3.0 UNIT 84 - METHANOL SYNTHESIS

3.1 PROCESS DESCRIPTION

This unit produces methanol using the Lurgi Methanol process. In the process, carbon monoxide, carbon dioxide, and hydrogen are converted to methanol at temperatures of about 500°F and at pressures of about 1000 psig in the presence of a copper-based catalyst according to the following equations:

$$CO + 2\ H_2 \longrightarrow CH_3OH$$

$$CO_2 + 3\ H_2 \longrightarrow CH_3OH + H_2O$$

The unit has two trains with one methanol converter for each train. The purified gas from the Rectisol Unit enters a compressor suction drum to separate the entrained liquid particles carried with the gas before entering the first stage of the syngas compressor. The gas leaving the first stage will be cooled in an air cooler before entering the second and final stage of compression. The second stage compressor compresses fresh feed gas along with recycle gas.

There will be two centrifugal compressors, each of about 15,000 HP, providing compressed gas to the two methanol converters.

The mixture of fresh feed gas and recycle gas leaving the second stage compression is heated to the reaction temperature by a feed-effluent exchanger before entering the top of the methanol converter. The methanol converter is a vertical tubular reactor with the tubes packed with catalyst. The methanol synthesis reaction is highly exothermic, therefore the converter is cooled by generating 550 psig saturated steam in the shell of the tubular reactor. The converter effluent is cooled to about 100°F by heat exchangers, air coolers and finally water coolers. The cooled effluent then enter a knock out drum for separating the condensed methanol from the gas. Part of the gas is recycled to be mixed with the fresh feed gas and compressed to raise the pressure before being fed to the methanol converter. The mixing of recycle gas is needed to control the process. The rest of the gas is purged from the system. The purge from the methanol synthesis loop is necessary to prevent the build-up of inerts, i.e., nitrogen, argon, and methane, in the synthesis loop. The purge stream is scrubbed with water to recover methanol and then sent to SNG production and H_2 Recovery Units. (Unit 66).

3.1 Unit 84 - Methanol Synthesis (Continued)

A small quantity of the purge stream will be supplied to the fuel gas header to meet fuel gas requirement of the plant.

The condensed methanol from the knockout drum will be depressurized to about 400 psia and sent to a flash drum. The gases released during flashing are collected in a fuel gas header and used a fuel gas in the plant. The methanol from the flash drum is routed to a storage tank for feed to the MTG Unit.

3.2 FLOW SHEETS

Flow Sheets for the Methanol Synthesis area are proprietary with the licensors involved. Details of the processes cannot be revealed until a licensing agreement is signed.

3.3 UNIT MATERIAL BALANCE

Stream compositions for the Methanol Synthesis area are proprietary with the licensors involved. Details of the processes cannot be revealed until a licensing agreement is signed.

3.4 ACCOMPLISHMENTS AND DECISIONS

The current process design is based on the Lurgi Process. The competing process for low pressure methanol synthesis is the ICI process. TSSC tentatively opted to use the Lurgi process on the basis of technical and economic evaluations done on another project. The Lurgi process uses tubular isothermal reactors with the catalyst in the tubes. The heat generated by the exothermic methanol synthesis reaction is removed by generating saturated steam from boiler feed water circulated on the shell side of the tubular exchangers. The Lurgi reactor offers a high operational The two 1500 ST/SD methanol reactors will be shop fabricated and will approach in size (diameter) the largest reactors commercially available at this time.

3.5 CURRENT STATUS

A preliminary design of the unit has been completed. The design is based on Fluor in-house data available from similar projects. On reactivation of the project, the design should be updated on the basis of licensor information.

3.6 LICENSORS AND EVALUATION

Lurgi is the licensor of the process.

Negotiations with Lurgi for licensing agreements have not been completed.