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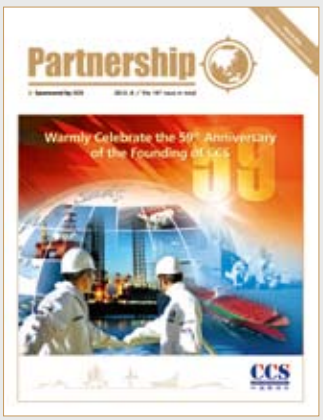

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CCS
CHINA CLASSIFICATION SOCIETY
中国船级社

Content

CCS President Sun Elected as Vice Chairman of the IACS Council

On 30th June 30 to 2nd July 2015, the 71st meeting of the International Association of Classification Society (IACS) was held in Paris. The meeting was chaired by Philippe Donche-Gay, IACS rotating chairman and executive vice president of ship and marine engineering business management dep. of Bureau Veritas (BV). In-depth discussion was carried out on some focus issues such as IACS common structure rules, container security, ship complex system reliability requirements and LNG filling guidance, and corresponding decisions were made.

During the meeting, general election for chairman of IACS was carried out. Christopher j. Wiernicki, president and chief executive officer of American bureau of shipping (ABS) was elected as the new chairman of the IACS council, Sun Licheng, president of China Classification Society (CCS) was elected as vice chairman, and Li Zhiyuan, vice director of technology management department of CCS was elected as deputy director of General Policy Group (GPG). In addition, Robert Ashdown was formally appointed by IACS council as the new secretary-general, replacing retiring permanent secretary, Derek Hodgson.

CCS Mediterranean Council 2015 Annual Meeting Held in Greece

On 7th July 2015, China Classification Society (CCS) Mediterranean Council 2015 annual meeting was held in Athens, Greece. During the meeting, Mr. Simos P. Palios was elected as the new chairman and other three vice chairmen were elected, honorary president was appointed and Mediterranean committee members were reemployed. The committee for the first time had Cyprus shipowner as a commissioner, and set up a technical advisory committee under the committee, chaired by Mr. Papageorgiou.

Sun Licheng, president of CCS said Mediterranean committee has played a very important role in promoting CCS business development in Greece. Especially in recent years, the influence of the committee has been gradually increased, and a growing number of Greece and Cyprus first-class shipowners had new VLCCs, Capsize bulk carriers and other large vessels classed with CCS. CCS as an important bridge of maritime cooperation between China and Greece, and China and Cyprus, will play a unique link role in promoting “maritime silk road of the 21st century”, greatly enhancing the cooperation between Greece, Cyprus shipping industry and China’s shipbuilding industry, shipping industry and ship financing institutions.

CCS Council 2015 Annual Meeting Held in Beijing

On 17th July 17, the Year 2015 annual meeting of China Classification Society (CCS) council was held in the headquarters of CCS. The meeting was chaired by Mr. Sun Licheng, president of CCS, and more than 20 directors and representatives from governmental authorities, shipping, shipbuilding, offshore engineer, finance, insurance and other related industries attended the meeting. Mr. Wang Changshun, the vice minister of the Ministry of Transport also attended the meeting and delivered an important speech.

Mr. Sun Licheng reported to the council about the current development status, future development trend, development strategy and target of CCS, and put forward proposal on the subsequent work of the council. Attending representatives carried out discussions and put forward some valuable suggestions and comments on current international and domestic situations, hot and difficult issues of the industry, and on the acceleration of the construction of international first-class classification society and the promotion of the development of related industries.

The Vice Minister Wang Changshun fully appreciated CCS work throughout this year and requested CCS to seize the opportunities brought about by the strategy of construction of China into a maritime power, further play an important role in safeguarding the building of China into a maritime power, provide service for implementation of this strategy, play a greater role

in the development of modern shipping service industry, play a fundamental role in building a low-carbon transportation system and make positive contribution to the development of transportation security.

Mr. Sun said that CCS will earnestly implement the important instructions of the vice minister and the suggestions and comments of the council members, strengthen the close cooperation with members of the council, provide better service for development of shipping, shipbuilding and associated industries and follow the implementation of the national strategy.

The World's First Marine Dual Fuel Low Speed Machine Passed CCS Tests

Recently, the FAT test and NOx emission test of the world's first 5RT - flex50DF marine dual fuel low speed engine, researched and developed by Yuchai Marine Power Co., Ltd. (YMPC), was conducted in Zhuhai. This 5RT - flex50DF engine, with a rated power of 6,000KW and classed with CCS, will be mounted in the 14,000 m^3 LNG carrier built by Zhejiang Huaxiang Shipping Co., Ltd..

The tests showed that all the performance indicators of the engine met the relevant requirements of CCS Rules for Classification of Sea-going Steel Ships and Rules for Natural Gas Fuel Ships, and, in gas mode, the engine can meet NOx emissions of IMO Tier III standard without any post-processing equipment. It has been learned that as a new generation of two-stroke low pressure common rail dual fuel engine developed by WinGD (a joint venture of Wartsila Corporation and CSSC), this 5 RT - flex50DF engine has two operation modes, i.e. fuel oil and gas mode and can realize smooth switching between the two modes. This engine adopts low pressure injection system in gas mode (with gas injection pressure below 1.0 MPa), which can run steadily at full load range.

