Partnership

Edited and Printed by CCS 2017 . 10 / The 29th issue in total

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CCS
CHINA CLASSIFICATION SOCIETY
中国船级社

安全、环保，
为客户和社会创造价值

Safety, environmental protection and creating value for clients and society

CCS
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Dynamics

New Deliveries

The fifth issue in 2017
(The 29th issue in total)

Edited and Printed by CCS

Add: CCS Mansion, 9 Dong Zhimen Nan Dajie, Beijing China.
Postcode: 100007
Tel: +86 10 58112207 / 58112218
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Websit: www.cssponline.com
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Weibo: http://weibo.com/ccsponline

Sender object: Manager and technical staff
Printing party: Beijing Tiancheng Printing Co.,Ltd.
Printing quantity: 3000

Wechat public ID

Please scan the QR code to follow

CCS President Sun Licheng meets with Secretary General of Panama Maritime Bureau

Recently, Sun Licheng, president of China Classification Society (CCS) met with Mr. Tomas Avila, Secretary general of Panama Maritime Bureau at CCS headquarters. Sun Licheng introduced the development of Panama flag ships in CCS fleet, and welcomed the Panama maritime authority intention to set up offices in China. Sun said CCS will actively provide technical support, provide good technical services for mutual customers, and ensure the safety of the ship and environmental performance. Mr. Tomas Avila thanked CCS for contributing to safety of Panama flag ships, and considered that with the diplomatic relations established between China and Panama, the two sides will have more broad prospects for cooperation, especially in the development of Panama port logistics and the shipping trade, Chinese factors are playing a positive role, and Mr Avila hopes that CCS will play a greater role in the promotion.

CCS vice president Sun Feng led a delegation to visit Denmark to carry out exchange activities

As invited by The Danish Maritime Bureau, Maersk Group and the Danish Clipper company, Sun Feng, vice president of CCS made a series of visits from September 25, 2017 to September 27, 2017 in Copenhagen, Denmark. During the visit, Sun Feng visited Maersk Line and Maersk Tankers respectively, and the two sides conducted in-depth discussions on deepening and expanding the scope of cooperation.

CCS signed a strategic cooperation agreement with Kimhae Chi

Recently, China Classification Society (CCS) and the Kimhae Chi (formerly Jinhai heavy industry Limited Co.) signed a strategic cooperation agreement in Zhoushan.

Kimhae Chi (formerly Jinhai heavy industry Limited Co.) and CCS have many years of good cooperative relationship, the two sides will take the signing of the strategic agreement as an opportunity to further deepen bilateral cooperation. Sun Feng, vice president of CCS said that, in recent years Kimhae Chi, through continuous transformation and upgrading, innovation and development, has achieved remarkable results, and CCS, based on the previous good cooperation, is willing to carry out more in-depth and extensive cooperation in intelligent manufacture, unmanned ship, CCS also hopes to further strengthen cooperation and mutual support with Kimhae Chi in the overseas market expansion.

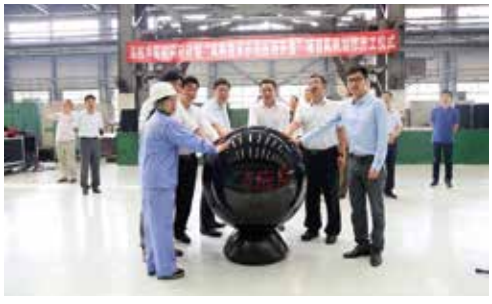
CCS signed a strategic cooperation agreement with CRRC

On September 6, 2017, China Classification Society (CCS) and CRRC Cooperation Limited signed a strategic cooperation agreement in Beijing. Zhu Kai, vice president and chief engineer of CCS, and Xu Zongxiang, executive director of CRRC, attended the signing ceremony and signed a strategic cooperation agreement on behalf of the two sides.

In January 2013, CCS and China Nanche Group signed a strategic cooperation agreement, over the years, the two sides have carried out successful and extensive cooperation, this strategic cooperation agreement is the first with CCS after the merge of China northern and southern automobile.

Manufacture of the MIIT sailing project researched and surveyed by CCS commenced

Recently, the manufacture of windsurfing engineering prototype, which is used to MIIT scientific research project “Research on demonstration application of sailing technology", was officially started by Dalian Shipbuilding Heavy Industry Group Co. The official start of windsurfing engineering prototype marks the energy saving and emission reduction technology research used in large cargo ship of Chinese enterprises has entered into a new stage of wind energy utilization; it also indicates that CCS has achieved partial results in sail project risk assessment and coping, as well as the construction of technical standard system.



CCS signed a MOU with German Becker company

Recently, China Classification Society (CCS) participated in the core seminar of LNG power generation ship in Shanghai, and signed a memorandum of understanding (MOU) with German Becker company at the meeting. In the future, the two sides will continue to strengthen the exchange of information and projects on LNG generating ships, and jointly promote and expand the areas of cooperation in green power supply technology.

The convening of the LNG power ship core Symposium identified the specific objectives and implementation plans for the next phase of the LNG generation ship project, marking a substantial step forward in this green power supply technology in China. CCS will actively provide technical support and provide good technical services to the parties concerned to ensure the safety and environmental performance of the project.

The first domestic river-sea transport container ship surveyed by CCS launched

Recently, the first domestic river-sea transportation container ship"Han Tang Shanghai" launching ceremony was held in Taizhou city, Jiangsu province. The ship is 84.9 meters in total length, 12.6 meters in width, 4.7 meters in modeled depth, navigation area is specific routes 1-1, A zone. The ship is designed so that it can realize the river-sea transport and reach Suzhou port by making full use of the mouth of the Yangtze River waterway conditions, this makes a tremendous achievement in oceangoing ships sailing into the river. The "Han Tang Shanghai" has strong versatility and good adaptability. It meets the requirements of CCS rules for construction of river-sea ships for specific routes.

CCS expert leads the development of ISO ship LNG fuel filling joint standards

Wu Shunping, senior engineer of Wuhan Rules and Research Institute of CCS, will be the team leader of the LNG fuel quick filling joint standard project (QCDC) under international organization for standardization (ISO) TC8. Wu Shunping under the support of all parties (CSIC 714 and other units in China), actively compete for the post of project group leader, and succeeded because of many factors such as his professional ability, the third party role, China's broad market prospects for LNG filling joint etc.

CCS issues the first MRV certificate that meets both IMO and EU regulations

Recently, Chinese Classification Society (CCS) issued confirmation to two ships, i.e. "Zhehai 1"and "Zhehai 2", attributed to Zhejiang shipping company. The confirmation is not only in accord with EU shipping CO_2 monitoring reporting and verification regulations (EU-MRV), but also the International Maritime Organization ship energy efficiency management plan in second parts (IMO SEEMP II) the "monitoring plan". This is the first time for CCS to issue the MRV certificate indicating compliance with both EU-MRV regulations and IMO SEEMP II to its customer.

CCS issued LNG marine invar alloy approval certificate for Baosteel Special Steel Co., Ltd.

Recently, China Classification Society (CCS) issued a marine LNG invar alloy certificate to Baosteel Special Steel Co., Ltd.in Baosteel Special Steel LNG marine invar alloy certification ceremony. Baosteel Special Steel Co., Ltd. became China's first and the world's second approved manufacturer of membrane type LNG marine invar alloy.

After 4 years of joint efforts of all parties concerned, Baosteel Special Steel Co., Ltd. successfully completed industrial trial of invar alloy, the performance completely meet the accreditation requirements, and ultimately won CCS' approval certificate and GTT certificate, realizing localization of LNG marine invar alloy.

CCS got the construction classification contract of the first domestic semi-submersible production platform

Recently, CCS got the construction classification contract of Lingshui 17-2 gas field development project attributed to CNOOC (China) Co., Ltd., and the scope of work includes classification and survey of a semi-submersible platform, certification and inspection of a submarine pipeline of 95km and a set of underwater production system.

As the first domestic new semi-submersible platform, the project is the first to use store condensate oil in the semi-submersible platform column in the world. It is the first time for CCS to carry out construction classification of the semi-submersible platform, certification survey of deep sea pipe of 1500 meters, and the certification survey of underwater production system.

