Life Cycle Management System for the Structure of Mobile Offshore Units

(Model, Survey, Emergency Response)



CCS
CHINA CLASSIFICATION SOCIETY
中国船级社

Background

In recent years, as the development of offshore resource development business , the application of offshore facilities is expanding from the traditional field of oil and gas development and processing to the newly developing field, such as offshore construction, offshore wind power, fishery breeding, tourism and so on. The number of offshore installations is also increasing.

Due to the harsh marine environment condition and the complexity of operation, it is impossible to avoid all kinds of accidents or emergencies, for example the breakage of anchor chain caused by strong typhoon, structural damage caused by huge wave slamming, structural damage caused by collision, structural damage caused by the loss of stability. If these accidents or emergencies are not handled properly, huge economic losses will be cause, even bring threaten to the safety of life at sea and marine ecological.

It is very important to establish a finite element model database of the platform structure to ensure the security of the mobile platform, base on the characteristic of design mode and type of the mobile platform. For this reason, CCS developed the life cycle management system for mobile offshore unit, named Model, Survey, Emergency Response, MSER for short.











Positioning

MSER is a large-scale management information system based on structural model database, which provides services for mobile units based on structure model database by site specific assessment, emergency response analysis and site survey, in order to ensure the structure safety of mobile offshore units.

Assessment conclusions, guidance to site inspection of survey agency and daily maintenance of owner are given out by finite element calculation and theoretical analysis. The finite element models in the database are combined the original design drawings with the dynamic data input during life cycle (modification, testing and etc.). Furthermore, technical support are provided for the rapid decision-making of the owner by site specific assessment and emergency response analysis, while the operating environment condition is changed or accidental events have happened.

Scope of application



◎ Jack up/self-elevating units



◎ Semi-submersible units



◎ Submersible units

Service function

a. Continuous technical evaluation to the structural condition in the life cycle of the units

Realize the structural analysis, tracing, monitoring and management for structure of mobile offshore unit in the life cycle, from the design, construction, survey, modification to the daily in-service operation.

b. Site specific assessment

Evaluate the adaptability of the mobile unit on the new site by site specific assessment. This will help the managers to make decisions quickly.

c. Emergency response support

Evaluate the safety of the structure of mobile units quickly and provide emergency response measures plan, while emergency occurs(e.g. leg punch-through, towing collision, etc.), in order to keep the structure safety and reduce the losses.

d. Technical support to maintenance, repair, modification and inspection of the units

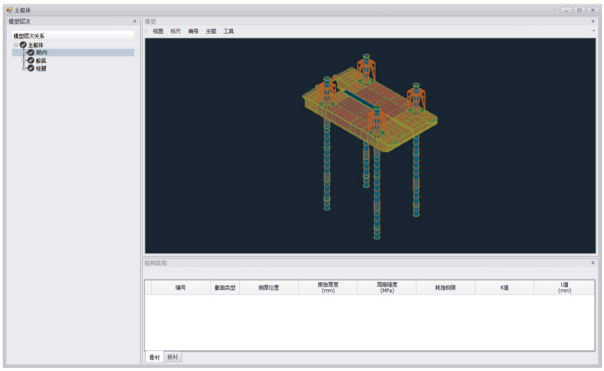
The actual state of the platform structure can be reflect timely and comprehensively in MSER, so the existing structural safety hazards can be found out, and the reasonable suggestions and key inspection suggestions can be given on site, which will provide technical support to the repair, maintenance, maintenance of the platform and the on-site inspection.

e. Safety management for aged units

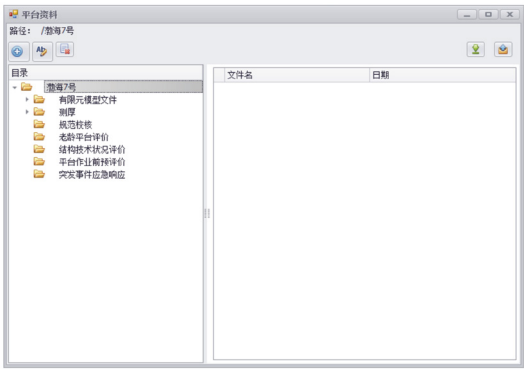
Through the continuous tracking and periodic safety evaluation of the structure of aged mobile units, technical support can be provided for the regular maintenance and the operational risk reducing of the aged units.