CCS Boosting the "Going-Out" of China's Shipbuilding Industry

China - Indonesia shipbuilding business forum was held on 8th July 2015 in Hangzhou of Zhejiang province, and on 10th July in Fuzhou of Fujian province respectively. The forum aims to help China shipbuilding enterprises invest in Indonesia, promote the development of Indonesia marine business and related manufacturing industries, and promote more comprehensive understanding and evaluation of Indonesia investment environment, industrial policy, laws and regulations, approval process and investment prospects, so as to bring an opportunity of face-to-face communication for China's shipbuilding enterprises seeking development in Indonesia.

Zhu Kai, the vice president and general engineer of China Classification Society (CCS), introduced to the participants on CCS development history and its globalized business. He also described the general situation of the shipbuilding industry in Zhejiang and Fujian areas. He stressed that CCS has always attached great importance to business development in Indonesia, and have maintained good cooperation with Indonesia shipping companies and BKI for many years. Recently, CCS has set up offices in Jakarta, which will provide support in more areas to the smooth development of shipping and related manufacturing industry in Indonesia, and will continue to provide good service for China's shipbuilding industry enterprises investing in Indonesia. Indonesia is the world's largest archipelago with substantial demands in shipbuilding, shipping, marine resources development, inter-island transportation and clean energy applications. He suggested that China shipbuilding enterprises may, through this forum, make more in-depth exchanges with Indonesian investment coordinating committee, carry out research on the demand of Indonesian market, explore a variety of investment and cooperation modes, look for business opportunities, achieve mutual benefit and win-win achievement by complementing each other's advantages, and seek a better development in the context of the strategy of "21st century marine silk road".

Mr. Zhu pointed out that under the background of in-depth integration of current new energy technology, green technology, Internet technology and intelligent into conventional industries, shipbuilding industry is developing toward a trend of intelligent design, intelligent products, fine management and information integration. CCS keeps pace with the development of our time and the demand of the market, continuously launches green, intelligent and innovative service products to the industry. Now, CCS is working on the establishment of the Technical Regulations for the Safety and Environmental Protection of Sea-going Ships Engaged on Non-international Voyages, which will promote in-depth cooperation between China and other countries in the field of shipbuilding industry and in the domestic ship technical standards. CCS will also study on the demand on shipbuilding and supporting products from Indonesian strategy of development of "sea highway", and will provide support and assistance for the enterprises of both countries in technology standard research, new ship type development, application of new technology for energy conservation and emissions reduction, and the improvement of shipyard capacity.

CCS Mumbai Office Officially Opened

On 22nd July 2015, the opening ceremony of Mumbai office under China Classification Society (CCS) was held. A total number of more than 60 guests, including the Chinese consulate in India, Indian Maritime Safety Administration, shipping companies, All India Industry Association, manufacturers, testing agencies and subordinated enterprises of COSCO, China Shipping, China Petrochemical Corporation and banks in India, etc., was invited to attend the opening ceremony.

Tian Xiaoping, director of CCS Southeast Asia regional center expressed, on behalf of CCS, his sincere gratitude for the support, help and attention from the Chinese consulates and all sectors of the community. He said that China

and India are both important engines of the world economic development, and the exchange and cooperation between the two countries in economy, culture and various fields are deepening, bilateral trade grows rapidly, India's shipping and shipbuilding industry has also witnessed momentum of rapid development, therefore, it's time for CCS to set up a branch in Mumbai.

He pointed out that as a specialized service agency, CCS has rich experience and expertise in the maritime sector, and its global service ability and quality are receiving increasing attention and good reputation. The set-up of Mumbai office will help to better serve the shipping industry, facilitate the business development in South Asia, and at the same time actively support the implementation of the "one belt and one road" strategy of economic development in China and provide convenient technical support for China's "going-out" enterprises. He stressed that CCS Mumbai office will strictly abide by India laws and rules and practice in accordance with the law.

At the same time, CCS will be adhering to the objective of "safety, environmental protection and create value for customers and society", and provide, together with the local industry circle, the most professional and reliable service to the government, society and new and old customers and help customers enhance their brand and create more value.

CCS Held Customer Training on LNG Fuel Ship Rules and Regulations

On 25th June 2015, customer training on LNG fuel ship rules and regulations was held by CCS. Lectures were made on current situation and trend of development of LNG fuel ship, key contents of the Rules and Regulations on LNG fuel ship (including IGF Code), essential equipment and technology of LNG fuel ship (gas supply units), and essential equipment and technology of LNG fuel ship (gas usage units), etc.

CCS Technology Center Made Technical Exchange with Xiamen Shipbuilding Industry

On 30th June 2015, China Classification Society (CCS) technology center expert group carried out technical exchange with Xiamen Shipbuilding Industry Co., Ltd. Both sides attached great importance to this exchange, and had fully communicated in advance and planed the subjects for exchange.

Experts from CCS technology center introduced EEDI requirements, passenger ship fire-fighting and safe return to port requirements, maintenance ship requirements and maritime labor convention 2006 etc., based on their own plan approval experience and by means of theoretical explanations combined with practical case analysis. In the Q&A of 2100PCTC plan approval, the expert team answered a series of technical questions from the shipyard technical personnel including that on ballast water replacement, fore and aft stairway door in cargo hold area, cargo hold CC notation, free port, A30 insulation of vehicle deck and emissions to atmosphere, etc.

