

Internal data
Free of charge and welcome to communicate

Partnership



■ Edited and Printed by CCS 2015.12 / The 18th issue in total



Technological Innovation Builds up Energy to 'Supply Front'

Technological innovation needs to work maximally in coordination with the industrial chain. CCS are willing to cooperate with shipping lines, designing institutions, shipyards, research institutions, universities and other related organizations, to form a technological coordination innovation system and to provide a strong technical support for shipping industries' transformation and upgrading.

The sixth issue in 2015

(The 18th issue in total)

(Internal data, free of charge and welcome to communicate)



Edited and Printed by CCS

Add: CCS Mansion, 9 Dong Zhimen
Nan Dajie, Beijing China.

Postcode: 100007

Tel: +86 10 58112206 / 58112218

Fax: +86 10 58112902

Websit: www.cssponline.com

E-mail: ccsinfo@ccs.org.cn

Weibo: <http://weibo.com/ccsponline>

Sender Object: Manager and technical staff

Printing party: Beijing Tiancheng Printing
Co.,Ltd.



Wechat public ID

Content

Dynamics

- 01 He Jianzhong, The Vice Minister of The Ministry of Transport Visited CCS European Regional Center
- 01 CCS President Sun Licheng Delivered Speech at Marintec China 2015
- 02 CCS President Sun Licheng Made a Keynote Speech at The 2015 International Maritime Annual Meeting
- 02 CCS Held New Technology Release Seminar
- 03 CCS Released The Rules for Intelligent Ships
- 03 CCS Signed Ship Intelligent Monitoring Agreement with Man
- 04 CCS Issued Scr Principal Approval Certificate to Csis 711 Institute
- 04 CCS Signed Strategic Cooperation Agreement with China Shipping Service
- 04 Business Exchange Meeting on Strategic Cooperation for 2015 Between CCS and Cosl Was Held
- 05 China Tanker Safety Forum (2015) Was Held in Nanjing
- 06 CCS Took Part in The International Oil Exhibition Held in Abu Dhabi
- 06 The Twenty-Third Executive Committee Meeting of Asian Association of Classification Societies Was Held in Indonesia
- 07 CCS and Norway Gexcon Company Jointly Organized The "Twenty-Sixth Global Flacs Software Users Annual Meeting"
- 07 2015 Annual Meeting of CCS Shanghai Regional Committee Was Held in Shanghai

Technology Tendency

- 08 CCS Completed Key Technical Research on River-Sea Ships and Proposed The Concept Ship Type

Standard Research

- 12 The First Rules For LNG Refilling Ships in The World Was Released
- 13 CCS Will Issue Guidelines for Design and Inspection of Polar Ships

Servicing Products

- 15 CCS Provides Considerate Services for Ballast Water Convention Implementation
- 17 Mser: The First Product of Offshore Mobile Platform with Structural Integrity Technology
- 20 CCS Released 3D Non-Linear Hydro-Elasticity Analysis Software for Large Ships

He Jianzhong, the Vice Minister of the Ministry of Transport Visited CCS European Regional Center

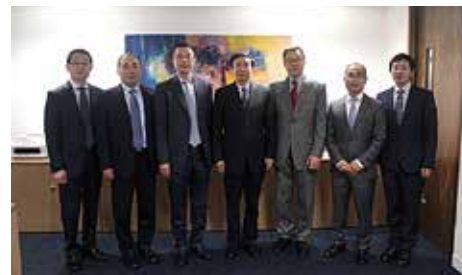
On Nov. 11th, 2015, taking the opportunity of attending the 29th IMO Assemble, Mr. He Jianzhong, the Vice Minister of the Ministry of Transport, paid an inspection visit to CCS European Regional Center and held talks with all the staff. He was accompanied by Mr. Yang Zan, Chinese maritime counselor to the United Kingdom, Mr. Chen Aiping, the Director General of China MAS, and Mr. Zhu Kai, the Chief Engineer of CCS.

Mr. Zhang Hui, the Director of CCS European Regional Center gave a report on the management structure and development history of the Center, the business situation of the region as well as expectations for the future. Mr. Zhu Kai introduced CCS work on advanced technical research, high-tech ship type development, the role CCS played in international maritime affair, and technical cooperation with LR.

After hearing the report and introduction, Mr. He Jianzhong spoke positively of the achievements CCS made in oversea market and was glad to see that the business of the Center is still maintaining robust development under the current external environment. He pointed out that expanding

overseas market should be the main direction of CCS development in the future. The improvement of technical capacity and service level

are the key to realize overseas development strategy. CCS should keep targeting at the first rank classification societies, incessantly narrow the distance with them, and realize quantum leap development in research and development of large ships and energy-saving and environment protection ships. In addition, CCS should play greater role in providing technical support to strengthen the voice of China in the framework of IMO. He emphasized that CCS development depends on a professional, high-end talent with high comprehensive capability. It is important for CCS to train and retain talents and develop relevant policies to this end.



CCS President Sun Licheng Delivered Speech at Marintec China 2015



The 2015 China International Marine-tech Academic Conference and Exhibition (the 18th Marintec China) was opened on Dec. 1st in Shanghai International Exhibition Center. As IACS vice Chairman, Mr. Sun Licheng, the President of CCS attended the exhibition and gave a speech on behalf of IACS entitled "Toward green- IACS contributions in technology and innovation". Mr. Sun explained the opportunities and challenges the global maritime industry and classification societies face from the aspects of promoting green and sustainable development of shipping industry, oceanic ecological environment protection and global scientific and technical innovation. He indicated IACS' wishes to cooperate closely with the industry to develop safe, green and efficient technical standards to promote the robust and sustainable development of the shipping and shipbuilding industry.

CCS President Sun Licheng Made a Keynote Speech at the 2015 International Maritime Annual Meeting



On Nov. 5th, 2015, CCS President Sun Licheng attended the 2015 International Maritime Annual Meeting in Guangzhou and gave a keynote speech entitled “Accurately grasp the direction of technical development, improve the value of production cooperation of the industry”. He

pointed out that the “cooperation and mutual benefits, connection and intercommunication” ideology of the “one belt and one road” strategy brings opportunities for the production cooperation of the inter-regional industries. The international production cooperation with technology as the leading force advocated by the national strategy will be combined with emerging technologies, such as internet tech, renewable energy, 3D print and big data to realize the intensive integration of the new generation information technology and shipbuilding and shipping industry and constitute new production mode, industry pattern, business mode and new economic growth points. He indicated that as the third-party technical service body, classification society should play to full its advantages of technical standard development, platform and international service network to help realize the production cooperation of the related industry in nations along the “one belt and one road” and to do well the service and support work for the implementation of the “one belt and one road” strategy.

