conduct more in-depth and extensive cooperation and jointly accomplish the development target to become the world first-class enterprises. Wang Yong believed that the signing of the cooperation agreement will further deepen the traditional friendship and the cooperation of both parties will not be constrained by the agreement content. He stressed that both parties will specially strengthen the cooperation in the development of technical standards, scientific research, technical communication, ship type research and recognition, etc., thus forming a mutual support and mutual beneficial strategic partnership.

According to the cooperation agreement, CCS will give full play to its own advantage in shipbuilding, offshore engineering equipment manufacturing, survey and certification, rules development, fully support and promote Hudong-Zhonghua Shipbuilding Group in accomplishing the development of shipbuilding and offshore engineering equipment manufacturing, support the group in achieving the target of revitalizing the national shipbuilding industry and building a world-class shipbuilding enterprise. During expanding its business areas and development, Hudong-Zhonghua Shipbuilding Group carries out substantive cooperation with CCS, supporting CCS as the national classification society in achieving the scale expansion and growth in the field of its fleet and offshore engineering, in order to play a bigger role in international maritime related field.

"Air Craft" Classed with CCS

By Tan Shenggen Wen Jianghua

Recently, "XIANG ZHOU 1"—a wing-in-ground craft which is researched and designed by China Ship Scientific Research Center affiliated to China Shipbuilding Industry Corporation (hereinafter referred to as the Center) has successfully completed construction and obtained the classification certificate issued by China Classification Society (CCS). This is the first wing-in-ground craft at sea certified by CCS. On April 3rd, 2014, CCTV reported the "XIANG ZHOU 1" wing-in-ground craft successively finished the sea trail including surface navigation, take-off, landing, the ground effect flying, flying without ground effect, climbing over, turning circle etc., and the results show that the ship completely meets the requirement of airworthiness classification, and has successfully completed the test at sea.

The successful research and development of this type of wing-in-ground craft has perfected the technology system of design, construction and survey of wing-in-ground craft, and demonstrates that China has already finished the related work of transferring the scientific achievements of such ship, which will promote the rapid development of the public and civil market.

Wing-in-ground craft is a new kind of high-speed waterborne transportation means between aircraft and ship. CCTV and major domestic media described "XIANG ZHOU 1" as "air craft", which is an appropriate description of its characteristics. It makes the hull completely out of the water surface by using the lift of the wing, which greatly reduces the movement resistance. By making use of the ground effect, the high lifting resistance is obtained to increase the economy of flying at minimum altitude. The cruising speed can reach 120 ~ 600 km/h, which is 2 to 10 times the high speed craft. It is not affected by the wave during cruising, and runs smoothly and comfortably. Wing-in-ground craft has the advantages of safety, economy, high speed, comfort, seaworthiness, concealment, etc.

According to the provisions of International Maritime Organization, for this kind of transportation means, if the normal flying altitude exceeds 150 m it belongs to the category of aircraft and if the altitude is below 150 m it belongs to the category of ship.

Figure 1 CCS issued classification certificate to "XIANG ZHOU 1" wing-in-ground craft
Figure 2 CCS held communication meeting with the Center
Figure 3 CCS internal communication meeting
Figure 4 Open meeting of wing-in-ground craft survey technology standard

In the civil field, the main difference between the two categories is that its airworthiness or seaworthiness is certified by different administrations, i.e. the approval of its commercial operation. In our country, the aircraft needs to be certified by the civil aviation administration, while the ship needs to be approved by a classification society.

China Ship Scientific Research Center as China's national team engaged in R&D of wing-in-ground craft, is the only domestic authority for R&D of wing-in-ground craft which has obtained the ISO9000 certification. The Center has rich research results, and is now vigorously promoting the transfer of scientific research achievements. But in terms of entering commercial market, productization and marketization also has a way to go. And the fact that "XIANG ZHOU 1" wing-in-ground craft is successfully classed with CCS plays a huge role in promoting the transfer of scientific research achievements for the China Ship Scientific Research Center, and has won the Center's high praise. The successful cooperation has reflected the important role and social value CCS has in the important link for wing-in-ground craft stepping into the market.

Firstly, type approved product. China Ship Scientific Research Center has 40 years' history of studying wing-in-ground craft, which has obtained intellectual property rights of independent innovation related to wing-in-ground craft technology, established standardization system of wing-in-ground craft, and formed a complete professional, experienced, strong technical team. The type of wing-in-ground craft is another scientific research result

of the Center, demonstrating that the Center's wing-in-ground craft technology system is more perfect and mature, and has the technology base for transferring results to commercial product. But as a scientific research institute, although it has a wealth of scientific research achievements, there is a lack of awareness and methods to transfer into products. Often a lot of research is made, but it cannot be transferred into products, so that a lot of achievements cannot be put into practice, thereby hindering the further development of scientific research and technology. At the beginning of the project "XIANG ZHOU 1", CCS conducted many technical exchanges with nearly thirty people of the scientific research group of the Center, carried out the discussion and implementation of every requirement in CCS guidelines for wing-in-ground craft and other technical requirements; CCS provided technical support all the way, as well as put forward improvement opinions for the related technical details; And all the technical parameters and technical requirements are defined and the type approval of the model is completed, so that the type of wing-in-ground craft is qualified as a mature product. It is ensured that only qualified products with design meeting the requirements can step into market and the good quality is well under control.

