

# China Classification Society Exploration and Innovationin Digitalized Ship Inspection

CCS
CHINA CLASSIFICATION SOCIETY
中国船级社



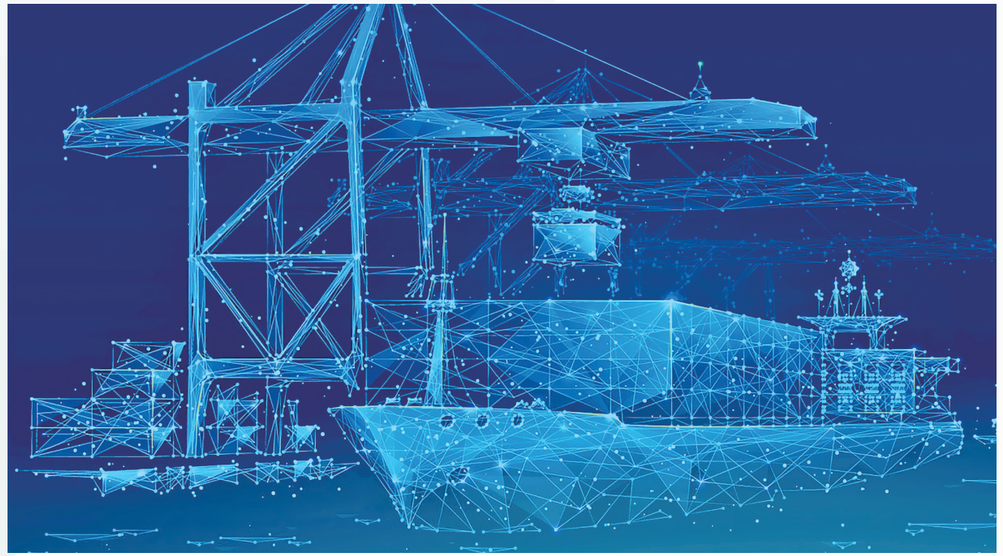
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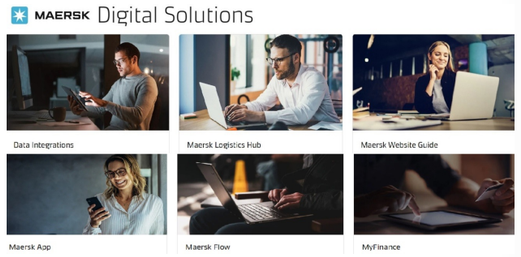
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## The Trend of Digitization & Intelligence of the Shipping Industry









Shipping giant Maersk intends to provide digital solutions that revolutionize integrated logistics, while COSCO is developing its Digital Innovation Industrial Cluster.

One such trend is the deeper application of artificial intelligence (AI), machine learning (ML), blockchain, virtual and augmented reality even digital twin technologies.



## CCS Vision for Digitalization

- Increased Efficiency
- Reduced Costs
- Improved Safety
- Optimize Management
- Sustainable Development
- Create new value

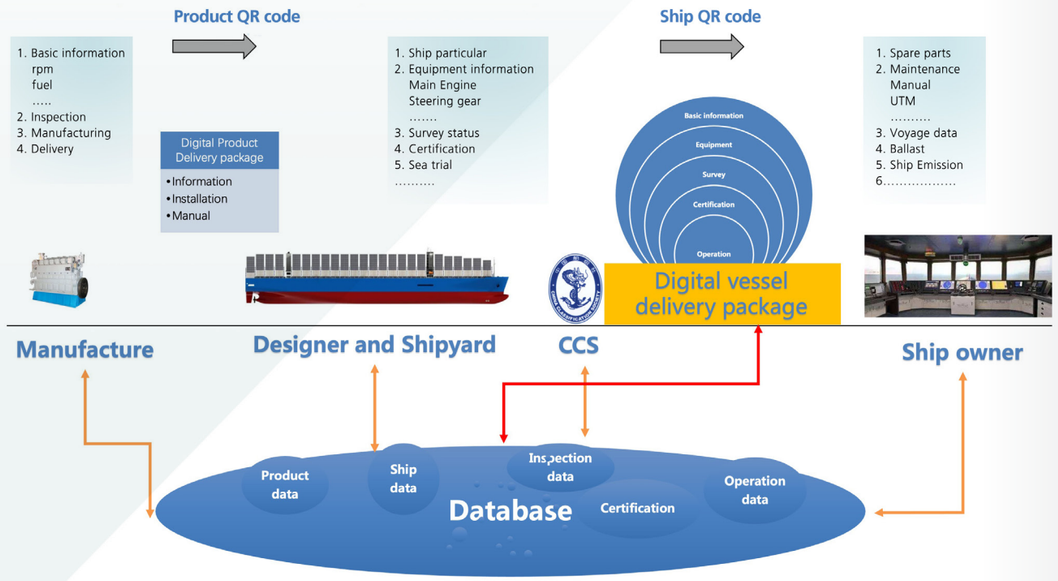
Digitalization has the potential to bring significant benefits, such as increased efficiency, reduced costs, and improved safety, to the industry including the Classification Society.