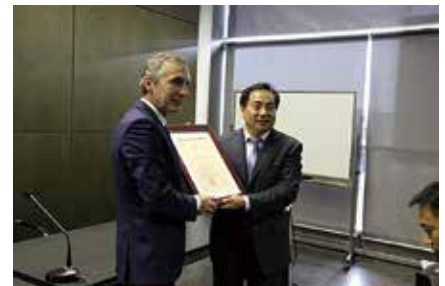
CCS Held New Technology Release Seminar

On Sep. 2nd, 2015, CCS held new technology release seminar during the 18th Marintec China and presented the latest achievements in intelligent ship, new ship type technology and CCS solutions, as well as hot topics in the shipping and shipbuilding industry.

First, CCS gave an interpretation of the newly released Rules for Intelligent Ships, and a detailed introduction of application of CCS intelligent ship technology, such as EOM and software certification guidance; second, discussions were held on the analysis of comprehensive solutions and hot topics related to NO_x, SO_x emission standards, low-sulfur fuel usage, SO_x waste gas cleaning system and NO_x waste gas post processing system, and LNG READY solution was proposed; third, the 3800TEU new type container ship for the “one belt and one road” southeast Asian route was introduced; fourth, large vessel 3d linear hydro-elastic analysis and 3d non-linear hydro-elastic analysis software was introduced. COMPASS-WALCS-LE/NE is mainly used to calculate linear and non-

linear movement and wave load of different kinds of ships as well as the effects of whipping on wave load and structural strength of large ships; fifth, Rules for LNG Refueling Ships was released and basic viewpoints of CCS about LNG refueling ship and STS refueling were elaborated.

At the seminar, Thierry Clément, the Manager of GTT business development gave a speech on “solutions for small LNG refueling ships”. After the speech and discussion, CCS deputy chief engineer, Chen Shi awarded the “AiP certificate for refueling system of LNG refueling ship” to GTT. This is the first AiP certificate CCS awarded to the industry for LNG refueling system.



CCS Released the Rules for Intelligent Ships

CCS officially released the Rules for Intelligent Ships during the 18th Marintec China, which will be put into effect on Mar. 1st of 2016. The Rules is based on the technical and research outcome of CCS in recent years and have taken into full consideration of the experience of intelligent ship application both at home and abroad and the future development trend of intelligent ships.

Rules for Intelligent Ships is composed of intelligent navigation, intelligent ship hull, intelligent engine room, intelligent energy efficiency



management, intelligent cargo management and intelligent integrated platform. As for the intelligent degree, standard makes requests on intelligent function from the aspects of ship data awareness, analysis, assessment, diagnose, prediction, decision support and automatic response.

Rules for Intelligent Ships mainly includes:

- (1) Purpose and applications of intelligent ships;
- (2) Definition, goal and functional requirements of intelligent ships;
- (3) Application principle of new technology;
- (4) Requirements for computer system and software development
- (5) Additional notation and notation of function for intelligent ships: i-Ship (Nx, Hx, Mx, Ex, Cx, Ix) ;
- (6) General requirements, functional requirements, technical requirements, inspectional requirements and personnel requirements of intelligent ships

Due to continuous development of intelligent ship technology, the Rules for Intelligent Ships is open for further improvement. The rules will be upgraded and enriched with the development of intelligent ship technology in the world and continuously incorporate new application achievements to improve and detail the existing technical requirements.

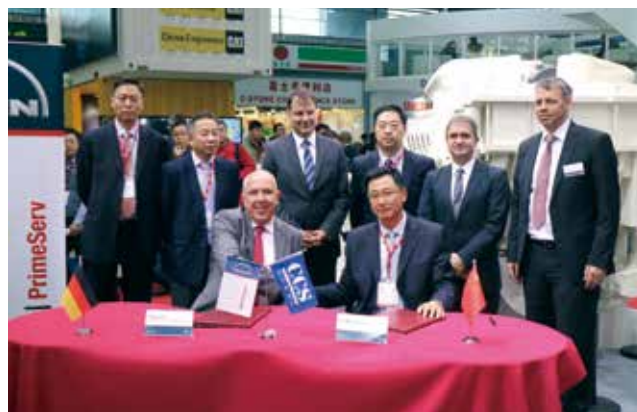
CCS Signed Ship Intelligent Monitoring Agreement with MAN

On Sep. 1st, 2015, on the opening day of the 18th Marintec China, CCS signed the ship intelligent monitoring agreement with MAN. CCS vice president, Sun Feng and board member of MAN, Wayne Jones signed the agreement on behalf of each side.

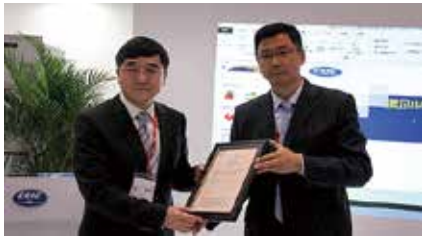
Based on the technical cooperation framework agreement signed by CCS and MAN in 2013, this agreement is a specific cooperation in the field of intelligent ship. Intelligent ship is regarded as an important development tendency in the ship field. Diesel engine on-line monitoring, fault diagnosis, and condition maintenance contribute to improving ship operation efficiency and reducing costs. The agreement will strengthen cooperation between CCS and MAN in the field of intelligent ship in next few years, including data exchange, on-line monitoring and services.

In addition, CCS Vice President Sun Feng has also issued

software approval certificate and the optional SCR design approval certificate.



CCS Issued SCR Principal Approval Certificate to CSIS 711 Institute



On Sep.2nd, 2015, during the 18th Marintec China, CCS issued to CSIS 711 Institute

the first SCR principal approval certificate and EIAPP to the diesel engine which complies with IMO Tier III. SCR system is the main technical means to comply with IMO Tier III requirements for diesel engine NOX emissions. For the ease of clients, CCS released principal approval service, a new type approval mode for the application of SCR system.

CCS Signed Strategic Cooperation Agreement with China Shipping Service

On Nov.2nd, 2015, CCS signed strategic cooperation agreement with China Shipping Company in Shanghai. CCS Vice President, Sun Feng, China Shipping Company Vice President, Xu Tinghui signed the agreement. CCS President, Sun Licheng, Sinotrans CSC board chairman and party secretary, Zhao Huxiang attended the signing ceremony.