Secondly, the establishment of technical standards. During the design process of "XIANG ZHOU 1", it involved a large technical team, which was divided into a number of technical teams, of which every scientific researcher has conducted a lot of work in their respective areas. The scientific research achievements such as the structure design, performance analysis, model test, data calculation and parameter selection, etc., were scattered in the hands of each technical staff, which did not form an integral part of the normative technical documents and also the design process needs to be based on rules. Through the whole process of review and survey carried out by CCS from drawings to construction, it helped the Center integrate all the technical information and data into a comprehensive standard file, making decentralized modules form a technical system, which is an important part of transferring scientific research achievements. In the process of construction, CCS and the Center communicated and discussed on the problems and difficulties

encountered in the plan approval and construction process, defined all the design and construction standard, making the whole design process of the Center meet the technical standards, and using the rules as the basis.

Thirdly, the establishment of the quality system. For the type approved ships already meeting the design criteria, a complete set of quality system is needed to guarantee from design to qualified products. During the R&D process this type of the wing-in-ground craft, the Center does not take the product manufacturing process, construction process and quality system into account, but it is a necessary link for building ships. For example, the ship hull structure uses new composite materials, and has applied for a patent, but the written technique documents and control standards have not been developed for its production process; the material performance and the bonding process of the composite material have not been tested and approved by a recognized body. CCS conducted the preliminary training for the Center. At the same time, CCS helped the Center establish a whole set of technological documents (covering the whole production process) from shipyard evaluation to construction process control according to CCS rules and procedural requirements, so that clear process control documents and control standards are available to each process of production, including construction process documents, list of certified products, inspection items list, mooring and sea trial programs, etc. As a result, the whole design and construction process of this type of wing-in-ground craft is in order and all construction processes are under the control of quality system.

Fourthly, the technical improvement. Through review of drawings and newbuilding survey, CCS put forward further technical details for improving "XIANG ZHOU 1". In order to strengthen the weak links of the ship and ensure safety and quality of ship and technology comprehensiveness. For example, structure strengthening should be carried out in the high stress area of the joint between hull and the central wing box, reasonable adjustment is made for the bolt connection arrangement and quantity; In order to improve the safety of the ship after damage, the lightening hole for the part of the structure is blocked, and watertight division is improved for structure, so that the ship arrangement is more reasonable and safe. As a novel ship type, it is inevitable that the design process will not be comprehensive. The problems exposed during the classification survey carried out by CCS, further improving and perfecting the technology, so as to form a good circulation of design – practice – redesign, which has promoted the development of the wing-in-ground craft industry.

Fifthly, the perfection of regulations. At present, due to the development of the tourism industry and the establishment of the city, San Sha, the wing-in-ground craft, as a new type of efficient transportation has the market demand. It is reported that it may first be put into passenger and cargo operations between San Sha reefs and mainland, shortening the voyage time from originally several days to one or two hours. In order to adapt to market development, China MSA held topic opening meeting on wing-in-ground craft survey technology standard research in Wuxi on April 2nd, 2013. CCS participated in the development and review work of the Technical Regulations for Statutory Survey of Wing-in-Ground Craft, and put forward some suggestions to perfect the regulations combined with the survey experience of "XIANG ZHOU 1".

Topic research finally formed research report and recommended draft of Technical Regulations for Statutory Survey of Wing-in-Ground Craft which is suitable for medium-range, long-range transport in inland river, lakes, coastal and greater coastal areas. The internal review has been completed for the recommended draft, which will soon be officially promulgated. We believe that with the promulgation and improvement of relevant regulations, it will further promote the development of wing-in-ground craft industry.

The successful completion of "XIANG ZHOU 1" demonstrates the successful cooperation between CCS and the Center, perfects the whole design, construction, survey and supporting system, and makes great contributions to the development of industry. It has the milestone significance to the development of wing-in-ground craft industry, demonstrates that China's wing-in-ground craft undertaking has completed the industrialization of scientific research achievements, taking the first step towards commercialization.

CCS Issued the Domestic First Classification Certificate of EEDI Notation

Recently China Classification Society (CCS) has issued the classification certificate of EEDI energy efficiency design notation to "HUA HAI 601"—an energy-saving bulk carrier of 6600 tons which is built with independent R&D by Jiangsu Hua Hai Shipping Group. This is the first classification certificate of EEDI(3) energy efficiency design notation issued by CCS to sea-going ships engaged on domestic voyages, which marks that the sea-going ships engaged on domestic voyages has reached the world advanced level in the area of energy saving and environmental protection, and also marks that CCS has taken a solid first step in promoting "green revolution" of the domestic shipbuilding industry.

