

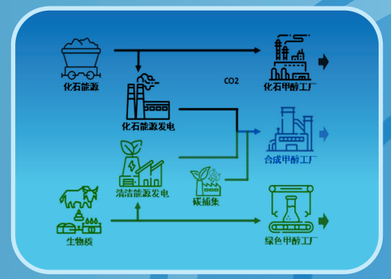
Methanol-fueled Ship

CCS Methanol Fuel Technical Services

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CHINA CLASSIFICATION SOCIETY
中国船级社

CCS Methanol Fuel Technical Services

• Methanol fuel production



Ship Methanol Fuels GHG Emissions Assessment and Certification

• Supporting service



- Ouantitative Risk Assessment of Methanol Onshore Facilities
- Methanol fuel bunkering consultation

• Methanol fuel Storage, Transportation, Bunkering, Application



- Technical Services for Methanol-fueled Ships
- Technical Services for Methanol Bunkering Ships
- Technical Services for Methanol Transportation Ships



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• Technical Services for Methanol-fueled Ships



Our Service

Investment Research	Ship Design & Building	Ship Operation
• Economic Analysis of Methanol-fueled Power Systems.	• Approval-in-Principle for Methanol-fueled Ships (AIP) • Optimization of Methanol-fueled Ship Design • Risk Assessment for the Layout and System Design of Methanol-fueled Ships	• Incremental Cost Analysis and Recommendations for the Operation of Methanol-fueled Ships/Fleet • Ship Methanol Fuels GG Emissions Assessment and Certification • Issuance of Fuel Lifecycle Label (FLL) for Methanol Fuels • Verification of Methanol Fuel Emission Reductions • Methanol Synchronous Bunkering Operations Consultation • ISCC Certification • Emergency Response Service for Methanol-fueled Ships

Classification and Statutory Survey Services for Methanol-fueled Ships

Methanol-fueled Ships Rules Training/Compliance Consulting

Guideline of Ship Fuels Lifecycle GHG Emissions Intensity Assessment and Certification

Guidelines for Ships Using Methanol/Ethanol Fuels, Application of Alternative Fuels for Ships (2017)

Guidelines for Ships Using Methanol/Ethanol Fuels (2022)

Interim Guidelines for Technical and Inspection of Alcohol-fueled Powered Ships

Rules and Guidelines

<Guideline of Ship Fuels Lifecycle GHG Emissions Intensity Assessment and Certification>

<Guidelines for Application of Alternative Fuels for Ships> (2017)

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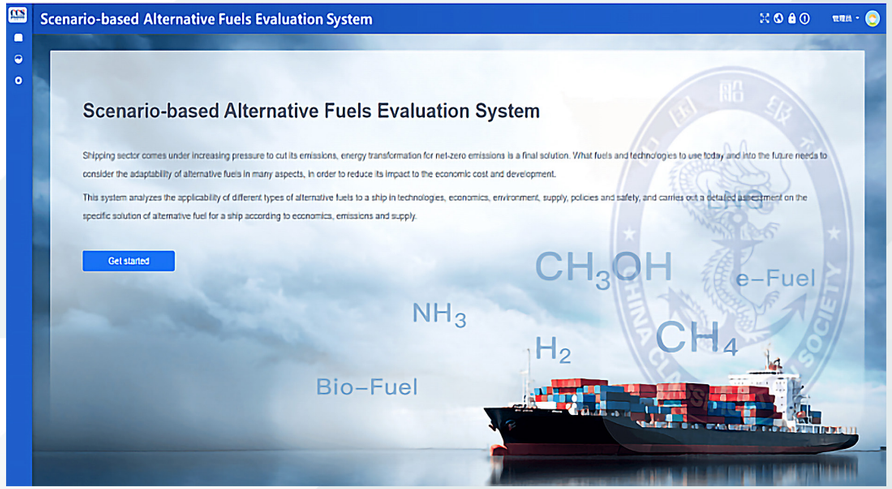
Economic Analysis of Methanol-fueled Power Systems

Applicable Customers: Ship Companies

Applicable Stage: Ship Investment Decision-making

Service Content: Based on the methanol-fueled vessel design scheme provided by the ship company, calculate the initial construction cost changes of the ship compared to a conventional fuel-powered parent ship, including cargo capacity or deadweight losses, changes in fuel costs, carbon pricing costs, maintenance costs, ship energy efficiency levels, etc., and provide a comprehensive analysis conclusion.