Composition of MSER

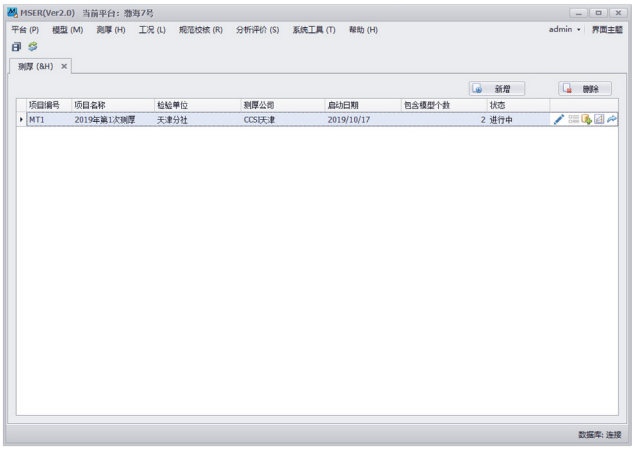
a. Main system



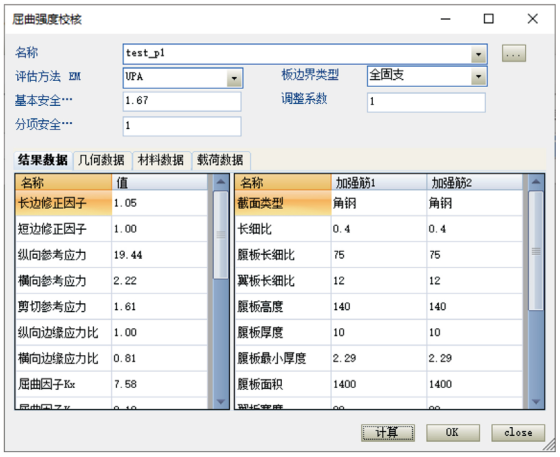
◎ Management of the FE model data base.



◎ Management of the data about the unit.(e.g. drawings, reports, environmental condition information of operated sites.)

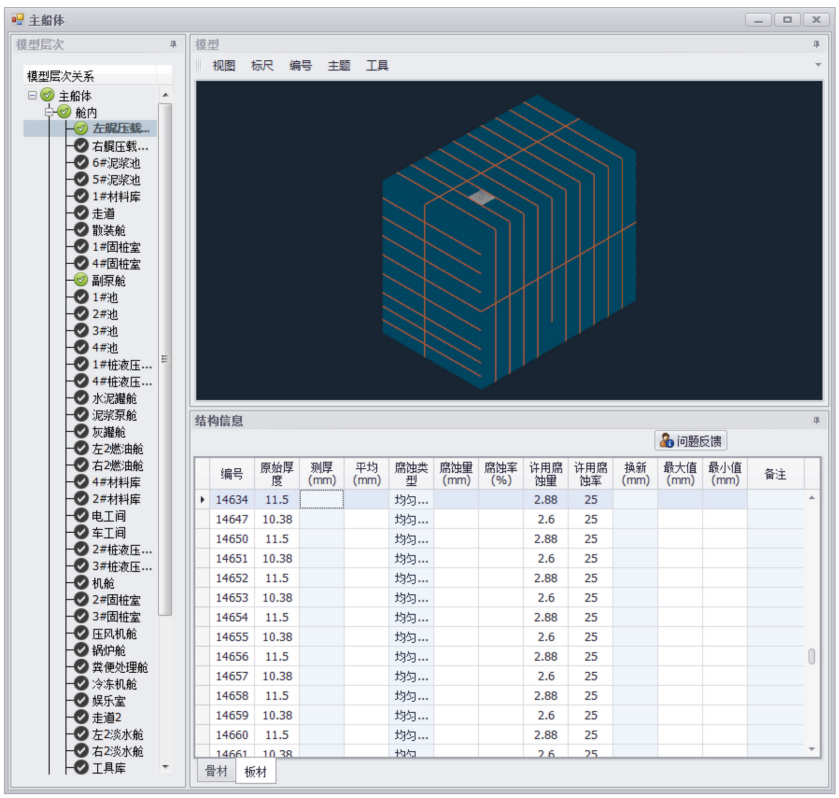


◎ Receive date of thickness measurement and modify the finite element model in database.



◎ Check the yield, buckling and fatigue strength according to CCS rules automatically.

b. Testing management system



◎ Collect and confirm the thickness and other testing data of the structure of units.

System characteristics

The seamless connection between condition data with the FE model is realized in MSER. A structure evaluation system in life cycle is established, which is continuous, dynamic and timely.

a. Fast response base on finite element database

By the realizing of the seamless connection between the thickness measurement data and the FE mode, it is possible to finish the structural evaluation of unit in docking period, which can quickly feed back the conclusions and suggestions according to the evaluation result, and guide the repair or modification construction.

