

Hydrogen Production Unit

Environmental Permitting Application

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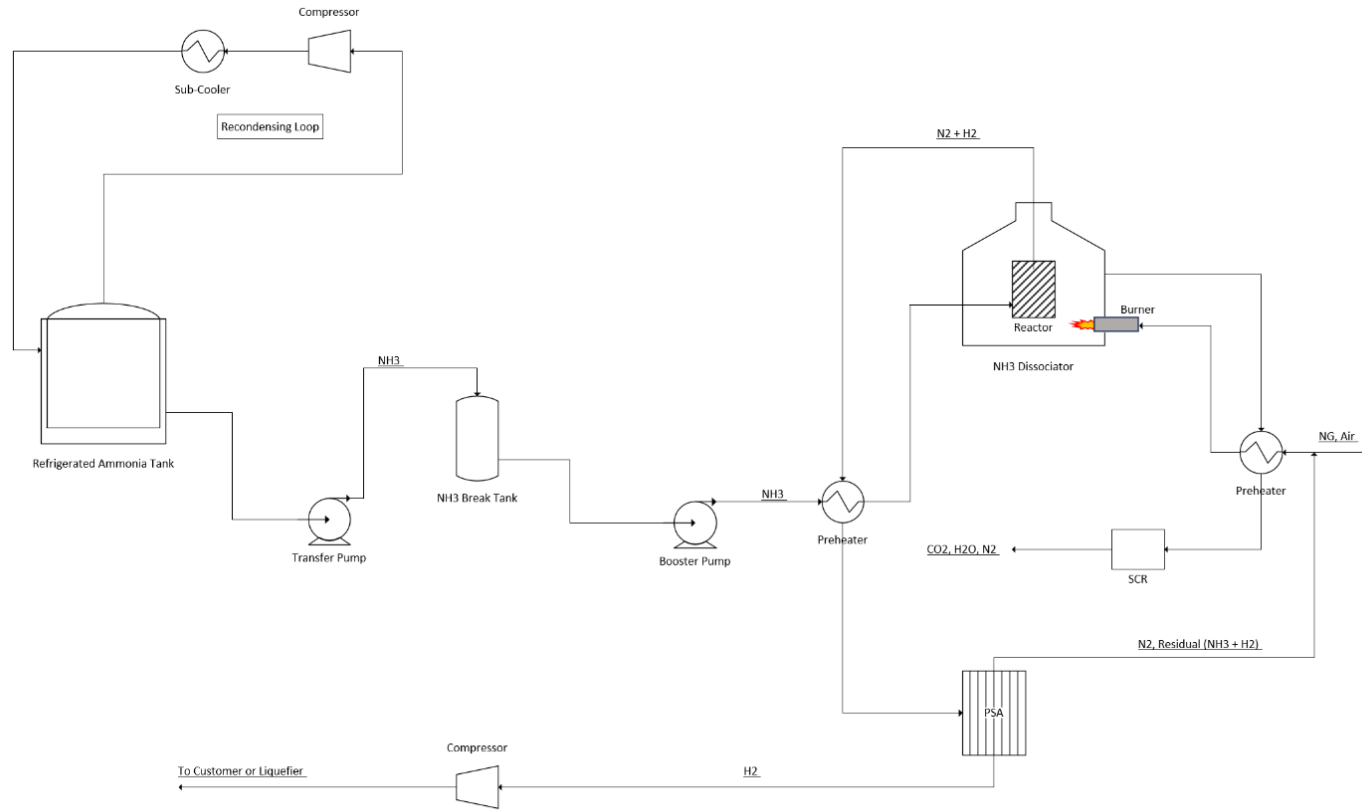
HPU High Level Process Overview

- ✓ The ammonia feed flows through a series of heat exchangers, which pre-heat and vaporize the ammonia, before it is reacted endothermically to produce nitrogen (N_2) and hydrogen (H_2) in a catalyst-filled fired heater.
- ✓ The hydrogen production unit consists of catalyst filled tubes inside a fired heater. The catalyst facilitates the ammonia to hydrogen reaction. Additional heat exchangers are in the fired heater convection section to recover energy from the flue gas before it is emitted through the flue gas stack. The convection section also includes heat exchanger coils for pre-heating the ammonia feed streams entering the fired heater.
- ✓ The convection section also includes process equipment to reduce nitrogen oxides (NO_x) to an acceptable level before discharging to the atmosphere. The unit is operated between 30 and 50 barg, as the hydrogen is required at elevated pressure for downstream uses.

HPU High Level Process Overview (Continued)

- ✓ The H₂ leaving the reaction section of the fired heater must be purified before being sent to the liquefier. Process equipment called a pressure swing absorber ("PSA") unit is located downstream of the fired heater and is designed to produce high purity H₂. The tail gas, which is a waste stream from the PSA, is recycled to the fired heater burners to reduce the natural gas demand and the carbon intensity of the process.
- ✓ The purified hydrogen gas leaving the PSA unit is sent to the hydrogen liquefier units.
- ✓ Initially the primary fuel source for the fired heater would be natural gas, which is supplemented with tail gas from the PSA unit to reduce the carbon intensity of the process. The fired heater will initially be fueled with natural gas because sources of renewable biogas may not be available initially to provide the heating duty requirements.

HPU Simplified PFD



Thank You

