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# Methanol, Hydrogen & LNG Fuel Bunkering and Fuel Cell Technology



## About this Training Course:

Methanol, and Hydrogen are emerging as promising alternative marine fuels in the shipping industry's drive towards decarbonisation and environmental sustainability. As the maritime sector faces increasingly stringent emissions regulations, methanol offers a cleaner burning option that can significantly reduce sulphur oxides, nitrogen oxides, and particulate matter emissions compared to conventional marine fuels. Additionally, with the potential for carbon-neutral production through renewable sources, methanol represents a key pathway for the shipping industry to meet ambitious greenhouse gas reduction targets.

This comprehensive introductory 3-day instructor led online course covers a wide range of topics essential to understanding these as a marine fuel. Participants will explore current methanol LNG and Hydrogen market dynamics and infrastructure development, gaining insights into the commercial landscape. The course delves into bunkering procedures and equipment for various delivery methods, including ship-to-ship, truck-to-ship, and terminal-to-ship transfers.

Fuel cell technologies and onboard power systems are examined, providing a thorough understanding of the latest propulsion options. Safety considerations and risk management for operations are emphasized throughout, ensuring participants are well-versed in best practices. The regulatory framework surrounding methanol, Hydrogen and LNG as a marine fuel is covered, including

# Methanol Hydrogen and LNG Fuels Bunkering and Fuel Cell Technology for Vessels

Technical, Commercial, Safety and Standards

international codes, standards, and compliance requirements. Methanol-fuelled Hydrogen and LNG vessel design and retrofit considerations are discussed, offering practical knowledge for both new builds and conversions.

The course also addresses the commercial and operational implications of adopting these as marine fuels, including cost factors, logistics, and performance considerations. Through a combination of lectures, case studies, and interactive sessions, participants will gain a comprehensive understanding of methanol bunkering and fuelled vessel technology, preparing them to navigate the challenges and opportunities in this emerging field.

## Learn what participants have said about the trainer's other courses:

*"We have utilised this training for our crew and LNG Tech Superintendents for several years,"* **Tech Superintendant China Shipping Lines (CSL)**

*"In this technical LNG Maritime field particularly in the future - this course is of great benefit to our teams,"* **Senior Manager, CMA CGM Group**

*"Marine LNG Institute Courses are very technical and informative, very approachable and professional".* **Corporate Strategist Evergreen Marine Corp**

*"The offshore technical aspects to the trainer's seminars are excellent,"* **Offshore Manager, OOCL Lines**

## Objectives of this Training Course:

After the completion of this course, the participants will be able to:

- ❖ Reinforce knowledge about operations that are carried out in accordance with all relevant national and international maritime legislation, local regulations, and industry best practices.
- ❖ Evaluate the different procedures and factors affecting cost of the operation.
- ❖ Ensure overall safety for Methanol operation on the use of correct size and number of fenders and certified tested hoses.
- ❖ Become familiar with Methanol and Hydrogen vessels, operations and equipment.
- ❖ Enhance understanding of Ship-to-Ship and bunkering transfer equipment, design, maintenance – and training methods for STS.
- ❖ Familiarise the differences of Person in Overall Advisory Control, Mooring Master and Master of the Ship.
- ❖ Establish a useful methodology in reducing risk.
- ❖ Understanding environmental challenges.
- ❖ Recognise and understand differences in operations and hazards between oil and gas vessels.
- ❖ Understand requirements for Methanol and Hydrogen vessel compatibility, Optimoor studies and gaseous spill responses and case studies

## Who should attend this Training Course?

This course is ideal for professionals involved in the maritime, bunkering, and energy sectors who are looking to understand the opportunities and challenges presented by emerging marine fuel. It is particularly relevant for:

- Ship owners, operators, and managers
- Marine engineers and technical superintendents
- Bunkering companies and fuel suppliers
- Port and terminal operators
- Classification societies and regulatory bodies
- Maritime consultants and surveyors
- Equipment manufacturers for marine fuel systems
- Energy and shipping traders
- Environmental compliance officers
- Maritime insurance and legal professionals

By attending this course, participants will be well-equipped to navigate the transition and capitalize on its potential in the evolving maritime landscape.