Through digital transformation, CCS hopes to optimize its management, achieve sustainable development and create new value for its customers.










CCS is devoted to drive data flowing and circulating among the supply chain. We believe that the industry might benefit a lot by collecting and utilizing data on ship operations, cargo movements, ship design and new buildings, and sharing it among different players to promote further innovation





## CCS Efforts and Research on Digitalization

Digitalization has the potential to bring significant benefits, such as increased efficiency, reduced costs, and improved safety, to the industry including the Classification Society.

Through digital transformation, CCS hopes to optimize its management, achieve sustainable development and create new value for its customers.

### ◆ Innovation of Inspection Mode

Remote inspection, On line monitoring

### ◆ Application of New Inspection Tech & Tools

Image recognition, Simulation verification, Data analysis

Drone, Robot, Wearable devices

### ◆ Resarch in Intelligent ship

Intelligent Hull, Intelligent Machinery, Intelligent Navigation

Intelligent Energy Efficiency, Remote Control,

Autonomous Operation





## ◆ Innovation of Inspection Mode: Remote survey + VR

In the past three years, to cope with the impact of COVID-19, China Classification Society has explored real-time remote surveys technology to reduce the physical attendance of surveyors.

We work with China Mobile and proposed a 5G CPE equipment（Customer Premise Equipment）+ ad hoc network communication solution, solving the problem of weak communication signal in enclosed spaces such as the engine room and cargo holds and making real time inspection possible for those spaces.

| Network and communication Software and hardware | |
|---|---|
| Communication | 5G/4G/VSAT+Ad-hoc network |
| Data Collecting gear | Smart phone/wearable device/drone…… |
| Interactive platform | Scenario-based remote inspection platform |





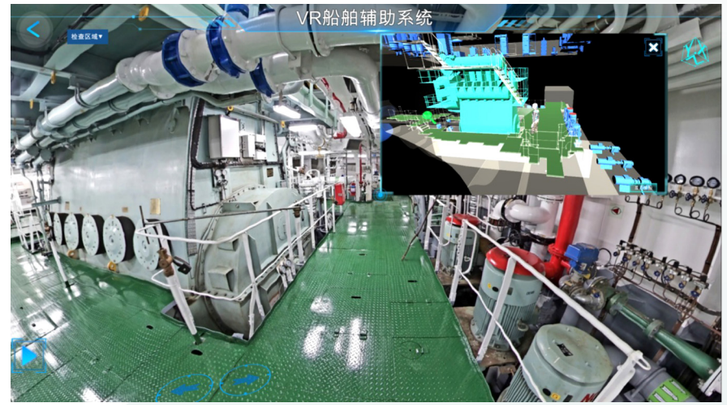





To ensure remote survey has the same effectiveness as an on-site survey, a scenario-based remote inspection platform was built and VR technology is applied in some cases.