CCSC Issued Energy Management System Certificate to Port of Tianjin

On 16th June 2015, the opening ceremony of Tianjin "green port" construction and the energy management system awarding was held in Tianjin. Mr. Huang Shiyuan, the general manager of China Classification Society Quality Certification Company (CCSC) issued energy management system certificate to Tianjin Port (Group) Co., Ltd., and at the same time issued certificates to its 17 sub-companies. This is the first certificate issued by CCSC in the area of energy management system certification of public agencies and service sectors, marking the extension of CCSC energy management system certification business in new areas.

308,000 DWT Oil Tanker "YUAN YUE HU"

The 308,000 DWT oil tanker M/V "YUAN YUE HU" is a new generation of energy efficient and environmentally friendly VLCC built by Dalian Shipbuilding Industry Group Co., Ltd. (DSIC) for Dalian Ocean Shipping Company.

The ship is at total length of 333 meters, molded depth of 30 meters, molded breadth of 60 meters, scantling draft of 21.8 m, gross ton of 162,542 tons and main engine power of 26,000 KW, in compliance with CSR rules. Plan approval and construction survey of the ship was carried out by CCS. The ship is classed with CSA, for non-restricted service.

As a new generation of retrofit VLCC, the ship has the following features:

1. The pod is designed with sediment prevention technique. A concept of "small tanks looped in large tanks" was introduced. When the ship departs with ballast from a port with many sediment resources, the ballast water is first pumped into the sedimentation tank, so as to facilitate the sediment to deposit. After the sedimentation tank is full, relatively clear sea water will overflows from the tank top overflow hole to the big ballast tank formed by connecting the double bottom with the ship sides;

2. The ship applied for CM notation for the first time. Monitoring of essential hull structure areas has been strengthened, and for the first time the bending plate technology has been adopted in VLCC key nodes;

3. This is the first VLCC series of DSIC applying for issuing international energy efficiency certificate. Speed measurement was witnessed during sea trials. Propeller energy efficient roller and rudder bulb combination equipment was used for the first time;

4. This is the first VLCC series of DSIC applying for the issuance of document of compliance for harmful material, and the software related to the inventory of harmful material developed by CCS has been used in the process of construction;

5. This is a first VLCC project whose plan approval was carried out independently by CCS and the first VLCC project for CCS in the real sense.

50,000 DWT Bulk Carrier " HENG RONG AN HAI"

On 28th May, "HENG RONG AN HAI", a bulk carrier of 51,000 DWT built by Jiangsu Nanyang Shipbuilding Co., Ltd. for Ningbo Heng Rong Century Shipping Co., Ltd. was successfully named and delivered. This ship is the lead ship of a series of 51,000 DWT bulk carriers, and is also the largest deadweight tonnage ever built by Jiangsu Nanyang Shipbuilding Co., Ltd.. It has been learnt that the ship was 199.99 meters long, 32.26 meters wide, with a design draft of 10.8 meters, sub-built by Zhejiang Zhenghe Shipbuilding Co., Ltd. and surveyed by CCS Jiangsu branch.

Purely LNG Powered Tug " HAI YANG SHI YOU 525 "

On 3rd July, a ceremony for completion of construction and delivery of Asian first LNG single fuel powered azimuth work ship "HAI YANG SHI YOU 525" was held in Zhenjiang shipyard. The ship is China's first LNG single fuel azimuth work ship for marine environment, the first LNG single fuel powered sea-going ship designed and constructed in strict compliance with the CCS Rules for Ships Powered by Liquefied Natural Gas, and is also the first ship handled according to the pilot program in the Document Hai Chuan Jian [2014] No. 671. The installation of pure LNG marine propulsion engine, by achieving 100% fuel replacement, shows China's first step of gas replacing oil practice in marine fuel usage, and thus the ship is the real clean ship with superior performance, low carbon, environment friendly and zero emissions.

It has been learned that the ship is 44 meter in total length, provided with two LNG tanks, each of 30m^3 C type. The propulsion system consists of two Rolls Royce Bergen C 26:33L 9PG engines and with two highly reliable Rolls Royce US 205 CP azimuth Thrusters, which can ensure that the tug has fast operating performance and powerful mooring force.

Ro-Ro Vehicle Carrier "MIN WEN"

"MIN WEN" is a ro-ro vehicle carrier on Yangtze River invested and built by Minsheng Shipping Co., Ltd. and its in-construction survey was conducted by CCS. The ship is 110 meters in length, its molded width is 17.8, molded depth is 4.8 meters, draft is 3.12 meters, and sails between Chongqing and Shanghai.

The ship's designed vehicle-carrying capacity is 922 cars. Improvement has been made on the original ship type in terms of the hull structure and ship type design. Due to the limitations of the Yangtze river waterway and in order to effectively broaden the width of the deck and increase the loading capacity while effectively controlling the main scantling and ship height, the upper deck was selected as the strength deck and a 500mm-wide sponson deck was provided on the main deck, so that the width of each vehicle deck was increased by one meter for loading, thus vehicle carrying capacity was greatly increased without sharp increase of ship main scantling and ship height while the stability of the ship can be maintained.