Other useful information at a glance:

| Course level:         | Maximum number of participants: | CPD Points | CEU Points |
|-----------------------|---------------------------------|------------|------------|
| Basic<br>Introductory | 10                              | 19.5       | 2          |

This course is offered through Virtual Instructor Led Training (VILT) format and In House Training World wide.

## 3-DAYCOURSE AGENDA

### DAY 1:

#### LNG - Methanol and the Gas Markets

- Current world energy supply
- Trends in New Energy development
- Technology Development in Methanol
- Market drivers for Methanol

#### What Methanol LNG and other Gaseous Bunkering Facilities are currently available?

- Existing infrastructure and locations
- Potential future development by regions
- Standardisation of facilities and procedures, is there any?
- What would be the best infrastructure in region and else where

#### Delegate Exercise & Case Study & Comparison Analysis

- The commercial arguments for Methanol as marine fuel
- Low-sulphur fuels LSFO explained. LSFO vs. Methanol as alternative fuel sources

#### Recent Developments in LNG/Hydrogen Methanol and Gaseous Bunkering Procedures and Standards

- Applicable codes
- International Safety Management (ISM)
- Tanker Management Self-Assessment (TMSA)
- International Ship and Port Security (ISPS)
- Users of TR 56 [Singapore] TR56 is applicable to bunkering of both ocean-going vessels and harbour craft.
- Scope of TR 56 - Singapore the technical reference covers delivery from bunkering facilities (i.e., trucking, shore, terminal, shipping and ISO tankers lifting facilities) to receiving ships through four modes of transfer (truck-to-ship, shore-to-ship, ship-to-ship and cassette bunkering)
- International code safety of ships using gases as fuel (IGF)

#### Introduction to Methanol, Hydrogen, LNG and gaseous fuels

- Definitions and abbreviations - Introduction to maritime systems
- Safety-related properties and Risk comparison for gaseous hydrogen and methanol
- Comparison of safety-related properties for hydrogen and methanol and Hydrogen in liquid (cryogenic) form
- Outdoor/ Enclosed-room releases

#### Generic System Configuration

- Vent mast system (for control and emergency)
- Air ventilation system (normal and emergency)
- Separate ventilation spaces (pipe in duct, fuel-cell spaces, tank connection space, etc.).
- Structural fire protection
- Fire detection and fire extinguishing systems.
- Hydrogen leakage detection. Void(s)

### DAY 1 (CONTINUED):

#### Fuel-Cell Power Installation, in Line with IMO Guidelines

- Compressed system and Liquid system
- Tank hold space:
- Liquid tanks (cryogenic). Structural fire protection (insulation towards neighboring spaces).
- Ventilation system (artificial ventilation to provide continuous air changes to the TCS).
- Detection system (e.g., audible detection, gas detectors).
- Safety system (fire detection, firefighting system, and emergency shutdown system).

#### Maritime Implementation Phases – Implement a System Onboard a Vessel for Bunkering

- Visualization of the implementation phases and the responsible party for a maritime hydrogen project in the shipbuilding process.
- Feasibility studies
- Redundancy systems
- Safety
- Segregation of spaces aboard vessels

#### Onboard Systems

- Design and procurement
- Fabrication and testing
- Installation and commissioning
- Operation and maintenance
- Documentation requirements
- Operation manual
- Maintenance - A plan for systematic maintenance and function testing

