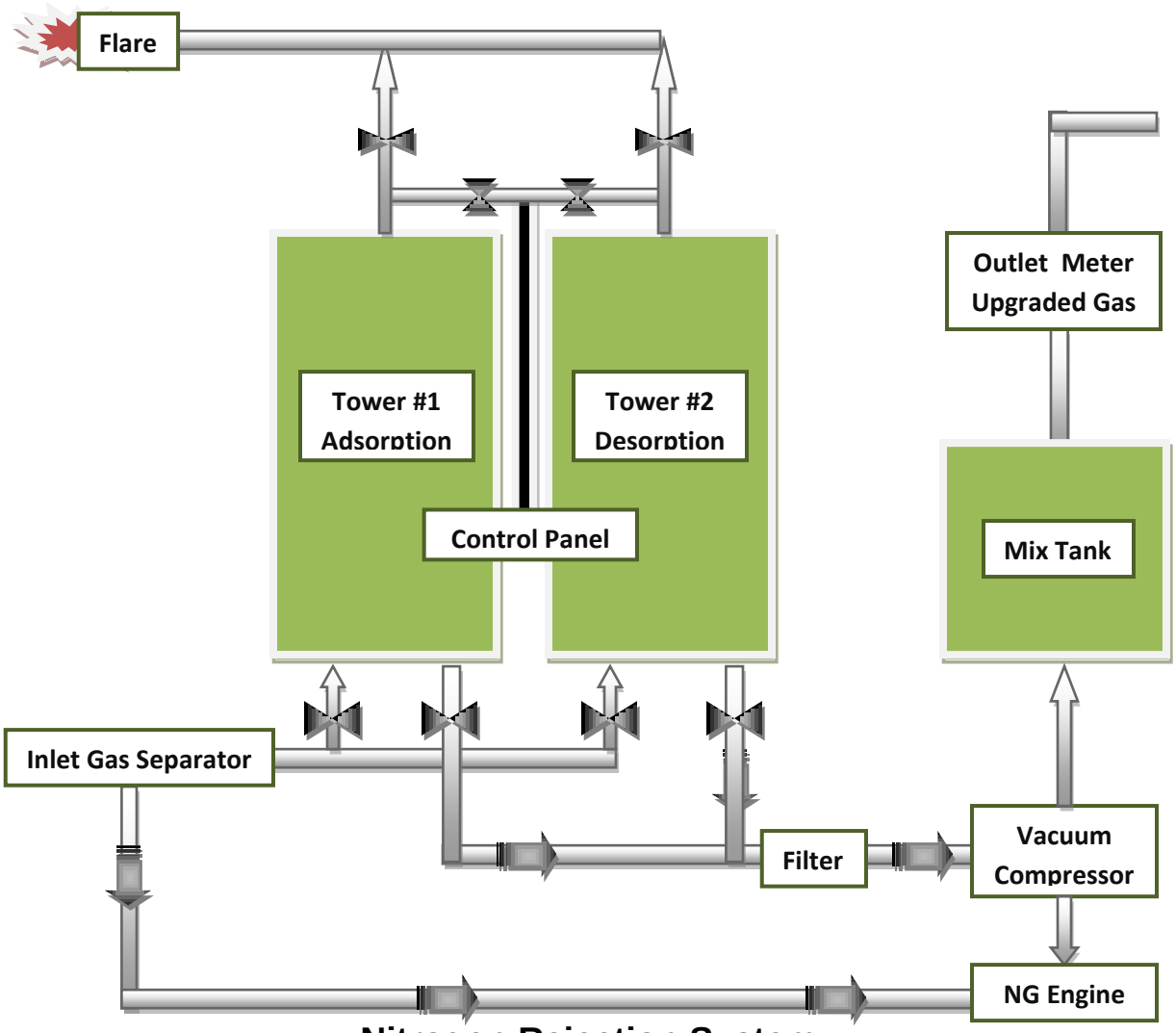
Nitrogen Rejection System (Pressure Swing Adsorption Plant) - Local pipeline specifications vary, but nearly all companies buy natural gas with the requirement that its heat content is at least 950 BTU/cu ft. As a result, as much as 17% of natural gas reserves in the United States are labeled as sub standard natural gas. N2 is hence the major target for removal in upgrading significant NG volumes of otherwise unsalable pipeline quality gas. A major portion of the United States N2-rich low-BTU gas is trapped in moderate to small fields owned by stripper operators.

