SYNGAS PRODUCTION FOR GAS-TO-LIQUIDS APPLICATIONS: TECHNOLOGIES, ISSUES AND OUTLOOK

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Introduction

Fischer Tropsch (F-T) chemistry understandably is often regarded as the key technological component of schemes for converting synthesis gas (or "syngas") to transportation fuels and other liquid products. However, syngas production itself accounts for more than half the capital investment and a disproportionate share of the operating costs for a gas-to-liquids (GTL) complex. A study completed earlier in 1998 by SFA Pacific examines the full range of commercial and developmental synthesis gas production technologies and provides an independent assessment of syngas production options and costs for GTL applications [1].

The manner in which syngas is produced can be influenced by, and in turn can profoundly impact, many facets of the overall GTL process design, such as:

- Plant size and location
- The need for an oxygen plant or oxygen enrichment facilities
- The physical size of downstream gas-handling equipment
- Syngas composition and its associated effects on F-T chemistry and yields
- Heat integration and gas recycle options
- Gas compression requirements
- The scope and configuration of power generation alternatives

This paper examines the status of commercial and developmental syngas production technologies in the context of GTL production based on F-T synthesis. The scope of this examination includes:

- A brief review of relevant commercial experience to date
- Consideration of the direct and indirect impacts of syngas production on GTL costs
- An update on new syngas generation technologies now under development
- Comments on the relative merits of air-blown and oxygen-blown syngas generation
- The outlook for reduced GTL capital and operating costs due to improved syngas generation

Syngas Generation Technologies

In principle, synthesis gas may be generated from any hydrocarbon feedstock. This is reflected in industrial practice, which includes large-scale syngas production from a wide variety of materials that includes natural gas, naphtha, residual oil, petroleum coke and coal. However, in the context of GTL applications, natural gas -- more specifically, low-value natural gas -- is the predominant, if not the only, feedstock of interest.

In large part, this is a reflection of the high investment costs of GTL processes which, in the absence of special circumstances, require a low or, even better, negative value feedstock to achieve attractive overall economics. Low quality residual oil or coke can, of course, have a low or even negative value. However, conversion of such feedstocks -- via gasification -- entails greater capital investment, in part due to the costs associated with materials handling, soot removal and syngas cooling and purification. The focus for GTL has thus been on associated gas, so-called stranded or remotely-located gas reserves, and larger gas reserves that are not currently being economically exploited. In the near-term, associated gas may offer the greatest potential, particularly where such gas is subject to flaring constraints and associated reinjection costs.