The third party qualification of CCS overseas offshore industry got first breakthrough

Recently, Dubai branch, Southeast Asia regional center of CCS formally entered the Dubai Petroleum company's service provider list in Dubai as an independent third party.

This is the first time for CCS to get independently the international offshore oil company service supplier qualification since its offshore engineering business entered into the fierce competition of the overseas market, and it is also a solid step in the field of qualification that CCS has taken in overseas marine market development work. Dubai Petroleum, a local oil company with a long history in the UAE, currently operates three offshore oil and gas fields with a total of over 60 offshore production facilities. This service provider qualification is only a microcosm of CCS's Middle East marine business development results, and in the future CCS will provide more quality services to more customers.

174,000 cubic meters membrane type LNG transport ship “CESI Tianjin” delivered

Recently, the LNG transport ship "CESI Tianjin" of 174,000 cubic meters built by Hudong Zhonghua shipbuilding (Group) Co., Ltd. and jointly surveyed by CCS and LR was smoothly named and delivered in No. zero line terminal of Changxing island.

As one of the world's largest LNG cargo transport ship at present, "CESI Tianjin" ship uses evaporation tank volume automatic matching of oil and gas mixed combustion technology, which has good maneuverability and strong propulsion over the full speed section and has high safety and reliability. The ship will serve in LNG transport routes from Australia to China. “CESI Tianjin” is the fourth ship of the APLNG project. The 3 "CESI Tianjin" ships which have been delivered have operated on 24 voyages, and their operation is in good condition.

CCS Fukuoka survey station officially opened

In order to provide quality and efficient survey services to the whole world and to strengthen technical exchanges and cooperation with the shipping and shipbuilding industry, CCS Fukuoka survey station has officially opened on September 10, 2017.

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The “Han Tang Shanghai” river-sea transport container ship

As the first domestic river-sea transport container ship, “Han Tang Shanghai” launching ceremony was held in Taizhou city, Jiang Su province recently. The ship is 84.9 meters in total length, 12.6 meters in width, 4.7 meters in modeled depth, navigation area is specific routes 1-1, A zone. The ship is such designed that it can realize the river-sea transport and reach Suzhou port by making full use of the mouth of the Yangtze River waterway conditions, this makes a tremendous achievement in oceangoing ships sailing into the river. The “Han Tang Shanghai” has strong versatility and good adaptability. It meets the requirements of CCS rules for construction of river-sea ships for specific routes and classed with CCS.

The “HUA XING HAI” bulk carrier

“HUA XING HAI” is the new generation Cam Sal type bulk carrier designed by Shanghai ship design and Research Institute for COSCO bulk cargo transportation Co., Ltd., and built by CSSC Chengxi shipyard Co., Ltd. The ship is surveyed and classed by CCS.

The ship is 229 meters in total length, 32.26 meters in width, has a designed draft of 12.2 meters, speed of 14.3 knots, and the deadweight tonnage of 81600 dwt. Based on the research of Panama limit type series bulk carrier, “HUA XING HAI” carried out lots of optimization study in linetype, layout, structure, propeller, electromechanical and etc, and can meet a series of future requirements for energy saving and emission reduction, environmental protection and other maritime regulations. The ship meets all requirements of effective rules and regulations, such as the common structure rules (CSR), fuel tank protection, ballast tank coating protection standard (PSPC) and so on, reaching the international advanced level.

The ship energy efficiency design index (EEDI) of this type of ship can be reduced by about 15% compared with the baseline value.

The 400,000 ton VLOC -- “OC400K-5”

The VLOC ship of 400,000 ton, which is built by Qingdao Beihai Shipbuilding Heavy Industry Co. Ltd. of Wuchang shipbuilding group for ICBC Leasing, is the first ship to launch of thirty 400,000 ton VLOCs ordered by Chinese ore, China Merchants Energy Shipping, and ICBC Leasing. The ship meets the Tier II emission requirements. The ship is surveyed by CCS and classed with CCS.

The ship is 362 meters in length, 65 meters in width, 30.4 meters in depth, with a design draft of 23 meters, a speed of 14.5 knots, endurance of 25500 knots, and equipped with a single machine, single paddle and low speed diesel engine drive.

The container ship of “Bo Da 36”

“Bo Da 36” ship is the container ship designed by Hangzhou modern ship design and Research Co., Ltd., and built by Ningbo Boda Shipbuilding Co., Ltd. for Indonesia PT. Meratus Line shipping company, surveyed and classed by CCS.

The ship is driven by a diesel engine and is a steel container ship with full welded structure. The total length is 119.9 meters, with length between perpendiculars being 115 meters. The ship is 21.8 meters wide, 7.3 meters deep, has 5.2 meters in draft design, the endurance of 600H. Its displacement is 11397 tons, gross tonnage is 6653 tons, net weight is 3725 tons, using single oar tail type diesel engine power plant.

The “ TS GOLF” bulk carrier

"TS GOLF" is the handysize bulk carrier for international navigation built by Shanhaiguan Shipbuilding Industry Co., Ltd. for Dalian tiger Shipping Co., Ltd., and classed with CCS. The ship is 182 meters in total length, 30.00 meters in width, 14.80 meters in depth, and has a design draft of 9.50 meters, the rating of 25 crew members and unlimited navigation area. The ship is 38859.30 ton in deadweight, 24124 in gross tonnage, and its main power is 7044 kilowatts.

The ro-ro passenger ship of “Chang Dao Jin Zhu”

"Chang Dao Jin Zhu" is the ro-ro passenger ship built by Bai Jing Lu Penglai shipyard Co., Ltd. for Long Island Bohai Changtong Travel Limited, surveyed and classed by CCS. The ship is the car ro-ro passenger ship with twin screw, double rudders, diesel engine driven, and has a vehicle deck which can accommodate 430 persons in total. In actual operation, the maximum load of the car is 80t and the gross weight of the truck is about 395t, and the parking space and the number of vehicles can be adjusted according to the actual conditions.

The “INNOVATION WAY” semi-submersible ship

As the largest converted semi-submersible vessel in Asia, the “INNOVATION WAY” is converted by CSSC Whampoa Wenchong ship Co. company (Longxue plant) for CCCC International shipping Corp. The maximum dive depth of the ship is 22.5 meters, and CCS carried out the field survey and plan approval survey.

The “INNOVATION WAY” is converted from a bulk carrier of 172 thousand DWT (289.08 meters in length, 45 meters in width, 24.1 meters in depth) into a new semi-submersible vessel of 65000 ton (248.43 meters in length, 48.80 meters in width, 13.50 meters in depth), increasing more than 12000 tons in volume.

The “PEACE UNIVERSE” dry cargo ship

The dry cargo ship, “PEACE UNIVERSE”, is built by the Hubei Huahai Ship Heavy Industry Company Limited for “PEACE OCEAN ENTERPRISE LIMITED”. The ship is surveyed and classed by CCS, and is awarded with PSPC(B), EEDI(III) and other notations. The total volume of the ship is about 2942 meters 3; it has 4 sets of fresh water tanks, with the total volume of about 158.68 steres; 2 sets of fuel tanks with total volume of 187.28 steres; 4 diesel oil tank with total volume of 46.64 steres.

Introduction of fire test requirements for cruise interior decoration materials

By Lai Hongyu

With the rapid development of China's cruise tourism industry, China's cruise market will be prosperous and future demand will be enormous. In order to comply with this trend, China has listed the cruise development into the 13th five-year plan, and vigorously promotes the domestic cruise industry development. Cruise ships are for pursuit of luxury, comfort and leisure and use large amount of decorative materials and cabin equipment in public areas and staff living rooms such as atrium, theaters, restaurants, shopping malls. Due to their flammable characteristics, it has brought a lot of hidden dangers in terms of fire-fighting. The SOLAS Convention has imposed corresponding statutory requirements to such dangers.

■ Firstly, the requirements of SOLAS Convention for interior decoration materials.