"HUA HAI 601"was constructed and delivered by Hubei HUA HAI Shipbuilding Industry Co., Ltd. The length overall is 99.9 meters, moulded breadth is 16 meters, moulded depth is 8.4 meters, length between perpendiculars is 96 meters, the scantling draft is 6.2 meters, 6375 DWT. Under the condition of the fully-loaded speed of 10.2 knots, the fuel consumption is of 3.2 tons in 24 hours, EEDI efficiency index is 7.309g-CO_2/t*nm.

During the trial test of "HUA HAI 601", CCS and the experts from ship overall performance test center of China State Shipbuilding Corporation carried out the conformance test and calculation to pass through the real ship speed test under full design load conditions according to the rules, verified that the ship meets the applicable requirements of ship design energy efficiency notations of EEDI (3) as given in CCS interim provisions on assigning the energy efficiency notations of sea-going ships engaged on domestic voyages. Recently, CCS has issued an interim classification certificate and assigned the ship highest notation of EEDI (3). Thus, "HUA HAI 601" has become CCS first domestic ship which is assigned the energy efficiency notation.

Ship Noise Measurement and Control

By Wu Gang

The IMO Code of Noise Level on board Ships will take effect for mandatory implementation on July 1st, 2014. In 2013, MSC91 adopted Resolution 338 amending SOLAS with a new article SOLAS II - 1/3- 12 - noise protection (hereinafter referred to as "article 12"). It requires the structure of ships should comply with the Code of Noise Level on Board Ships adopted by Resolution MSC. 337(91) to protect personnel from the harm of noise. At the same time, SOLAS chapter II - 1 / article 36 - noise protection was deleted. Requirements for noise protection which were recommendatory before have become mandatory and are part of ships' structural safety.

Ship noise protection is one of CCS' priority work in 2013. CCS established expert group in the first half of 2013 and launched weeks of research and presentation in regions where the industry is developed such as Dalian, Shanghai, Guangzhou. CCS mastered detailed first-hand data and current situation about noise. The current situation indicates that only few laboratories will comply with the rules, and bodies which have been approved are even fewer. The number of bodies and personnel engaged in noise measurement is relatively small, and the situation is not optimistic. The limited experience the industry has was obtained from taking over high standard ships which incorporated the requirements of the Noise Code adopted by A468(12) or those with class notations, such as CCS COMF (NOISE) N.

To address the above situation, CCS actively formulated related guidelines and invited the industry experts and some customers to take part in the discussion and review. In July 2013, CCS released the Guideline for Noise Test of Marine Products; In September the same year CCS released the Guideline for Test of Ship Noise and Guideline for Ship Noise Control; In October, CCS combined the three guidelines and published the integrated version of Guidelines for Noise Control and Test of Ships and Products, laying the foundation for the smooth implementation of the new noise protection requirements.

In addition, in 2013, CCS technical teams made up of senior surveyors were sent out to attend all kinds of activities including the annual event of CSNAME and shipowner gatherings to explain the new requirements and the corresponding measures, giving full play to CCS' role as the strong technical support; Internally, CCS Shanghai Training Center held trainings for field surveyors on

theory and actual operation, and established field working groups according to division of regions, to ensure that CCS will provide high quality service in the process from early stage technical consultation to design approval and survey of ships.

Noise control is herewith introduced in order to make the industry understand the parts of ship noise control which require participation and active response and to have a preliminary cognition of the new requirements. Ship noise control is systematic, which goes through different stages of the life cycle including the concept design phase; the preliminary design stage; the detailed design stage; the production design stage (as shown by figure 1).

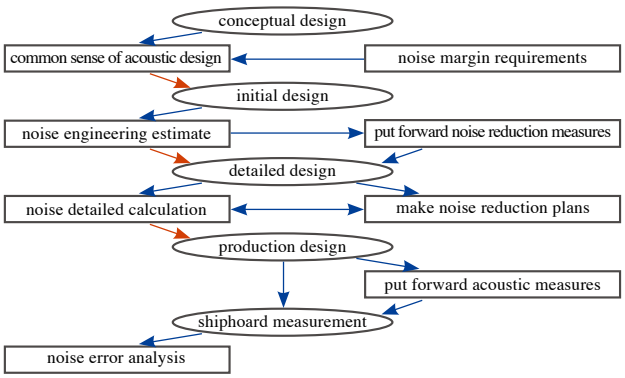


Figure 1 basic flow of ship noise control

Concept design phase, to develop reasonable acoustics design solution taking into account the index requirements for ship acoustics design. To adopt reasonable acoustics arrangement; determine main engine type onboard and propulsion mode. To select as far as possible mechanical equipment with low vibration and low noise and to arrange in groups or in concentration; to make primary distribution of noise index, put forward acoustic requirements for noise source or reducing noise and vibration.

This phase requires consideration of acoustics design and noise index when selecting type of ship and equipment. Ship design industry should especially attach more importance to this. CCS research shows that there are few people in the industry who are specialized in acoustics or have the basic acoustics knowledge. The industry should pay attention to talent training and reserve.

Preliminary design stage, for the schemes determined at the conceptual design stage make the cabin noise estimation based on empirical formula method or numerical calculation: the model of empirical formula and data sources; The method of numerical calculation are including finite element, boundary element and statistical energy analysis, finite element (ANSYS, PATRAN, etc.) and boundary element (SYSNOISE) mainly for low frequency, statistical energy method (Auto SEA 2) aims at the high frequency.