Customer Benefits: Conduct economic, carbon emission, and ship energy efficiency analyses for specific ship types and power systems.



Approval-in-Principle for Methanol-fueled Ships (AIP)

Applicable Customers: Ship Companies, Design Companies, Shipyards, etc.

Applicable Stage: Ship Development, Ship Design

Service Content: Based on the information and specific requirements provided by the customer, international regulations and relevant CCS rules, and taking into account the characteristics of methanol-fueled ships and the operation characteristics, a conformity review of the relevant specifications is conducted on aspects such as ship arrangement, fuel tank selection and arrangement, fuel containment and bunkering supply systems, firefighting and ventilation during the design approval stage, and an Approval-in-Principle certificate is issued.

Customer Benefits: Tailor the most suitable preliminary methanol-fueled ship design scheme according to the customer's personalized needs.

Service Experience:

- AIP for 306000t methanol dual-fuel powered VLCC
- AIP for 79500t methanol dual-fuel powered Bulk Carrier
- AIP for 68000t methanol dual-fuel powered Pulp Carrier
- AIP for 3500 TEU methanol dual-fuel powered Container
- AIP for 85000t methanol powered Bulk Carrier
- AIP for 49700t methanol powered Chemical Tanker









Optimization of Methanol-fueled Ship Design

Applicable Customers: Ship Companies, Design Companies, Shipyards, etc.

Applicable Stage: Ship Development, Ship Design

Service Content: Based on the information and specific requirements provided by the customer, and in consideration of the characteristics of methanol-fueled power ships and ship operation, we provide ship design optimization evaluation services in areas such as ship arrangement, fuel tank selection and arrangement, fuel containment systems, bunkering and supply systems, firefighting, ventilation, personnel protection, and risk assessment (if required), and ultimately propose ship design optimization recommendations.

Customer Benefits: We provide our clients with highly competitive ship design optimization recommendations that take into account comprehensive factors such as ship energy efficiency, greenhouse gas reduction, and economic viability.

Risk Assessment for the Layout and System Design of Methanol-fueled Ships

Applicable Customers: Ship Companies

Applicable Stage: Ship Investment Decision-making

Service Content: Based on the methanol-fueled vessel design scheme provided by the ship company, calculate the initial construction cost changes of the ship compared to a conventional fuel-powered parent ship, including cargo capacity or deadweight losses, changes in fuel costs, carbon pricing costs, maintenance costs, ship energy efficiency levels, etc., and provide a comprehensive analysis conclusion.

Customer Benefits: Conduct economic, carbon emission, and ship energy efficiency analyses for specific ship types and power systems.

Ship Methanol Fuels GHG Emissions Assessment and Certification

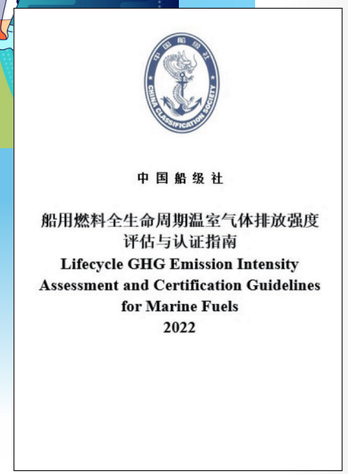
Applicable Customers: Ship Companies, Methanol Fuel Producer, etc.

Applicable Stage: Ship Operations

Service Content: Certification is provided for the full life-cycle GHG emissions of methanol fuel, the pre-shipment GHG emissions of methanol fuel and the GHG emissions generated by methanol fuel at the ship's end. Accounting and certification of the full life-cycle greenhouse gas emissions intensity of marine fuels can be carried out in two parts: Well to Tank, Tank to Wake. Methanol fuels that have completed the accounting and certification of GHG emissions intensity for Well to Tank, Tank to Wake or full life-cycle can be issued with a statement of GHG emissions intensity for marine methanol fuels based on the actual accounting and certification results.