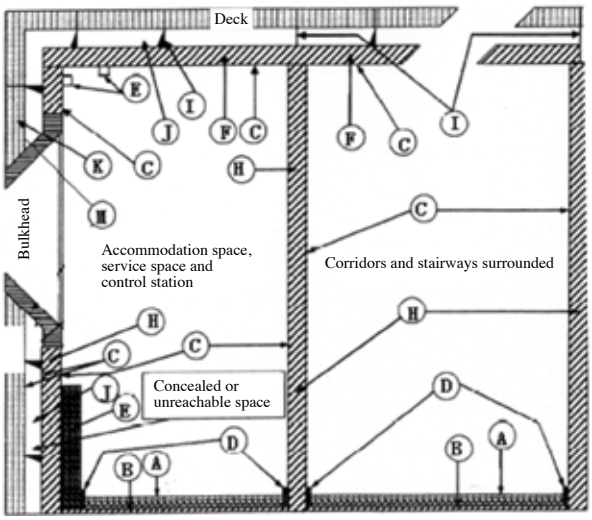
For classification of interior decoration materials, in accordance with the requirements of the Convention, interior decoration materials can be divided into the following two categories. The first category is non-combustible materials, including panels, lining, lining and support, ceilings, local bulkheads, windbreakers, insulation materials. The second category is combustible materials: including flammable veneers, laths, ornaments and decorative panels; paint (varnish) and ceiling (lining) on the paint, varnish and other coatings; fabric and decorative panels exposed surface; cover; deck base dressings and so on.

For the relevant statutory requirements, according to the SOLAS Convention on statutory requirements for interior decoration materials, article II-2 / 3.33, the definition of noncombustible material is defined as the fact that a material is heated to about 750°C following the Fire Test Procedure without burning or flammable vapor sufficient to cause spontaneous combustion. The requirements for use is that the insulation material should be non-combustible materials, but moisture barrier, adhesive and insulation materials used for the cooling system pipes and fittings accessories do not have to be non-combustible materials. Those above mentioned non-combustible materials should be as little as possible and its exposed surface should be with low flame spread. Lining, windshield and ceiling on the passenger liner should be non-combustible materials. In Article II-2 / 3.15, the definition of combustible material is defined as any material other than incombustible materials. The operation requirement for the partition facing, inlays, ornaments and decorative panels is that they are allowed to be used on the passenger's premises and service spaces of class A, B or C, but total volume and calorific value are limited. Those places below should be with low flame spread: the exposed surrounding surfaces of corridors and stairways of a passenger ship; the exposed surfaces of bulkhead and ceiling lining of accommodation, service spaces and control stations; surfaces of closed or inaccessible places of accommodation, service spaces and control stations. In Articles II-2/6, for paint, varnishes and other finishes and deck basal dressings, it is required that the paints, varnishes and other finishes used on the exposed inner surface should not cause excessive flue gas and toxicity substances in accordance with the Fire Test Procedures. Deck base dressings used in accommodation spaces, service spaces and control stations shall be of a recognized material which does not produce smoke, toxic substances or explosive hazards at high temperatures and shall be used in accordance with the Fire Test Procedure. In Article II-2 / 3.40, the requirement for furniture, hanging textiles, bedding, etc. is that they should be provided to a room with furniture and equipment that limits the risk of fire.

■ Secondly, the FTP rules on the test requirements of interior decoration materials.

The test requirements for interior decoration materials can

Figure 1 Passenger compartments setting example of various types of materials (excluding furniture and hanging textiles)



be divided into two parts. The first part is the 2010FTP rule. The 2010FTP rule, revised by MSC.307 (88), has been in effect since July 1, 2012, including the main body and four attachments, among which annex 1 specifies the test methods and procedures of 11 parts, they are: incombustible test, flue gas and toxicity test, "A", "B" and "F" grade separation test, fire door control unit test, surface flammability test, vertical suspension textiles and film experiment, upholstered furniture test, bedding tests, the fire proof material test for high speed boats, the fire proof structure test for high speed boats, and the testing requirements for interior decoration materials mainly in the part of 1, 2, 3, 4, 5, 7, 8 and 9. In addition, general products made of glass, concrete, ceramics, natural stone, stone, ordinary metal and alloy shall be deemed as non-flammable and shall be used on board without trial and approval. The second part is test requirements for other interior decoration materials used in the public area and the cabin.

Table 1 Test requirements for each material

Type	Control Station	Stairway	Corridors	Public Spaces Used As Evacuation Stations And Collection Stations, And Open Decks For Boarding Areas	A Place With A Small Risk Of Fire	A Place With A Medium Risk Of Fire	A Place With A Big Risk Of Fire	Bathroom And Similar Premises	Cabin, Empty Or Auxiliary Space With Very Little Or No Risk Of Fire	Moderate Spaces Cargo Spaces, Cargo Tanks And Other Tanks And Other Similar Premises With Medium Risk Of Fire	Machine Premises And Main Kitchen	Main Kitchen, Work Room And Pantry	Storage Of Other Parts Of Flammable Liquids
Category / Material	1	2	3	4%5	6	7	8	9	10	11	12	13	14
Floor Coverings A	Part 2	Part 2,5	Part 2,5	Part 2,5	Part 2	Part 2	Part 2	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Part 2	Not Applicable
Deck Cover B	Part 2,5	Part 2,5	Part 2,5	Part 2,5	Part 2,5	Part 2,5	Part 2,5	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Part 2,5	Not Applicable
Bulkheads And Ceilings (Liners) Include Exposed Surfaces Such As Coatings, Fabrics And Decorative Panels, Especially Varnishes C	Part 2,5	Part 2,5(Heat, Total Capacity)	Part 2,5(Heat, Total Capacity)	Part 2,5(Heat, Total Capacity)	Part 2,5(Heat, Total Capacity)	Part 2,5(Heat, Total Capacity)	Part 2,5(Heat, Total Capacity)	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Part 2,5(Heat, Total Capacity)	Not Applicable
Wallboard D	Not Applicable	Total Capacity	Total Capacity	Total Capacity	Total Capacity	Total Capacity	Total Capacity	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Total Capacity	Not Applicable
Combustible Veneer, Trim, Ornament And Trim Panel E	Part 2,5(Heat, Total Capacity)	Part 2,5(Heat, Total Capacity)	Part 2,5(Heat, Total Capacity)	Part 2,5(Heat, Total Capacity)	Part 2,5(Heat, Total Capacity)	Part 2,5(Heat, Total Capacity)	Part 2,5(Heat, Total Capacity)	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Part 2,5(Heat, Total Capacity)	Not Applicable
Wall Panels, Linings, Bushings, And Ceilingsf	Part 1	Part 1	Part 1	Part 1	Part 1	Part 1	Part 1	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Part 1	Not Applicable
Partial Bulkheadg	Part 1	Part 1	Part 1	Part 1	Part 1	Part 1	Part 1	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Part 1	Not Applicable
Wallboard (Lining)H	Part 1	Part 1	Part 1	Part 1	Part 1	Part 1	Part 1	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Part 1	Not Applicable
Lining And Supporti	Part 1	Part 1	Part 1	Part 1	Part 1	Part 1	Part 1	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Part 1	Not Applicable
Windshield J	Part 1	Part 1	Part 1	Part 1	Part 1	Part 1	Part 1	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Part 1	Not Applicable
Insulation Layer K	Part 1	Part 1	Part 1	Part 1	Part 1	Part 1	Part 1	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Part 1	Not Applicable
Insulated Into Surface M	Part 5	Part 5	Part 5	Part 5	Part 5	Part 5	Part 5	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Part 1	Not Applicable

Table 2 Test capability and items of test center

Test Equipment	Test Capability (Test Standard)		Test Object
	Ship	Land	
Material Non Combustibility Test Furnace	FTP Rule Part 1	GB/T 5464-1999 ISO 1182:2002	Ceramic Wool, Rock Wool, Deck Dressing, Etc.
Smoke Density Box Infrared Spectrum Analyzer	FTP RulePart 2	ISO 5659 GB 10671 GB 8323	Carpets, Floors, Plastic Pipes, Etc
3.0m * 3.0m Vertical Test Furnace 4.0m * 3.0m Level Test Furnace 1.1m * 1.1m Vertical / Horizontal Furnace	FTP RulePart 3 FTP RulePart 4 FTP RulePart 11	GB/T 9978.1-2008 ISO 834-1:1999 BS 476-20:1987 EN 1363-1:1999	Marine Structures (Bulkheads, Fire Doors, Fire Windows, Decks, Pipes, Penetrations, Cables, Linings, Ceilings, Etc.); Building Components (Doors, Partitions, Ceilings, Elevators, Beams, Etc.)
Materialtest Furnace Of Low Flame Spread	FTP RulePart 5 FTP RulePart 6	BS476-7:1987	Bulkheads, Ceilings And Deck Finishes; Floor Coverings And Deck Base Dressings
Vertical Suspension Textile And Film Test Device	FTP RulePart 7	-	Textiles And Films
Soft Furniture Test Device	FTP RulePart 8	-	Soft Furniture
Beddingtest Devic	FTP RulePart 9	-	Bedding
Double Cabinet Type Cone Calorimeter Large Scale Calorimeter Equipment	FTP RulePart 10	ISO 5660 ISO 9705	Marine Structural Materials, Building Materials
L3 Plastic Pipe Fire Performance Test Equipment	IMO A.753(18)	-	Marine Plastic Pipe
Oxygen Bomb Calorimeter	-	ISO 1716 GB 14402	Marine Structural Materials, Building Materials

Thirdly, the technical support provided by the CCS Far East Fire Test Center (FEFTC) for the industry.

Far East Fire Test Center (hereinafter referred to as "Test Center") established in 1989 is one of the subordinate scientific research institutions of CCS mainly engaged in fire prevention materials and scientific experimental research of fire structure and provide test basis and technical support for developing ship fire-fighting rules and take part in the relevant rules and resolutions of the International Maritime Organization (IMO). As a third party impartial institution, the test center also carry out standard fire tests in accordance with the requirements of IMO, the International Organization for Standardization (ISO), the European Community Standard (EN), the British National Standard (BS), China National Standard (GB) and other requirements of various types of standard, provide internationally approved test reports and technical supports for both domestic and international clients so as to obtain product approval from the competent authorities. The fire test capability of the test center covers all 11 parts of the IMO Application Rules for the 2010 International Fire Test Procedure (hereinafter referred to as the "2010FTP Code"), as well as the IMO fire resistance test method for water injection plastic pipes and ISO material test method for determination of calorific value. See the table below for details.

The test report issued by the test center are accepted by IACS members such as ABS, BV, DNV-GL, LR, NK, CCS and so on. The test center has also obtained the accreditation certificate issued by the National Laboratory Accreditation Committee (CNAL) and the measurement certificate issued by the State Administration of Quality Supervision, and has become the only laboratory in China on the list of IMO. The comprehensive test capacity of test center fully demonstrate to the world the great upgrade of scientific research ability of CCS and it will surely be a strong impetus to the sustainable development of China shipbuilding industry.

Development of *Rules for LNG FSRU*

By Qi Kuili

In recent years, many domestic enterprises have become interested in LNG FSRU. In order to meet the rapid development of LNG industry in China, CCS has organized experts and technicians to carry out research and initiate the formulation of the "*Rules for Classification of FSRU*".

At present, FSRU are all ship-type. Its shape is similar to LNG carrier, with the functions of receiving, storage and regasification of LNG as well as delivering and calculation of LNG to onshore natural gas pipelines.

FSRU can be newly built, or can be converted from the operational LNG carriers.

The traditional operation mode of FSRU is to anchor long-term at a fixed location, receiving unloaded LNG from LNG carriers, pressured and re-gasified and transported to land-based natural gas pipeline.

Recently, the new operational mode of FSRU has arisen. To be specific, FSRU receives LNG from a liquefied natural LNG liquefaction plant or terminal and transports it to the operating site for mooring, and press, regasify and transport to land-based natural gas pipeline. When LNG cargo becomes gasified and exhausted, FSRU will be remove from the operating site and goes to the LNG liquefaction plant or terminal to load LNG cargo once again. As the cycle repeats, FSRU also possesses the transportation function of LNG carriers in this model.

CCS rules for the construction and equipment of ships carrying liquefied gases in bulk and Rules for Classification of Sea-going Steel Ships have already put forward comprehensive and mature technical requirements for LNG carriers. FSRU rules which is currently being compiled only puts forward technical requirements for FERU with long-term mooring and fixed operating site in the traditional model.

The basic framework of FSRU rules includes the general rule, technical requirements for the integrity of FSRU hull, technical requirements for the main system, turbine equipment, electrical system, automation and monitoring system, fire and safety operations and other parts. The integrity of FSRU hull includes structure and equipment, stability, subdivision and load line. While the structure and equipment part includes the overall layout, design principles and technical content. FSRU turbine mainly involves the transmission system including input, output, process processing equipment, and other power systems and equipment other than the above three aspects. Compared with LNG carrier, the FSRU cargo processing equipment is used more frequently, so the transmission system should be considered as the key research content. Furthermore, the technical requirements should be refined and perfected on the basis of Rules for the construction and equipment of ships carrying liquefied gases in bulk, simultaneously considering the FSRU operation characteristics. Other parts of the FSRU turbine and cargo containment system are exactly the same as the LNG carrier, so the relevant technical requirements should conform to Rules for the construction and equipment of ships carrying liquefied gases in bulk. During the compiling process of the FSRU specification, the contents of relevant technical provisions should conform to CCS existing specifications. The main contents of the FSRU specification are described as follows.

First is the general rule. It is specified that the FSRU rules apply to the design, construction and inspection of the newly constructed FSRU. In addition to meeting the requirements of the rule, FSRU also shall meet the relevant requirements of Rules For Offshore Floating Installations Classification , Rules For The Construction And Equipment of Ships Carrying Liquefied Gases In Bulk , Rules For Materials And Welding and Rules For Offshore Oil and Gas Process . Whether FSRU has a self-

propelled function is determined by the owner of FSRU. With regard to FSRU with main propulsion devices, the structure, machinery and electrical and automation devices associated with the main propulsion system and the steering system shall meet the relative requirements applicable to CCS steel ship classification specifications. Additional symbols included in the specification are listed as follows:

Table 1 Additional notations

Additional notations	Description	
LNG FSRU	FSRU	The additional notation is granted to floating devices with LNG storage and regasification function
REGAS	Re-gasification of LNG	Floating devices with LNG regasification system should be added with this additional notation
PM	Positioning mooring system	Floating devices with the positioning mooring system should be added with this additional notation

The modified FSRU has two cases: the existing ships or offshore floating devices, which have been converted into floating devices, shall be constructed in accordance with the provisions of the FSRU specification and qualified by CCS. Furthermore, if the LNG carriers are simply converted into carriers with LNG regasification and external transportation function, they should meet the requirements of the cargo operating system, regasification system, positioning mooring system and other relevant sections of the specification. This section should also include definitions applicable to the specification, filing and review of drawings, product inspection, FSRU inspection and so on.

Second is the structure and equipment. The structure and equipment part includes the overall requirements of the structure and layout, design principles, equipment and modules. Based on the characteristics of FSRU long-term and fixed-point operation, this part puts forward provisions of the environmental condition and design load. In addition, this part also includes technical requirements of the component size, strength assessment, the structure of the upper module and ancillary facilities, outfitting and anti-corrosion aspect. The requirements of FSRU are similar to that of offshore floating devices, and the technical requirements of the external environmental are also the same.

Therefore, there are no obvious differences of technical requirements between FSRU and offshore floating devices regarding component size, strength evaluation method, ancillary facility structure, outfitting and anti-corrosion aspect. Existing related research results can be followed. Due to installation of LNG storage tanks, the internal load and loading mode of FSRU shall be specifically considered regarding Rules for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk and the characteristics of LNG storage, and the strength check is carried out using direct calculations.