A New Member of Liquefied Gas Containment System: LNT A - BOX ® Tank System

By Fu Xihua

As the high quality clean energy which is secure and suitable for long distance transportation and can be directly used, liquefied natural gas (LNG) is getting more and more attention on its characteristics of being economic and environment-friendly. With rapid development of Chinese economy, energy shortage and environmental problems are increasingly prominent. LNG, as clean energy, is expected to make an important contribution to energy supply security in China, optimization of energy structure and the realization of sustainable economic and social development.

In recent years, LNG import has grown very fast in China, according to customs statistics, China's LNG import volume from 2008 to 2013 are respectively 3.34 million tons, 5.52 million tons, 9.36 million tons, 12.21 million tons, 14.69 million tons and 18.02 million tons, with an average annual growth of 40.1% (figure 1); LNG import volume is close to half of China's gas imports. BP world energy statistics yearbook 2014 shows that China's LNG import growth in 2013 is as high as 23%, much higher than the growth of 0.34% of the world's LNG trade.

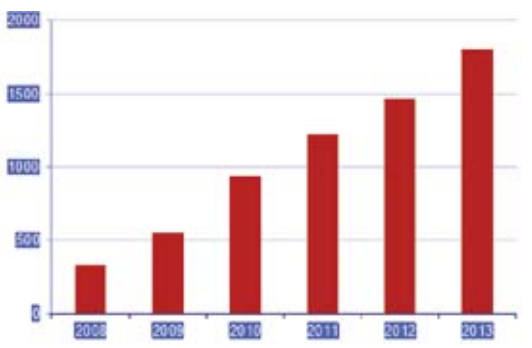


Figure 1: China's LNG import volume (ten thousand tons)

LNG carrier, as the "offshore gas pipeline" connecting supply and demand, is a major equipment to guarantee smooth implementation of China's energy strategy and ensure the safety of energy strategy. In addition to Hudong Zhonghua Shipbuilding which has successfully built and delivered LNG carrier, other Chinese shipyards, such as Dalian Shipbuilding Industry, Jiangnan Shipbuilding, Cosco Kawasaki and Rongsheng Heavy Industries are also making headway into the LNG shipbuilding market to increase the LNG ship project development and investment.

During the past two decades, especially in recent years, in the related fields of liquefied gas, CCS has completed research, plan approval, inspection and type approval of work of membrane tank type LNG carrier and independent cargo tank ship of type A, type B, type C, and has accumulated rich experience in liquefied gas field service. In the field of independent tank of type A, CCS completed inspection and verification of type A tank of one 80,000m^3 LPG carrier, and carried out research and development study of type A application in LNG field together with other related technology and research units.

On April 3, 2015, CCS signed a comprehensive cooperation agreement with LANKMARK CAPITAL on jointly developing LNT A - BOX® tank system application in China, to further broaden CCS service means in type A independent tank used for LNG transportation, storage and of LNG fuel tank, etc.

1. Technical background

On the basis of the IGC rules, containment system of liquefied gas can be divided into film type cargo tank (e.g., GTT NO 96, MARK III), independent type of cargo tank.

Film cargo tank is not self-support cargo tank, it is formed by a layer of thin film which is supported by insulation blanket adjacent with the hull structure, mainly used for large LNG carrier. Its characteristics include high cargo tank capacity utilization, but has a high requirement on the construction process.

Independent cargo tank refers to self-support cargo tank, it does not constitute a part of the hull structure, and the hull strength is not required. Of which, the liquid tank types are divided into type A, type B and type C.

Type A is mainly used for large LPG carrier. Its characteristics are that most of the cargo is made of the plane and is conducive to building construction.

Type B independent cargo tank refers to a liquid cargo tank designed by adopting model test, accurate analysis approach and analysis method to determine the stress level, the fatigue life and crack propagation characteristic, such as IHI SPB. Its characteristic are that most of the cargo is made by plane and is conducive to building construction.

C type independent cargo tank (also called pressure vessel) refers to conforming to the pressure vessel standards, mainly used for small liquefied gas carrier. Its characteristic is that it is convenient for construction, but the cargo tank weight is heavier, capacity utilization rate is not high.

2. Application of independent cargo tank of type A

Independent cargo tank of type A can be used for transportation and storage of liquefied petroleum gas (LPG) and liquefied natural gas (LNG), at present mainly used in the field of very large LPG carrier (VLGC) and small and medium-sized LNG carriers, such as 80,000m^3 square large LPG carrier (VLGC) of independent cargo tank of type A (figure 2), and 40,000m^3 LNG carrier developed based on the LNT A - BOX® liquid filling system, which is the first to use independent cargo tank in the field of LNG carrier in the world.