This is a case of remote annual survey for an ore carrier

M.V. “YUAN HUA HAI”
Ore Carrier
DWT：400k
Remote Annual Survey











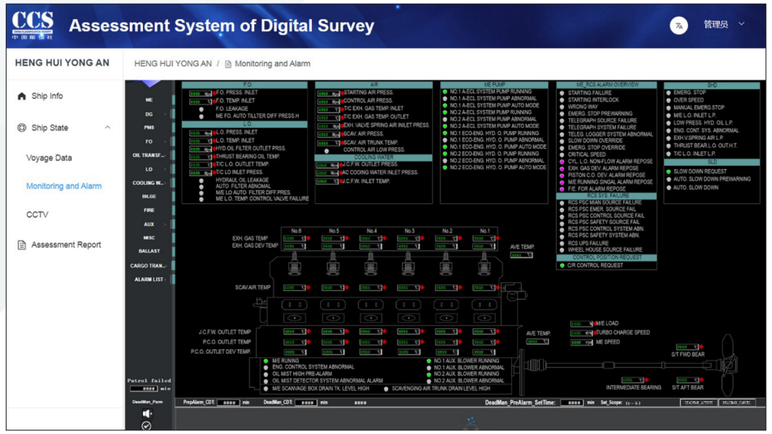




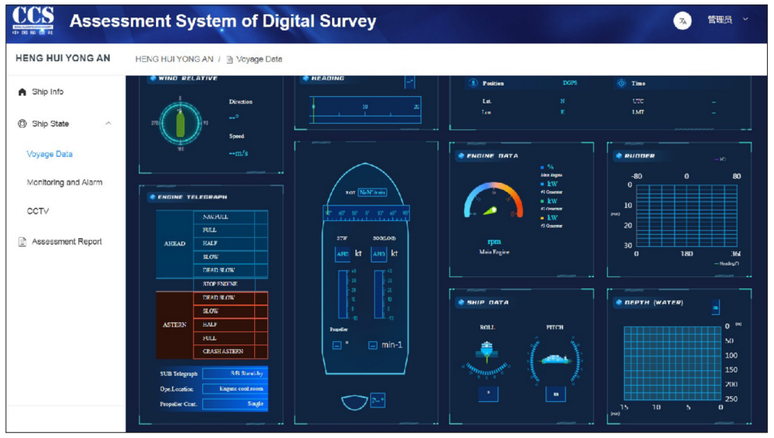
## ◆ Innovation of Inspection Mode: Digitalized survey for machinery

CCS is now developing a digital inspection system for machinery.

The system includes an onboard data collection platform that supports ship-to-shore transmission, a digital database, and algorithms for data-based inspection and verification

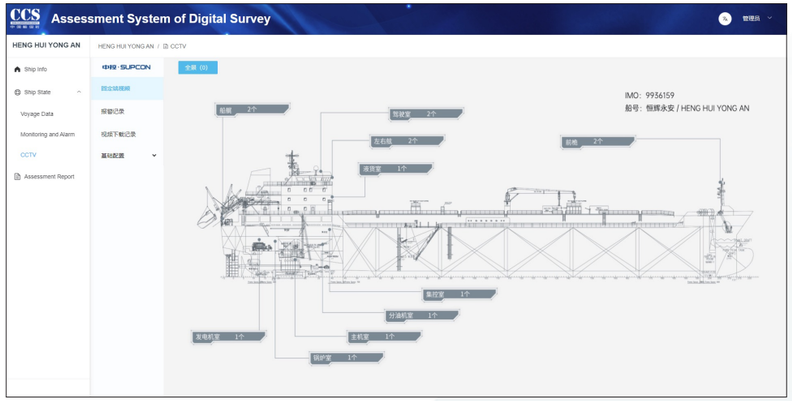


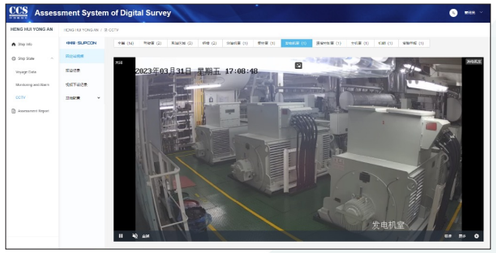

Status & parameters with monitoring and alarming signals  are collected by the platform in real-time and are visually displayed to both the company and CCS simultaneously