China Shipping Service is a shipping service operation and management platform established by Sinotrans CSC, which takes charge of unified management and integrated development of shipping services of groups. China Shipping Service leads a dozen of specialized subsidiaries, which are respectively in charge of international dry bulk transportation, oil product transportation, roll-roll shipment transportation, container transportation, break-bulk cargo transportation and supplementary

services. It is the only shipping enterprise that is capable to provide high-sea, inshore and Yangtze River transportation services in China. At present, this enterprise owns or controls more than 300 ships, total transportation capacity exceeds 1200 million tons, annual transportation capacity exceeds 120 billion tons. CCS will cooperate with China Shipping Service in fields of information exchange, technical support, new building ship type selection, energy conservation and emission reduction technical standards. In the years to come, CCS, with its own capability and the technology at home and abroad as well as information resources, will support China Shipping Service to realize diversified and comprehensive operation including repair, shipbuilding and shipping to expand its scale and increase its strength.

Business Exchange Meeting on Strategic Cooperation for 2015 Between CCS and COSL Was Held

China Classification Society (CCS) and China Oilfield Services Limited (COSL) held the "annual business exchange meeting on strategic cooperation for 2015 between CCS and COSL in CCS headquarters, Beijing. Mo Jianhui, vice president of CCS and Li Yong, President of COSL co- chaired the meeting. On the meeting, the two sides reviewed the implementation of the 2015 annual strategic cooperation plan, and

mainly discussed the technology focus of projects under construction, and development of new technology requirements and regulation and etc.

The both sides gave full recognition to the implementation and effect of 2015 annual strategic cooperation, and put forward specific requirements for key work in 2016 taking into account the urgent problems to be resolved in COSL equipment development.

In 2016, CCS will provide full support to COSL, which represents the Chinese offshore oil development services industry, enhance the overall technical management of marine oil development services, and realize the goal of becoming world first-class offshore oil development service providers by means of its ability and service experience, as well as

technology and information resource. COSL, by continuing to develop its own business in 2016, will give CCS substantial support to achieve CCS' scale and strength growth in the development of offshore oil development service equipment and test business, so that CCS will play a greater role in the industry.

China Oil Transportation Safety Forum (2015) Was Held in Nanjing

On October 21, 2015, China Oil Transportation Safety Forum (2015) with the theme of "safety, green, innovation and development" was opened in Nanjing, Jiangsu Province. More than 160 representatives from overseas and domestic oil companies, oil terminals, oil tanker transport companies, shipyards, Design Institutes, product factories attended the forum, and held joint discussion on oil transportation safety and development.

This forum, co-hosted by the China Classification Society (CCS), China Sinotrans Group Co., and undertaken by NJTC, China National Offshore Oil Corporation, China ship survey magazine, aims to further strengthen communication among related parties of tanker safety chain, promote China to take part in establishment of safety standard of international oil transport industry and to express views, ensure national energy transportation safety and prevent pollution of the marine environment. The delegates actively exchange views and held discussion on issues i.e. the latest development, the

best practice of oil transportation safety etc.

On the opening ceremony, Zhao Chongjiu, the Chief Engineer of the Ministry of Transport (MOT) made a keynote speech entitled "strengthening safety management, creating new situation for oil transportation development". He proposed to strengthen major oil spill emergency response capabilities for maritime transport, to create a green, intelligent oil industrial chain, to promote function of the Yangtze River golden waterway, and to build a modern seafarers team. Sun Licheng, CCS President made a speech entitled "join hands to create a safe, green, intelligent transportation industry chain", advocating the industrial parties to strengthen cooperation, to innovate forum mode, strengthen safety responsibility, strengthen multilateral communication and cooperation between domestic industry and international organizations, and actively maintain oil transportation safety.



CCS Took Part in The International Oil Exhibition Held in Abu Dhabi

The eighteenth session of the International Petroleum Exhibition (ADIPEC) was held in the International Exhibition center, Abu Dhabi, the United Arab Emirates on November 9, 2015. Mo Jianhui, vice president of CCS led a delegation to the exhibition, and introduced the latest technology development and marine service product and service ability of CCS. During the exhibition, CCS delegation also visited important customers including the Abu Dhabi national oil companies, Qatar national oil companies, Oman national oil companies, Abu Dhabi national oil field company, SUD TUV Middle East companies and so on. This exhibition is the largest one held by ADIPEC in 32 years, more than 2000 oil, natural gas, marine offshore engineering, maritime and shipbuilding industry enterprises and organizations from more than

120 countries participated in this exhibition (including 15 national oil companies and 15 International Oil Co).



The Twenty-Third Executive Committee Meeting of Asian Association of Classification Societies Was Held in Indonesia



The twenty-third Executive Committee meeting of Asian Association of Classification Societies (ACS EC) was held in Indonesia on October 29~30, 2015. Ludijanto, the current chairman of the ACS as well as the president of Indonesia classification society hosted the conference. Zhu Kai, vice president and chief engineer of China Classification Society (CCS) attended the meeting. The meeting

discussed the ACS Charter and amendments to procedures, deliberated the technical work of ACS. The members of ACS considered that the technical work of ACS has been continuously enhanced. ACS held a seminar on ACS technology in Vietnam this year, which was aimed to promote Asian maritime industry to implement the new rules and regulations of IMO.

CCS undertook the chairman work of ACS Environment Working Group, actively led and coordinated member positions in implementing Hongkong Convention and ballast water management convention, and played a positive role in cooperating with Asian maritime industry and promoting implementation of Asian maritime convention. CCS also participated in the ACS technical seminar, and did a profound interpretation to convention implementation by integrating publicity relating to CCS technical service product. At the same time, CCS also undertakes the work of ACS technical officials, effectively promotes and ensures the effective development of ACS technical work by submitting technical work report to the conference.

CCS and Norway Gexcon Company Jointly Organized The “Twenty-Sixth Global Flacs Software Users Annual Meeting”

On November 3 to 4, 2015, the twenty-sixth global FLACS software users annual meeting, co-hosted by CCS and Norway GexCon branch was held in Shanghai. This is the first time for Asia to hold such meeting.

FLACS user annual meeting is a leading academic application and exchange meeting in the field of international gas safety, aiming at strengthening the communication and exchange on oil and gas safety with a view to protect the safety of the oil and gas industry. A total of 120 experts and scholars in gas safety area from China, Norway, Russia, Indonesia, South Korea, India, China Hongkong and China Taiwan attended the meeting. In the meeting, experts and scholars gave speeches on some industrial forefront problems such as the refilling safety for LNG ship, safety design of FLNG, safety assessment of land LNG project, and etc.

As the world's leading gas risk assessment software, The three-dimensional computational fluid dynamics software, developed by Norway GexCon company, represents the industrial standard in the field of gas leakage,

diffusion, fire and explosion simulation, and has been widely used in the world.

CCS and GexCon will conduct a full range of cooperation in the field of quantitative risk assessment technology research and development and service, and will devote to protect the safety of China's oil, gas, hazardous chemicals industry.