Customer Benefits: To enable ship companies or other customers to understand the carbon emission intensity of the methanol fuel used, and to provide evidence of compliance with IMO and EU regulations for their vessels.




中国船级社

船用燃料全生命周期温室气体排放强度评估与认证指南

Lifecycle GHG Emission Intensity Assessment and Certification Guidelines for Marine Fuels

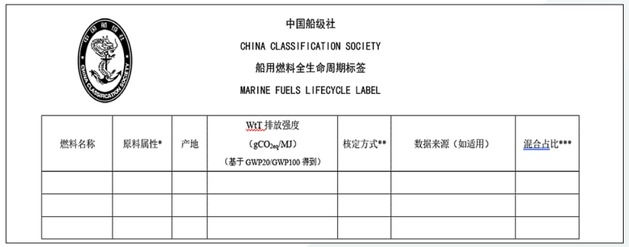
2022

Issuance of Fuel Lifecycle Label (FLL) for Methanol Fuels

Applicable Customers: Ship Companies, Methanol Fuel Producer, etc.

Applicable Stage: Ship Operations

Service Content: Upon completion of the pre-shipment emission calculation and certification for marine methanol fuel, a Full Lifecycle Label (FLL) can be issued along with the marine methanol GHG emission intensity declaration. The FLL includes the fuel name, raw material properties, origin, emission intensity, calculation method, data sources, and blend ratio of mixed fuels, which can provide a basis for customers to complete the fuel emission certification with reference to our <Guideline of Ship Fuels Lifecycle GHG Emissions Intensity Assessment and Certification>, as well as for customers to participate in other forms of certification.

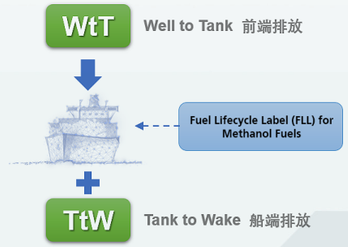

中国船级社

CHINA CLASSIFICATION SOCIETY

船用燃料全生命周期标签

MARINE FUELS LIFECYCLE LABEL

燃料名称	原料属性*	产地	WtT 排放强度 (gCO_{2eq}/MJ)（基于 GWP20/GWP100 得到）	核定方式**	数据来源（如适用）	混合占比***



Verification of Methanol Fuel Emission Reductions

Applicable Customers: Ship Companies

Applicable Stage: Ship Investment Decision-making, Ship Operations

Service Content: Based on the assessment and certification of the whole life cycle GHG emission intensity of methanol fuel for ships, the emission reduction/intensity of using methanol fuel compared to traditional fuel for ships on specific routes is verified, and the methanol fuel emission reduction for ships or fleets is certified according to different requirement targets and accounting indicators, in order to help enterprises achieve their ESG targets.

Incremental Cost Analysis and Recommendations for the Operation of Methanol-fueled Ships/Fleet