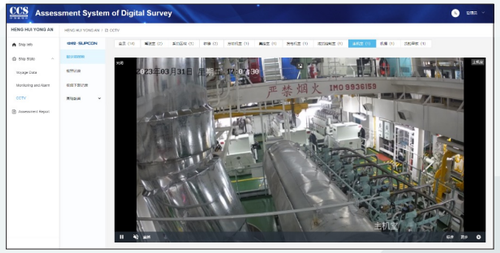




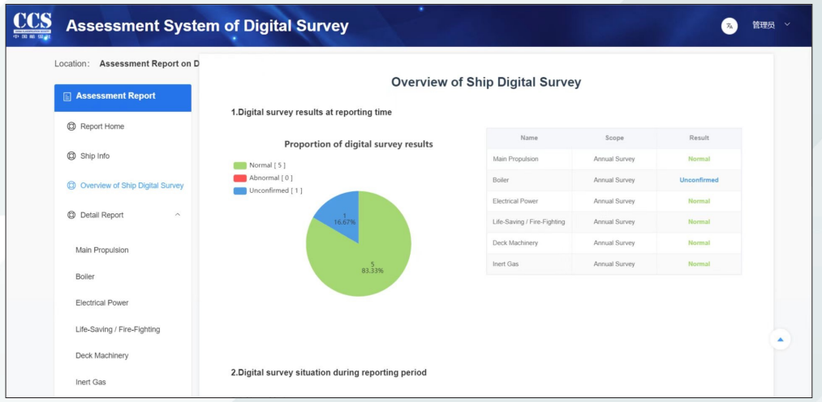

If necessary, CCTV video data can be received and displayed onshore.



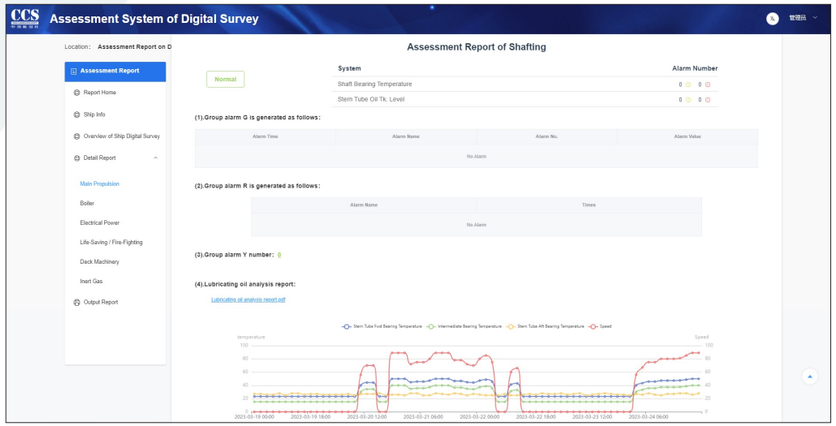



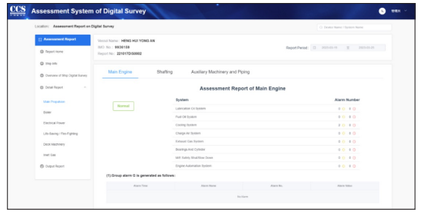




All the collected data will be evaluated by the system, and a condition report for the machinery will be generated for the surveyor's final verification



