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KNPC

The 5th Liquefied Petroleum Gas Train
Achievements Continue

Introduction

Kuwait National Petroleum Company (**KNPC**) recently inaugurated its Fifth Gas Train, which is an addition to Kuwait's refining and petrochemical industry. The expansion of gas exploration and processing is an essential part of KPC's 2040 strategy.

Gas is increasingly important as an energy source and has become a preferred global option from an environmental and economic point of view, compared to other fossil fuels such as coal and other oil derivatives, as it contributes to preserve the environment by reducing harmful emissions, making it one of the cleanest sources of energy.

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Gas

Gas has two forms, Natural Gas (NG), which is extracted from oil fields as associated gas, or from independent fields as free gas (non-associated gas). The second is Petroleum Gas (PG), and is extracted during crude oil refining operations at refineries.

The name Liquefied Gas is given to Natural Gas or Petroleum Gas that has been processed and liquefied by cooling and high pressure, with the aim of reducing volume and ease of transportation, to become Liquefied Natural Gas (LNG) and Liquefied Petroleum Gas (LPG).

The Appearance of Liquefied Gas

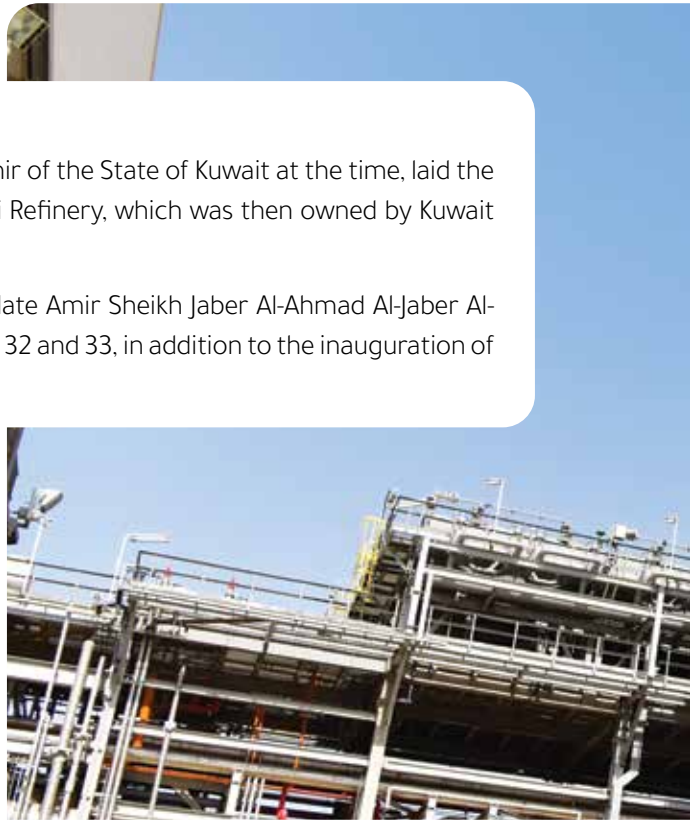
The idea of Liquefied Gas began in 1914 in the United States of America as a patent, and in 1917 Britain made the first commercial operation using the "Liquefaction" process.

The actual commercial use of Liquefied Gas began when Britain signed a 15-year contract with Algeria in 1961 to import close to one million tons of Liquefied Natural Gas annually.

Liquefied Gas in Kuwait

In November 1976, the late Sheikh Sabah Al-Salem Al-Sabah, the Amir of the State of Kuwait at the time, laid the corner stone of the Liquefied Gas Plant project at Mina Al-Ahmadi Refinery, which was then owned by Kuwait Oil Company.

The Plant was inaugurated in February 1979 by His Highness the late Amir Sheikh Jaber Al-Ahmad Al-Jaber Al-Sabah, where three Trains of Liquefied Gas were commissioned: 31, 32 and 33, in addition to the inauguration of the southern Liquefied Gas tanks at the Refinery.



Keeping Pace with Development

In 1979, which witnessed the inauguration of the Liquefied Gas Train, the Company began a trial program to use Liquefied Gas as fuel for cars, by introducing some necessary mechanical modifications to a number of cars, followed by testing them for a period of time to assess the appropriateness of using this fuel under the prevailing climate conditions in Kuwait. However, the idea was abandoned due to the high temperature in the country.

Kuwait National Petroleum Company (**KNPC**) and the Receipt of the Gas Plant

With the establishment of Kuwait Petroleum Corporation in 1980, and the restructuring of the Oil sector, Mina Al-Ahmadi Refinery and Liquefied Gas Plant became administratively under **Kuwait National Petroleum Company** on the first of July 1981.

The Company assumed responsibility for the actual management and operations of the Plant on 1 October, 1983, during which time the Gas Plant consisted of three production Trains with a production capacity of 505 million standard cubic feet of gas per day (mmscfpd) and 40,000 barrels of condensate per day (bpd) for each Train.

The Iraqi Invasion

The LPG Plant experienced extensive damages during the 1990 Iraqi invasion, causing it to cease operations. Following liberation in 1991, the Company immediately began repair and reconstruction operations.

The First Gas Train resumed work in April 1992, while the Third Gas Train returned to production in October 1992, and the Plant recovered its full production capacity after the Second Gas Train resumed its production in May 1993.