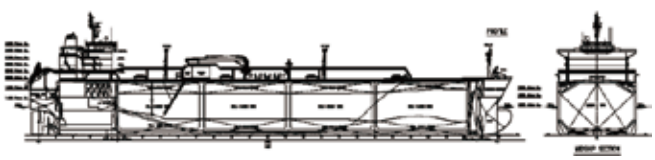


Figure 2: 80,000 m^3 VLGC layout drawing

Figure3: 40,000m^3 LNG carrier

In recent years, with the increasing requirement of the ship energy conservation and emissions reduction, as a kind of clean energy, LNG has been widely used as an alternative fuel of ship propulsion. The application of LNT A - BOX® tank system can not only be used in cargo tank, but can be used in the fuel tank, LNT A - BOX® tank system used in the fuel tank can better solve the problems existing in the layout, effectively reduces the cost of construction and installation.

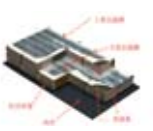
3. LNT A - BOX ® tank system characteristics

LNT A - BOX® tank system (figure 4) is constituted by freestanding LNG tank of IMO type A placed within a fully insulated cabin, it has a solid self-supporting primary barrier and completely independent secondary barrier.

Figure 4: LNT A - BOX® tank system

Compared with LNT A - BOX® tank system and other containment system, it has the following advantages: stable self -supporting primary barrier and completely independent secondary barrier; higher security due to two completely independent barrier systems; accessibility to both barrier systems, convenience for future inspection and containment; effective design and construction costs; easy building, LNG ships can be built by more shipyards.

Table 1: LNT A - BOX® system compared with other containment systems

containment system	film cargo tank type		independent cargo tank type		
			Type A	Type B	Type C
secondary barrier	complete secondary barrier		complete secondary barrier	part of secondary barrier	non secondary barrier
design pressure	≤0.025MPa		≤0.07MPa	≤0.07MPa	pressure vessel
	MARK III	NO96	LNT A-BOX	SPB	Type C
sketch drawings					
patent holder	GTT	GTT	LNT	IHI	TGE etc
primary barrier material	304L stainless steel	invar	stainless steel or 9 nickel steel	aluminium alloy	stainless steel or 9 nickel steel
secondary barrier material	“triplex” material	invar	aluminum sheet plywood	———	———
insulating layers material	polyurethane foam	perlite	polyurethane foam	polyurethane foam	polyurethane foam
geometrical shape	prismatic	prismatic	prismatic	prismatic	monomer tank catamaran tank

4. Application promotion

Currently, the main liquefied gas used in marine engines is compressed natural gas (CNG), liquefied petroleum gas (LPG) and liquefied natural gas (LNG). Compared to the CNG and LPG, LNG has the advantages of high power density, low emissions, convenience for storage and transportation, it is considered to be the most promising alternative marine engine fuel.

Internationally, for the designing scheme of marine LNG fuel tank, the cargo containment systems is classified in accordance with the IGC rules into membrane tank type, type A independent tank, SPB and type C independent tank. The characteristics of the membrane module type are that the capacity utilization rate is high, but construction process is complex; the characteristics of SPB type is that the capacity utilization rate is not high, and the weight is heavier; for type C independent tank, its fuel tank pressure capacity is high, design and manufacturing technology are mature, but it requires bigger layout space, capacity utilization rate is low.

Through co-operation with LANKMARK CAPITAL, CCS will carry out research on the economy, capacity utilization and the fuel tank layout, design and construction of LNT A - BOX® tank system as the LNG fuel tank, and make conceptual design approval of LNG fuel tank design scheme based on the LNT A - BOX® of tank system etc. in order to introduce the LNT A - BOX® tank system production line to market.

Principle Approval of Products with New Design

By Wang Min & Qi Ming & Zhang Ling

On Apr. 4th of 2015, CCS issued the first product principle approval certificate to SCR. This is the first time that a member classification society of IACS provides AIP service in the area of production inspection. It is also the first attempt to provide service based on customers' requirement.

Market is in need of principle approval

Marine production inspection market needs principle approval services, especially the new products and complex system modules, and this is mainly demonstrated in the following respects:

Firstly, the feasibility of new technology needs to be tested. For example, for ship and diesel energy saving technologies, designers tend to assert that the energy-saving effect of their product is really inspiring, however, ship owners and shipyards don't believe that. Third-party approval is conducive to expand the market and win the customers. In addition, customers hope new designs to be approved by classification society. For instance, process flow of a gas supplying system determines its economical efficiency and safety to a great extent.

Secondly, new design should better be approved in early design phase. New product is not perfect in normal conditions, but fortunately product series have not been finished. Common principle approval is suitable for products in this phase. Then it can be applied to the whole series of products. For instance, the SCR system, serialized designs have not been finished, principle approval meets customers' requirements to expand the market on one hand, and repeated tests can be avoided on the other hand.

Thirdly, product principle approval lays a foundation for follow-up system application, duplicate effort can be avoided. For example, function, process, thermodynamic cycle, gas supply capacity, gas quality, safety program, venture analysis of LNG air-feed system, principle approvals can be used for follow-up ship design to avoid significant problem and redesign. In addition, principle approval reduces drawing approval pressure. Key technology assessment of principle approval reduces review omissions and shortens review cycle.

Fourthly, newly increased system principle approval contributes to modularization and serialization design. For instance, newly increased gas ECU and control system of low-speed dual-fuel engine can be used to assemble series of dual-fuel engines with principle approval, performance approval and safety philosophy approval after matching tests. Another example is that for exhaust gas re-circulation ratio, pressure and temperature of EGR system of diesel engine should be under control, principle approval reduces specific models to a great extent.