Applicable Customers: Ship Companies

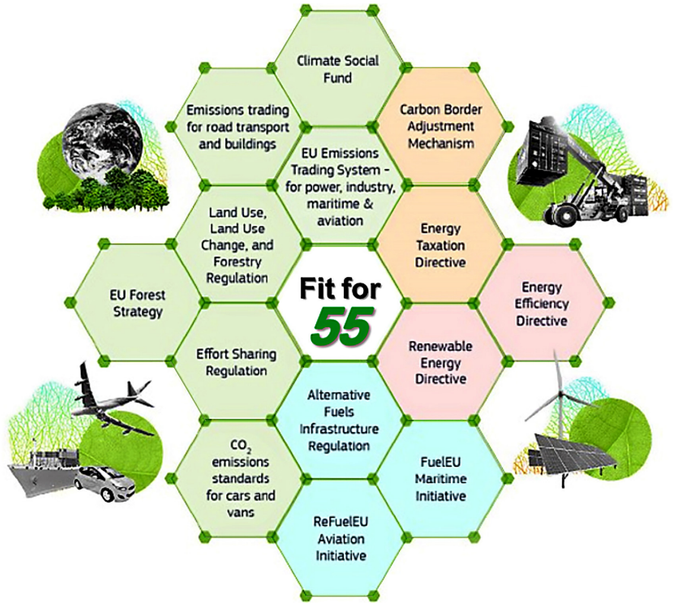
Applicable Stage: Ship Operations

Service Content: IMO is currently developing mid-term market-based measures for reducing GHG emissions from shipping, and will complete the selection of existing proposals at the MEPC 80 meeting in July 2023. EU has recently completed the development of EU-ETS and FuelEu Maritime requirements under the Fit for 55 framework. In order to address the impact of the new rules on the fleet, CCS can carry out predictions and analysis of the incremental operating costs and fleet replacement proposals under the IMO and EU frameworks (including FuelEU Pool compliance decisions), and provide recommendations on the application of methanol fuel for ships/fleets in a cost minimizing manner.

Customer Benefits: Decision support for ship companies to operate with minimal cost compliance under IMO/ EU market mechanisms.

certification results.

Customer Benefits: To enable ship companies or other customers to understand the carbon emission intensity of the methanol fuel used, and to provide evidence of compliance with IMO and EU regulations for their vessels.



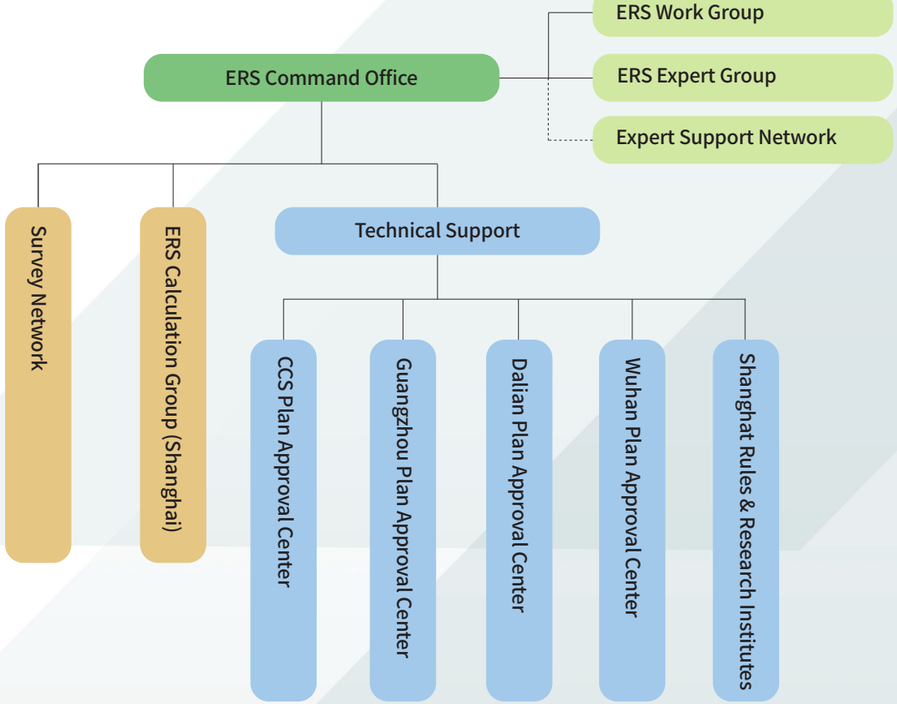
Emergency Response Service for Methanol-fueled Ships

Applicable Customers: Ship Companies

Applicable Stage: Ship Operations

Service Content: For methanol-fueled ships with pre-agreed emergency response services between the ship company and CCS and with an established emergency response database relating to stability and structural strength, once the ship is in an emergency situation, e.g. water ingress, grounding, explosion/fire, collision, hull failure, etc., at the request of the ship company, CCS's permanent shore-based emergency response agency should quickly assembled to activate the ship's emergency response database and provide a calculated analysis of damage stability, residual strength, oil spill, etc., as well as a comprehensive consideration of the risks associated with methanol fuel, and make recommendations for the ship to escape from danger.

