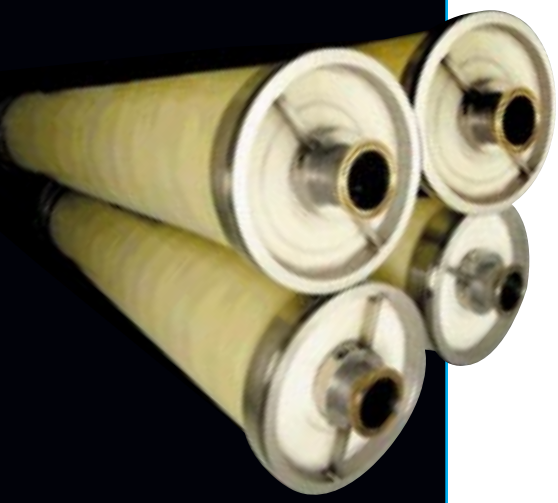
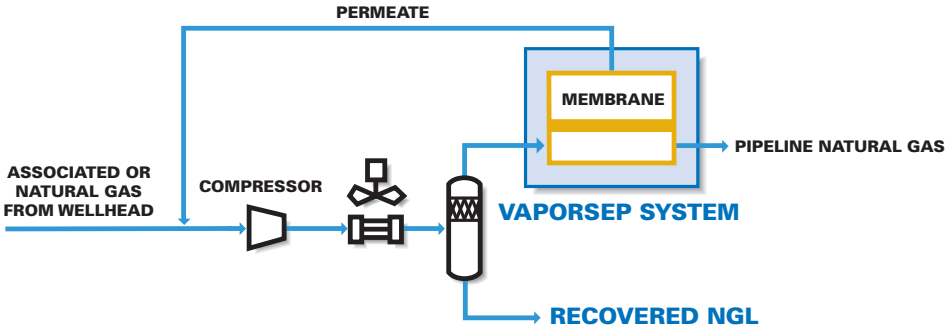


NGL Recovery

- Achieves high recovery of NGL from natural and associated gas
- Reduces hydrocarbon and water dew point for pipeline natural gas
- Reduces emissions from flares
- Minimizes installation cost with skid-mounted construction
- Overcomes space and weight limitations on off-shore platforms
- Achieves short payback time of one year or less

"VaporSep turns low pressure associated gas into high value oil."



VaporSep system for NGL recovery and dew point control.

Problem

Natural gas is processed to remove heavy hydrocarbons (C_3+) to meet pipeline specifications for dew point and Btu value. Recovery of Natural Gas Liquids (NGL) is desirable because these hydrocarbons have greater value as a chemical feedstock than as fuel. Refrigeration and turbo-expander plants traditionally have been used for NGL recovery. These plants have high capital and operating costs. Moreover, they contain numerous moving parts and are complicated to operate.

VaporSep Solution

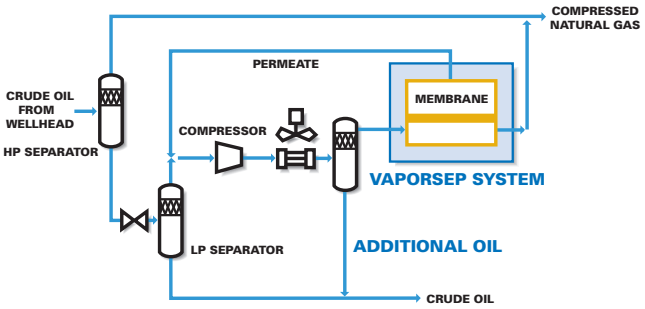
VaporSep offers a simple and low-cost solution for removal and recovery of heavy hydrocarbons from natural gas. The VaporSep process is based on a high-flux membrane that selectively permeates heavy hydrocarbons compared to methane. These hydrocarbons permeate the membrane and are recovered as a liquid after recompression and condensation. The residue stream from the membrane is depleted in the heavy hydrocarbons and has a lower dew point and Btu value. In addition, since the membrane also preferentially permeates water vapor, the residue gas will also be dehydrated, thereby reducing or eliminating the need for a conventional dehydration system. The VaporSep system is compact, skid-mounted, and can be easily and inexpensively installed into existing facilities. VaporSep is particularly well suited for off-shore platforms due to the compact size and low weight.

VaporSep® Systems for

NGL Recovery

Benefits

- Recovers NGL from associated and natural gas at the wellhead
- Removes heavy hydrocarbons and water vapor which reduces hydrocarbon and water dew point in the pipeline gas
- Permits unattended operation at remote locations
- Overcomes space and weight limitations on off-shore platforms
- Simplifies operation with few or no moving parts
- Operates at ambient temperature
- Minimizes installation cost due to skid-mounted construction



VaporSep system for increased oil recovery.

Application Example

In crude oil production, the pressurized fluid from the wellhead is progressively depressurized in flash vessels to remove entrained light hydrocarbons from the oil phase. The light gases are collected and compressed in a multistage compressor. The operating pressure and temperature of the separators determines the total oil production. The VaporSep system can be integrated into this process to increase oil recovery. The feed to the VaporSep system is compressed gas from a low pressure separator. The membrane preferentially permeates the heavy hydrocarbons which are recycled to the compressor suction. A significant quantity of additional condensable hydrocarbons is recovered from the recycled permeate stream.

The VaporSep system significantly increases oil production without changing operating conditions. The payback time can be as low as 6 months.

System Performance

- Feed flow rate: 0.2–50 MMSCFD
- Feed NGL content: 5–50%
- NGL recovery: up to 95%
- Dew point reduction: 20–100˚F
- Typical payback time: 6–18 months

Application Areas

- Wellhead liquids recovery
- Associated gas liquids recovery
- Dew point control (water and hydrocarbon)
- Flare gas recovery
- Turbo-expander plant debottleneck
- Propane refrigeration plant debottleneck

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