If the estimated results exceed the noise limit, should make noise index distribution again, and formulate the corresponding vibration and noise reduction plan, including equipment reselection, cabin arrangement modification and other vibration noise reduction measures, etc.

Detailed design phase, after completing main technology drawings (including equipment installation, etc.), make detailed calculation to assess the cabin noise level and noise transmission control situation, further refine and improve the noise reduction measures or design, makes the calculation results conform to the requirements of the acoustic design index. Participants mainly are design institute and shipyard technical department.

Production design stage, according to the final design scheme and details to make the cabin noise assessment; If cannot meet the noise control indicators, we should according to the evaluation results to further improve anti-vibration noise reduction measures, and until to meet the requirements. Participants mainly are shipyard technical department and production department, and research institution, measurement institutions, research institutions and CCS surveyors.

For the sake of unifying platforms, CCS has also introduced some commercial noise prediction software, and will launch its own calculation software with independent intellectual property rights when the time is right. CCS has also set up a specialist ship noise database to support the industry development. The basic measures and means of reducing vibration and noise will be introduced in the texts below. The primary question for noise control is to identify

noise sources, secondly to figure out noise transmission route, and finally to formulate corresponding measures to solve the problem.

Figure 2 diagram of ship noise source

The main noise source onboard ship is mechanical vibration noise and aerodynamic noise. The former includes the main and auxiliary equipment, pumps and air conditioners, and the latter mainly are the induction noise, exhaust noise, fan noise, air-conditioning duct noise etc., of the internal combustion engine, gas turbine machine and other locomotive machines.

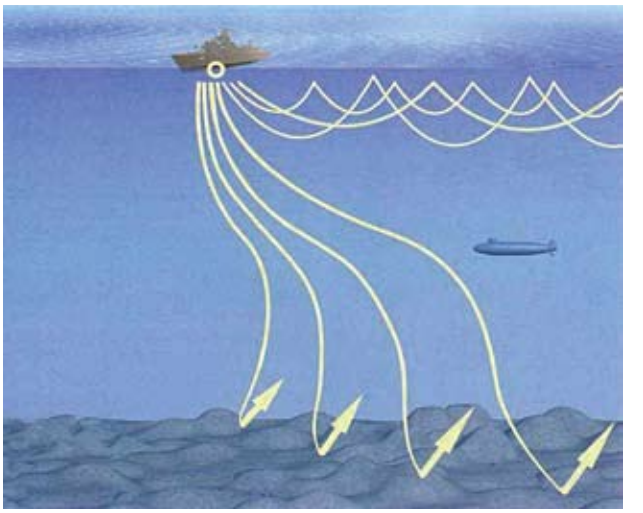
Mechanical vibration noise control, is mainly to control the mechanical vibration, the vibration control is mainly some vibration absorbing material and the system and the vibration isolation material and system, its principle is making the vibration of mechanical energy converts into heat energy and other forms of energy to consume or in accordance with the design requirements, allocate the subsystem or cut off, don't try to make energy transfer to the surrounding structure. For example, the function of damped system is to make the vibration of mechanical energy convert into heat energy, so this kind of system is best for the situation of large amplitude and high frequency, which is high frequency resonance region.

The main means of noise control are sound absorption, sound insulation and noise elimination. Material with greater absorptive capacity is termed as sound-absorbing material. Sound absorption material (or sound absorption structures) can be the lining or be hanged inside the cabin to reduce sound reflection and reduce the cabin noise by means of sound absorption effect of the material. Acoustic design is suitable for the engine room and emergency generator room, air conditioning room, etc.; the absorption quantity is about 3~10dB(A).

Sound-absorbing material is mainly porous material, such as fiber, glass wool, mineral wool, rock wool and so on. Apart from some sound-absorbing material, the resonance absorption body can also have the effect of sound absorption. The commonly used sound absorption structure includes micro perforated panel and slit resonance sound absorption structure.

Sound insulation is a commonly used technical measure for mechanical noise control, to put it simply, it is a control measure that isolates sound source from the receiver. In practice, isolation booth can be used to encircle the area which requires quietness such as engine control room.

As an important link of maritime safety chain, CCS is always taking the lead. CCS can provide early stage consultancy services, ship plan approval, certification of sound insulation material approval laboratory, certification of noise measurement body and noise measurement personnel training and the test of field noise measurement. Together with the industry, CCS will try its best to take positive measures to deal with the challenge brought by the new requirements of ship noise protection. New requirements might not be familiar and full of challenge, however, with the joint efforts of CCS and the industry, it is believed that we can cope with the challenges and achieve a win-win solution.



International Maritime Pro-environmental Legislation Tendency

By Li Lu

Environmental protection and sustainable development are the common themes of human beings in the 21st century. Global warming, energy sustainability, occupational health of human beings and some other issues are becoming more and more important on international political and economic stages. Ship greenhouse gas emission reduction, energy saving and ship re-cycling standards are becoming the focus of the new round of competition of the rights and interests in international standards. This also makes international rules and standards for ships developing towards safety and environmental protection and towards green ship technical standards. Introduction and entering into force of new standards exerts significant influences on shipping industry, which requires detailed study and active response.