#### Regulations, Codes and Standards as Maritime Fuel

- Introduction to the international regulatory framework and outline the Alternative Design approval process for fuelled vessels.
- Relevant rules and standards for methanol and hydrogen fuel cells, hydrogen storage, and hydrogen bunkering are also introduced. summary of engineering details for LH2 and CH2 systems on ships.
- Maritime regulations and rules exist on three levels. International regulations developed by IMO; National regulations; and class rules
- The IGF Code/Preliminary design phase

#### Proposed Steps in the Process Towards 'Approval of Preliminary Design' for Ships

- Initiation of Preliminary Design Development/ Preview
- Categorization of new technology Definition of the approval basis
- Developing preliminary design and documentation
- Role of the Administration
- Stakeholder interaction

## DAY 2:

### **Methanol/Hydrogen and LNG Bunkering Operations and Procedures for various delivery methods of gaseous fuels**

- Key principles of Methanol STS
- Parties involved, pre planning and equipment
- Mooring, Operations and Manoeuvring
- Cargo Transfer Operations

### **Land to Ship**

- Truck to Ship (TTS) and Loading Arm options
- Parties involved and roles in preparedness
- Equipment and compatibility
- Key steps in preparation
- Operations

### **Terminal Pipeline**

- ISO standards
- Pilotage and vessel traffic services (VTS)
- Tug and mooring boat operators
- Terminal layout and operations
- Terminal and ship operator collaboration

### **Fuel Cell Technologies**

- Summary of Fuel Cell technologies
- The 3 most promising fuel cell technologies
- Alkaline fuel cell (AFC)
- Proton Exchange Membrane fuel cell (PEMFC)
- High Temperature PEM
- Direct methanol fuel cell (DMFC)
- Phosphoric acid fuel cell (PAFC)
- Molten carbonate fuel cell (MCFC)
- Solid oxide fuel cell (SOFC)
- System efficiencies of fuel cells

### **Custody Transfer, Measurement and Calculations**

- System setup parameters
- Ship and surveyor roles
- Quality and quantity controls and calibration – equipment
- Certificate of Loading
- Bill of Lading issuance and presentation for certain receiving countries
- Mass/Volumetric Flow measurements
- Types of Custody Transfer Measurement
  - Systems and Equipment
  - Liquid form measurement
  - Volumetric measurement
  - Temperature measurement
  - Custody Transfer Measurement system
  - (CTMs) testing and checks

### **Bunkering Operations and Transfer Inspections**

- In service inspections
- Service Leak Testing
- Hose Ops and Vessels Procedures
- COLOUR COUPLINGS INDEXES
- Operational risk profiles in Bunkering
- Inspections and Audit – Rigging
- Inspections and Audit – Wire Ropes

## DAY 2 (CONTINUED):

### **Case Study**

- Gas Transfer Failures Investigation and Root Cause Analysis - Diagnosis, Analysis and Planning

### **POAC and Proposed steps in the process towards final approval for Re-fuelled and fuelled ships**

- Detailed requirements for tests, manufacturing, and operation
- Proof of equivalence and risk criteria
- Individual risk - The basis for individual risk criteria is the consideration
- Societal risks
- Class rules and the role of the Classification society
- The qualification process from Approval in Principle to Approval.

### **Methanol - Compatibility Analysis and Fuelling stations**

- Detection of leaks detection apparatus
- Stationary applications/ piping network
- Pressure-relief devices
- The Compressed Gas Association standards
- Supplementary codes and standards - The aim of this subsection is to introduce supplementary standards that may provide useful input to the ongoing work

### **The International Code for Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) - An interim guideline of the IGC Code as cargo for one pilot project (Australia to Japan)**

- Safety distances and hazardous zones Criteria for safety distances
- Main stakeholders and information flows involved in a bunkering operation
- Bunkering operations for low-flashpoint fuels
- Risk-based approaches are likely to be required in define safety distances for bunkering.