2015 Annual Meeting of CCS Shanghai Regional Committee Was Held in Shanghai

2015 annual meeting of China Classification Society (CCS) Shanghai Regional Committee was held in Shanghai branch on November 20, 2015. The committee members from the maritime authorities, shipping companies, shipbuilding companies, marine equipment enterprises and financial enterprises in Shanghai participated in the meeting.

Yang Yong, party secretary of CCS attended the meeting and delivered a speech. He firstly expressed heartfelt thanks to the strong support provided by all members of the Shanghai District Committee units for a long time, briefly introduced the latest situation of CCS in 2015, analyzed the current opportunities and challenges faced by shipping market, hoped committee members from Shanghai regional units to seize the national strategies such as “one belt on road”, “oceanic power” and etc., and development opportunity of

establishing Shanghai free trade zone, contributing our own strong strength to enhance core competitive ability of shipbuilding and shipping industry in China.

Members and representatives of the meeting had a heated discussion about current international and domestic situation and industrial hotspots and difficulties, around accelerating CCS to establish the first-class international class classification society, and promoting the development of related industries, and put forward valuable suggestions and comments. Representatives expressed that they would cooperate with related industries with the greatest sincerity in the future, seize the current development opportunities, actively resist the impact led by financial crisis, international new standards, and new conventions, jointly promote China to be the national marine and maritime power.

CCS Completed Key Technical Research on River-Sea Ships and Proposed the Concept Ship Type

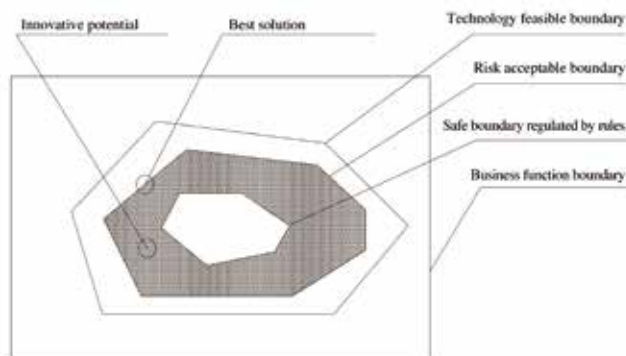
By Liu Guangming & Wang Zhifang

The implementation of “One Belt and One Road” and “National Strategy of Yangtze River Economic Belt” has deeply promoted joint development of economy along Yangtze River and the coastal areas. A large sea-river logistics channel has been formed with the triangle Yangtze River economic area as the dragon head, the vast hinterland as the dragon body and the Chengdu-Chongqing economic circle as the dragon tail. Sea-River shipping integration has become the new normal of Yangtze River shipping development.

In order to meet the requirements of development of Sea-River ships, the Yangtze River shipping bureau, Zhoushan municipal government and CCS have signed cooperation agreement at the beginning of the year and set up the joint Sea-River ship research project group. Based on wind and wave conditions of Zhoushan water area and by applying the risk-based design concept, the project group conducted monographic study, which covers ship load line, ship

structure and fitting-out, marine engine, electric appliance, material and welding, ship safety and pollution prevention.

Taking into account the differences between river and sea navigation conditions, CCS research group adopted the research plan integrating theoretical analysis, experimental test, and real ship verification. Based on collection of mass data, the project group firstly made use of the specific hydrologic conditions and wave environment data to forecast, analyze and compare wave loads of sea-river ships, and has carried out series of special research in the fields of wave load, structural strength, stability, load line and equipment. This filled the void of sea-river ship technical research, met the requirements of Zhoushan sea-river shipping service center construction and provided technical support to the development of sea-river ships. CCS is now in the process of compiling Temporary Provisions for Inspection of Sea-River Ships and Rules for Classification of Sea-River Ships.



Picture 1 Risk-based Ship technical assessment criterion

Three specific conditions

1. Specific sea area-East China Sea area
2. Specific routes-Route1,2
3. Specific ship types-Bulk carriers and container ships

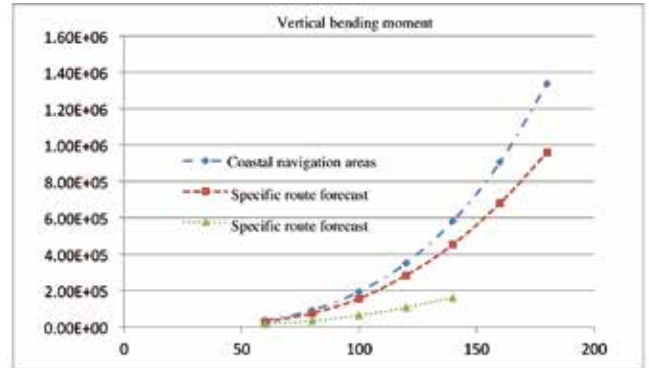
Three compilation principles

1. Load first

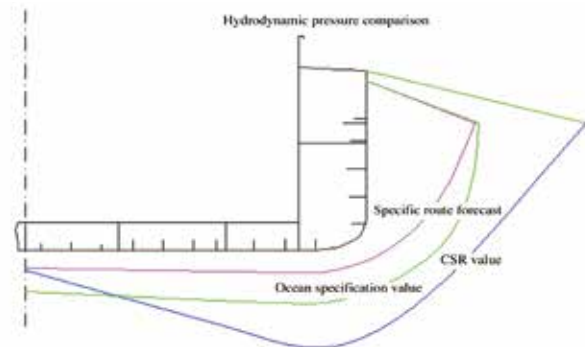
The first step of structural design is to determine reasonably all kinds



Picture 2 Specific sea area and specific route



Picture 3 Vertical bending moment comparison



Picture 4 Hydrodynamic pressure comparison

of dynamic loads and load combinations acting on hull and local structures;

2. Integrate mathematical forecast, theoretical analysis and experimental verification

A new technical method which integrates mathematical forecast, theoretical analysis and experimental verification.

3. Comprehensive assessment, which takes economical efficiency into consideration.

Coordinate safety, economical efficiency and adaptability.

Three monographic studies

1. Load and structural strength

Based on the principal of "Load First", determine the technical requirements to assess structural strength according to wind and wave conditions along specific route and taking into account ship type features.

① Wave load

Aiming at specific sea area of Zhoushan, wind and wave data has been collected in the last twenty years from State Oceanic Administration, and CCS three-dimension wave load forecasting software was used to forecast the wave load of series ships.

The laws of forecast load variation are consistent with ocean specification; load values are less than the requirements of ocean specification of coastal navigation area.

