

#### 7.4 PSA Process Skid

The PSA unit will have three (3) adsorbing towers which cycle on a time interval basis as dictated by continuous monitoring to ensure delivery of Spectra sales specification gas. A building will have to be field erected over the PSA valve skid and the PSA buffer tank at site.

The system is designed to process 33.8 e3m3/d (1.2 MMscfd) of raw natural gas with a C<sub>3</sub>+ composition and CO<sub>2</sub> concentrations of 10-12 mol% and deliver Spectra sales gas of not greater than 2 mol% CO<sub>2</sub> by volume.

The PSA Processing Skid includes the following main systems:

- Inlet Filtration
- Three (3) PSA Vessels with fixed adsorbent beds with numerous butterfly valves and limit switches to allow cycling of gas adsorbing, generation, and venting off gas to the vent stack
- Two (4) 1000 gal buffer tanks on independent skid
- One (1) 6000 gal stand alone recycle buffer tank
- One (1) Liquid Ring Vacuum Compressor System with a cooler and 5 hp cooler fan

Raw gas passing through the PSA system contacts a fixed bed of adsorbent. The adsorbent is a solid material that will adsorb the CO<sub>2</sub>, C<sub>3</sub>+ HCs', and H<sub>2</sub>O molecules. Methane passes through the bed uninhibited.

When the adsorbing towers reach saturation with HC/CO<sub>2</sub>/H<sub>2</sub>O the raw gas feed is switched to another vessel. The HC/CO<sub>2</sub>/H<sub>2</sub>O is removed from the vessels by reduction of the gas pressure to vacuum. When the bed is regenerated the vessel will be re-pressurized as required and switched back to the adsorption cycle.

The system will be designed for unattended operation. Normal operation would require a site visit to the unit each day to monitor the operations.

## Liquid Ring Vacuum Compressor

Driver:	Electric Drive
Compressor:	Liquid Ring
Application:	Pressure Vacuum Cycle
Number of Stages:	1
Max. Gas Flow Rate:	6.2 e <sup>3</sup> m <sup>3</sup> /d (0.22 MMscfd)
Min. Gas Flow Rate:	0.00 Mscfd
Suction Pressure:	0 to Vacuum (0 kPag, 0 psig)
Operating Discharge Pressure:	20 kPag (3 psig)
Design Discharge Pressure:	1,827 kPag (265 psig)
Suction Temp:	50°C (122°F)
Discharge Temp:	49°C (120°F) Max at 35°C (95°F) amb

The major components of the Vacuum Compressor System will include a 480V, EMD TEFC, electric drive engine rated for 75 HP driving a Liquid Ring compressor. The package will be capable of compressing 6.2 e<sup>3</sup>m<sup>3</sup>/d (.22 MMscfd) at a suction pressure of 0 kPag (0 psig) to approximately 21 kPag (3 psig).

A plant sales and waste gas meter complete with OGC approved RTU's will be included in the PSA Process skid for accounting, monitoring, and trending. The PSA process has been designed with buffer tanks to dampen the flow fluctuating as the process vessels cycle from adsorption to regeneration

A Spectra-sensors SS3000 analyzer located in the PSA Building will be used for monitoring CO<sub>2</sub> and H<sub>2</sub>O and will sample the outlet gas continuously. This unit will also automatically adjust the system cycles respective to changes in the raw gas rates. The analyzer will ESD the facility on off-spec gas. The Spectra-sensors SS3000 is a Dual Channel Gas Analyzer

PSA MCC cabinet will be relocated to the MCC building due to area classification concerns.

PSA process dedicated PC with the user interface software will be installed in the MCC / Office building