### **Methanol/Hydrogen and LNG Bunkering Safety and Risk Management**

- Risk Analysis and Job Safety Analysis – objectives
- Technical characteristics of Methanol
- Handling, storage and spill risk.
- Volatile cargo and gas vapours leak from ruptured tanks, hoses and pipelines, causing oxygen deficiencies
- Gas Hazard Monitoring Equipment for JSA
- Adverse Weather Working – Guidelines examples for JSA
- Approach to Methanol and Installations
- Hose construction and length
- Hose quality and identification

### **End of Day 2**

## DAY 3

### **Marine Engineers and Tech Superintendents – Wear down, Fatigue and Failure Management Practices and planning for LNG/Hydrogen and METHANOL Fuel and Bunkering**

- Overview of SMS & PMS
- Discuss onboard planned maintenance systems – PMS
- Discuss Trend analysis – T.A
- Analysis of Condition monitoring technical - CME
- OEM Main Engine component failures relevant to engine performance

## DAY 3:

### Offshore Installation and Safety Management Practices

- OIM - Operations inside 500m safety zone;
- Manoeuvring; safe approach, weather monitoring,
- Methanol and Bunkering Cargo handling and Planning
- Methanol Installation Data Cards
- Accidental causes - fire on board ships.
- Methanol, Bunkers and Mechanical energy
- Liquids and gases
- Bunkers, Fire and the Fire Responses safety
- Investigation priorities upon arrival due to Bunkering failure
- Determining the point of origin
- Reconstruction of fire
- Documentation, sketches, sketching systems plotting methods

### Bunkering Methanol LNG and Hydrogen and other Gaseous Infrastructure - decisions, location, designs, equipment

- Optimum location and equipment required
- Methanol supplier contract and bunker cost to vessels
- Equipment types, storage tanks, pumps, Road rail requirements
- Emergency response facilities

### Bunkering Project Facility Development

- Decide on location and facilities
- What bunkering operations will we do and how
- HAZID, what are the project risks
- Costing, development time, personnel
- Technical issues in Methanol Bunkering Facility Development
- Feasibility assessment for a small-scale Methanol bunkering project

### Port and Vessel Planning – Considerations, Consultations

- Market assessment – demand
- Port and Vessel operations, emergencies, mooring systems
- Other options road tankers, ship to ship, alongside jetty
- Public relations, environment, jobs, education
- Risk Assessment, Operational and Safety benchmarks for Methanol Bunkering Facilities

### Trading developments

- New production facilities and locations
- New trading routes and hubs developing
- Off-shore industry expansion options for Methanol as fuel
- On shore development of infrastructure
- Remote supplies and disaster recovery, portable Methanol

### Fuel and Ship Design Configurations

- Current Methanol LNG and Hydrogen Propulsion Options
- Fuel Tanks
- STORAGE
- Fuel System
- Impacts on Ship Configurations and Operation
- Suitable Ship Types

### CASE STUDY - PLANNING/DEVELOPMENT CONSIDERATIONS AND TRANSFERS

#### General Arrangement of Bunkering Systems

- Material requirements
- Arrangement of bunkering system
- Methanol bunkering station
- Bunkering control station
- Ventilation in closed or semi- enclosed spaces
- Transfer Systems

#### ERC and QCDC Systems

- Hoses Type approval of OEM bunkering hose
- Quick connect disconnect coupler (QCDC)
- Break-away and emergency release coupling (ERC)
- Type approval of break-away and ERC
- Transfer arm
- Methanol transfer system
- Testing of the complete system
- Bunkering transfer rate
- Sampling
- Arrangement for draining the Methanol transfer lines
- Compatibility between receiving ship and bunkering ship

#### Gas Detections and Automated Systems

- Gas detection in enclosed spaces
- Gas detection in open areas
- Emergency shut-down systems (ESD)
- Automation Systems
- Emergency shut-down systems (ESD)
- Alarms and safety actions
- Communication systems
- Water Spray systems
- Dry chemical powder
- Fire protection
- Fire extinction
- Vapor return line