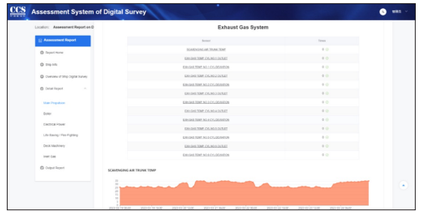


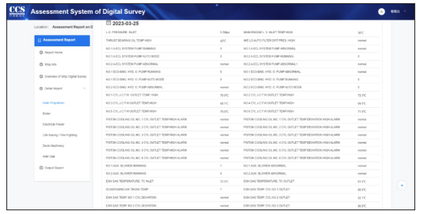









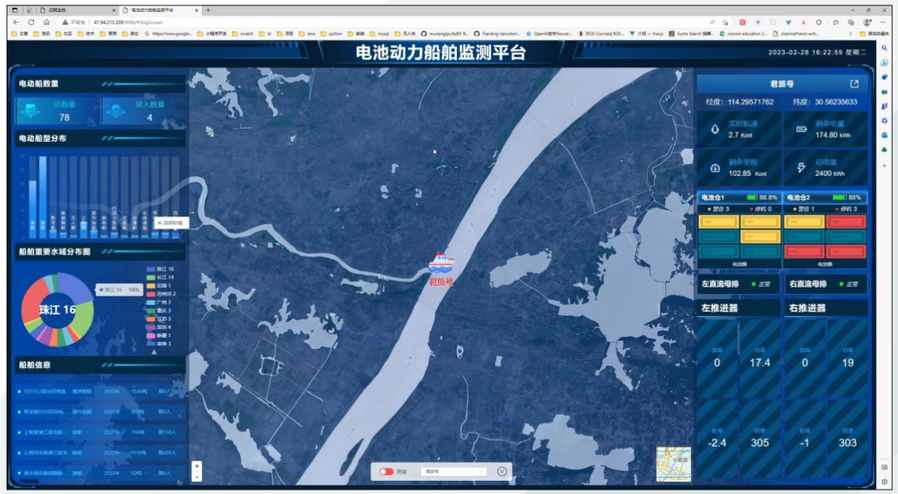






## Real time monitoring of batteries’ condition



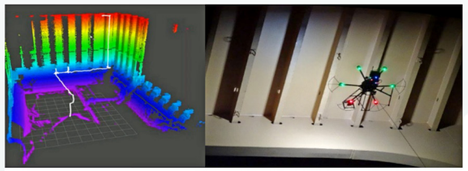

## Fault alarm and analysis based on data and algorithms




With the booming of electric ships in China, CCS is developing a power battery detection and monitoring system to ensure the safety and reliability of batteries used in electric ships.

Parameters and status of power cell are collected and displayed, and the condition of the battery is supervised continuously.

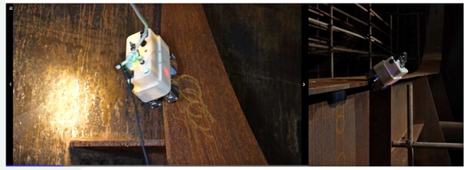
## ◆ Application of New Inspection Tech & Tools



Drone & Robot for Close up survey and UTM



- Reduce risk of entry into enclosed spaces
- Reduce work at height
- Reduce cost of staging or cherrypicker or raft

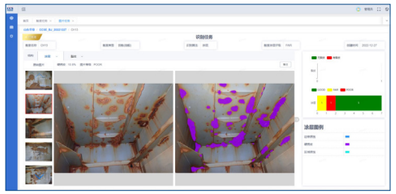


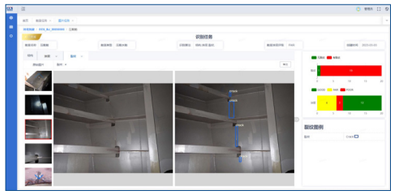
- Instability of drone in case of narrow space
- Obstacle surmounting ability of robot
- Surface conditions

CCS has introduced several new inspection technology and tools, such as drones and robots.
While they are used  for close-up surveys and thickness measurements, the advantages are apparent

**Smart Image Recognition**

- Coating condition
- Structural defects
- Critical area








CCS is researching intelligent diagnosis of structural defects based on image recognition and machine learning technology.

An image recognition system has been built, and coating conditions, some type of structural defects, and critical areas may be identified.



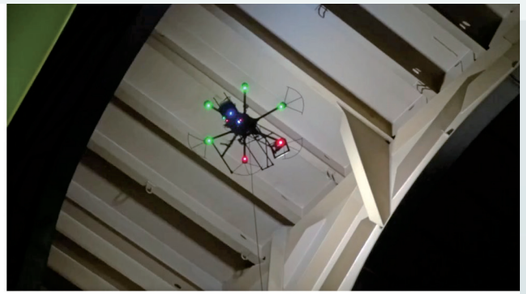


Deck girder gauging in cargo tank



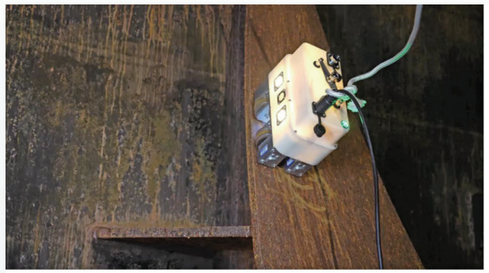
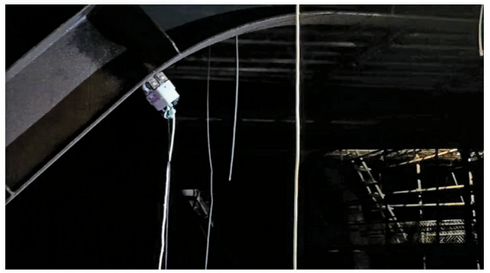
Robot patrolling



