Development of 1bpd GTL Pilot Plant Using Natural Gas

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The 21st century is witnessing the establishment of a new global business based on natural gas processing. The Gas-to-Liquids (GTL) industry is entering a new phase of expansion based on the use of the Fischer-Tropsch (FT) synthesis. While for many this might look like new technology, most of the fundamentals are not so new. Decades ago, the pioneers of this industry were able to foresee with ingenuity and provide with science the foundation that is used by today's engineers and scientists. They also predicted the unique benefits that could be expected from the use of synthetic fuels. Moreover, based on the unique composition of the primary products, they anticipated their importance as chemicals and other non-fuel products.

The development of the FT-based GTL technology is intimately related to the initial efforts to apply it using coal as feedstock. Its evolution followed a logical process that was delayed by years of abundant, low cost petroleum and a lack of stringent fuel specifications aimed at protecting the environment.

The production of FT products is one way of valorizing large natural gas reserves that cannot be readily utilized by other means. The FT synthesis, first developed in Germany during the early decades of the 20th century, has been further developed and improved in South Africa by SASOL. Many studies of potential for Fischer-Tropsch plants are ongoing, and recently, two projects were announced for the production of more than 30,000 barrels/day in Nigeria and Qatar.

A GTL plant for the production of FT products can be divided into three sections as illustrated in Fig. 1. In the first section, the natural gas is converted into synthesis gas a mixture of hydrogen and carbon oxides. In the second part, the actual FT synthesis takes place, and in the final section, product upgrading and separation occur. Unconverted synthesis gas and light synthesis products may be recycled or used as fuel.

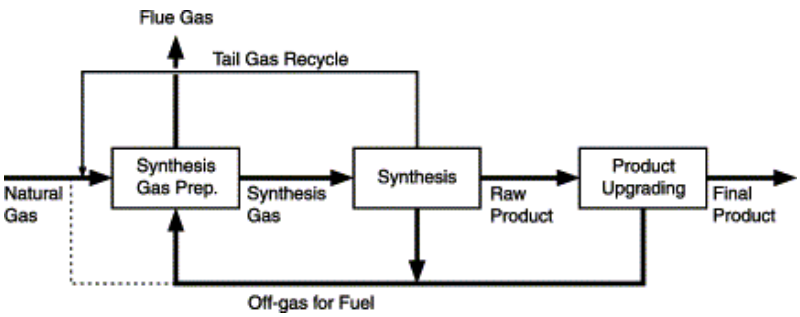

Fig. 1. Schematic layout of Fischer-Tropsch plant.

In response to the worlds growing demand for clean energy, KOREA GTL consortium has been composed for development proprietary technologies in 2006. KOREA GTL consortium has been developing GTL technologies, and the consortium of 4 organizations composed of KNOC(Korea National Oil Company), KOGAS(Kogas Gas Corporation), Daelim Industrial Co., LTD and Hyundai Engineering Co. LTD. The cost, at $4.8 million, was invested by a KOREA GTL consortium with the financial support of Korea Institute of Energy Technology Evaluation and Planning (KETEP) under “Energy Efficiency and Resources Programs” of the Ministry of Knowledge Economy, Republic of Korea.

In case of Japan, a research organization was set up by 6 Japanese companies which were built and test a plant for gas-to liquid fuel, with the aim of international development also. The companies: Nippon Oil Corp; Inpex Holdings Inc; Japan Petroleum Exploration Co; Cosmo Oil Co; Nippon Steel Engineering Co; and Chiyoda Corp, started setting up the organization by end Oct 2006. The test plant was scheduled for completion in fiscal 2008 and joint research would be undertaken through fiscal 2010.

Therefore, to develop the KOREA GTL process, KIER(Korea Institute of Energy Research) and KRICT(Korea Research Institute of Chemical Technology) have been joined in research parts. The role of KIER is to develop the SMR for syngas production with stoichiometric ratio (H2/CO=2), and KRICT is developing FT catalyst and FT slurry phase reactor for possessory catalyst and the main purpose of KOGAS R&D Division is to optimize the 1 bb/day GTL pilot plant.

KOGAS R&D Division has completed and successfully started up a KOREA GTL consortium 1 bbl/day GTL pilot plant, which is located at Korea Gas Corporation LNG terminal in Incheon city. The $2.7 million was invested as a pilot plant for GTL technology development activities. The pilot plant will be tested for syngas reformer, performance of FT catalyst and FT reactor of KOREA GTL process, a proprietary process for converting natural gas in to synthetic fuels. This pilot plant is designed to study, catalyst evaluation, product development and process variables (pressure, temperature, ghsv, or heat transfer), according to high quality level state of the art. In order to realize stability tests, the pilot can be run more than one month.

The 1 bbl/day GTL pilot plant will be operated to obtain the engineering data for a 3000 bbl/day GTL commercial plant design until 2012 by KOGAS R&D Division. Next phase is planning with KOREA GTL consortium in gas fields.

The authors would like to acknowledge the financial support of Korea Institute of Energy Technology Evaluation and Planning (KETEP) and GTL Technology Development Consortium (KOGAS, KNOC, Daelim Industrial Co., LTD and Hyundai Engineering Co. LTD) under “Energy Efficiency and Resources Programs” of the Ministry of Knowledge Economy, Republic of Korea.