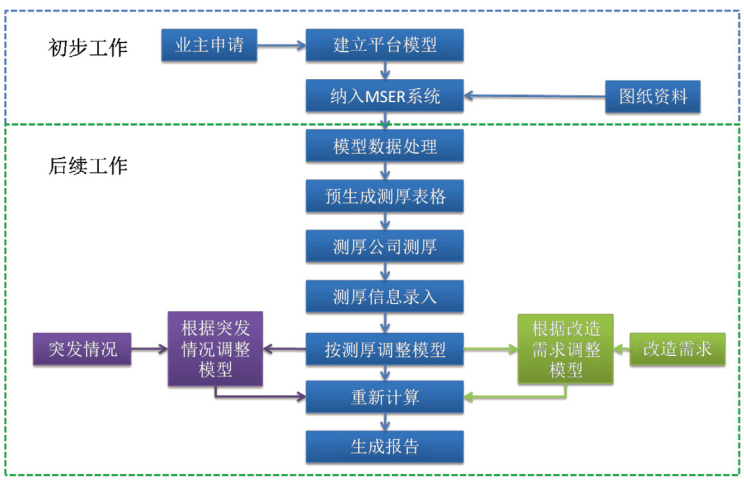
b.Accurate and efficient thickness measurement

A systematic platform for thickness measurement is provided. The thickness measurement range is determined based on the last evaluation results and field conditions, the thickness measurement map can be printed, and the standardized thickness measurement report can be generated automatically according to the input thickness measurement data. These functions make the work of thickness measurement more accurate and efficient.

c. Realize the life cycle management of the structure safety of mobile offshore units

As the drawings of original design and every modification/repair, the data of every testing and inspection, FE model, the data of every calculation and analysis are managed in MSER. Based on these data the functions such as technical evaluation to the structural condition, site specific assessment, emergency response analysis, Technical support to maintenance, repair, modification and inspection of the units, evaluation and management of aged units can be provided. So the life cycle management of structure safety of mobile offshore units can be realized by using MSER.

Application process





Applications

MSER has been employed in over 200 site specific assessment, emergency response analysis, structure safety evaluation of aged units for China Oilfield Service Limited, CNPC Offshore Engineering Company Limited, Shengli Oilfield Offshore, SINOPEC offshore petroleum and etc. successfully and produced huge economic and social benefits .

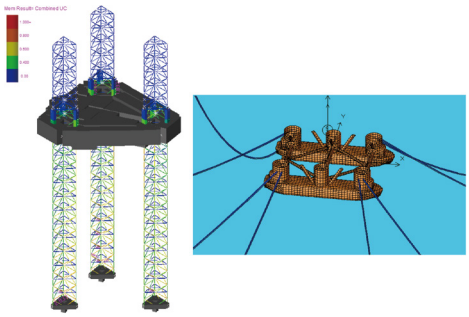
COSL
中海油田服务股份有限公司
China Oilfield Services Limited

中国石油海洋工程有限公司
CNPC OFFSHORE ENGINEERING COMPANY LIMITED

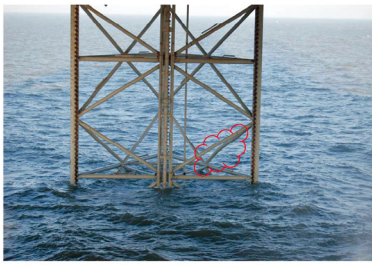
胜利油田海洋钻井公司

中国石化上海海洋石油局

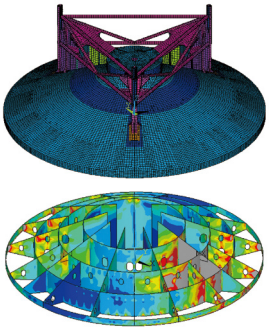
MSER creates a new mode for the safety management of the structure of mobile offshore units, and will promote the safe operation and scientific management of mobile offshore units effectively.



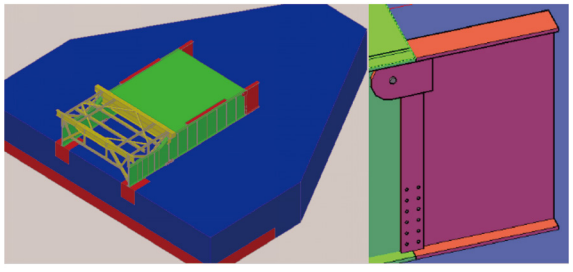
◎ Site specification Assessment expand the working area of mobile platform and ensure the structural safety platform