Ship Greenhouse Gas Emission Control

With increasing demand for low-carbon transportation from the international community, the International Maritime Organization (IMO), after resolving the problems of SOx and NOx emission and having incorporated related emission control requirements into MARPOL VI, has shifted its priority of environmental protection work to GHG emission reduction. After ten years, energy efficiency requirements for ships were incorporated into MARPOL VI, and took effect on January 1 in 2013. Later on, IMO introduced corresponding guidance, including Guidance for Energy Efficiency Design Index calculation, EEDI test and certification guidance, baseline calculation guidance, Ship Energy Efficiency Management Plan development guidance, to facilitate implementation and verification.

In addition, from the perspective of regional legislation, EU strengthened integrated planning of maritime energy saving and emission reduction, and introduced white paper on transport and low sulfur fuel oil directive. It is currently considering developing ship greenhouse gas emission monitoring, reporting and verification regulation. The United States introduced ballast water law and California shore electricity law. Singapore introduced green ship plan to reduce and exempt taxes for fuel-efficient ships flying Singapore flags. Japan and South Korea, Singapore, Mediterranean, Australia and Hong Kong are also considering setting up emission control areas. In addition, the Ministry of Transportation and the Ministry of Industry and Information of China are developing policies to promote ship emission reduction and certification standards of energy-saving ships in order to promote low-carbon transition of the shipping and shipbuilding.

Though IMO is trying to improve the relevant EEDI technical requirements, due to the complexity of EEDI verification, many problems need further solutions, including EEDI calculation methods for unconventional propulsion modes, such as diesel-electric propulsion system, turbine propulsion system, gas fuel propulsion system and dual fuel propulsion system. EEDI applicable requirements for large oil tankers and bulk carriers as well as assurance of propulsion power for ship operational safety under bad sea conditions also need to be settled. However, the green tendency is irreversible. The mandatory EEDI improves design standards and levels of new ships. Shipbuilding costs will also increase due to technical requirements associated with high added values. This is a serious challenge for Chinese shipping industry.

For new ships, development and application of new energy-saving technology should be accelerated. The development of energy-saving environmental-friendly ships should and the development and research in green ship technology should be the core and support in promoting the level and capability of design of energy-saving ships in order to produce elite high energy efficient ships and compete for market shares. At present, objective of new ship design in the world is set to reach Phase 2 and even Phase 3. To achieve this, main technical means are ship type optimization and upgrading, including ship power system and electric system optimization, ship drag reduction (hull form optimization design), ship lightweight design, energy saving equipment optimization and auxiliary equipment optimization design.

For ships in operation, new management measures should be introduced or the existing ships should be renovated (such as ship trimming optimization measures). Operation energy consumption should be reduced for ships and fleet (e.g. to adopt optimal trim), to prepare for the ship emission reduction market mechanism to be introduced by IMO in the future.

The International Convention for the Safe and Environmentally Sound Recycling of Ships

Convention for Recycling of Ships (Hong Kong Convention) sets out regulations on ships from design and construction, operation to dismantling, the three phases covering a ship's lifetime to ensure that harm is reduced to the minimum at the time of dismantlement. As of December of 2013, France, The Netherlands, Italy, Turkey, Saint Kitts and Nevis have signed the convention, EU and some other countries are in preparation. Hong Kong convention comes as a shock to industry supply chain. It is also hard to make IHM of new building ships and ships in operation. According to convention requirements, new building ship should make an IHM and keep it aboard the ship. The existing ship owners should also submit IHM within a certain time limit. IHM needs to be updated all the time during ship operation.

As for products, with further recognition about possible harmful materials by international community, some materials may be limited. If existing products contain the forbidden materials, substitutes are badly needed, if not the products may be forced out of the market.

For these potential legal and economic risks, ship building industries should strengthen management and control of supply chain, against the risks (such as claim and ship abandonment) caused by shipped products that are forbidden. China classification society has introduced the software of Green-Chain and IHM authentication service. IHM making and verifying guideline has also been compiled, which may assist the industry to solve problems during convention implementation.

The International Convention for the Control and Management of Ships Ballast Water and Sediments

IMO passed The International Convention for the Control and Management of Ships Ballast Water and Sediments in 2004. In addition, 14 corresponding guide rules (G1-G14) have also been introduced for ease of better convention implementation. The convention will go into effect after 12 months that 30 countries agreed this convention and joined in, the involved shipping tonnage should also be more than 35% of global commercial tonnage. By 2013, 38 counties agreed the convention, nearly covers 30.38% of the global commercial tonnage. The convention does not come into effect by far.

For IMO Ballast Water Management Convention, requirement (D1 standard) for replacing ballast water is only a kind of transitional management measures. Discharged water processed by ballast water treatment device aboard the ship should finally meet D2 standard, this is the ultimate objective. Ballast water treatment devices will be required aboard new building ships and the existing ships to meet D2 discharge standard. The 28th IMO meeting was held at the end of 2013, A.1088(28) resolution "2004 ballast water management convention" was passed, that gives guidance for D2 standard implementation, for the ships which were built at different times, with different tonnages.