Third is the stability, subdivision and load line. The stability, subdivision and load line part are main applicable to the ship-type FSRU, relative requirements of other types of FSRU in the FSRU specification should conform to Rules for Offshore Floating Installations Classification. Regarding the stability requirements of ship-type FSRU, because its ship type and layout characteristics are the same as LNG carrier, its intact stability and damage stability should not only meet the relevant requirements of intact stability and damage stability in "*rules for offshore floating installations classification*", but also meet the relevant requirements of ship residual capacity in "rules for the construction and equipment of ships carrying liquefied gases in bulk". Similarly, the load line marking and surveying of ship-type FSRU should not only be consistent with the load line convention, but also meet the requirements of "*rules for offshore floating installations classification*" and "*rules for the construction and equipment of ships carrying liquefied gases in bulk*".

Fourth is the regasification system. The regasification system is one of the core systems of FSRU, which should not only meet the functional requirements of LNG gasification, but also minimize the risk to the personnel, ships and the environment. The regasification system is first used as LNG processing system; hence its design, manufacture, installation and inspection should meet the requirements of Rules for The Construction and Equipment of Ships Carrying Liquefied Gases in Bulk. Based on this, risks brought by high-pressure and low-temperature LNG / NG components in the system should also be fully considered. The high-pressure and low-temperature pipeline stress analysis and other means should be adopted to reduce the possibility of system leakage. By increasing the system redundancy and other means, the function and security of the system are not greatly affected when any single device is failed. Putting forward requirements of pressure release, gas detection, fire, layout and other aspects of the system, the consequences of the accident can be decreased to the minimum when any high-pressure and low-temperature leakage occurs.

Fifth is the transmission system. The transmission system includes LNG transmission and NG output. When the technical requirements of LNG transmission system are formulated, it is necessary to consider the frequent operation, large amount of transmission, easy leakage and other characteristics of the cargo operation of FSRU. Furthermore, the operating environment is complicated and changing, and the transmission medium is low-temperature, flammable and explosive. FSRU LNG transmission system can be divided into two parts: the own pipeline system and the ship-to-ship connection equipment. With regard to the ship's own pipeline system, its requirements are the same as the LNG carrier. With regard to the ship-to-ship connection equipment, it includes mainly flexible hoses, LNG loading and unloading arms or pull off valves, which has been put forward corresponding technical requirements in the specification. In addition, the transmission rate of LNG transmission system is specified, mainly considering the static electricity, BOG management, LNG temperature, the maximum allowable flow of connected equipment and other factors during the transmission. The NG output system mainly includes two parts, the liquid pipeline between the LNG cargo tank to the regasification device and regasification device to the natural gas pipeline joints. The low temperature protection, valve setting, purging, inserting, degassing and other basic requirements of these two parts are the same as the LNG carrier, and the technical requirements should conform to "*Rules for the construction and equipment of ships carrying liquefied gases in bulk*".

Sixth is the positioning and mooring system. The types

of FSRU positioning and mooring system include single point mooring and dock mooring. Currently, most FSRU use the dock mooring type, including offshore terminals and temporary wharfs. The technical requirements of FSRU positioning and mooring system are mainly based on the structural framework and contents of Rules for Offshore Floating Installations Classification. On the basis of Rules for Offshore Floating Installations Classification, this part first stipulates the environmental conditions and design conditions, then mooring analysis and balance check, finally proposing technical requirements of the equipment related to mooring. According to the characteristics of FSRU, CCS carried out FSRU dock mooring test to study the performance of FSRU dock mooring and the effect of ballast sloshing on FSRU mooring performance, improving the technical requirements of synthetic fiber calibration.

Seventh is the electrical system. The electrical system part mainly includes requirements of the power system, lighting, explosion prevention, communication and other contents. The main power supply part mainly includes considerations of working power and emergency power to ensure the security of operations, personnel and equipment. The emergency power supply focuses on lighting and signaling equipment, as well as power supply of ESD, fire and other equipment. The main consideration of the power distribution system is the safety of the cargo tank, hence the insulation system should be adopted. Regarding explosion prevention, FSRU is similar to the LNG carrier and existing technical requirements of LNG carriers and IEC requirements can be drawn lessons from.

Eighth is fire. The fire part of FSRU includes fire prevention and fire extinguishing. The fire protection part mainly includes relative requirements and design principles of ship layout and heat-resistant separation. The fire extinguishing part mainly includes relative requirements and design principles of water fire-extinguishing system and chemical dry powder fire extinguishing system. The main function of FSRU is to add relevant systems and equipment on the basis of LNG carriers, so the ship layout, heat separation and fire extinguishing system are basically the same as LNG carriers. Based on above considerations, the technical requirements of fire protection in the FSRU specification are consistent with those in Rules for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk. The relevant requirements of fire protection conform to relevant sections of the overall arrangement. Based on rules for the construction and equipment of ships carrying liquefied gases in bulk, the relevant requirements of fire protection propose additional requirements regarding additional systematic equipment.

Ninth is safe operation. Based on safety considerations, the FSRU specification provides technical requirements for cargo operation from three aspects: drawing data, safety and operation. FSRU cargo operations mainly include loading and unloading operations and gasification external operation. In terms of safety, the main consideration is personnel safety and structural safety, and this part provides relevant provisions of personnel protection, structural protection and safety management. In terms of personnel protection, we mainly consider the low temperature injury, which specifically points to relevant requirements in Rules for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk. In terms of structural protection, the relevant technical requirements are put forward based on accumulated experience of CCS in the use of LNG in ships. In terms of safety management, it is borrowed from China's Tianjin FSRU management experience.

CCS has completed the draft of Rules for Classification of FSRU, which is based on Rules for Classification of Offshore Floating Installations, Rules for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk, Rules for Materials and Welding, Rules for Offshore Oil and Gas Process and other existing CCS rules. Based on the characteristics of FSRU operations, it has carried out in-depth study in the hull structure, regasification system, transmission system and positioning and mooring system to work out existing technical requirements for the draft. The review meeting of Rules for FSRU Classification is scheduled to be held in December 2017. Industry experts and delegates will be invited to the seminar to exchange views.

Introduction of *CCS Guideline for Liquefied Natural Gas Fuel Filling Operation*

By Liu Tieying & Wu Shunping & Shi Guozheng

Compared with other common fuels, LNG has different risk points. According to the ship accident data analysis from 1965 to 2011, 70% of accidents are related to improper operation. Therefore, special safety considerations and correct operating procedures are required in the implementation of LNG fuel filling operation. In order to make LNG fuel filling operation more structured, efficient and safer, CCS has been actively engaged in the research work of LNG fuel filling mode, filling equipment, risk assessment and so on. Based on the existing filling experience of tanker, and shore station as well as related international standards, CCS has also compiled the first domestic Guideline for Liquefied Natural Gas Fuel Filling Operation which has gone into effect officially on January 1, 2017.

The Guideline is composed of seven chapters and three appendices, covering four kinds of LNG filling modes, and it further puts forward technical requirements such as equipment operation, safety protection, risk assessment, operation procedure and emergency response, adapts to the LNG fuel filling process safety control needs, provides technical reference for LNG fuel fillers, operators and related personnel so as to promote standardized, efficient and safe LNG fuel filling operation.