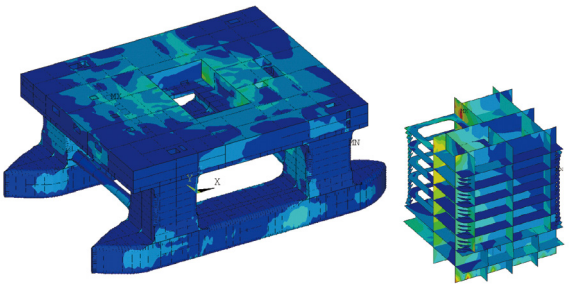
◎ Emergency response analysis taken after the brace of jack-up leg is bended by impact bending to support operation with injuries



◎ Guidance on key inspection area of the spudcan of jack-up after punch-through



◎ Discussion on the scheme of lengthening cantilever beam of jack-up

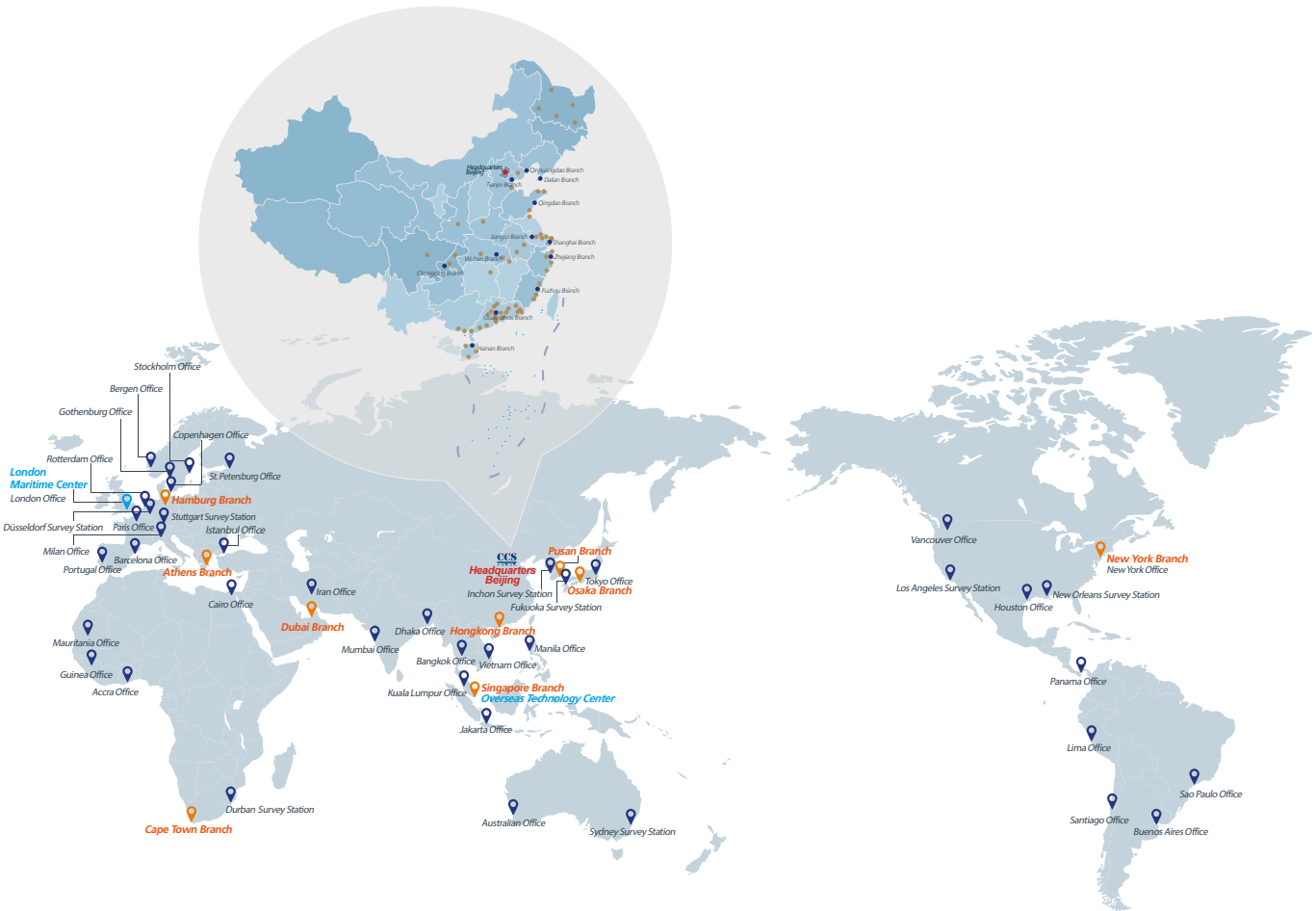


◎ Structure evaluation of aged mobile offshore units understand the trends of structural safety

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