② Strength criterion

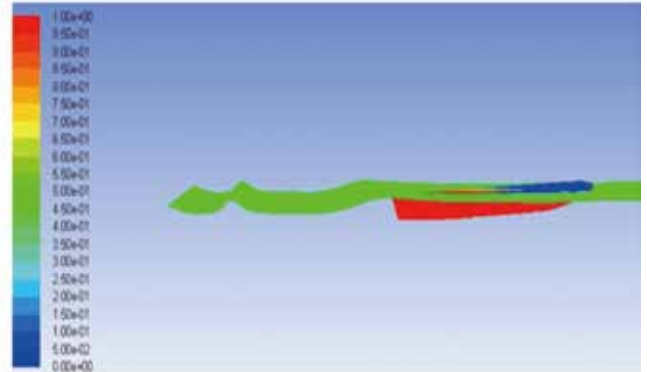
Reliability analysis method of "water level 1 method" based on load and strength eigenvalues obtained at a certain probability level is used to assess structural strength. Structural strength criterion system is established combining with real-ship verification. Finally, the component size of sea-river ship is between that of ships operating in inland water A-level navigation area and ocean specification coastal area.

2. Ship performance

Based on wind and wave conditions of specific routes, requirements for ship stability, load line and manoeuvrability.



Picture 5 Real-ship stress test



Picture 6 Numerical forecast of green water

① Stability and load line

Sea-keeping software is used to forecast ship shake. Roll angle is modified taking into account model test. The minimum freeboard is modified with reference to the experience of international load line convention research method, and taking into account the model test.

② Manoeuvrability

Aiming at sea-river ships operating on specific routes, the comprehensive ship manoeuvrability forecast system is established; in combination with numerical simulation, CFD simulation and system identification, criterion for ship manoeuvrability requirement was proposed.



Picture 7 Model experiment

3. Electromechanical equipment

① Principle of equipping devices

The general principle is to maintain certain residual power of the equipment which safeguards ship safety in cases when some of such equipment fail, in order to ensure the capability of the ship to make return voyage, call at ports and punch the beach. The general principle to equip:

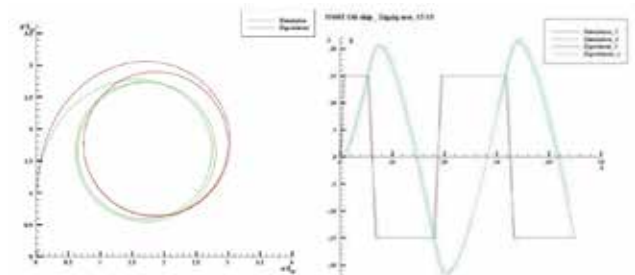
- (1) Whole ship standby
- (2) Self rescue and rescued by others
- (3) Taking single risk accident into consideration

② Requirements of equipping devices

Put forward requirements for equipping river-sea ships.

Suggestions for device optimization are mainly reflected in:

- (1) Stand-by pumps or equipping stand-by pumps



Picture 8 Manoeuvrability forecast

- (2) Equipping bilge pump
- (3) Equipping air compressor and air bottle
- (4) Starting equipping storage battery

Introduce “concept sea-river ship for specific route: 20000 ton bulk carrier”

Based on key technical researches, CCS followed the principle of “appropriate for navigation, appropriate for the port and appropriate for the cargo”, and conducted further researches on ship type optimization, seakeeping, green technology and economic analysis. CCS cooperated with ship owners and design companies and developed “safe, environmental friendly, advanced and efficient” concept ship. The “concept sea-river ship for specific route: 2000 ton bulk cargo ship” has been already completed. This ship is of great economic performance.

For detailed expected indexes see table 1. CCS is now developing concept sea-river container ship for specific route.



Picture 9 The concept sea-river ship for specific route: 20000 ton bulk carrier

Table 1 Economic indexes of 20000 ton bulk carrier

Economic efficiency \ Ship type	Concept ship type	Excellent ship type	Data comparison
Carrying capacity coefficient	0.81	0.78	up 3.85%
Unit power load capacity	6.88	5.73	down 20.07%
Kiloton-Kilometer fuel consumption	1.32	1.60	Down 17.5%
EEDI	5.439	6.828	Down 20.34%
Ton cost	0.24	0.34	Down 29.41%
Ton freight rate	8.12	10.29	Down 21.09%
Dynamic payback period	6.14	9.536	Down 35.61%
Static payback period	5.07	7.233	Down 29.9%
Internal rate of return	13.37%	7.59%	Up 76.15%

The First Rules for LNG Refilling Ships in the World Was Released

By Cheng Shiyao

In recent years, with the rapid development of inland ship transportation in China, and increasing of the fuel consumption, fog and haze day appeared frequently, PM2.5 and other serious environmental problems have become increasingly prominent. With the projects such as “gasification of the Yangtze River”, “Yangtze River Green Logistics Innovation Project” and other projects being gradually promoted, as a kind of economic, green, safe energy, liquefied natural gas (LNG) gradually becomes known to people, and becomes the first choice of green energy for ships in the future recognized by industry. On September 29, 2014, China MSA, together with the National Energy Bureau issued the notice on “Issuing the liquefied natural gas powered ship propulsion application program of work promoted by National Energy Bureau of the People’s Republic of China and Maritime Safety Administration “. The notice clearly requires the strengthening of the research of mobile refueling ship, and China classification Society (CCS) undertook this project. At the same time, CCS set up the project aiming at LNG filling ship in 2014 and carried out the key technology research of it.

As a new ship type, Liquefied natural gas (LNG) refilling ship has distinct characteristics from the LNG transport ship.

The specification of LNG filling ship developed compiling work based on the theory of risk analysis and the concept of goal-based standard. The specification was divided into 9 chapters from the perspective of use of convenience, which includes classification and inspection, ship layout, cargo envelope system, charging system, power system, monitoring, alarm and safety system, electrical equipment, fire and personnel protection, operation and training requirements, etc.

The Interim Provisions on the legal inspection of liquefied

natural gas fuel filling vessel carried out the compiling work based on risk analysis and goal-based concept. The provision was divided into 7 chapters, which mainly contains inspection, certification, shipping arrangement, cargo envelope system, charging system, monitoring, alarm and safety system, electrical equipment, fire-fighting etc.

The rules for LNG refilling ships, which will be issued by CCS, is the first such rules in the world. In the process of preparing the rules, CCS did quantitative risk analysis to LNG fuel filling ship and operation process and put forward the corresponding risk control measures from safety, reliability, operability of technical requirement.

In this study, CCS carried out in succession layout research of LNG refilling ship, LNG cargo containment system requirements, requirements of research, LNG and refilling systems and equipment technology requirement. The whole research process is a combination of theoretical research and experimental research.

The development of the rules is not only the latest initiatives of focusing on the development of green, clean shipping, but also the implementation of the notice on promoting application of LNG in waterborne industry issued by MOT. It has positive effect on safe development of Chinese LNG refilling. Meanwhile, it also would promote the development of Chinese marine cryogenic equipment.