More than 60 ballast water treatment devices have been developed on a global scale. By May of 2013, 45 of that got the green light; 31 of that had IMO final approval (3 devices are made in China); 33 of that got BWMS type approval. To date, 9 ballast water treatment devices made in China got type approval.

BWMS will be the key point of new building ships and the existing ships. On one hand, BWMS is directly or indirectly related to operation features of ships, processing requirements of ballast water, space of the cabin which is used for installing treatment equipments, total capacity of ballast tank, displacement of ballast pump, power supply, coordination with other equipments and operational requirements. On the other hand, ballast water system is a new developing product. Some ballast water systems are already in use now, however the industry is still inexperienced. Each system has its own characteristics, water electrolysis is not available for fresh ballast water, ultraviolet radiation system is not good for ballast water with great turbidity. Some treatment systems are too big, some of that are of high energy consumption. Filtering method, separation method and ultraviolet radiation method are used when the ships are loading or unloading, on the contrary, chemical method and deoxidation method are used when the ballast water concentration reaches a critical level. Pump flow rate makes nearly no difference on these systems. The pump flow rate is used for controlling ballast water storage time in water tank and the killing rate. This method is not available for short distance ships.

Based on the above reasons, there is not one treatment equipment that can be applicable to all ships. In order to play to the full advantages of all sorts of ballast water systems and avoid disadvantages, many ballast water systems are based on combination of two or more kinds of technology. In fact, selection of ballast water management systems is the result of evaluation of all kinds of factors. Generally, specific features, water characteristics of the shipping route (water quality required for normal system running conditions, such as turbidity, salinity and concentration of organic matter), ballast water treatment system characteristics and arrangement (such as power equipment capacity, installation space of ballast water treatment equipment, pipeline layout) as well as maintenance requirements should be considered comprehensively. At the same time, CCS introduced Recommendation for Implementation of Ballast Water Convention 2013, assisting the industry to select suitable BWNS.

CCS Contributes to IACS' Research on Marine Crack Arrest Steel

By Xu Bowen

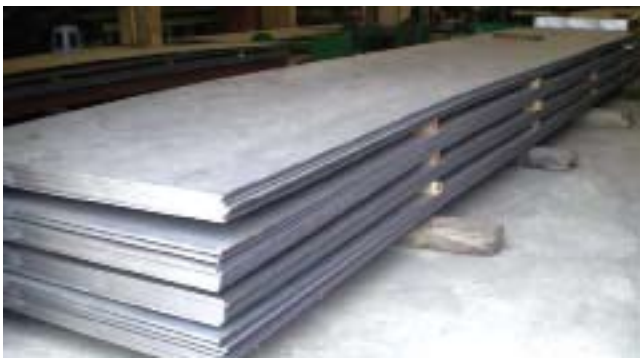
In recent years, large-scale container ships are becoming the tendency. Super large-scale container ships of more than ten thousand TEUs are already in the stage of construction and operation, and the wide use of high intensity steel super thick plate will come as a result. Super thick plate generally refers to the steel spate thicker than 50mm. As such steel plates would have obvious plane strain condition, in addition to the high stress force of high intensity steel, it is possible that low stress brittle fracture would occur. In order to ensure safe application of high intensity steel ultra thick plate on ships, IACS established the UR S33 and UR W31.

The above two URs constitute two preventive means for safe application of ultra thick plate of high intensity steel: one is brittle crack initiation and the other is the crack arrest after the initiation.

Due to fatigue loading, the size of ship structure crack will not remain the same, but will gradually expand along with service. Therefore, nondestructive testing can not be carried only at the construction stage, but should cover the whole life time of ship. However, the nondestructive testing similar to TOFD has higher requirements to surface quality of structure, whether in construction phase or in operation phase, the nondestructive testing would face many difficulties. Therefore, IACS gives the corresponding alternative measures, which is a treatment to butt welded seam.

It is the basis to classify the steel toughness in the standards, the steel curve form with different toughness level is roughly similar, and only transition temperature is different. Therefore, reasonable evaluation to crack arrest of steel can ensure its effective arrest under the service temperature.

At present, the evaluation methods to steel anti crack performance regulated by IACS has two, i.e. the crack arrest toughness (Kca) and crack arrest temperature (CAT). China



Classification Society (CCS) discovered after research that, the test results according to the standards above will be affected by temperature field test parameters, and can't get stable test results. For this purpose, CCS developed related research, and provided CAT evaluation method with more stability according to research results, and finally obtained acceptance of IACS and used it into UR.

After research, CCS has basically obtained the relation between crack arrest temperature and the nil-ductility transition temperature, and brought the measure on nil-ductility transition temperature into CCS inspection requirement on crack steel.