In the aspect of filling mode, the current domestic and foreign mainstream is by boat, barge, tanker or shore station. Among them, tanker filling is currently the most popular one and most of the Nordic LNG power ships adopt this practice. Ship fueling by shore station has been applied in Norway and ship fueling by ship has also been applied in Europe, but there are no examples of these two filling modes in China. Ship fueling by filling barges is the first LNG fuel filling mode in China and this method is especially suitable for inland waterways with large water level fluctuation in low-water seasons and high-water

Table 1 Advantages and disadvantages comparison of filling modes

	Tanker - Ship	Shore Station - Ship	Barge - Ship	Fuel Filling Ship - Ship
Advantages	good mobility	fixed, conducive to risk control	Suitable for natural river (water level) in inland river	good mobility
	low investment and operating costs	suitable for quick filling	fixed, conducive to risk control	high filling efficiency
	suitable for small scale	suitable for big scale	the position can be moved with the demand,	suitable for big scale
		suitable for channeling rivers		can be filled at sea
Disadvantages	filling in a small amount with low efficiency	need matched the port	high security requirements	poor operational performance in port
	security management complex	occupy shoreline resources	onshore supply is low and requires water supply	high investment and operating costs

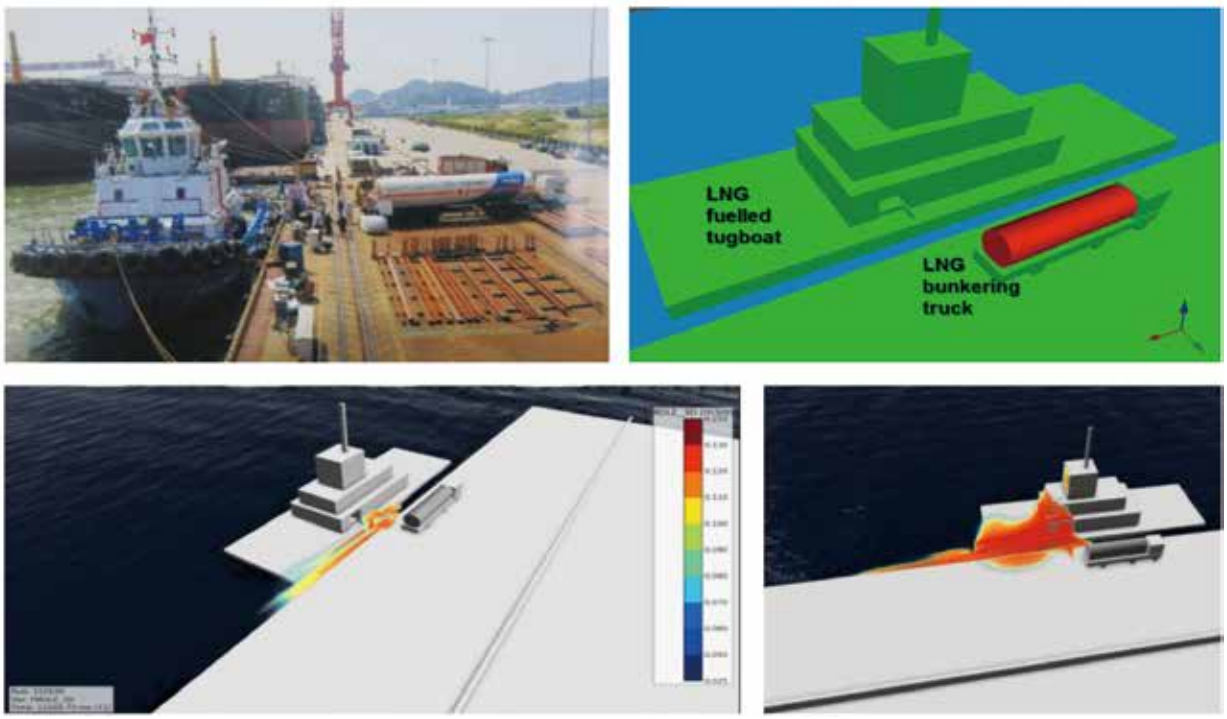


Figure 1 Risk assessment of LNG fuel filling by a tanker

seasons. Meanwhile, the barge position is relatively fixed, which is favorable to the risk control. The Guideline covers the above four filling modes, but filling modes in feasibility study stage such as the replacement of mobile fuel tanks, replenishment of offshore floating filling facilities are not included. The advantages and disadvantages of each filling mode are shown in Table 1.

In the aspect of filling equipment, the equipment involved in the filling of LNG fuel mainly includes safety equipment such as hose, filling arm, filling joint and other connecting equipment and pull-off valve, emergency disengagement device, ESD, fire protection system, and auxiliary equipment such as mooring

equipment, bumps, communication systems and so on. The guideline mainly puts forward the issues requiring attention for the daily operation or pre operation of equipment mentioned above.

In the aspect of risk assessment, in view of the LNG with low temperature is flammable and explosive, and the serious consequences of the LNG accident, the international LNG operating standards have put forward the risk assessment requirements. For the regular way of filling operation, that is, the four filling modes that meet the requirements of the guideline, only qualitative risk assessment is required, and for non-routine filling operation, simultaneous operations (currently not allowed in China) or other filling operation that are not in accordance with the requirements of the Guideline, quantitative risk assessment needs to be done. Based on the practical experience accumulated by CCS in risk assessment, this guideline further elaborates the risk assessment methodology on the basis of the international standard requirements, and specifies the criteria for hazard type and hazard calculation, disaster acceptance and risk acceptance criteria which makes it more operational. The risk assessment case is shown in Figure 1.

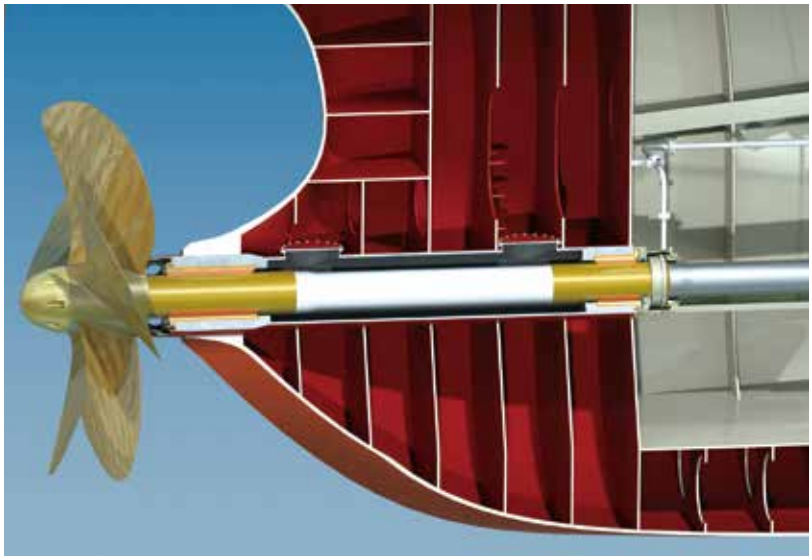
In the aspcet of safety distance, for LNG fuel filling operations, in addition to risk control of the object and the filling system itself, the area of the work site needs to be divided and the corresponding risk control should be carried out. Hazardous areas are areas where an explosive gas atmosphere may be formed. The electrical equipment used in this area shall be of an explosion-proof type. The restricted area refers to the range of combustible gases, which, when the gas / vapor reaches 50% of the minimum flammable lower limit in the atmosphere and for natural gas it means the zone in which steam concentration reaches 2.5% and the ignition source and personnel identification should be strictly controled. The guard area is to prevent the filling process from being disturbed. The area where the filling operation is disturbed. Among them, the scope of the restricted area will be different due to the different methods of analysis, and quantitative risk assessment can provide support to narrow the restricted area.

In the operating procedures, at present, the international common LNG fuel filling process is generally divided into three stages, preparation stage, filling stage and completion stage. On the LNG fuel filling operation, in addition to anti-leakage, anti-static and other safety considerations, the preparation group also focused on the BOG suppression of filling process, mainly by means of pre-cooling, the filling rate control and injection method alternation. Filling process, checklist, filling delivery form of the guideline is associated with the international standards and the preparation group refined the process in practice and experience at home and abroad, and further added the operation diagrams and flow charts of the various stages which make the Guideline more operational.

In terms of safety protection and emergency response, based on the low temperature of LNG, the guideline provide protection requirements for the operator and the hull structure, including personal protective equipment for the operator, medical equipment, catch tray set at places where valve parts, flanges, joints, etc. easy to produce leakage and water curtain protection for fuel filling process. Based on the flammable and explosive properties of LNG, the guide also set out the corresponding fire and explosion protection and management requirements for open flames control, anti-static, anti-stray current, portable electrical equipment and signal transmission equipment. The guide also provide emergency measures for accidental and personnel protection in case of LNG vapor clouds, pool fires and jet flame when LNG leakage happens during filling.

This guideline is the first domestic LNG fuel filling operation guide which fills the gaps in China LNG fuel filling technical standards, and it has reached the same level with relevant standards such as ISO, IACS and SGMF. The guideline, together with CCS Rules for Natural Gas Fuel Power Ships, Rules for Liquefied Natural Gas Fuel Filling Barge, Rules for Liquefied Natural Gas Fuel Filling Ships constitutes the series of technical standards for LNG ships.

