

## NITROGEN REMOVAL FROM NATURAL GAS

### NitroSep™

#### Problem

Nitrogen is a common contaminant in natural gas and is quite difficult to remove. Nitrogen lowers the BTU value of the gas and makes it unsaleable to most pipelines. Natural gas will be accepted for transport by pipeline only if it contains less than a specified amount of nitrogen, typically somewhere between 4% and 6%.

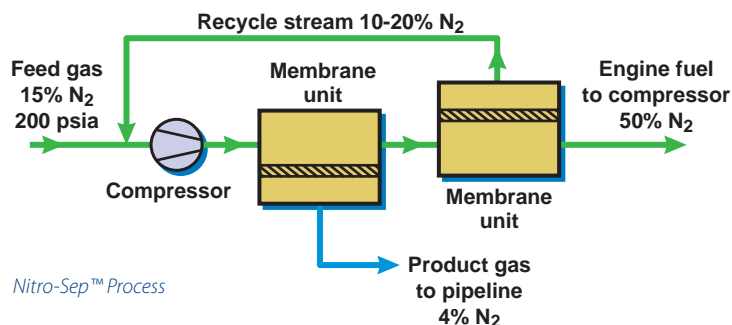
Cryogenic nitrogen removal is complex and prohibitively expensive at modest scale. MTR's membrane based NitroSep™ system is a proven and economical solution.

#### Membrane Solution

MTR's NitroSep™ system produces pipeline-quality or pipeline-acceptable gas and a nitrogen-rich fuel from raw natural gas. The proprietary membranes are significantly more permeable to methane, ethane, and other hydrocarbons than to nitrogen.

- **Allows shut-in, high-nitrogen gas to be produced**
- **Rugged and simple — skid-mounted construction allows quick installation**
- **Typical paybacks of less than 1 year**
- **Hydrocarbon BTU recoveries of 75% to 98%**

*“The N<sub>2</sub> removal membrane system works very well and is very simple to operate.”*



Gas containing 8% to 15% nitrogen is compressed and passed across a first set of membrane modules. The permeate, which contains 4% nitrogen, is sent to the pipeline; the nitrogen-rich residue gas is passed to a second set of membrane modules. These modules produce a residue gas containing 50% nitrogen and a nitrogen-depleted permeate containing 10% to 20% nitrogen. The residue gas is used as fuel; the permeate is mixed with the incoming feed gas for further recovery.

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*NitroSep™ units upgrading high nitrogen gas in California*

#### Benefits

- Nitrogen content reduced to pipeline specification (3% or higher)
- Heavy hydrocarbons captured in the product gas
- Easy, low-cost installation; system can be installed in 1-2 days
- Membrane unit requires no maintenance; robust long-lasting membranes
- System is easily moved from one location to another

#### System Performance

- Feed rate: 0.4 to > 100 MMscfd
- Feed N<sub>2</sub> content: 4% to 50%
- Target N<sub>2</sub>% or BTU value
- Product gas pressure: 35 to 350 psia
- Product BTU recovery: 90%+
- Heavy hydrocarbon recovery : >95%

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