Customer Benefits: To provide technical support to assist distressed ships in getting out of danger and to provide reference opinions for the final decisions of captains/ship companies.



Classification and Statutory Survey Services for Methanol-fueled Ships

Applicable Customers: Ship Companies, Design Companies, Shipyards, Manufactory, etc.

Applicable Stage: Ship Design, Construction, Operations

Service Content: Provide classification and statutory survey services such as drawing review, product approval/inspection, construction survey and operational survey for methanol-fueled ships applying for CCS classification, and CCS class notations methanol dual-fuel will be assigned.

Service Experience:

- Classification Services for 24000 TEU methanol dual-fuel powered Container
- Classification Services for 16000 TEU methanol dual-fuel powered Container
- Classification Services for 49900t methanol dual-fuel powered Chemical Vessel
- Classification Services for 130m methanol dual-fuel powered Bulk Carrier

Methanol-fueled Ships Rules Training/Compliance Consulting

Applicable Customers: Ship Companies, Design Companies, Shipyards

Applicable Stage: Ship Design, Construction, Operations

Service Content: According to the specific needs of customers, we conduct online/offline promotion and training of the Rules for methanol-fueled ships, or conduct consultation and exchange on the implementation and enforcement of specific provisions of the Rules for specific ship types and issues, so as to deepen customers' understanding of the relevant requirements of the Rules and help the industry to better implement the Rules; at the same time, we actively take on board feedback from the industry to promote the revision and improvement of the Rules.

Customer Benefits: Training or consultation sessions with clients on the Rules to help them understand and implement it more accurately.

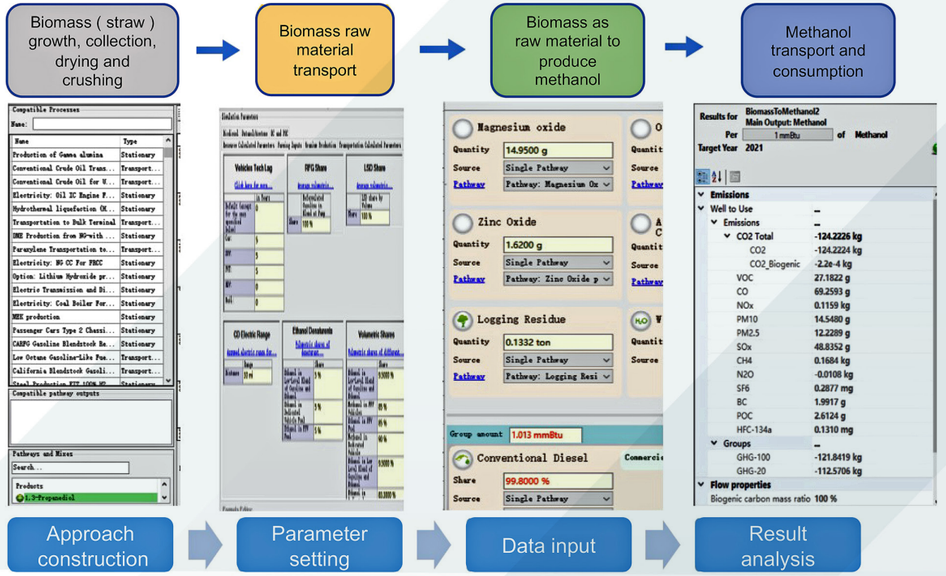
ISCC Certification (International Sustainability and Carbon Certification)

Applicable Customers: Ship Companies, Bio-Methanol Fuel Producer, etc.

Applicable Stage: Ship Operations

Service Content: Provide ISCC certification services for our clients' biomass energy sources, such as marine biomass methanol. ISCC certification is the first globally recognized certification system for biomass energy, including life-cycle carbon assessment and sustainability certification, developed by the EU for the sustainable production and processing of biomass energy. The ISCC EU certification is a mandatory requirement for foreign biomass energy sources to enter the EU energy market.

Customer Benefits: Helps ship companies identify and procure Green Methanol fuels that meet EU requirements.