New development of high temperature prevention technology for shafting alignment and tail bearing



With the trend of large ships and the diversification of arrangement of marine propulsion shafting system, as well as the application of green lubricating oil in recent years, the phenomenon of high temperature tail propulsion shafting bearings have become increasingly prominent, and bearing wear, or even damage happen frequently. In view of this, China Classification Society (CCS) in 2015 established a research group, and set up a tail shaft temperature ship database, combined with industry leaders, including Shell, Krub, wartsila (China), Wuhan University of Technology, Dalian University of Technology, Dalian Maritime University, 702 research institution and etc., to carry out in-depth study of the reasons and prevention of high temperature tail bearing.

The research results are used to guide the shipyard to improve the shafting alignment process, so that the conventional shafting design, especially the high temperature condition of the tail bearing using the environmental protection oil, could be alleviated greatly. Meanwhile, the Symposium on environmental protection lubricants and the new requirements for environmental protection, sponsored by CCS, has attracted attention and recognition from the industry. In addition, the International Association of classification societies (IACS) set up a dedicated research team, and CCS participated in the study as one of the four members of the working group.

I. Research results

CCS research group includes six sub tasks: research on influence of shafting led by hull deformation; research on influence of lubrication led by physical characteristics of environmental protection oi; study of inspection control of shafting alignment in construction etc. At present, the project team has completed the work as follows:

1. Study of the performance of environmental friendly lubricating oil, and the tail bearing high temperature problems led by using environmentally friendly lubricant, completed and released the "guide to implement the inspection requirements of the EPA environmental protection lubricating oi".

2. To carry out shafting alignment design and installation research, and include its research results into "Rules for Classification of Sea-going Steel Ships", 2017 amendment.

3. Study and analysis of the influence of ship hull deformation on shafting alignment, and being applied to large ore carrier and super large container ship.

4. Research on development of strain test method and test system. Strain measurement and analysis system has been developed. At present, the analysis system is being improved / validated.

5. Research on hydrodynamic characteristics of propeller under the condition of large rudder angle and its influence on shafting alignment.

6. Study of the dynamic model and characteristics of oil lubrication of tail bearing, determine the calculation model and method.

II. The reason and prevention of tail bearing high temperature

Tail bearing high temperature prevention is the design, techniques, manufacture and application, attention should be paid to reasonability. The main causes and preventive measures are:

1. Rationalisation of shafting alignment calculation design.

2. Ensure the boring accuracy of the tail tube steel casting.

3. Shafting alignment technology is reasonable and be implemented effectively. Especially the process control of the bearing load in the middle and later period.

4. Positioning accuracy of main engine and intermediate bearing. Too much attention is paid to the vertical position of the fulcrum of the shafting, while the importance of the transverse position of the shafting is neglected.

5. If ship uses the environmental protection oil, attention should be paid to the boring hole and the alignment guarantee, and to full grind during the trial period.

6. If reasonable ballast navigation in the shallow draft, large waves and other harsh sea conditions has not been conducted, it was prone to high temperature in case of big rudder angle in high speed. Therefore, according to the sea conditions and the draft, reasonable ballast and main engine turning speed control is the focus of consideration for crew under emergency.

From our experience in dealing with cases, it is important to ensure the accuracy of the tail shaft boring or the accuracy of the overall tail pipe after pouring.

III. Shafting alignment technical service provided by CCS

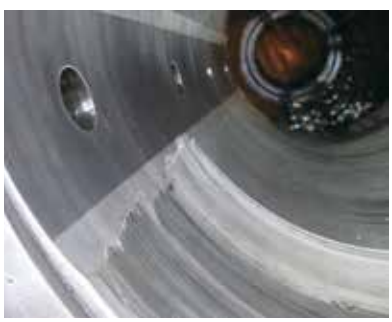
1. Approval and assessment of the shafting alignment calculation plan and review the relevant shafting alignment technology.

2. Inspect the shafting alignment of the ship using environmentally friendly lubricants and grant EAL additional notation. The EAL additional notation will be awarded to the new ship in accordance with the “guidelines for the inspection of environmental protection lubricants as required by the United States environmental protection agency”.

3. Analyze the cause of high temperature of tail bearing, calculate and evaluate the alignment adjustment plan of shafting. After the high temperature occurred to the tail bearing, the adjustment scheme of shafting alignment is evaluated on the premise of the accurate measurement of the data after the demolition and examination, and the evaluation opinions are given.

4. Implement audit and inspection of air type tail shaft seal modification and issue compliance statement.

5. Carry out technical training of quality control in shafting alignment. In order to meet the requirements of shipyards and shipowners, carry out technical training of shaft alignment quality control technology and tail bearing high temperature prevention technology.



Uninterrupted survey service for ships in operation

By Zhou Lu

The downturn of the shipping market continues and ship-owners are facing serious challenges. In order to help ship owners to confront the chilly market from the service perspective, CCS consistently improves its survey service capacity, efficiency and quality, strengthen the supervision of ship safety and environment protection, and ensure the quality of ship survey, maintenance and repair with a view to guarantee that shipping companies' economic benefits are not affected by safety accidents. In particular, CCS further improves its global survey service for ships engaged in global shipping from the perspective of the scope of global service, uninterrupted service provision and establishment of field technical service positions.

CCS continues to increase its service network in the world and provide uninterrupted service. Up to now, it has established survey stations in 36 cities abroad, covering the major global ports. Since April 2014, the European and American Center have taken on part of the in-service survey management responsibility of the Headquarters, in addition to its original in-service survey management responsibility. As the extension of the management function of the headquarters, they ensure that speedy and timely response could be provided to ships sailing in any time zone and in any sea area if any one of the email boxes receives an email from the ships.

In addition, CCS set up a 24-hour phone service in Beijing to handle emergency cases at any time. As an example in April 2017, a bulk carrier calling a port in Taiwan applied to open a hole in the hatch for cement loading and unloading due to loading requirements. Due to its limited time at the port, the ship was in urgent need of obtaining the techniques approved by the classification society to carry out the corresponding work. At 22:00, the ship contacted "24 hour service" for help, under the coordination of the headquarters and the technical guidance of the office in the administrative region, response was provided to the client at 1:00 am the next day. The hole was opened in advance and the time for ship loading and unloading was reduced. It can be said that economic efficiency can be improved by fast, timely and accurate technical services which can indirectly save customers a lot of time.

In terms of the establishment of on-site technical service positions, in order to further enhance technical service capabilities, CCS selected R & D experts to all offices to provide field guidance. For example, two ship structure experts from Shanghai Institute of Rules & Research were selected to be the technical manager of Southeast Asia Regional Center Singapore Branch in order to solve practical problems more accurately and to strengthen technical service capability of the Center. It has been proved that this practice has increased the timeliness, expertise and accuracy of the solutions provided by the region to address complicated problems. In the future, China Classification Society will gradually promote the establishment of the technical expert positions in overseas centers, forming the independent survey management and technical guidance team in the three major overseas centers of America, Europe and South-east Asia. Under the premise of being professional and accurate, CCS intends to change the mode of forwarding technical problems to the Headquarters which then coordinate technical centers to provide solutions with a view to streamline management procedure and improve service efficiency.

In addition, survey application can be confirmed within one hour, and in the first time coordinate the work of the survey unit to confirm the survey arrangement with shipowners and inform the name and contact means of the surveyors, this is the so-called 1 hour response service. At the same time, CCS also use WeChat communication group to facilitate communication when more than one party should be involved in providing survey service, including person in charge of the survey unit, department head and customer manager of the unit in the administrative region of the shipowner, the management department of the Headquarters and technical units will also get involved when necessary. This approach effectively solves the problem of time differences, rapid discussion via WeChat group can be held for urgent problems to reach initial solutions, so that shipowners can have the uniform technical solutions provided by CCS in the first time.

At the same time of strictly supervising the quality and safety of ships, CCS provides more efficient, accurate, and innovative technical and survey support which have played important role in assisting clients to restore their economic benefits.