The rules for LNG refilling ships is suitable for ships engaged in inland, coastal and international navigation. At present, the 200 m³ inland LNG refilling ship, ordered by CIC Energy Corp, is the first LNG refilling ship in China, which is classified and surveyed by CCS and met the technical requirements of CCS.

CCS will Issue Guidelines for Design and Inspection of Polar Ships

By Ding Shifeng



The polar region is attracting more attention of the international community as it enters the 21st century and is seeking to participate in the opportunities for future exploitation of the polar region to promote the expected growth of navigation in the polar area. However, the unique geographic location and the special environmental conditions, such as ice and cold weather as well as other conditions that should not be under-evaluated are potentials for additional risks. Therefore, IMO has issued the International Code for Ship Operation in Polar Water Areas to protect the fragile ecological environment of the polar area. In order to promote implementation of the Code, CCS developed the Guidelines for Design and Inspection of Polar Ships.

Main content

Provide basic information about navigation in polar areas

and polar ships to customers. Introduce basic environmental information and data about polar area. Explain regulations and laws related to polar area navigation.

Provide guidance for ship inspection and certification. Comprehensively explain regulations and requirements about polar ship inspection, certification, workflow and assessment method.

Summarize regulations and design features of polar ships, such as material selection, coating requirements, structure, layout, rudder, ship accessory which are necessary to ensure security and reliability of ships sailing in ice and cold areas.

Explain regulations, laws and related methods to check ship stability from the perspectives of intact stability and damage stability.

Explain regulations about main engine, propulsion unit, steering engine and deck to ensure normal functions and equipment of good condition. Point out technical key points in design process and collect typical cases.

Explain regulations and laws from aspects of fire-fighting and live-saving to ensure persistent effectiveness of all the equipments, and then propose technical essentials and matters needing attention of design and layout of safety equipments.

Polar Ship User Guide is necessary to ensure navigation safety in polar area. This guide introduces detailed guide compilation methods, including guide composition, operational capacity and restriction, risk management.

Important information are collected in appendices, such as ice class comparison table, POLARIS, polar ship certificate form, ice

pool experiment, operation manual sample, ship operation assessment report sample, special area requirements of northeast route/northwest route/south pole water area, which are convenient for users to better understand and use the guide.

■ Features and highlights

This guideline can be used to reduce accidents and promote environmental protection. With risk method, it provides technical guidance about ship structure, equipment, operation, training, search and rescue, environmental protection and some other aspects of polar ships.

On basis of risk analysis, find out risk points of polar region navigation, conduct researches on technical essentials of polar ship design and inspection, pointedly propose technical scheme to reduce risks.

Systematically explain technical points of polar region navigation, provide guidance for ships sailing in polar water area to meet requirements of international conventions, coastal state regulations and classification society laws.

Aiming at principle requirements of polar region regulations, make technological breakthrough and provide all-sided technical support to polar ships, including:

Comprehensively introduce technical requirements about hull, material, stability, marine engine, fire control, lifesaving of polar ships, provide guidance for ship design and inspection.

Systematically explain manual compilation of polar ship operation, provide sample and technical support for polar region navigation;

Provide technical method for operation assessment of ships sailing in polar water area, provide sample report and lay foundation of polar ship assessment;

Combining with ship inspection regulations of our country, propose inspection method, inspection range, inspection procedure



and inspection documents of polar ships, provide a basis for polar ship inspection;

■ Significance

This guideline is intended to provide guidance for implementation of CCS ice class rules and IMO polar code, reflected mainly in aspects below:

Provide technological means for polar region regulation implementation;

Provide technical guidance for design institute to design polar ships;

Provide technical basis for inspection unit to inspect polar ships;

Provide technical support for shipping companies;

Provide reference for research institute to conduct research on polar ships.

■ Application scope and object

Application scope: polar ship design, polar ship inspection, navigation in polar areas, polar technical research.

Application object: competent authorities, classification societies, design institutes, shipyards, shipping companies, colleges and universities.

CCS Provides Considerate Services for Ballast Water Convention Implementation

By Wang Huifang



On November 23 to December 2, 2015, the IMO 29th Assembly was held in London. On November 24, the representatives from Indonesia submitted the paper to ratify ballast water convention to IMO Secretary General. The IMO secretariat expressed that this means the total tonnages of merchant ships in signatory countries have reached or exceeded 35%. Meanwhile, IMO also expressed that it would carefully verify the data provided by professional body. If confirmed, the convention would be officially implemented on November 24, 2016.

On the meeting of November 25, the secretary general of IMO reiterated in evaluating the MEPC report: We must verify the world fleet data on the day of November 24, 2015 to confirm whether the

Convention has reached entry-into-force condition.

The industry is invited to note the Convention's implementation process and get prepared. CCS will provide technical service for the industry to implement the ballast water convention.

As of September 2015, 44 countries, with a total of 32.86% of the world's total tonnage of merchant ships, have ratified the Convention, the condition for implementation has not been reached (30 countries, 35% gross tonnage). At the same time, the United States put forward the requirements of the ballast water treatment system which are different from the IMO requirements. Therefore, when and how to install the appropriate equipment has become the issue most concerned by owners.

CCS provides timely and strategic recommendations on installing and inspecting the ballast water treatment system by analyzing the latest development of the ballast water convention, the requirement of regional (United States) ballast water control, change of PSC management mode and existing problem of implementing the ballast water convention at present. At the same time, CCS puts forward appropriate arrangement and maintenance method by combing and aiming at different ballast water control system type in current market. Especially, CCS put forward installation and device

suggestion aiming at the difficulty in installing ballast water control system on ships.



1, Clear up different types of ballast water treatment system in current market, collect relating information of its application scope, installation space etc., and provide comprehensive reference for relevant parties to choose equipment.

2, Analyze the latest development of ballast water convention, implementation requirement of regional (United States) ballast

water control, ballast water control, PSC method change and existing problems of implementing ballast water convention currently, provide installation of ballast water control system, inspection opportunity and strategy suggestion of installation.

3, Provide installation and layout suggestion of ballast water control device based on the working principle of different types of ballast water treatment device, aimed at different tonnage ship and different navigational area, and put forward the additional requirements for installation ballast water system on the liquid cargo ship.

4, Put forward suggestions on installation of ballast water treatment for ships navigated in the American area based on the special requirements of the ballast water management system from the United States.

Ship installing ballast water management system (BWMS) is the main means to meet D-2 standard. However, the BWMS is restricted by factors such as treatment technology, environmental conditions and so on. Meanwhile, for existing ship, it would be restricted by more factors for tracing installation of BWMS, such as the ship's route, the environment temperature, the installation space, the power load limit, the pressure carrying capacity of the pump and the BWMS processing power, the cost of the transformation and so on. In addition, IMO is revising the G8 guidelines, guidelines for BWMS' type approval, and the United States put forward the requirements of the ballast water treatment system differed from the requirements of IMO. Therefore, the results of this research can help the owner solve when and how to install the appropriate equipment.