As a new thing, crack steel has been accepted by IACS and the marine material world. Some frontline steel mills in China including Anshan Iron and Steel Company, Baosteel, and Shagang steel group etc. quickly follow and carry out research and production work. Among which, Baosteel has completed approval work. In this field, CCS intervened and carried out research early and completed research on cracking test and technical introduction to domestic mills before IACS launched related subjects. At related PT meetings, technical proposals provided by CCS won unanimous support of the participating members and were incorporated into UR, this is another successful case of CCS taking part intensively in IACS R & S work.

Key Points of LNG Ship-to-ship Bunkering Operation

CCS Wuhan Rules and Research Institute

With energy restructuring and energy-saving and emission reduction strategy in China, and the implementation of IMO Teri III emission standard in 2016, LNG as clean energy will surely be widely used for waterborne transportation. In China, with the coming into force of CCS Rules for LNG Ships and Provisional Regulations for Statutory Survey of Inland Waterway LNG Ships, the number of LNG ships may experience a substantial growth, and the problem of LNG bunkering that will follow will become significant. Among all sorts of bunkering methods, LNG ship-to-ship bunkering method will become the main method due to its high efficiency, flexibility and wide range of application.

As the main force of marine LNG fuel research, CCS has conducted research on LNG ship-to-ship bunkering operation and other key technologies.

CCS has been involved in LNG ship application security research set up by China MSA and National Energy Administration, Inland river LNG transport ship risk assessment and preventive measures proposed by Ministry of Transportation and LNG fueling ship research leaded by Ministry of Industry and Information. CCS also took part in compiling works of Design specification of LNG fueling wharf and Design specification of LNG fueling wharf (government standard). At the same time, CCS provided services of LNG fueling ship plan making, hazard identification and risk control for ENN ENERGY "Zhoushan LNG international fueling station project", "Luoma hu LNG fueling station project". In addition, CCS compiled maritime LNG ship-to-ship fueling operation handbook for CNOOC.

Involved in projects above, CCS conducted a lot of researches, researches related to LNG fueling mainly includes LNG essential attributes and risk research, LNG fueling mode research, LNG fueling process flow and operation research, LNG accident analysis and consequence research, fueling ship layout and facility research, LNG storage tank key technical research, LNG fueling equipment technical research, storage tank impoundment structure and catch tray performance research, LNG ship-to-ship fueling risk assessment and analysis, anti-thunder, anti-static and stray current research. etc.

During the project of ENN ENEGY "Zhoushan LNG international fueling station project", "Luoma hu LNG fueling ship project", and compiling maritime LNG ship-to-ship fueling operation handbook for CNOOC, CCS performed risk assessment for five stages of ship-to-ship fueling (planning before arriving, arriving, berthing, LNG fueling and un-berthing) with formal safety assessment method (FSA). 93 potential risks were uncovered, such as communication failure, berthing failure, collision, mooring hawser breakage, anchor dragging, fueling tube breakage,

decompression valve failure, operating system pipe fracture, cryogenic liquid spill, over-fueling, instrument failure, static electricity, stray current, short safe distance. CCS used risk matrix to assess the risks.

Figure 1 Different stages of ship-to-ship LNG fueling

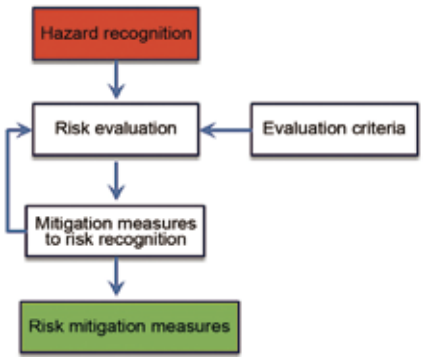


Figure 2 Risk identification of ship-to-ship LNG bunkering

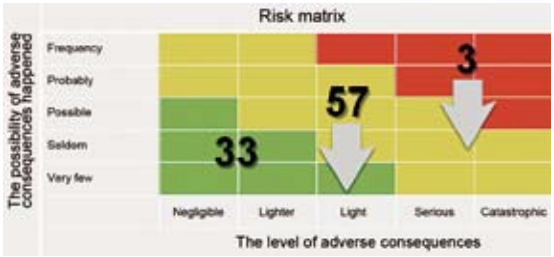


Figure 3 Risk matrix of ship-to-ship LNG bunkering

After risk identification, CCS conducted safety assessment analysis on developing risk control measures, ship-to-ship LNG fueling safety measures were proposed, which are divided into two parts. One part is relative to technical requirements of LNG fueling ships. The other part is about specific fueling operation.

Based on research results of LNG ship-to-ship fueling risk analysis and preventive measures, CCS summarized operational essentials of five stages during LNG fueling.

Before arriving, fueling work should be approved by competent departments, mainly including fueling area and fueling time. Secondly, ship compatibility should also be considered, including main dimensions of supplying ship and receiving ship, prospective maximum and minimum heights between fueling joint and horizontal plane, freeboard difference, freeboards of two ships, sizes and number of fueling joints, berth and fender. In addition, equipments related to LNG fueling operation should be checked out, including LNG storage tank temperature, pressure and liquid level, fueling tube, ESD cutting off. All the ships involved in fueling operation should have emergency response plan and risk management measures.