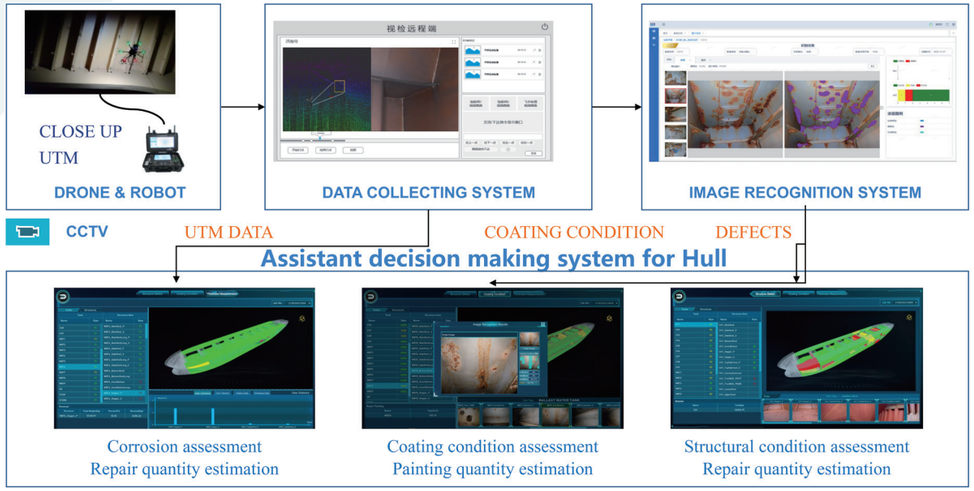











Based on these new technologies and tools, CCS has set up an Assistant Decision Making System for Hull.

Data is collected by drones and robots instead of surveyors, and the hull structural condition is evaluated by image recognition system.

We think it may reduce human error and improve accuracy, leading to improved safety and reduced costs in the near future.



## ◆ CCS Involvement in Intelligent ship



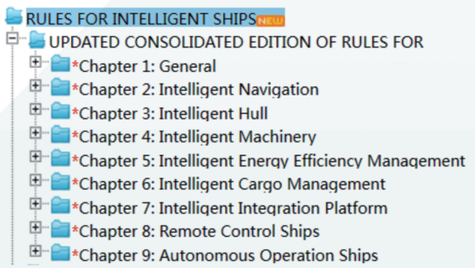

Increased automation onboard ships is not a new issue.

IMO’s Maritime Safety Committee discussed automated ships as early as 1964.

However, recent technological breakthroughs have opened the possibility of autonomous navigation or remote control to ships.









CCS released its Rule for Intelligent Ships in 2015.
Intelligent level is identified as from local application to full ship application and from assistant decision-making to fully autonomous operation.




Year 2017 Delivery of Intelligent bulker “DA ZHI”

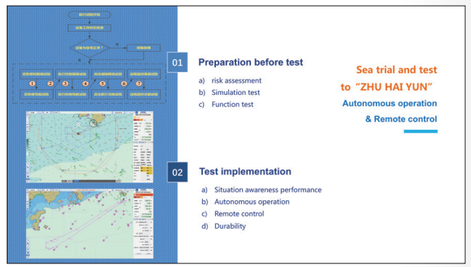



Year 2021 Autonomous navigation and remote control test of Intelligent box ship “ZHI FEI”



End of year 2022 Intelligent research ship “ZHU HAI YUN” Sea trial

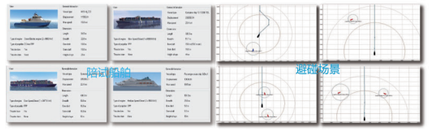


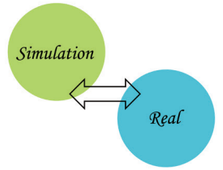



To ensure safety, before sea trial of "ZHU HAI YUN", CCS completed risk assessment, collision avoidance testing and scene simulation testing.



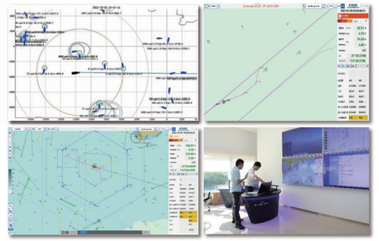
Test Platform for Intelligent Ship








Real ship testing



CCS has established an Intelligent Ship Testing and Verification Laboratory.

Although some intelligence and digitalization solutions are not mature so far and engineering practices are not yet widely applied, the future of digitalization and intelligence is exciting.

CCS is committed to explore further with partners like TMS BULKERS, remaining at the forefront of these innovations to provide the best possible services to our clients.



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