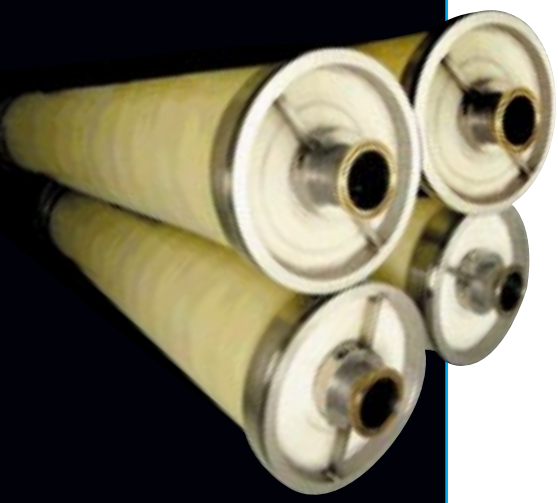
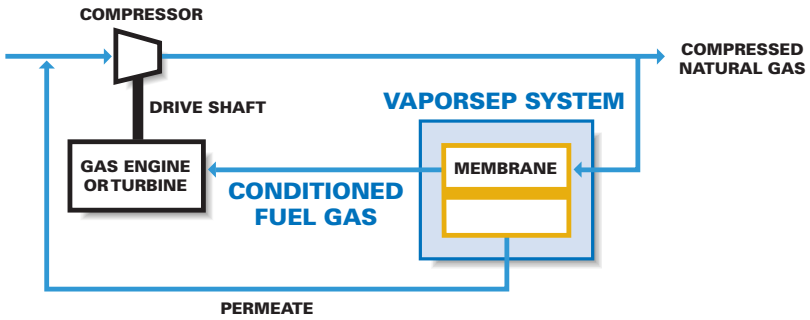


Fuel Gas Conditioning

- Improves equipment reliability and on-stream time
- Increases engine and turbine component life
- Requires no moving parts, ideal for remote locations
- Minimizes installation cost with skid-mounted construction
- Increases liquid hydrocarbon recovery

"Conditioning fuel gas using VaporSep minimizes costly unscheduled down-time, a smart and simple solution"



Fuel Gas Conditioning unit for gas turbines and engines.

Problem

Natural gas is commonly used as a fuel in gas engines and turbines in the hydrocarbon processing industry. In many cases, raw natural gas is the only fuel available to operate compressor stations in remote locations or gas turbines on off-shore platforms. The presence of heavy hydrocarbons, acid gases, and water vapor in the fuel gas results in significant operating problems. The rich fuel causes predetonation, which can damage the internals of the firing chamber. Also, due to the high hydrocarbon dew point in the fuel gas, day-night temperature variations can lead to condensation of liquid hydrocarbons in the fuel line. Injection of these liquids in either gas engines or turbines can result in internal damage, incomplete combustion of fuel, and carbon deposit build-up. Unscheduled downtime due to these problems can lead to significant production losses.

VaporSep Solution

VaporSep removes C_3+ hydrocarbons and acid gases to improve fuel quality. The high flux membrane selectively permeates heavy hydrocarbons compared to methane. The permeated hydrocarbons are recovered as a liquid upon recompression and cooling or are blended with the compressed natural gas. Capital and operating costs for the VaporSep fuel gas conditioning unit are low and payback times are short. Maintenance costs for the gas engine and turbine are reduced and unscheduled downtime is minimized. The VaporSep system is very simple to operate, highly reliable and compact. The unit is custom designed to meet specific needs, and is skid-mounted for easy installation.

VaporSep® Systems for

Fuel Gas Conditioning

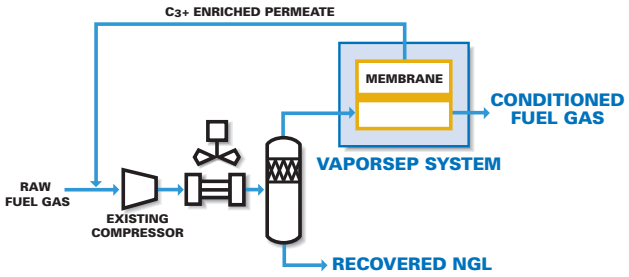
Fuel Gas Conditioning unit for gas turbine, designed for off-shore use.

Benefits

- Removes heavy components such as C_3+ to clean up fuel gas
- Removes significant portions of acid gases such as H_2S and CO_2 which will reduce acid formation in the turbine or engine exhaust and reduce emissions
- Increases reliability of gas engines and turbines
- Operates at ambient conditions with no external heating required to prevent hydrate formation
- Eliminates need to de-rate gas engine
- Decreases maintenance costs and reduces unscheduled downtime
- Increases recovery of liquids
- Contains no moving parts, simple to operate and maintain

Application Example

In gas turbines, raw fuel is compressed in a multistage compressor. The VaporSep system is installed on the compressed fuel line, and the heavy hydrocarbon enriched permeate is recycled to the compressor suction. The membrane residue gas is the conditioned fuel. Additional NGL is recovered in the compressor aftercooler.



VaporSep Fuel Gas Conditioning unit for gas turbines.

System Performance

Gas Engine Unit

- Feed flow rate: 0.5–2 MMSCFD
- Raw feed Btu value: 1350–1500 Btu/scf
- Conditioned fuel gas Btu value: 1150–1250 Btu/scf
- Feed dew point: 80–120°F
- Conditioned gas dew point: 40–60°F
- C_3+ removal: greater than 70%
- Unit dimensions and weight: 8 ft (L) x 6 ft (W) x 6 ft (H), 2,000 lbs

Gas Turbine Unit

- Feed flow rate: 5–15 MMSCFD
- Raw feed C_3+ content: 8–20 vol%
- Raw feed dew point: 80–120°F
- Conditioned gas dew point: 40–60°F
- C_3+ removal: greater than 70%
- Unit dimensions and weight: 20 ft (L) x 10 ft (W) x 10 ft (H), 8,000 lbs

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