

# LNG Technology Training

## Pre-Symposium Workshop



**Gas Processing Center**  
....Integrating Fundamentals with Practice

**Ritz Carlton Hotel**  
**January 10, 2009**  
**Doha - Qatar**



### Introduction:

As natural gas is the cleanest fossil fuel, it is an attractive solution for domestic use and power generation. Demand for liquefied natural gas is expected to grow at around 7 to 10% per annum – three to four times the annual growth rate of natural gas overall. The Natural Gas Liquefaction process is a key technology for the LNG value chain in terms of capital and operating cost, complexity, operation, availability and reliability. Although the base load LNG industry is already 50 years old, there are still many developments in the LNG process as well equipment, which have major impact on current projects. Examples are the new 7.8 mmtpa LNG trains in Qatar based on the APX technology and the 4,8 mmtpa LNG trains in Sakhalin using DMR technology. Qatar will produce a significant part of the global LNG with a production of 77 mmtpa around 2011.

### Key Benefits:

The workshop introduces the fundamentals of the LNG industry and the Natural Gas Liquefaction processing technology. It allows participants to understand the key aspects of LNG plant design, equipment and engineering. The workshop provides a solid framework to understand the symposium presentations in the area of Natural Gas Liquefaction Technology. On completion of the workshop delegates will be able to:

- Understand the key characteristics of the LNG industry.
- Be familiar with the LNG specifications and behaviour.
- Be aware of the key gas processing steps in the LNG value chain.
- Understand key thermodynamic principles of Liquefaction.
- Have an awareness of the key equipment and engineering aspects of a LNG plant.
- Be familiar with a number of (technical) developments in the LNG industry.

### Target Audience:

This pre-symposium workshop is for people who like to receive an introduction into LNG industry and LNG technologies, the basic principles of Liquefaction and the associated key equipment. This may be of interest to university students, graduate engineers but equally is of relevance to experienced participants of different process industries.

### Logistics:

- Workshop starts at 7:30 AM and ends 2:30 PM.
- Fees: Participants attending symposium: 1460 QR (400 US\$) per participant.  
Participants attending training only: 3650 QR (1000 US\$) per participant - 15% discount for Consortium Members.
- For symposium participants, register through website: [www.gasprocessingcenter.com/symposium.aspx](http://www.gasprocessingcenter.com/symposium.aspx)
- For registration and more information please contact: The Gas Processing Center e-mail: [gpc@qu.edu.qa](mailto:gpc@qu.edu.qa)  
Or visit our website at: [www.gasprocessingcenter.com](http://www.gasprocessingcenter.com)
- For registration and more information please contact:  
The Gas Processing Center e-mail: [gascenter@qu.edu.qa](mailto:gascenter@qu.edu.qa)  
Or visit our website at [www.gasprocessingcenter.com](http://www.gasprocessingcenter.com)

### Who are we?

The **Qatar University Gas Processing Center (GPC)** has been launched, March of 2007, to be the main research center in the State of Qatar addressing challenges and opportunities in the field of gas processing. The Center enjoys an excellent relationship with local and international companies that have presence in Qatar. Its consortium has attracted major players in the gas industry. In addition to the research activities, the center is offering periodic technical training programs and is organizing an annual international symposium on gas processing in January 2009. The Center is collaborating with world leading universities and institutes to provide the best quality training sessions.

This workshop is organized in collaboration with **Qatar Shell and Shell Global Solutions International**, building on Shell's worldwide experience in designing, executing and operating LNG projects. Shell in Qatar is involved in the building of two of the leading energy projects in the world in Ras Laffan Industrial City. Qatar Petroleum and Shell launched the Pearl GtL project in July 2006. The project comprises the integrated development of upstream gas production as well as an onshore GtL plant which will produce 140,000 barrels of GtL products as well condensate, liquefied petroleum gases and ethane. The Qatar Petroleum and Shell financed Qatar Gas 4 LNG project is also under construction. This project will take some 1,4 BCF per day of feed gas, producing annual 7,8 mmtpa of LNG as well as condensates and LPG's. In addition Shell participates and advises 6 other LNG projects in the world in Brunei, Malaysia, Australia, Oman, Nigeria and Sakhalin.

#### Lecturer:



**Mr. Rob Klein Nagelvoort** received his degree in Radiation Physics from Delft Technical University, Nuclear Reactor Institute in 1969. During military service he developed a night vision system and soon after joined the Royal Dutch / Shell Group in The Hague. After various jobs in refining technology Rob joined the LNG and Gas technology group in 1974. Subsequent work included the design and servicing of LNG and Gas Extraction plants in Brunei, Malaysia, Australia, Oman, Nigeria, Russia and Scotland. Postings took him to Malaysia, Exploration and Production and Australia.

Following his experience of more than 30 years in gas/LNG technology and implementation, Rob became VP of Gas Technology for Shell worldwide. His current job covers the development and licensing of LNG technologies, Treating Technologies and Natural Gas schemes in general. Rob holds several patents on gas liquefaction and processing and is member of the series of LNG conferences and the International Gas Union.

#### Lecture Program:

The program will require active contribution of the participants and cover the following elements:

**Why LNG** – Natural Gas can be monetized in various ways. The LNG export industry will be introduced and the following topics addressed:

- business drivers of LNG export schemes,
- pros and cons of a LNG (export) value chain compared with various other development options, like power, GtL, and pipeline gas.
- Description of the global LNG trade
- Description of the LNG export chains

**What is LNG** – This session will provide an understanding of the properties and characteristics of LNG and the gas processing steps in order to meet the LNG quality specifications:

- transport and safety characteristics of LNG liquid
- LNG composition and combustion properties
- Basis for LNG quality specifications
- Description of natural gas (pre) treating, and gas processing steps from the upstream well head, down to the storage and loading of the final product.

**Principles of Liquefaction Technology** – A sound understanding of the basics of Natural Gas Liquefaction will be provided and various liquefaction technologies covered:

- Introduction of hydrocarbon properties
- Understanding of basic thermodynamic principles of refrigeration
- cascade, propane pre-cooled mixed refrigerant, single mixed refrigerant refrigeration cycles
- main characteristics of refrigeration cycles, LNG plants
- illustration with project examples.

**Key Equipment and Engineering aspects of LNG processes** – Following the introduction of the LNG process it is essential to understand the role of material sciences and engineering in the development of a LNG plant. Key issues in this area will be discussed:

- Rotating equipment (compressors, expanders, gas/steam turbines, motors)
- Heat exchange equipment (shell and tube, spoolwound, plate fin, printed circuit, fired heaters)
- material science and material selection

**Developments in the LNG Industry** – Following the above introduction, the challenges and developments in the LNG Liquefaction Technology will be highlighted:

- challenging new type of feed gases
- large compared to small LNG plants
- construction modularization
- floating LNG
- electrically or combined cycle driven LNG processes
- reduction of environmental impact

The above workshop allows participants to understand and recognize the key elements of LNG projects as well as LNG Liquefaction technologies. A quiz plus question and answer session will conclude the workshop.

In cooperation with:

