

HYDROGEN RECOVERY FROM AMMONIA PLANT PURGE GAS

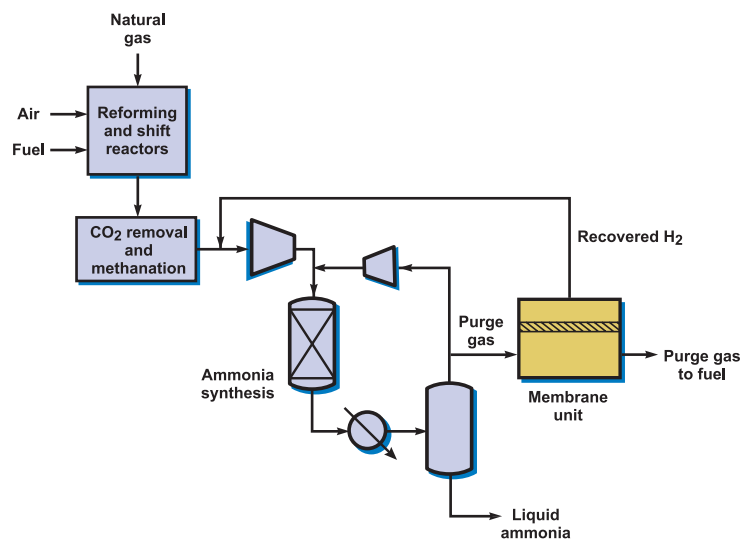
- **Increases ammonia production and yield**
- **Simple passive system with no rotating equipment**
- **Minimizes installation cost with skid-mounted construction**

“VaporSep-H₂™ is a simple system with compelling economics for recovering hydrogen from the purge gas.”

Problem

In ammonia production, hydrogen and nitrogen are reacted at high pressure to form ammonia. Since the conversion per pass is not 100%, the reactor is operated in loop mode. Ammonia is continuously condensed out of the loop and fresh synthesis gas is added. Because the synthesis gas contains small quantities of methane and argon, these impurities build up in the loop and must be continuously purged to prevent them from exceeding a certain concentration. Although this purge stream can be used to supplement reformer fuel gas, it contains valuable hydrogen which is lost from the ammonia synthesis loop.

VaporSep-H₂™ Solution



Simplified ammonia production process showing addition of the VaporSep-H₂™ membrane system

The VaporSep-H₂™ unit consists of a single-stage membrane system that recovers most of the hydrogen from the purge gas stream. The hydrogen permeating the membrane, almost free of methane and argon, is recycled to the synthesis gas compressor suction, pressurized and returned to the synthesis loop. The hydrogen depleted residue, containing the purged methane and argon, is sent to reformer fuel.

VaporSep-H₂™ systems recover more than 80% of purge gas hydrogen. Installation of such a unit will increase ammonia production by 4-5%, without increasing gas feed to the reformer.

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VaporSep-H₂™ system for hydrogen recovery from ammonia plant purge gas

Benefits

- Recovers valuable hydrogen in ammonia plant purge gas
- Increases ammonia production by 4-5%
- Less gas consumed per kg ammonia produced
- Requires no additional rotating equipment
- Easy to operate, passive system
- Ambient temperature operation
- Simple installation with skid-mounted construction

System Performance

- Complete skid-mounted unit includes all necessary instrumentation and controls
- Typical size: 6m (L) x 3m ft (W) x 2.5m (H); 6000 kg

System Description

- Typically 80% of purge gas hydrogen recovered
- Payback is 6 to 12 months

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