Liquefied Natural Gas (LNG)
Hazards - Technology - Operation - Economics

5 days
Overview

LEVEL
Foundation

PURPOSE
This course provides a comprehensive technical and economic review of the Liquefied Natural Gas industry.

LEARNING OBJECTIVES
Upon completion of the course, participants will be able to:
- review the structure of an LNG chain and the world map of LNG plants,
- understand main LNG physical properties and specificities,
- assess LNG facilities’ hazards and HSE issues, along with risk mitigation and prevention techniques,
- grasp main liquefaction processes’ operating principles, conditions and constraints,
- gain an overview of the technology of equipment used in the LNG industry, grasp the essence of LNG markets and contracts.

WAYS AND MEANS
Highly interactive training by industry-specialist lecturers.
Numerous applications, illustrations and videos.

LEARNING ASSESSMENT
Assessment by test at the end of the course.

PREREQUISITES
No prerequisites for this course.

Agenda

THE LNG WORLD
The LNG chain. Order of magnitude and trends. Location of main plants worldwide.

0.5 d

LNG SPECIFIC PROPERTIES & ASSOCIATED HAZARDS
Physical properties: liquid-vapor equilibrium, density, ratio of vapor methane/LNG, heat of vaporization, heat of combustion...
Safety aspects: flash point, fire point, auto-ignition point, minimum spark energy, flammability limits, deflagration.
LNG vaporization, Rapid Phase Transition (RPT), radiation levels, stratification/roll-over, sloshing, LNG clouds ignition.
Asphyxiation risks, cryogenic liquids jets, piping behavior.

0.5 d

LNG HAZARD PREVENTION & MITIGATION MEASURES

0.5 d
LNG spillage control at design stage and in operation.
LNG clouds control in operation.
LNG fires control at design stage and in operation.

LIQUEFACTION & REGASIFICATION PROCESSES
Feed pretreatment: sweetening, dehydration, NGL extraction, Hg and aromatics removal.
Different liquefaction processes: pure component refrigerants, pure component(s) and mixed refrigerant(s), mixed refrigerants.
Peak shaving simplified scheme.
Regasification process.

LNG STORAGE, LOADING/OFFLOADING & TRANSPORT
LNG tanks: single or double or full containment (self-standing, membrane). Hazards.
Jetty head, jetty trestle, harbor.
LNG carriers: common features, technology, cargo operations, safety systems.

TECHNOLOGY OF LNG SPECIFIC EQUIPMENT
LNG cryogenic heat exchangers: spiral wound heat exchangers, aluminum brazed heat exchangers.
Technology of the cryogenic compressors and their drivers (gas turbines).
LNG Vaporizers: Open Rack Vaporizers (ORV), Submerged Combustion Vaporizers (SCV), etc.
Safety and environmental aspects.
Submerged LNG pumps: in-tank retractable pumps, cargo pumps, HP canned send out pumps, etc.
Liquid cryogenic turbo-expanders, cryogenic valves.
Cryogenic personnel protection items.

LNG PLANT OPERATION
Day to day activities in an LNG plant. Experience of some plants.

LNG TRENDS - RESEARCH & NEW DEVELOPMENTS

LNG ECONOMIC ASPECTS
Gas markets: natural gas reserves and production, worldwide gas demands distribution, international natural gas trade.
LNG contracts: specificities of LNG contracts, pricing, shipping contracts.
LNG markets trends.