Fourth Gas Train

In 2015, the Fourth Gas Train was commissioned with a Processing capacity of 805 mmscfpd, in addition to 106,000 bpd of condensate, bringing the capacity of the LPG Plant to a record 2,320 mmscfpd, and 226,000 bpd of condensate.

To accommodate the additional products from LPG Trains 4 & 5, the North LPG tank project was commissioned in 2017, with 10 tanks, each holding 72,000 cubic meters.

Strategic Directions

The project is in line with Kuwait Petroleum Corporation (KPC) strategic directions and its subsidiaries in the field of meeting the energy demand of Kuwait, which states for meeting the current and future energy demand by providing an economically and environmentally friendly mix of fuels as well as strategic backup. In addition to keeping pace of KPC strategic direction regarding the increase of the production of associated and non associated gas.

The project is in line with the company's strategic objectives 2040 strategic plan, with regard to Enabling increased Upstream Gas Production.

And to keep pace with future Upstream Gas production, an assessment study is underway for 6th Gas train requirement.

Contracting

The contract for the construction of the Fifth Gas Train was signed in July 2015 with Technicas Reunidas International, a Spanish Oil and Gas giant.

Construction took close to 6 years, during which, **KNPC** overcame all the challenges imposed by the Corona pandemic that swept the world and led to the delay of all projects at the global level, yet, the Company was able to successfully operate its Fifth Train in March 2022.

Out of the total cost of KD 428 million for the Fifth Gas Train, 29.7% was awarded to the local private sector, by which exceeding the minimum required domestic expenditure of 20%, making a substantial added value to the local economy.

Fifth Gas Train

The Fifth Gas Train at Mina Al-Ahmadi Refinery is **KNPC**'s second largest Project in terms of significance and productivity post CFP.

The Train aims to to provide additional gas processing and Condensate processing capacities for effectively utilizing the upstream gases from KOC/KGOC and produces value added products, which are a major source of clean energy on a large scale due to their limited environmental impacts.

Increased Production Capacity

The Fifth Gas Train has a production capacity of 805 mmscfpd and 106,000 bpd of condensate, pushing the total production capacity of the Five Gas Trains into a record 3,125 mmscfpd of gas, and 332,000 bpd of condensate, an increase of around 30%.

Gas Trains Processing Capacity

Train	Gas / mmscfpd	Condensates X 1,000 bpd
1st	505	40
2nd	505	40
3rd	505	40
4th	805	106
5th	805	106
Total	3,125	332

Main Process sections in Gas Plant

1- Pre-treatment to remove moisture and metal impurities.

2- Fractionation and separation of gases and natural gasoline.

3- Removal of residual sulfur compounds.

4- Deep cooling and liquefaction process for easy storage.

Products

The Fifth Gas Train produces methane, ethane, propane, butane, as well as Kuwait Natural Gasoline (KNG).

These gases are of high importance due to their use in many industries, especially petrochemicals. Propane and butane gases are used domestically to supply homes and local businesses with gas cylinders intended for cooking, and in various other industries.

The condensed natural gasoline product is sent as feedstock to gasoline production units.

Fuel Gas Treatment Unit

The Fifth Gas Train includes an additional sub-unit for the production of clean fuel gases to meet KEPA regulations.

This unit serves the fourth and Fifth Gas Trains by treating the fuel gas to reduce H^2S levels from 2,400 ppm to a maximum 50 ppm.

Manpower

The construction of the Fifth Gas Train required 6,900 workers at the peak times.

The full total number of working hours from the beginning of the Project until the initial commissioning date reached close to 58 million hours without lost time incidents. This was a result of the concerted efforts of the team supervising the Project from **KNPC** together with the contractor's labor.

More than 100 Kuwaiti engineers from various Departments and Divisions under took over 60 training courses that took place in two phases, one at the Headquarters of manufacturers and the other at the work site.

5th Gas Train in Highlights:

- Processing capacity of 805 mmscfpd of gas and 106,000 bpd of condensates.
- Translates the Company's objectives to expand Gas Processing capacities to handle Upstream Gas production and produce value added products that comply with global market requirements and environmental standards.
- Provides additional job opportunities for young national cadres.
- Processing of Natural Gas produced in the fields of Kuwait Oil Company and Kuwait Gulf Oil Company.
- The Train produces methane, ethane, propane, butane and natural gasoline.
- The private sector accounted for 29.7% of the Project cost.
- The magnitude of the P-roject necessitated the presence of 6,900 workers on site at the construction peak stages.
- The total number of working hours from inception to initial delivery was 58 million.
- No serious accidents were recorded throughout the execution period, and came out with a clean safety record.

- In the construction phase, the ALE crane was used, which is one of the largest cranes in the world.
- Huge towers weighing more than 1.4 thousand tons each were installed.
- 3.67 million meters of pipes were used, equivalent to the distance between Kuwait and Italy.
- The steel used weighed 13,986 tons, more than twice the weight of the Eiffel Tower in Paris.
- The length of the instrumentation cables was 1,358,992 meters, equivalent to the distance between Kuwait and Oman.
- 589 pieces of equipment weighing a total of 19,039 tons were installed, 85 times the weight of the Statue of Liberty in America.
- 37,000 cubic meters of concrete were used to make the bases for equipment and pipe holders.
- About 14,000 tons of iron were used in pipe and equipment manufacturing.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