#### Gas Detections and Automated Systems

- Claims for Shortage of Oil/LNG and Cargo – Statistics
- Overview of Supply Chain
- 'Boil-Off' During the Voyage and Bunkering
- Owners' Warranted Performance
- Charterparties for the Carriage of Methanol Cargo
- Examination of the Contractual Allocation of Risk Controls to Prevent Methanol Cargo and Bunkering Shortage

#### COURSE Q & A SESSION

#### Marine LNG Institute – Certifications and Certificates

##### Individualized "One to One" for 1 hour post training!

To further optimise your learning experience from our courses, the Marine LNG Institute also offer individualized "One to One" for 2 hours post training **free of charge**.

We help improve your competence in your chosen area of interest, based on your learning needs. This is a great opportunity to improve your capability and confidence in a particular area of expertise. It will be delivered over a secure video conference call by one of our senior trainers.

# REGISTRATION FORM

|  |  |   |               |   |   |
|--|--|---|---------------|---|---|
| Methanol, Hydrogen and LNG Fuels<br>Bunkering and Fuel Cell tech |  | ✓ | <b>NORMAL</b> | ✓ | Recognises the value of learning in teams.<br>Group bookings at the same time from the same company receive the following:<br>3 or more at 5% off<br>5 or more at 7% off<br>8 or more at 10%<br><br>All other promotions including are exclusive of the group discount. |
|  |  |   | MAX 10 PAX    |   |   |

## DELEGATE DETAILS

### Delegate 1

Mr  Ms  Mrs  Dr  Others: \_\_\_\_\_

Name : \_\_\_\_\_

Job Title : \_\_\_\_\_

Department : \_\_\_\_\_

Telephone No. : \_\_\_\_\_

Email : \_\_\_\_\_

### Delegate 2

Mr  Ms  Mrs  Dr  Others: \_\_\_\_\_

Name : \_\_\_\_\_

Job Title : \_\_\_\_\_

Department : \_\_\_\_\_

Telephone No. : \_\_\_\_\_

Email : \_\_\_\_\_

Company : \_\_\_\_\_

Address : \_\_\_\_\_

Country : \_\_\_\_\_ Postcode: \_\_\_\_\_

Attention : \_\_\_\_\_

Invoice to : \_\_\_\_\_

Telephone No. : \_\_\_\_\_

Fax No. : \_\_\_\_\_

#### PAYMENT METHODS

By Direct Transfer. Please quote your Students Name with the remittance advise via email to student enrolments via our website. [www.marinelnginstitute.com](http://www.marinelnginstitute.com)

All bank charges to be borne by payer. Please ensure that the full invoiced amount per student is received in USD.

We do not accept By Credit Card.

As Payment through credit card incurs a 3.5% admin fee payable by the payer. Payment through credit card is not applicable.

#### PAYMENT POLICY

Payment is due in full at the time of registration and enrolment. Full payment is mandatory for event attendance. By submitting this registration form, you have agreed to payment terms.

#### CANCELLATIONS & SUBSTITUTIONS

You may substitute delegates at any time. For cancellations received in writing more than seven (7) days prior to the training course, delegates will receive a 100% credit on the amount paid which can be used in another training course for up to one year from the date of issuance. The credit is transferable to other persons in the same company and applicable against any future public course. For cancellations received seven (7) days or less prior to an event (including day 7), no credit will be issued. In addition, a cancellation fee equivalent to 15% of the course fee will be charged. In the event that we postpone or cancels a course, delegate payments at the date of cancellation or postponement will be refunded in full. MLNGI does not provide refunds for cancellations and postponements or waive fees for unpaid invoices upon receipt of registration

### 3 EASY WAYS TO REGISTER

#### Please note

- Indicate if you have already registered and made payment by Email + or Web.
- If you have not received an acknowledgement by email before the training course, please contact us to confirm your booking.
- Photocopy this form to register multiple delegates.

### 3 EASY WAYS TO REGISTER

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