• Technical Services for Methanol Bunkering Ships



Our Service

- Methanol Synchronous Bunkering Operations Consultation
- AI for Methanol Bunkering Operation Scheme
- Oualitative Risk Assessment for Methanol Bunkering Operations
- Methanol Bunkering Operation Process Optimization
- Ouantitative Risk Assessment of Methanol Bunkering Design Scheme
- Quantitative Risk Assessment of (synchronous) Methanol Bunkering Operations
- Ouantitative Risk Assessment of Methanol Onshore Facilities

Classification and Statutory Survey Services for Methanol Bunkering Ships

Methanol Bunkering Ships Rules Training/Compliance Consulting

Guidelines for Methanol Bunkering Operations for Ships (2023)

Guidelines for Methanol Bunkering Ships (Under Development)

Guidelines for Quantitative Risk Assessment of Oil and Gas

Rules and Guidelines

<Guidelines for Methanol Bunkering Operations for Ships> (2023)

<Guidelines for Methanol Bunkering Ships> (Under Development)

<Guidelines for Quantitative Risk Assessment of Oil and Gas> (2020)

Methanol Synchronous Bunkering Operations Consultation

Applicable Customers: Ship Companies

Applicable Stage: Ship Operations

Service Content: Technical consulting services are provided to clients on the technical aspects of synchronized bunkering operations and the delineation of restricted and cautionary zones.

Customer Benefits: Consulting services of synchronized operations such as methanol fuel bunkering and cargo/passenger loading and unloading to improve the safety of synchronized operations.

AIP for Methanol Bunkering Operation Scheme

Applicable Customers: Ship Companies

Applicable Stage: Ship Operations

Service Content: An Approval-in-Principle (AIP) service based on the CCS < Guidelines for Methanol Bunkering Operations on Ships>, for methanol bunkering operation scheme proposed by customers.

Customer Benefits: Approval in principle for the customer's proposed methanol bunkering operation scheme.

Qualitative Risk Assessment for Methanol Bunkering Operations

Applicable Customers: Ship Companies

Applicable Stage: Ship Operations

Service Content: Provide qualitative risk assessment services for methanol fuel tanker bunkering vehicle-to-ship, ship-to-ship, shore-to-ship, barge-to-ship and other bunkering methods, to help clients make informed decisions.

Customer Benefits: Qualitative risk assessment of methanol fuel bunkering operations to improve the safety of the operations.



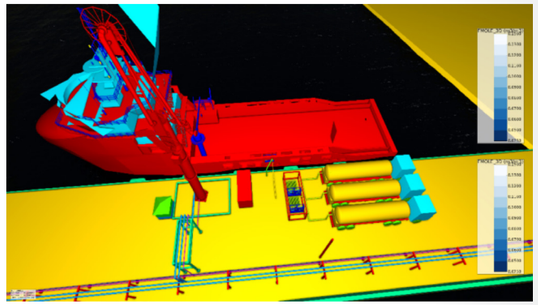
Methanol Bunkering Operation Process Optimization

Applicable Customers: Ship Companies

Applicable Stage: Ship Operations

Service Content: Provide customers with technical services for optimizing the bunkering process of methanol fuel tanker bunkering vehicle-to-ship, ship-to-ship, shore-to-ship, barge-to-ship and other bunkering methods.

Customer Benefits: Optimize the process of methanol bunkering operation to improve the safety of the operations.



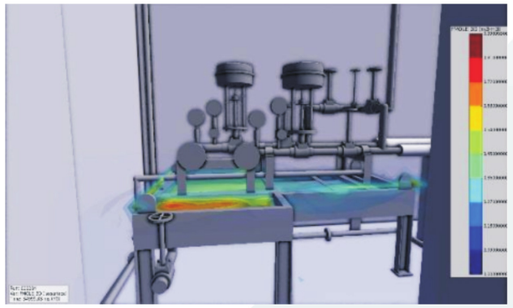
Quantitative Risk Assessment of Methanol Bunkering Design Scheme