Another key point is safety distance. There is a certain safety distance for each fueling ship. When a ship is under LNG fueling operation condition, other ships are not allowed to berth in this safety distance. Before arriving fueling area, person in charge should fully understand this safety distance.

Arriving stage, the two ships should get ready for moving and exchange relevant information. Signal required in international regulations for preventing collisions should also be ensured.

All crew on both ship involved in fueling operation should fully understand relative procedures and risks, especially about berthing and un-berthing; The ships should conform with relevant regulations, zero-trim and suitable trim; All the LNG equipments and safety facilities should be tested; The steering gear, navigation and communication equipments should be in good working conditions; Engine control equipments and main propulsion systems should be tested; berthing equipments should be ready according to berthing plan; Fender and fueling tube should be correctly placed, connected and fixed according to fueling program; Fueling tube and relevant operating equipments should be ready.

At the same time, the two ships should exchange information with each other, mainly including berthing equipment conditions at berthing side, quantity and component of LNG which is ready for fueling, sequence of the storage tanks; LNG fueling system, quantity of the pumps, detail of the maximum allowed pressure, fueling rate (at the beginning, the maximum and at the end), the

time the supplying ship would take to change the fueling rate, at the beginning, at the end and late near the end, normal shut down procedure and emergent shut down procedure. etc.

Berthing, better in daytime, unless related personnel have special experiences of ship-to-ship maneuver at night. Generally, bigger ships moor first, then the smaller ships.

If the ship moors in wharf, captain and crew should fully understand handling quality of their own ship, especially in complex approach channels, in which handling quality of the ship is limited, the captain should take good control of speed and course of the ship. Channel, depth, buoy, turning basin, anchor dropping area, obstruction of the harbor, direction, angle, structure, length, depth of the harbor, size of berth, width of the water should be fully familiar with. In addition, the influence of the wind on ship entering and leaving the port should be taken into account. Effect of the wind on ship rotation should be considered, combing with loading conditions and wind area. If necessary, tugboat may assist the ship to berth.

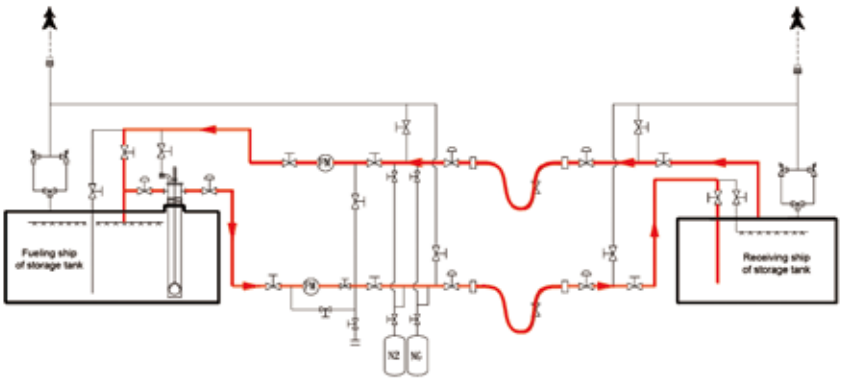


Figure 4 LNG bunkering operation diagram

LNG fueling operation, this is an extremely complex and risky link, mainly including verifying receiving task plan, tube connection, tube drying, degassing, ESD test, opening fueling valve, ready signal of both tow ships, opening LNG pump, transmission, sequence of stopping the LNG pumps, residual liquid sweeping and tube disconnecting. LNG fueling operation is as shown in Figure 4. Matters need to be noticed in each step. For example, when the tubes of two ships are connecting, each manifold should be earthed. Receiving ship should be equipped with insulating flange against fire caused by accumulated static charge. Tubes with joints are not allowed to touch any part that is not earthed before connecting to avoid possible electric spark.

Some safety problems should be noted, such as smoking, open fire and personal communication tools, grounded switch panel, boiler, diesel, electric current from one ship to another ship, radio, satellite communication, radar, gas accumulation, thunderstorm, kitchen wares, fire-fighting equipments, entrance to living quarter, unlicensed raft. etc.

Un-berthing, generally it is suggest that only staff with LNG ship-to-ship operational experience can do this. If necessary, tug boat may assist to complete this step, especially when the anchor boat is going to deflect. During un-berthing step, unpredictable environmental conditions and predictable difficulties should be noted, such as tide. Un-berthing is usually not advised to do during tidal variation.

Based on existing research results and ability of CCS, services related to LNG ship-to-ship bunkering operation can be divided into three parts: government authorities, ship owners and CCS itself. All these services will achieve reasonable design of LNG bunkering operation process and safe operation, as well as risk management of operational safety.

For government authorities, CCS can provide regulation compiling service related to LNG ship-to-ship bunkering operation (including Chinese and foreign government authorities). In addition, CCS can provide bunkering area (anchorage area and wharf) risk assessment for government authorities.

For ship owners and the industry, CCS can provide LNG bunkering program optimization and risk assessment (supplying ship), zero-emission bunkering solution (supplying ship, shore station); risk assessment of LNG transshipping (including transshipping water verification, influence area of transshipping operation and preventive measures).