These smaller fields are not agreeable to NG upgrading technologies such as conventional pressure swing adsorption (PSA) and cryogenic separation because these fields cannot deliver large enough feed volumes for profitable operations utilizing more traditional technologies.



Nitrogen Rejection System

Advantages of the N3 Rejection System

- Uses inexpensive activated charcoal as the adsorbent bed.
- Modular skid mounted units which are scalable as per changing NG feed volumes.
- Has a small real estate foot print (400 sq. ft).
- Does not emit any volatile organic compounds (VOCs).
- Has few moving parts (other than the engine and compressor) to reduce labor and maintenance costs.
- Operates in remote locations by solar panels and low-BTU feed gas.
- Can economically upgrade low-volume (30 to 300 mcf/d) and low-pressure (<100 psi) feed gas.

Equipment

- Twin Carbon Bed Towers (48” x 12’ Seam to Seam)
  Solenoid Valves
- Activated Carbon 3200lbs. Per Tower
- 50-70 HP NG gas-fired engine, operating on the low-BTU feed gas
- Compressor unit designed for vacuum service (-22 to 30” Hg)
- Condensate removal tower
- Surge Tank (Optional)
- Gas Meter
- Connection pipe to pipeline.

Operating Parameters

- Field Gas above 630 BTU/cub. ft.
- Inlet pressure between 20 to 70 psi depending on BTU content.
- Vent N2 from Adsorption Tank between 2 psi and 13 psi.

Conversion Ratios

- 54% to 58% of the feed gas by volume was upgraded from 630 BTU/cub. ft. to 950+ BTU/cub. ft. with minimal heavy hydrocarbon fraction of 3.8%. BTU-recovery efficiency decreases to around 59% as compared to 75% obtained with a superior feed having an average of 715 BTU/cu ft.

- Effective in adsorbing and then desorbing 98% of the entrained heavy hydrocarbons (C2H6+) from a feed stream of low-BTU gas

- Granulated Carbon Swing Bed Nitrogen Rejection Plant works well on a average hydrocarbon content of 63% (CH4+ % mole) which upgrades to a saleable stream containing around 84% of CH4+ (% mole), resulting in 73.2% of hydrocarbon recovery and 75.7 % BTU recovery. The vented gas contains about 63.1% N2 (% mole) resulting in an average N2 rejection efficiency of 76.7%.

Pressure Swing Adsorption System

Conclusions

- Pressure Swing Adsorption Plants upgrade low-BTU gas (as low as 630 BTU/cu ft) to pipeline quality (> 950 BTU/cu ft) using a low maintenance, cost-effective micro-scale nitrogen rejection unit (NRU).

- Approximating plant construction costs of $120,000 and assuming gas prices at $4/mcf and a feed of 200 mcf/d, the ROI is estimated at 5 to 6 months for 615 BTU/cu ft feed. Higher BTU/cu ft. streams increase ROI rates.

- The towers have to be evacuated (desorbed) from vent pressure (around 2 psi) to maximum vacuum (≈25 to 28" Hg) to maximize heavy hydrocarbon recovery and to lower cycle time, which is inversely related to plant throughput.

- Both nitrogen content and the fraction of heavy hydrocarbons in the feed control the optimum NRU plant settings and determine its efficiency.

- NRU Plant settings, namely tower charge pressure and vent pressure, will have to be adjusted if feed composition (BTU and C2H6+/CH4+ ratio) changes over 10%; this may be controlled by use of a programmable logic controller. Greater amounts of heavy hydrocarbons in feed results in higher sales/feed ratio and thus better plant operating economics.

- Low BTU Reference data:

✓ In general, the shallower zones tend to produce low-BTU gas.
✓ Hydrocarbon-wetness increases with age and depth of the producing zone.
✓ Nitrogen-to-helium ratios are unaffected by the age of the pay zone.
✓ Given the limited data set available, the deeper formations appear to display greater compositional ranges for hydrocarbon and non-hydrocarbon gases.

For more information about partnerships, joint ventures or purchasing a Nitrogen Rejection System (Pressure Swing Adsorption Plant) visit our website or call today +1 918 708-1253.

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