



LNG AS A FUEL AND BUNKERING

LIVE ONLINE TRAINING**Nov 2023**Part 1: **6th Nov**Part 2: **7th Nov**Part 3: **8th Nov**Part 4: **9th Nov**Course Parts will commence at **16:00** and end at **20:00 (AEDT)**. There will be short breaks during each course Part.**4 Part
Series**

Our Expert Course Instructor

**James Gardiner**

Marine Engineering, LNG and Ship Fuels Expert

James is an Independent Marine Engineering Surveyor and Forensic Marine Engineer. For the past 27 years, he has been heavily engaged as an expert regarding LNG vessel and offshore platforms, STS – ports and harbour infrastructure, machinery failure investigation and safety, LNG propulsion and vessel component integrity and failure.

KEY LEARNING OBJECTIVES

- ▶ Refresher on LNG properties (composition, vapour density, flammability, tank, pressure, etc)
- ▶ Current regulations, rules and codes (SOLAS, IGF, IGC, IMO, STCW, SGMF)
- ▶ LNG Bunkering Operations and Procedures for various delivery methods
- ▶ Characteristics of various LNG containment systems
- ▶ Management of LNG fuel tanks
- ▶ Vessel operational preparedness for LNG Bunkering
- ▶ Implementation of end-to-end LNG Bunkering
- ▶ LNG Custody transfer, calculations and quality & quantity measurement
- ▶ Bunkering safety, risk management and emergency response
- ▶ SIMOPS procedure during LNG fuel transfer

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ABOUT THE COURSE

Increasing adoption of LNG as a fuel and steady investment on bunkering infrastructure are driving significant growth in LNG bunkering market, which is poised to double-digit growth in the next decade. Catering to LNG suppliers, shipowners and terminal operators, this masterclass offers a refresher on LNG properties as a fuel, important regulations & codes as well as best practices in bunkering operations.

Recognised by Nautical Institute for Continued Professional Development (CPD), this course enables attendees to better manage LNG containment systems, LNG fuel tanks, understand the various bunker delivery methods, quality & quantity measurement, as well as planning for vessel preparedness and emergency response.

WHO WILL BENEFIT

- LNG suppliers – IOCs, NOCs and independent suppliers
- Shipowners, charterers, operators and managers
- LNG traders and distributors
- Shipyards and ship designers
- LNG ports and terminals
- Marine fuel service and surveyors
- LNG technology and equipment vendors
- Ship and gas equipment and service providers
- Conventional bunkering companies looking to diversify

COURSE DIRECTOR



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and harbour infrastructure, machinery failure investigation and safety, LNG propulsion and vessel component integrity and failure.

He advises multinational participants in the Oil and LNG/STS, and the geotechnical LNG drilling sector in areas regarding offshore LNG and oil platform installations in Australia, Europe, USA and throughout South East Asia.

He has been engaged on experimental and theoretical investigation of liquid hydrogen pool spreading and vaporization. Pool spreading and vaporization of liquid hydrogen. Simulation of Small-Scale Releases from Liquid Hydrogen Storage Systems by Oil and Gas majors internationally. His recent research has involved assessing cost-effective choices of marine fuels in a carbon-constrained world resulting from theoretical global energy models in Environmental science & technology.

He is an independent expert in the Marine Engineering field, dominating matters involving the Oil and LNG, Hydrogen and biofuel sectors. He lectures in the field of marine survey engineering, LNG auditing and safety throughout South East Asia, the United Kingdom, New Zealand, Australia and the United States of America (Gulf). This includes developing and providing expert training in LNG and Hydrogen vessel and offshore platform HSE/NEBOSH/SIMOP/LNG/IMO and ILO.

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4-Module Course Syllabus

MODULE 1

SESSION 01 – INTRODUCTION FOR THE USE OF LNG AS FUEL

Understand where natural gas comes from & transportation

- Natural gas constituents
- Processing natural gas
- Composition and energy content relationship
- Transporting natural gas by pipe or by ship
- Main exporting and importing countries, NG reserves

Why use LNG as a fuel?

- MARPOL Annex VI why is it needed?
- Background to MARPOL Annex VI
- Overview of Annex VI
- Regulation 13 NOx
- Regulation 14 SOx
- Compliance Options

LNG Fuelled Vessels Facts & Figures

- Vessels Fuelled by LNG
- Small scale LNG infrastructure development
- Environmental emissions comparison

SESSION 02 – LNG PROPERTIES AND GAS LAW REVISION

Composition of natural gas

- Differences in load port compositions
- Effect of different compositions
- Physical properties of the components

Relationship between pressure and temperature

- Saturated vapour pressure
- Relationship of SVP with temperature
- Boiling
- Change of boiling point with temperature

How LNG is kept cold

- Evaporation and boiling in a tank
- Dropping pressure to cool liquid

Natural gas vapour

- Vapour density
- The visible white cloud
- Difference between a vapour and a gas

Flammable range of natural gas

- Flammable mixtures in air
- Flammable range diagram

Managing tank atmospheres

- Inerting to avoid a flammable atmosphere
- Gas freeing to avoid a flammable atmosphere

Other properties of Methane

- Flash point
- Auto ignition temperature

SESSION 03 – HAZARDS OF LNG

Health

- Asphyxiation
- TLV

Low Temperature

- Cold burns and frostbite
- Liquid and vapour effect of ship structures
- Brittle fracture

