

5.0 UNIT 66 - SNG PRODUCTION AND H₂ PURIFICATION

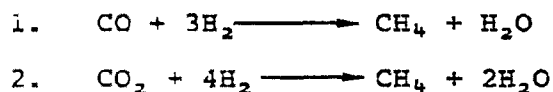
5.1 PROCESS DESCRIPTION

The purge gas stream from Methanol Synthesis (Unit 84) is used by this unit to produce SNG and H₂. The purge gas stream is split into two parts - the major portion (about 97 percent) is converted to SNG and a smaller portion (about 3 percent) is treated in a pressure swing absorption unit to supply hydrogen for plant hydrotreating purposes. The purge gas stream from the methanol synthesis loop in Unit 84 is necessary to control the inerts, i.e., nitrogen, argon, and methane in the system.

SNG Production

A preliminary process flow diagram and material balance for this unit is shown in Section 5.2.

Two major reactions occur during the methanation of carbonoxides.



Both reactions are strongly exothermic and since most of the reaction takes place in the first methanator a substantial recycle of the methanator effluent gas is necessary to control the temperature rise in the reactor. Catalyst vendors limit the outlet temperature to a maximum of 850°F. The inlet temperature should be about 550°F to get a proper reaction rate for the methanation reaction. The temperature rise in the reactor is therefore about 300°F.

The feed gas to this reaction, which is the purge gas stream from Methanol Synthesis, is heated in a series of feed-effluent exchangers against hot effluent gas before entering the first methanation reactor. The methanated gas leaving the first reactor is first passed through a waste heat boiler to produce steam and then cooled in a feed-effluent exchanger before being split into two parts. One part then enters the second and final methanation reactor and the other part after passing through a feed-effluent heat exchanger is compressed in a recycle compressor and added to the fresh feed gas at the inlet of the first methanation reactor.

5.1 SNG Production (Continued)

The effluent from the second methanation reactor after passing through a waste heat boiler is cooled in an air cooler and the liquid condensate is removed in a knock-out drum. Condensate is recycled to the boiler plant. After separation of the condensate, the gas is then washed with cold methanol in a CO₂ Absorber where Carbon dioxide is removed and the gas is also simultaneously dried. The CO₂ Absorber will be located in the Rectisol Unit (Unit 12) and will be operated in conjunction with the Rectisol Unit. The gas leaving the top of the absorber is of pipeline quality and supplied to the gas pipeline. The SNG will be supplied to the pipeline battery limit pipeline at about 1000 psig.

H. Purification

A Pressure Swing Absorption (PSA) Unit designed by Union Carbide Corporation is used for hydrogen purification. These units are supplied by Union Carbide as a packaged unit. Material balances given in Section 5.2 were estimated by Fluor using data from similar projects. A simplified process flow diagram is also included.

About 3 percent of the purge gas from Methanol Synthesis (Unit 84) is the feed gas to PSA Hydrogen Purification Unit. Molecular sieves are used for the absorption of impurities and preparation of purified hydrogen. The feed gas is separated into two gas streams in this section, - a purified hydrogen stream and a waste gas which will be used as a fuel gas. The purified hydrogen is more than 90 percent pure and is available for general plant use.

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5.2 FLOW SHEETS

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

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5.3 UNIT MATERIAL BALANCE

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

5.4 ACCOMPLISHMENTS

A preliminary process design has been completed and a cost estimate has been made for both SNG production and H₂ Purification.

5.5 CURRENT STATUS

The current design is based on Fluor in-house information that is available from work on similar projects.

Licensors information from Lurgi for Methanol Synthesis is needed for the composition and quantity of the purge gas which is the feed to this unit. This should be used to update the process design of this unit.

Licensors (Lurgi) information should be used for the CO₂ Absorber and for the final composition of SNG.

The process design data on the PSA Unit should be updated by Union Carbide when Lurgi supplies the methanol purge data.

5.6 LICENSORS AND EVALUATIONS

Union Carbide is the potential supplier for the PSA Unit for hydrogen production. On reactivation of the project, yield data based on Lurgi data should be obtained from Union Carbide.

A licensing agreement with Lurgi for their Rectisol process should be modified to include the design of the CO₂ Absorber in the SNG production section.