Provide method of installing ballast water aimed at target customer (shipping company). Meanwhile, provide inspection and certification for entire fleet and BWMS installation schedule according to the entry-into-force time of ballast water convention. Provide layout requirement of ballast water treatment device for different ship type, and put forward modification suggestion for existing ships.

MSER: the First Product of Offshore Mobile Platform with Structural Integrity Technology

By Li Hongtao

MSER system is based on structural model database and composed of structural state data input module, feature data storage database module, status data storage database module and marine environmental condition database module. Through seamlessly linking structural state data to finite element model data, MSER can rapidly analyze offshore mobile platform structure, thus realizing the functions of mobile platform well position safety evaluation, structural safety evaluation, emergency response, old mobile platform evaluation and management, filed inspection plan making etc. This cycle management mode of “data collection, structure evaluation, inspection planning and inspection implement” can be used to manage the full life cycle of offshore mobile platform.

Over the past two years, researchers of MSER system had built SACS models for 12 ship types and ANSYS models for 5 ship types and verified repeatedly. Technical difficulties, such as finite element modeling of hull and spud legs connection, hydrodynamic calculation of truss-type spud legs, structural dynamic response calculation of self-elevating drilling platform, spud-earth interaction analog calculation and Ansys secondary development have been conquered overcome. MSER system has been used in practical engineering, providing strong technical support for safe operation of mobile platform, which is highly evaluated by COSL and other companies.

At present, MSER system is at the service of COSL and SLODC; by providing strong technical support for ship owners' decision-

making, it has won good reputation. The application of MSER system will further improve the management level of large-scale maritime engineering equipments, increase maritime engineering technical strength of CCS and raise brand image of CCS maritime engineering service.

Structural integrity management technology is defined as an offshore mobile facility applicability evaluation system, covering the full life cycle of the facility. When modification, damage, load variation, well position storm-proof analysis, lifetime extension and emergency response happens, the system will rapidly, continuously and dynamically assess the platform structure, and provide a reasonable solution for platform structural damage assessment, applicability assessment, inspection plan and repairs and maintenance.

Structural integrity technology has been already used for offshore fixed facilities. API and ISO have issued related regulations and standards, which have been widely used on offshore fixed platforms in Gulf of Mexico. At present, structural integrity technology has never been used on offshore mobile platform. To ensure the structural safety of offshore mobile facilities, it is very necessary to develop a structural integrity management system for offshore mobile platform, which will realize a full-life-cycle safety management of mobile platform structure from design, construction, serving stages to the end thus helping the platform users to get information about technical conditions and safety environment, discover potential safety risks and take measures. In addition, it helps competent authorities to fully

know about platform structural state, make reasonable inspection plan and ensure safe operation and scientific management of the platforms.

Being developed by CCS, the full-life-cycle management system for mobile platform structure, i.e. MSER (Model, Survey, Emergency Response) system, is a large information management system based on structural model database. It can be used for analyzing operation capacity of mobile platform well position, providing services for emergency response and field inspection, thus ensuring the structure safety of offshore mobile platforms. By creating finite element model database, combining original drawing data and dynamic data of life cycle (such as modification and inspection) and applying FEM calculation and theoretical analysis, this system can reach an evaluation conclusion of structure safety and provide guidance for filed inspection and routine maintenance. When ship owners need an analysis on the well position operational capability to face changed platform working condition or an emergency response to deal with accident, the system can provide technical support for efficient decisions.

MESR system is composed of six subsystems, feature data storage subsystem, status data storage subsystem, finite element model subsystem, inspection plan generation subsystem, status data input subsystem and webpage system.

In the first place, it's a concept innovation of structural integrity technology. It is the first time to apply structural integrity technology on offshore mobile platform to form the first technological product-offshore mobile platform structure full-life-cycle management system

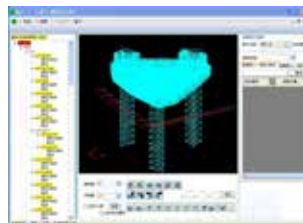
(MSER system), which provides an integrated, continuous, dynamic and rapid structure evaluation system for offshore mobile platforms. Through effective management of load variation data and structural status data, as well as seamless linking to finite element model, the system provides rapid structural stress evaluation of the platform structure under any load conditions at any time, thus realizing full-life-cycle structural safety management and providing comprehensive and accurate technical solutions for operation, inspection, maintenance and emergency response.

In the second place, it's an innovation of assessment method and measure. A series of key modeling technologies achieved lays theoretical foundation for assessment technology. In addition, it breaks the monopoly of foreign design companies and promotes development of domestic maritime equipment with self-intellectual property; it is the first time to establish a complete assessment method, assessment flow and assessment requirements for offshore mobile platform, which regulates structural status assessment method for mobile platforms; through secondary development of ANSYS, it is the first time to realize seamless connection of actual status data of platform structure and finite element model data, so that the finite element model data can be automatically updated and the model can always keep with the latest structural status, which offers a basis for rapid response analysis.

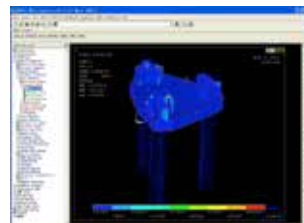
In the third place, it's an innovation of technological means and service model. Project achievement is of great practical value and excellent user experience. Traditional mobile platform management



Picture 1 Data Storage Database



Picture 2 Status Data Input System



Picture 3 Finite Element Model Database



Picture 4 Ocean Environmental Condition Database

technology and service mode have been changed; it is the first time to propose the service theory of offshore mobile platform emergency response and create an emergency response product with CCS characteristics, named CCS-MODU-ERS, which provides powerful technical support for emergency response; it is the first time to develop automatic CCS, ABS, API rule-checking software for offshore mobile platform in China; on the basis of traditional classification survey services, MESR system has been developed and applied to provide high-quality and value-added services such as well position safety assessment, emergency response support and old platform applicability, which rightly meet actual requirements of platform users and provide guidance for actual production. In addition, it makes management requirements of government agency seem to be clear and definite, so that the technical management level of Chinese maritime engineering equipment can be further improved.

In the fourth place, it's a technological innovation of well position applicability assessment. It is the first time to create well position operation safety assessment method and procedure for offshore mobile platform and produce relevant guidelines, which can be used to pre-evaluate platform operation safety before the self-elevating and semi-submersible platforms getting into new well positions. Corresponding measures provided improve the safety of offshore mobile platforms. Practices have proved that well position safety assessment technique is being perfected and has been approved in the industry with its international leading level.