Fifthly, product principle approval can be used as AIP input.

Sixthly, principle approval can serve for scientific research projects. At the beginning of the research, principle approval helps to test norm conformity. Venture analysis can help to assess safety of alternative design.

Characteristics of principle approval

As means of technical service, principle approval is not a compulsive requirement, it is flexible, working scope and plans can be developed according to customers' requirement.

Principle approval is generally related to complex product and technology and is highly professional. It is usually better to be implemented by professional team, which is good for concentrating technical forces and providing personalized services to customers. Inspection standard difference and human resource decentralization can be avoided at the same

time. Expert teams check alternative solutions, approve new products, identify risks, and assess security and feasibility.

Principle approval brings risk control points forward and avoids major non-determinacy. For example, a gas supply system test of a natural gas ship shows that design institute has no time and manpower to assess risks due to time limit and inexperience. In addition, according to CCS new product principle approval regulations, designers have to finish ship schematic design and product detailed design before submitting the drawings. Therefore, relevant departments are under tremendous pressure, system theory and detailed design have to be examined and approved in a short time. There is not enough time to fully demonstrate and analyze risks. Design has been finished at this time, designers don't cooperate well to deal with design alterations. Risks are postponed, gas supply system performance can not be tested. Hidden dangers emerge in ship building period and this may result in ship test failures, re-doing and usage limits. If gas supply system AIP approval was conducted in early period, many problems can be avoided on this basis. Product AIP lays good foundation for ship type approval. The same system theory can be used on different ships.

For classification societies, principle approval contributes to recognizing novel design; contributes to providing flexible and attractive services; contributes to early technical exchange and services; contributes to bringing risk control forward and test key technologies at early stage.

For manufacturers, principle approval contributes to reducing risks of uncertainty of the design; meeting design specifications; meeting requirement for market expansion; reducing delivery cycle and avoiding unqualified system.

Approval process

Note: Type approval should be on the basis of production type. For example, gas supply system directly goes to ship checking program, type approval is not necessary. Design principles confirmed by principle approval could be used as reference basis for follow-up works. Test results of principle approval could be used for type approval.

Principle approval is flexible. For example, CCS and customers noticed modeling tool innovations, SCR was approved according to a mechanism that is different from international rules. When the design scheme was proposed to client (classification society should keep the scheme absolutely secret), both sides determined content and plan of principle approval. The principle is meeting requirements of clients and proving the feasibility of the scheme. Both two sides assess and improve modeling tools, closed-loop control strategy, on-board inspection program, design principle diagram and risk analysis (including necessary simulation experiments), then the principle can be approved. Both sides agreed that detailed design would be finished and approved later. For the contents needed to be clarified and equal-effect processed in IMO file, both sides should draw up proposals, which can be widely accepted.

Application prospect and significance

Principle approval proposed by CCS is a supplement to existing modes to approve new products, designs and principles. It is flexible and it reserves plentiful options for follow-up assessments. Basic design principles approved can be used for specific engineering designs, similar verifications and computational analyses could be omitted. In addition, principle approval lays good foundation for follow-up type approval and actual ship system designs. It is especially applicable to new technology approvals, such as: energy conservation and emission reduction scheme, engine high-pressure gas supplying system, modern fuel compartment technology, exhaust gas recirculation system, waste heat recovery system. Furthermore, it can be linked well with ship AIP.

Once introduced, principle approval service drew public attention tremendously. An international enterprise applied this service firstly and it brought strikingly good effect. On this basis, this enterprise hopes CCS to involve in PM emission research and development in early stage and gets principle approval. At present, lots of enterprises have applied for this service.

Principle approval proposed by CCS is innovative and of practical significance. It is indispensable for a leading classification society to develop prospective researches and services. It can serve scientific research projects of the shipping industry and it also can be used as third-party research product and patent evaluation tools, and the important role of CCS in renovating the nation with innovation can be brought to a full play. Principle approval may make classification societies follow suit in terms of their approval mode and the eager response from the industry, the potential of its market may be on a par with those existing approval modes.

CCS Issued Handbook for Assessment of Onboard Software Security and Reliability

By Wang Xing Yu & Wen Yu Kui & Zhang Ning

With development of intelligent ships, global shipping industry is under risks caused by intelligent systems. To this end, maritime industry stipulates onboard software security and reliability assessment to ensure navigation safety. CCS has conducted intensive research on ship intelligence and made some advances in ship software security and reliability assessment. Software evaluation and verification methods of the shipping industry were proposed, which could regulate quality control and management of onboard software.

CCS upholds that industrial investigations and technical researches should be combined to ensure research direction is absolutely correct, research results meet actual requirements of shipping industry.

In the first stage, CCS analyzed important changes of shipping industry caused by information and communication technologies. Firstly, characteristics of information and communication technologies as well as effects on shipping industry were discussed. Then effects of information and communication technologies on shipping industry were analyzed from the aspects of ship company management and ship product applications. In addition, CCS studied

information and communication technologies applied on ships and the works conducted by international peers, as well as related technical requirements.