Pressure

- In tanks
- In pipelines

Flammability

- Flammable range in a vapour cloud
- Ignition of a vapour cloud
- Ignition of a cloud from a vent mast
- Burn back of ignited clouds
- Vapour cloud explosions, detonation and deflagration
- BLEVE

Slashing in membrane tanks

- In large LNGCs
- In small fuel tanks and bunker vessels

Rollover

- Stratification of layers
- How it may occur

MODULE 2

SESSION 04 – REGULATIONS

Current regulations status

- SOLAS statement on low flashpoint fuels

Rules for bunker vessels

- The IGC code

Rules for vessels using LNG as a marine fuel

- The IGF code
- Evolution of the IGF code
- IMO interim guidelines for LNG as a fuel
- Crew training requirements

- Proposed amendments to STCW
- National regulations for inland waterways
- Additional guidance – SGMF

SESSION 05 – LNG CONTAINMENT SYSTEMS

Tank types approved by the IGC code

- Independent tanks, A,B,C and Membrane tanks

Type A tanks

- Description of tank type
- Main characteristics

Type B tanks

- Description of tank type
- Main characteristics

Type C tanks

- Description of tank type
- Main characteristics

Membrane tanks

- Membranes generally
- NO96 description
- MkIII description
- MkV description

Options for bunker vessels

- Examples of small scale LNGCs with type C & membrane
- Comparison of size and weight differences

Tank location requirements

- Requirement for greater volume
- Draft IGF code requirements
- Examples of membrane and type C tank usage
- Inland barge Eiger example use of type C

SESSION 06 – BUNKER DELIVERY METHODS

Methods of bunker delivery

- Pipe, truck or barge to ship
- container swap out

Bunker station and hose requirements

- Draft IGF requirements
- Dry disconnect couplings
- Emergency release system
- Emergency shutdown

Management of pressure during the bunker transfer

- Factors to consider
- Pressure and temperature relationship
- Typical tank pressure settings
- Membrane to membrane transfer
- Type C to membrane transfer
- Membrane to type C transfer
- Type C to type C transfer
- Keeping cargo cold in a bunker vessel

MODULE 3

SESSION 07 – BUNKERING SAFETY CONSIDERATIONS

Organisation

- Master
- Person in charge

Communications

- Receiving vessel and bunker supplier
- Verbal & non verbal communications

Hazardous areas

- Definition of the hazardous area
- Electrical equipment in hazardous areas

Safety and security zones

- Definition of safety and security zone

Cryogenic protection

Controlling sources of ignition

- Potential sources of ignition
- Static electricity
- Galvanic currents

PPE

- Protective clothing
- Resuscitators and BA

SESSION 08 – THE BUNKERING OPERATION - PROCESS

Before bunkering

- Compatibility
- Safety
- Checklists
- Weather
- Lighting
- Authorisations/Notifications
- Maximum filling level

Hose connection

- Connection
- Purging
- Leak testing

During bunkering

- Supervision
- Starting
- Bulk transfer
- Topping off
- Filling Limits
- Vapour management

After bunkering

- Post transfer checklist
- Draining and purging of hoses
- Disconnection of hoses

SESSION 09 – TYPES OF GAS FUELLED ENGINES

Propulsion systems using gas fuelled engines

- Electrical and mechanical systems
- Fuel gas delivery pressures

Basic principles of gas fuelled engines

- Pure gas engines
- 4 Stroke dual fuel engines
- 2 stroke dual fuel engine HP and LP gas injection

Knocking and methane number

- Cause of knocking
- Problems caused by knocking
- Methane number and relationship to knocking

MODULE 4

SESSION 10 – MANAGEMENT OF LNG FUEL TANKS

Gas fuel management and delivery systems

- Requirements of stored fuel systems
- Main components in delivery system
- Example of Wartsila LNGPac for LP delivery
- Example of HP gas delivery system

High fuel demand

- Delivery of BOG gas to engines
- Generation of additional gas

Low fuel demand

- Delivery of BOG gas to engines
- Dealing with excess BOG

Bringing a tank into service

- Inerting
- Gassing up
- Cooling down

Taking a tank out of service

- Removal of liquid
- Warming up
- Inerting
- Aerating

SESSION 11 – QUANTITY AND QUALITY MEASUREMENT

Understand the requirement to measure quantity and quality

- Recognise that LNG traded on energy content which varies with evaporation
- Discuss the variability of LNG composition around the world
- Understand the need to pay for what is received and the taxes due
- State the requirement to know the Methane Number for engine performance

Quantity measurement

- List the measurement options
- Describe a Coriolis Mass Flowmeter
- Describe an Ultrasonic Flowmeter
- Describe the way in which density is determined

Quality measurement

- Recognise the issues associated with taking a sample of LNG liquid
- Describe the way in which samples may be taken
- Discuss the use of gas chromatography in determining composition of samples

Legal Metrology

- Explain the meaning of legal metrology
- State the difference between OIML and MID
- Have an understanding of the requirements under MID

SESSION 12 – EMERGENCY RESPONSE

Leaks

- Detection
- Response
- Protection from low temperatures
- Use of water spray to deflect gas clouds

Venting

- Location of vent mast
- Vapour cloud dispersion
- Lightning strike

Fighting Gas Fires

- Fire-fighting equipment
- Techniques for fighting gas fires
- Use of dry powder

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Course Code	Location	Course Parts	Month	Standard Price		4+ Dels Discount
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