CCS has overcome many technical difficulties, such as well position safety assessment, emergency response support, modeling technology of hull and spud legs connection, structural dynamic response calculation, spud-earth interaction calculation, mooring coupling analysis and air-gap calculation of semi-submersible platforms, which break technological monopoly of foreign companies and lay technical foundation for development of maritime engineering

equipment with self-intellectual property.

Development of safety management database with Chinese characteristics for maritime engineering equipments is based on urgent demands for maritime engineering equipment safety management. With a view to future direction of the maritime engineering structure development, the system effectively improves maritime engineering equipment management level and enhances market core competitiveness. It is beneficial for offshore oil enterprise to connect track with international well drilling market with technical support for bidding from MSER. For example, MSER system has helped COSL open the international market and gain market share in Gulf of Mexico, the Persian Gulf and the North Sea.

This research result enriches technical service means of CCS. On the basis of traditional classification survey services, CCS improves the service mode and provides more high-quality value-added services for customers, which has been successfully applied on COSL offshore mobile platforms. It helps users to promote equipment management level and reduce cost. The system has used more than 100 times for well position safety assessment, 18 times for old mobile platform structure safety evaluation and 18 times for emergency response supporting, which totally saves around RMB 1469.37 million for COSL. In addition, the system has been successfully applied on offshore mobile platforms of SNPC Offshore Engineering Company Limited. It has been used 2 times for well position safety assessment and once for emergency response supporting, which saves RMB 50 million. Shengli Offshore Drilling, CNOOC Energy Technology & Services Limited and Shanghai Yangtze River Zublin Engineering Co., Ltd also positively use the system to ensure operating safety of old mobile platforms, completing structure status evaluation for five mobile platforms with extended service term successively. Successful application of the research results helps companies to save a large amount of cost and wins economic and social benefits.

CCS Released 3D Non-linear Hydro-Elasticity Analysis Software for Large Ships

By Liu Riming



With large ship as the development trend, the inherent frequency of ships is continually decreased, which is close to the wave frequency. Ship hull beam vibration caused by wave slamming exerts more influence on the strength of high-speed large-scale ships, including growing fatigue damage and limit load on ship hull beam, which are deemed to be the causes for some structural damages. This phenomenon attracts the attention of IMO, IACS and some academic research organizations such as ITTC and ISSC.

IACS developed UR S11A (which will come into force on Jul.1st of 2016) for container ships. In the form of functional requirement, UR S11A requires all classification societies to

consider the effects of whipping on vertical wave bending moment in making large-scale ship hull beam strength assessment. MOL COMFORT accident investigation report shows that whipping is one of the causes of accident. Therefore IMO clearly requires ICAS to continue related works and report to IMO at the 95th MSC meeting.

ITTC and ISSC also set out to conduct verification and confirmation of Springing and Whipping assessment results. With software calculations, model tests and real ship measurements, impact

analysis regulations of Springing and Whipping were laid down based on existing assessment methods.

To meet computing requirements and ensure structural safety of large-scale ships, CCS cooperated with Harbin Engineering University in developing 3D linear hydro-elasticity analysis software (COMPASS-WALCS-LE) and non-linear hydro-elasticity analysis software (COMPASS-WALCS-NE). 3D non-linear hydro-elasticity analysis software can be used to solve complicated fluid-solid coupling problem of ship hull beam vibration caused by non-linear loads such as non-linear wave exciting force, slamming force on ship hull and shipping sea. It is mainly used to calculate non-linear movement of ships, wave loads, effects of Whipping on

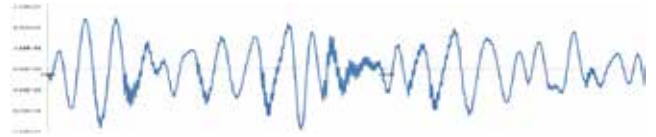
wave loads and structural strength of large-scale ships.

Based on three-dimensional potential flow theory, this software can be used to calculate fluid acting forces(including non-linear incident wave force, non-linear still water restoring force, slamming force). Structural elastic deformation should be considered into boundary conditions of solving flow field velocity potential. On basis of 3D structural dynamics, time-domain hydro-elasticity mechanical equations with consideration of fluid loads and structural responses are established. Runge-Kutta algorithm is used to solve principal coordinate time history in time domain. Modal superposition method is used to solve ship movement, section load and deformation at any location. In response time history calculation of irregular wave, delay function is added to record contributions of wavelets to overall load. With time history simulation results of section load, deformation and non-linear ship movements under different sea conditions, corresponding distribution curve is matched out to conduct long-term and short-term predictions.

Main functional modules of the software includes: (1) offset-based floating body shell mesh based automatic generation; (2) vibration modal calculation based on the transition matrix method and finite element results; (3)rolling damp approximate calculation; (4) infinite added mass, damping coefficient, stiffness coefficient matrix calculations; (5) instantaneous wetted surface mesh automatic capture;(slamming load calculation with consideration of strenuous ship movement); (delay function matrix calculation of irregular waves); (8) automatic steer control which could avoid lateral movement divergence;(9) time history calculations of moving and sectional loads; (10) short-term and long-term statistical analyses of non-linear movement and load; (11)graphic chart output of results.

The most characteristic functions include:

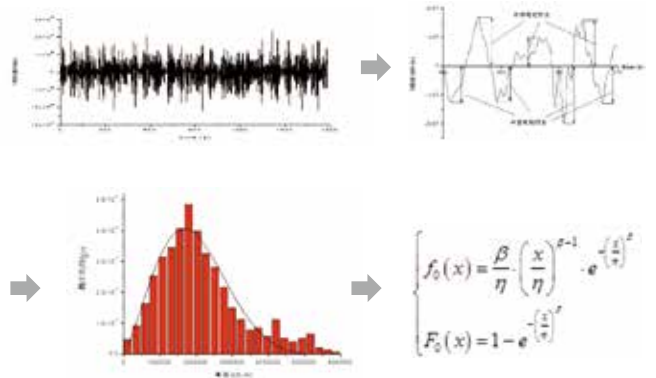
Non-linear effects with considerations of ship body elastic effect and slamming loads(take time history high frequency response of non-linear load into consideration).



PID automatic steer motion control technology, which solve the problem of diagonal wave motion divergence.



Long-term and short-term predictions of non-linear motion and wave load, which can be used to determine design values of non-linear motion and wave load.



COMPASS-WALCS-NE is widely used to solve hot and difficult problems recognized in international shipping industry. Publication of the software indicates that CCS is capable of providing advanced load analyzing services. COMPASS-WALCS-NE will certainly become an important tool and means of CCS to serve the industry. It will also contribute to improving safety of large ships.