In the second stage, CCS intensively studied quality control and testing of software industry, from the aspects of software engineering, software quality assurance and quality standard. Based on marine field, CCS expand researches to other industries in which software quality control is matured, fully understood software engineering development, developing modes, testing strategy and domestic software testing industry.

In the third stage, on basis of the first two research stages, CCS finished handbook of assessment of onboard software security and reliability. Experts from main research institutes and manufacturers of software industry evaluated the handbook. This handbook has already been officially issued on Jul. 1st of 2015. Before this, representative marine product manufacturers tried it out. Assessment results based on this handbook mostly reflects real quality control level of factories over marine software.

handbook of assessment of onboard software security and reliability is a handbook to assess security and reliability of marine software. It makes security and reliability requirements through computer software development processes of developing, testing, approving and maintaining. In addition, it makes demands on hardware related to software. Therefore, requirements on hardware should coordinate with other technical requirements.

According to injury extents to sailors, ship and environment caused by computer system failures, handbook classifies marine computer systems into Iclass, IIclass and IIIclass systems. In respect of quality system requirement, manufacturers should strictly implement ISO9001 quality management system or equivalent ones and obtain valid certificates. IIclass and IIIclass systems should meet requirements of ISO9003. In addition, there are many other principles, such as software quality plan, quality control in production, final testing report, traceability and configuration management. At the same time, this handbook makes detailed requirements in order to facilitate product manufacturers to develop software quality system documents that meet requirements of handbook. The handbook divides system life cycle into 5 stages: concept, requirement, realization, testing and operation. Relationship and links between each stage are also regulated. This handbook controls all activities of all stages from concept stage to the end, including requirements about demand, development, test, integration, installation and modification. And it also recommends universal software developing life cycle models. The handbook makes requirements on these three computer systems from eight aspects of quality system documents, hardware and software descriptions, software testing documentary evidence, hardware testing, software testing, performance testing, on-board experiments and modifications. In view of actual demands of ship automatic control, the handbook introduces the concept of mini low-complexity computer system and makes detailed requirements.

According to part1 chapter 3 section 1 of Rules for Classification of Ocean-going Steel Ships 2015, CCS provides voluntary additional notification service for ships that meet handbook requirements. For computer system products with system life cycle, CCS issues additional notifications: SLC1, SLC2 and SLC3 according to conventions and rules to show product differences. At the same time, the products are assumed to meet IACS UR E22. The handbook gives detailed descriptions of IACS UR E22 and it is significant in providing guidance. This handbook will unify requirements related to marine software development and provide technical support for follow-up system integration and complex ship-borne system research.

Under the background of big data era, intelligent ship has already become the development trend of ship building and shipping industries. Keeping in pace with this, CCS will consistently conduct researches on onboard computer system software, provide technical support for intelligent ships, push shipping industry to a new world with greater courage and a wider vision.

Prevention Against Technical Risks of Ship Investment and Financing

By Xu Jie & Shu Hua

China is developing from a big shipping and shipbuilding nation to a major power in shipping and shipbuilding. To be commensurate with the huge productivity, the powerful Chinese capital has also hit out in all directions. There are more than 120 ship leasing companies in Tianjin Dongjiang bonded area alone. By the end of April 2015, more than 70 ships and 8 drilling platforms have been rented out. It is believed that guided by "Made in China 2015", "One Belt And One Road" and "Developing international production cooperation", the development in the next few years will be amazing. As we applaud and feel proud of Chinese manufacture industry and Chinese capital, we should pay more attention to capital safety.

Wrong focuses of sponsors

The shipping industry began to decline since "financial crisis" in 2009, and has been in downturn ever since . Offshore engineering equipment has become the competition hotspot for shipyards and investment institutions, and this lasted less than five years. At the end of 2014, the crude oil price slumped sharply, the expenses of oil companies shrank greatly, the construction of upstream projects were canceled or deferred, making the leasing rate and rent of offshore engineering equipment fell sharply. The winter for offshore engineering has come. No one knows when will the spring come.

The era of high profit for shipping and offshore engineering market has gone, and "surplus" has become the "new normal" for this industry. It must be realized that ship financing has entered an era of low profit.

Every investment brings profit when the market is booming. However, problems will arise when the market is depressed. Ship enterprises go bankrupt, charterers break contracts and competition becomes more intense. In this era of low profit, technical risk prevention is more important. What common mistakes will the sponsors make?

In the first place, sponsors pay more attention to financing contract profit and neglect technical risk of subject matter. Sponsors generally

care the most about coverage of the contracti.e. whether they can take back the capital and expected returns. The shipping industry and offshore engineering are of high risks, and accident happens frequently. The rigorous management boundary conditions have made the price for operation omissions higher and higher. Sudden fluctuation of market leads to frequent contract violations, which, due to disagreements on technical factors, are difficult to be dealt with as contracts. All these make it very important to conduct control of technical risks of subject matter.

In the second place, sponsors focus more on operation value and are not familiar with industry characteristics. They are more concerned about the price and never consider the consequences in the event of making the wrong purchase.

Thirdly, sponsors focus more on partners and neglect the values and prospect of the subject project due to the lack of professional judgment. Capital is to "despise the poor and curry favor with the rich". Today, investors run after Letv and Ari, which were once ignored , although their value and profit are huge.