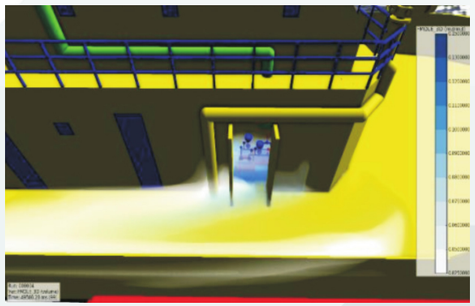
Applicable Customers: Ship Companies, Design Companies

Applicable Stage: Ship Design

Service Content: Based on international regulations and relevant CCS Rules, modeling and simulation calculations are carried out for the design of the liquid collection capacity of the methanol bunkering station, as well as for the design of the enclosure/semi-enclosed bunkering stations and ventilation in other locations. Optimized design schemes are provided based on the calculation results.

Customer Benefits: Quantitative risk assessment of methanol fuel power and bunkering related arrangements and design scheme to ensure ship safety.





Quantitative Risk Assessment of (synchronous) Methanol Bunkering Operations

Applicable Customers: Ship Companies

Applicable Stage: Ship Operations

Service Content: Provide quantitative risk assessment services for methanol fuel tanker bunkering vehicle-to-ship, ship-to-ship, shore-to-ship, barge-to-ship and other bunkering methods, providing a basis for the delineation of restricted areas and alert areas for (synchronous) bunkering operations

Customer Benefits: Quantitative risk assessment of methanol fuel (synchronous) bunkering operations to improve the safety of the operations.

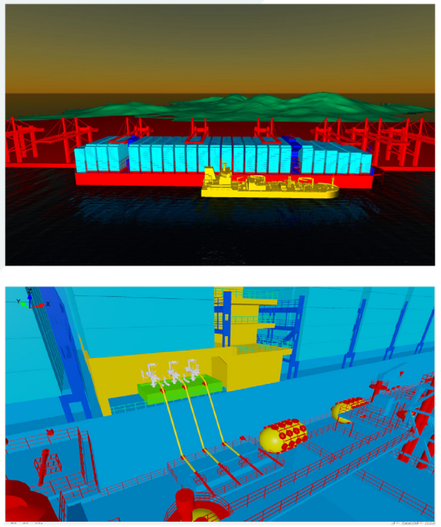
Quantitative Risk Assessment of Methanol Onshore Facilities

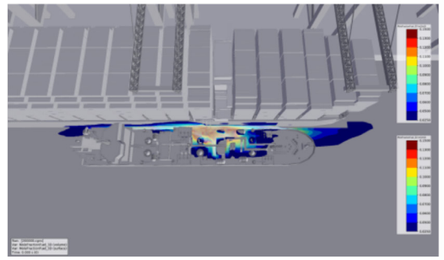
Applicable Customers: Ship Companies, Ports, etc.

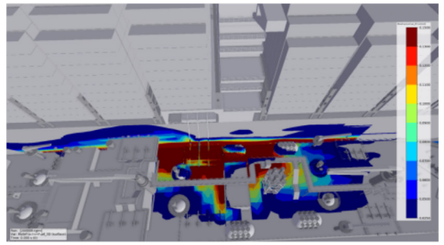
Applicable Stage: Ship Operations

Service Content: Provide quantitative risk assessment services for the design of onshore facilities such as methanol fuel storage tank areas, optimizing tank area layout, the scope and height of the cofferdams, etc.

Customer Benefits: Quantitative risk assessment of onshore facilities, such as methanol fuel storage tank areas, to improve the safety of methanol onshore facilities.







Classification and Statutory Survey Services for Methanol Bunkering Ships

Applicable Customers: Ship Companies, Design Companies, Shipyards, Manufactory, etc.

Applicable Stage: Ship Design, Construction, Operations

Service Content: Provide classification and statutory survey services such as drawing review, product approval/inspection, construction survey and operational survey for methanol bunkering ships applying for CCS classification.

Methanol Bunkering Ships Rules Training/Compliance Consulting

Applicable Customers: Ship Companies, Design Companies, Shipyards

Applicable Stage: Ship Design, Construction, Operations

Service Content: According to the specific needs of customers, we conduct online/offline promotion and training of the Rules for methanol bunkering ships, or conduct consultation and exchange on the implementation and enforcement of specific provisions of the Rules for specific ship types and issues, so as to deepen customers' understanding of the relevant requirements of the Rules and help the industry to better implement the Rules; at the same time, we actively take on board feedback from the industry to promote the revision and improvement of the Rules.