CCS offshore mobile platform structural integrity management system

By Li Hongtao & Xu Jie & Li Ye & Ding Guolin & Yang Qingxia

Based on the idea of structural integrity management, CCS, together with China Oilfield Services Limited (COSL) developed a structural safety management system for offshore mobile platforms (hereinafter referred to as the system). This system with the structural finite element model and the framework of structural integrity management philosophy of data, evaluation, inspection plan and implementation as the core, can be used for platform safety management throughout the whole life cycle of design, construction, inspection, transformation to the daily operation, thus providing technical support for scientific decision-making, regular maintenance and inspection of the competent authority. It is of great significance for the safe operation and scientific management of the platform.

System module

The system is divided into three modules: the main system, the state data record system, web system.

The main system is divided into the following four subsystems: First, the feature data storage subsystem. This subsystem can be used to store the original construction of the mobile platform, the previous transformation of the drawings data, records and data. It can also be used to store the records of the marine environmental conditions of the workplace and platform work history thus to facilitate the user to accumulate, view, download platform related technical data. Second, the state data storage subsystem. This subsystem can be used to store records of previous thickness measurement, nondestructive testing and other test data so that users can easily understand the current state of the platform and focus on dangerous areas such as serious corrosion area and areas with large deformation. The finite element model of the platform is established by using the platform drawing data in the feature data storage subsystem, which is stored in the subsystem after the initialization process. When the platform evaluation analysis is carried out, the system can call the state data record system to obtain data such as the platform thickness and automatically update the platform finite element model while perform structural strength calculation based on the latest situation. All evaluation of the calculation model, load files, standardized check results, calculation reports and other information are stored in this subsystem so as to facilitate user inquiries. Fourth, the test plan generation subsystem. According to the specific platform structure and evaluation conclusions, the system can automatically generate inspection plans, including the specific test content and thickness plan for on-site inspection personnel to download and use. When the final test is completed and recorded into the state data record system, the system can automatically generate inspection reports and thickness reports for access and reference by users.

State data record system of a console layout database which uses data file transmission to communicate with the main system, is mainly used by the thickness measurement company and site monitoring staff. When you start a new thickness measurement project, the main system first generates a system configuration information file for a platform; the thickness measurement company should firstly install the system and then can use it to collect the current thickness data for the platform structure which would be submitted to the main system after the confirmation of the field monitoring personnel. When the main system gets this information it automatically updats finite element model of the finite element subsystem, while the main system also stores the platform of the previous thickness measurement data for users to understand the

corrosion history of platform components.

In the aspect of web system, through the Internet network you can access the system's server to query the basic platform information, drawings, assessment of calculation information, inspection plans, thickness measurement data, other testing and inspection information, environmental conditions and platform operating history and so on.

System function

First, achieve the structural integrity management of the mobile platform through the integration of the following four management procedures: data storage, calculation and evaluation, inspection plan and inspection implementation. Second, timely and comprehensively reflect the actual structure of the platform so as to find out the existence of structural safety risks through continuous, dynamic, intelligent structure assessment and inspection of the offshore mobile platform. Third, make safety evaluation of the mobile platform structure and provide emergency response measures in case of events (such as leg puncture, platform towing collision, anchor chain break, etc.). Fourth, through the anti-storm ability analysis function of the operational position, make evaluation of the platform to see if it can adapt to the new environmental conditions thus to help the platform managers to make rapid decisions. Fifth, achieve full life cycle structural safety analysis, tracking, monitoring and management of the mobile platform from the design, construction, inspection, transformation to the daily operation.

System characteristics

First, the rapid response capability of the finite element calculation. Based on the background data transmission technology, the system realizes the seamless docking of the thickness measurement data and the platform finite element calculation model, so that the finite element calculation can make quick response, and can timely and effectively analyze and feedback the conclusions and suggestions for repair and improvement. In case of emergencies, it can quickly make structural safety assessment and provide emergency response measures.

Second, standardization, normalization and high efficiency of the thickness measurement. The system provides a unified working platform for thickness measurement, and pre-customized one-on-one, personalized thickness range, drawings and reports, in this way to achieve the standardization, normalization and high efficiency of the thickness measurement.

Third, full life cycle structural safety management of the offshore mobile platform. As data of the platform such as original design, the previous transformation / repair of the drawings and the previous test, test data, finite element model, the previous calculation and analysis of information are all stored in the system and based on its various functions, the system can achieve full life cycle structure safety management of the mobile platform.

Fourth, good versatility for all types of mobile platform. The system is a versatile system for all types of platforms such as jack-up platforms, sit-bottom platforms, semi-submersible platforms, boat platforms, and any other structural models built by ANSYS.

In addition, since the development and after 6 years of application practice, the system has completed a total of more than 30 offshore mobile platform structure assessment and testing, more than 180 mobile platform workplace anti-storm analysis and more than 20 emergency response analysis. All these prove that the system is stable and reliable has brought huge economic benefits for the platform operators. Maritime mobile platform structural integrity management theory and structural integrity management system create a new model for offshore mobile platform structure safety management, and will effectively promote the safe operation and scientific management of the offshore mobile platform.

Classification survey service for natural gas fuel power preset

By Qin Leiyu & Guo Jian

As a relatively clean energy, liquefied natural gas (LNG) fuel is being used by more and more countries as a future substitute for petroleum. According to estimates, compared with the traditional fuel ship, the ship used LNG fuel can reduce the sulfur oxide emissions by nearly 100%, greenhouse gas emissions by 15% to 20% and particulate emissions by nearly 80%, which has great significance to energy efficiency and emission reduction from ships.

Although the industry has reached a consensus on the importance of LNG fuel promotion in reducing pollution emissions from ships, however, fuel economy is often the key factor for shipowners to consider. In recent years, the international crude oil price has declined, compared with low sulfur oil and heavy oil in marine fuel economy, LNG has little advantage in terms of fuel economy. Moreover, LNG filling and other infrastructures worldwide have not been completed and popularized, plus the downturn of the shipping industry, few owners at present would want to invest in building or transforming LNG fuel ships.

On the one hand, we are facing more and more strict mandatory environmental standards, on the other hand, the current construction of LNG filling facilities is not perfect and the price trend of LNG and crude oil is not clear, this puts shipowners in dilemma when it comes to deciding whether to choose LNG fuel for ships in construction.

LNG READY as a more flexible design program came into being. LNG READY refers to the ship which has taken into account using natural gas as fuel when it is in design, and the ship will use oil fuel power system in contruction and in operation, but plans to convert to LNG fuel power system in the future. This will not increase any cost of shipbuilding, but conveniently convert to LNG fuel ships with less cost when more severe environmental protection standards or obvious advantages of LNG prices appear in the future. If LNG READY is chosen, the shipowners would be in an invincible position, and address any changes without the need to change.

In order to meet the needs of the industry, China Classification Society (CCS) timely launched a classification survey service for natural gas fuel power preset, and issued a series of standards to support the technology, such as the “Guideline for natural gas fuel power system preset for ships”, “Rules for natural gas powered ships”, “Rules for structure and equipment for ships carrying bulk liquefied gas” and so on, and has included the relevant requirements into CCS rules.

Shipowners may apply for CCS's additional classification notation DFDR when they are in ship design and construction process. After confirmation by CCS plan approval and survey, they would be awarded the “conformity certificate of the natural gas fuel system preset for ships”. In the future, after the fuel gas system transformation, and CCS approval of meeting the “Rules for natural gas powered ships”, DFDR classification additional notation would be withdrawn, and shipowners would be granted the additional notation of Dual Fuel or LNG Fuel, thus simply and conveniently realize the conversion to LNG fuel ship.

Overlooking the whole world, the U.S. shale gas revolution brought breakthrough to mining technology, started the giant resources of shale gas and shale oil, making the U.S. natural gas production soared, and will also increase the global natural gas production in the future. Coupled with the construction and improvement of LNG filling infrastructures by various countries and ports at present, it can be foreseen that in the future, LNG fuel’s advantages in price, environment protection and popularity will exceed the traditional fuel, becoming the “mainstream of ship energy”. By adhering to the mission of “safety, environment protection, creating value for customers and society”, CCS is willing to get prepared together with our clients in order to meet the opportunities and challenges brought by this “future fuel”!