Enhanced Oil Recovery Systems

Market Application Publication

Background:

After oil and gas wells are drilled, completed, and placed into initial (primary) production, only about 12-15% of the original oil in place is typically recovered. This is due to the continually decreasing drive pressure of the well, making recovery difficult. Techniques such as fracturing, stimulation, and gas lift are sometimes used to assist and sustain the initial gas drive. Secondary recovery methods, most often water flooding of the oil reservoir or natural gas reinjection, if available, can be utilized to recover an additional 15 to 20 % of the trapped oil. Even after these techniques are used, as much as 65-70% of the oil still remains in the formation, difficult to recover. Tertiary recover techniques, such as gas injection using either carbon dioxide (miscible) or nitrogen (immiscible) can be used to increase the reservoir pressure and promote additional recovery.

Features and benefits:

- Continuous on-site production of dry, inert nitrogen to your purity specifications
- High flow capabilities in a compact, easily transportable container
- Avoids the transportation logistics and costs associated with cryogenic-based N2 supply
- Can process low pressure air from conventional lubricated or oil-free compressors
- Optional built-in membrane air dryer is available to process saturated feed air
- Simple process controls with N2 flow, purity and pressure readouts and signal outputs
- Suitable for direct injection or as a carrier gas for foam to maintain an inert atmosphere
- Rapid set-up, start-up, and de-rigging on location within hours

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ENGINEERING YOUR SUCCESS.

Application:

Gas injection EOR is typically utilized in older reservoirs, where the current production rate is no longer economically viable. Nitrogen, injected into multiple wells distributed throughout a formation, forces the oil into a production well for recovery. Nitrogen injection can improve existing production by as much as 200-300%. Gas injection with nitrogen has significant benefits over the common alternatives (carbon dioxide, hydrocarbons), as it is inert, non-corrosive and oxygen-free. A Parker Hannifin Nitrogen Generator, which separates nitrogen and oxygen from a compressed air supply, can often be the most economical method to supply this nitrogen.

Case Study:

An independent U.S oil and gas producer was seriously investigating tertiary EOR methods to recover existing oil reserves from depleted wells on their leases. Carbon Dioxide was originally considered based on convenience, as there was a major CO2 pipeline delivering gas to leases in surrounding fields. However, the customer was faced with the high costs of installing a secondary CO2 pipeline to their injector wells, and also a percentage of the increased production was required by the supplier. After evaluating the true costs of CO2, it was determined that nitrogen was the more economical choice. As a bonus, by utilizing a nitrogen generator, they were allowed to keep 100% of the increased well production. A custom membrane nitrogen generator system, sized for 1000 scfm, 95% N2 purity and 2000 psig outlet pressure, met all of the client's requirements, and significantly improved recovery.

Convenient operator controls in a spacious, temperature controlled enclosure to easily monitor continuous nitrogen flow rates, purities and pressures.

Parker Hi-Fluxx Air separation membranes provide the highest productivities on the market, delivering high N2 flow rates in a compact configuration.

Parker's membrane air dryers provide dew point suppression to ensure dehydrated air is fed to the N2 membranes. No external dryers or additional electric demand is required.

Principal Specifications

All Models	
Nominal Conditions - All Models	
Feed Pressure	100-125 psig
Feed Temperature	80°F to 100°F (26°C to 37°C)
Ambient Pressure	1 Atmosphere
Compressed Air Specifications - Low Pressure Membranes	
Maximum Pressure	115 psig
Temperature Range	60°F to 120°F (16°C to 49°C)
Recommended Dew point	40°F pressure dp or lower
Residual Oil Content	Trace
Particles	<.01 micron
Ambient Conditions	
Temperature	40°F to 110°F (4°C to 43°C)
Minimum Membrane Temperature	35°F storage
Ambient Pressure	Atmospheric
Air Quality	Clean air without contaminats

Performance Chart

Parker HiFluxx® Containerized Membrane Systems

N2 flow rates at 95% inerts, pressures in psig, external air dryer

Model Number	Flow Rate (scfm)(1)(2)	Feed Pressure	Delivery Pressure	Dimensions (L x W x H, ft)	Weight (lbs)
FB ST16010	150-500	175-180	140-150	8 x 10 x 8.5	6000-7500
FB-3 to 6 ST15020	300-750	100-115	75-100	20 x 8 x 8.5	10,000
FB-6 to 8 ST15020	750-1200	100-115	75-100	20 x 8 x 8	10,000
FB-12 to 15 ST15020	1500-2000	100-115	75-100	20 x 8 x 8	15,000
Consult factory	2000-3000+	100-115	75-100	(20-40) x 8 x 8	15,000-25,000

Notes:

1 Performance based on actual feed air flow, pressure, temperature and required N2 purity. Consult factory for higher N2 purities, flow rates, or delivery pressures.

2 Custom flow rates and packaging options available; consult factory.

MAP EnhancedOilRecovSys-B August 2011

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