Fourthly, sponsors focus on service plates and pay less attention to ship type selection. Among the same kind of subject matters, ships with high performance (working functions, efficiency, energy conservation and environment protection, comfort degree) are generally more competent in terms of lease.

Lastly, pre-research and professional consultation are inadequate. Fierce competition results in less rigorous preliminary work. It can be seen from the consultation projects in recent years that in most cases, the information provided is limited and the time is short, which means that only simple answers can be provided.

Technical risks sponsors face

Firstly, it is the safety risk of the essence of the subject matter. From the points of engineering technology and the insured subject, shipping and maritime engineering are high-risk industries with relatively high accident rate. This year, during the OTC, which is the biggest oil equipment exhibition, two major operation accidents happened. One is the explosion of a production platform and the other is the overturn of a self-elevating platform. These accidents became the hot topic during the meeting. There are many failure cases like these.

Life safety and environment protection are receiving more attention now. Accident cost is also increasing. Property insurance makes up for a loss, but will not avoid the loss. Those responsible have to take joint liability and pay for the costs related to the handling of the accident.

Secondly, the technical risks brought by the new requirements of conventions, rules and regulations. In contrast with the downturn market, the technical requirements are more rigorous; new conventions are continuously introduced(BWM Convention, The Hong Kong Convention, Nox/Sox emission control, Rules for Polar Ships, Rules for Noise onboard Ships, SEEMP, European and American ship recycling rules, Europe and America/USCG low sulfur oil requirements, USCG rules for ballast water, IACS CSR-H). Technical risk prevention should also take full account of requirements of Port State Control (PSC), Flag State Control (FSC) and the special requirements of the coastal states in the operation area, as well as the more and more stricter charterer access threshold. For example, before the Hong Kong Convention was put into effect, a new building worth billions of dollars was returned to the shipyard for non-asbestos reconstruction as required by the charterer less than one year after it was delivered, the huge maintenance cost and the loss of leasing profit are tremendous.

Thirdly, the competitive advantage of ship type technology market. This is the technical challenge brought by the ship type market selection. The trend for ship type technology development: high reliability, maximization, functional specialization (high precision, super power, multifunctional and integrated, modularization, operation and management intellectualization), occupational health(including comfort), environmental requirements. Limits are frequently challenged.

How to avoid and prevent technical risks

Firstly, select a reliable project. In the aspect of service plate, relationship between numbers of hand-held orders, yearly number of ships delivered and growth of freight volume should be considered. A reasonable supply-demand relationship is the foundation of sustainable stability. Sudden increase of orders, for example large container ships, LNG carriers and VLGC, is not a normal, but a situation for a specific stage. The global shipping route layout is changing. The Panama Canal widening project is going to be completed (295m x32.2m to 365m x 49m, container ship capacity increases from 5000TEU to 12000TEU. Bulk carrier capacity increases from 80K to 170K. The oil tanker capacity increases from 70K to 160K). The polar route is gradually commercialized. Investors should pay more attention to key factors such as advanced ships and mainstream ships, ships meeting route requirements, offshore construction operation habits, efficiency, health, energy conservation and environmental protection when selecting ship types.

Secondly, select reliable person. Due to their risk preference and professional background restrictions, investors lay too much emphasis on trustworthiness and ability to pay for contract breach. State owned and famous western enterprises are mostly preferred. Small and medium-sized enterprises, private enterprises are generally ignored. However, we hold the opinion that business judgment, and the capability for market segment operation, operation management and technical risk control are more important.

Thirdly, select reliable design and builders. Design is important at the time of low profit. An outstanding design contributes to safety in essence, cost control, function optimization, easy operation and maintenance. Design maturity is worth investing. In addition, conceptual design of functions is also necessary for special ships, because it is not the advantage of ship design companies.

In terms of selecting ship yards, MIIT has issued “white list”. Two batches of enterprises have been included. The white list of offshore engineering construction enterprises will also be issued. In addition, classification societies will carry out ship yard assessment procedure for newbuilding projects.

CCS can be consulted if investors want to choose the best from the best. CCS has developed the “atlas” of the domestic and overseas design institutes and ship yards based on statistics of their previous performance, providing detailed information on their ship type performance and other related information.

Fourthly, select reliable ship management companies and related shore-based service companies. Ship management and shore-based service are highly professional. Operation capacity and low cost management are important at the time of low profit. Therefore selection of service supplier is also of great significance.

Fifthly, select professional consultation firms. Shipping and offshore engineering equipment industries involve 60% of the industrial technical outcome. The related legal requirements and industry standards are infinite and professional work should be left to professionals. Investment and financing project should be based on the control of technical risks of subject matter. Professional consultants are irreplaceable.

Based on long-term cooperation experience with ship finance agencies like finance companies and banks, CCS took full advantage of its professional skills and its unique position in the collection and assortment of information, and provided Ship Financing Technical Risks Assessment and Monitoring (TRAM) service, based on Financing Classification Clause, which provides technical condition assessment, assessment and risk monitoring of builders’ quality guarantee ability and guarantee ability within construction cycle, professional consultation and on-site verification about handover of ships for leasing and throwing leases, , risk monitoring and report of ships in service, periodical inspection, safety management inspection and assessment of ship management companies.