Customer Benefits: Training or consultation sessions with clients on the Rules to help them understand and implement it more accurately.



• Technical Services for Methanol Transportation Ships



Our Service

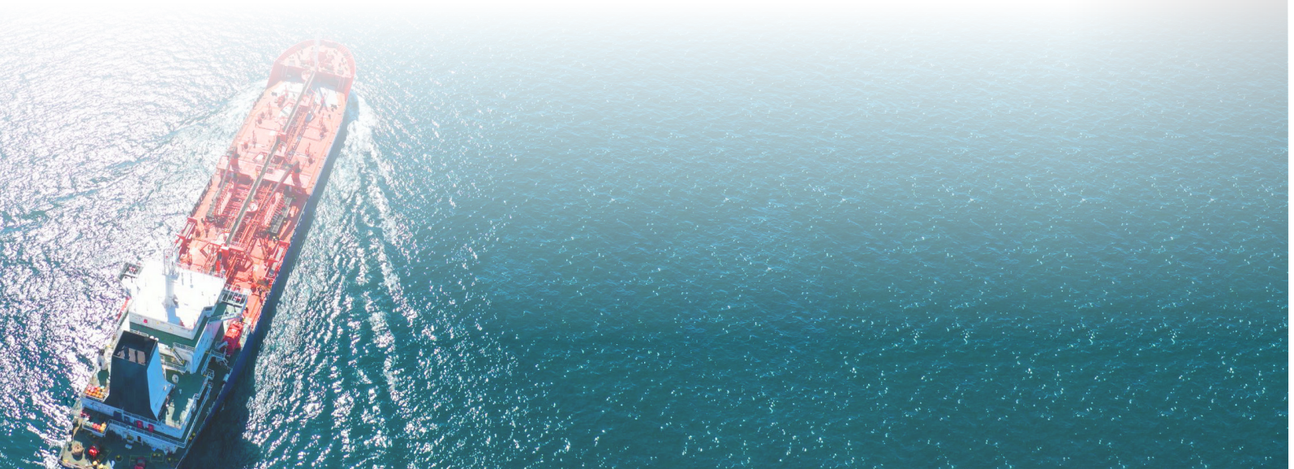
Methanol Transportation Ships Rules Training/Compliance Consulting

Applicable Customers: Ship Companies, Design Companies, Shipyards
Applicable Stage: Ship Design, Construction, Operations
Service Content: According to the specific needs of customers, we conduct online/offline promotion, training and consultation related to the Rules for methanol transportation ships.
Customer Benefits: Training or consultation sessions with clients on the Rules to help them understand and implement it more accurately.

Classification and Statutory Survey Services for Methanol Transportation Ships

Applicable Customers: Ship Companies, Design Companies, Shipyards, Manufactory, etc.
Applicable Stage: Ship Design, Construction, Operations
Service Content: Provide classification and statutory survey services such as drawing review, product approval/inspection, construction survey and operational survey for methanol transportation ships applying for CCS classification.

Rules for Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk



Rules and Guidelines

<Rules for Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk>

Methanol Transportation Ships Rules Training/Compliance Consulting

Applicable Customers: Ship Companies, Design Companies, Shipyards
Applicable Stage: Ship Design, Construction, Operations
Service Content: According to the specific needs of customers, we conduct online/offline promotion, training and consultation related to the Rules for methanol transportation ships.
Customer Benefits: Training or consultation sessions with clients on the Rules to help them understand and implement it more accurately.

Classification and Statutory Survey Services for Methanol Transportation Ships

Applicable Customers: Ship Companies, Design Companies, Shipyards, Manufactory, etc.
Applicable Stage: Ship Design, Construction, Operations
Service Content: Provide classification and statutory survey services such as drawing review, product approval/inspection, construction survey and operational survey for methanol transportation ships applying for CCS classification.

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APR, 2023