**Plant 1 Design Conditions:**

**General Description:**

The purpose of the NRU facility is to remove water (H2O) and nitrogen (N2) from a natural gas stream for the production of pipeline quality natural gas. The water is removed from the inlet gas stream in a mole sieve dehydration system. Once dehydrated the gas enters the cryogenic portion of the plant to separate nitrogen from methane for subsequent sales to pipeline. The NGL stream that is produced routed back to the sales gas stream. Due to the extremely low temperatures in the cryogenic portion of the plant the water must be removed to prevent ice formations.

One product streams from the facility:

Pipeline quality natural gas. (Less than 4% non-hydrocarbon gases).

Liquid waste streams produced from processed gas:

Water and compressor oils captured in the Inlet and Sales Compressor scrubbers. (Note that the sales gas will be extremely dry due to the mole sieve beds. For this reason, no water should be found in the compressor scrubbers during normal operating conditions. Inlet Compressor scrubbers will capture significant amount of water, especially from the regen system.

Water captured from NRU dehydrator skid Inlet Coalescing Filter.

Compressor skid liquids collected from wash down or rain downpour.

**Product Specifications**

The Sales Gas stream will be delivered at the exit of the Nitech™ Facility to meet the following conditions:

Maximum Nitrogen Content (by volume): 4.0 mol % or less

**Quality of Gas to be Processed**

The gas delivered to the Nitech™ Unit inlet shall be merchantable natural gas, except as to nitrogen and CO2 content and shall at all times comply with the following quality requirements.

The inlet gas to the Nitech™ Facility shall:

A. Contain carbon dioxide (CO2) of not more than 150 ppm by volume;

B. Have an inlet pressure of not less than 550 PSIG and a temperature not greater than 120°F;

C. Be devoid of free condensate, foreign solids and impurities (including, but not limited to, mercury, glycol, hydrogen sulfide);

D. Have no free water.

**Quantity of Gas Required to be Delivered to the Inlet of the NitechTM Facility**

A. Minimum Guaranteed Facility Inlet Flow Rate: 1.25 MMSCF/D

B. Maximum Guaranteed Facility Inlet Flow Rate while producing Sales Gas : 5 MMSCF/D

C. Inlet gas to the Nitech™ Facility shall be supplied at a steady flow rate.

**Design Basis**

The design of the Gas Processing Facility is based on the flow rates and compositions provided by as listed below.

|  |  |  |
| --- | --- | --- |
| **DESIGN BASIS** | | |
| **Inlet Gas:** | |
| Inlet Flow Rate | 5 MMSCF/D |
| **Site Conditions:** | |
| Maximum Ambient Temperature: | 100°F |
| Minimum Ambient Temperature: | 35°F |
| Design Wind Speed: | 90 mph |
| **Facility Inlet Gas Analysis:** | **Component - mole percent** |
|  | **(+/-15% of stated percentages with the exception of carbon dioxide)** |
| Nitrogen | 22.40 |
| Carbon Dioxide | 0.01 |
| Methane | 61.83 |
| Ethane | 9.37 |
| Propane | 4.07 |
| I-Butane | 0.43 |
| N-Butane | 1.12 |
| I-Pentane | 0.21 |
| N-Pentane | 0.28 |
| N-Hexane | 0.13 |
| N-Heptane + | 0.14 |
| Water | Saturated |

Notes:

1. Simulations are based on a 4.0% by volume nitrogen content in the Sales Gas product stream.

2. Inlet gas to the Nitech™ Facility shall be supplied at a steady flow rate

**Plant 2 Design Conditions:**

**General Description:**

The purpose of the NRU facility is to remove water (H2O), nitrogen (N2) and natural gas liquids (NGL’s) from a natural gas stream for the production of pipeline quality natural gas. The water is removed from the inlet gas stream in a molecular sieve dehydration system. Once dry, the gas enters the cryogenic portion of the plant to separate nitrogen from methane for subsequent sales to pipeline. Due to the extremely low temperatures in the cryogenic portion of the plant, the water must be removed to prevent ice formation. The NGL stream that is produced may be sold as a product or may also be routed to natural gas sales, which will be discussed later.

There are two product streams from the facility:

* Pipeline quality natural gas (less than 4% non-hydrocarbon gases);
* Pipeline quality NGL.

Liquid waste streams produced from processed gas:

* Water and compressor oils captured in the Inlet and Sales Compressor scrubbers (Note that the sales gas will be extremely dry due to the mole sieve beds. For this reason, no water should be found in the Sales Gas Compressor scrubbers during normal operating conditions. Inlet Filter Compressor scrubbers will capture a significant amount of water.);
* Water captured from NRU Dehydrator skid Inlet Filter Separator;
* Compressor skid liquids collected from wash down or rain downpour.

**Specifications:**

The equipment to be installed at the NRU locations will be designed to:

1. Sales gas product shall meet or exceed a maximum total nitrogen content of 3% as delivered to the sales gas pipeline.
2. The overall performance of the Nitech™ Unit is designed to meet or exceed 98% overall thermal performance calculated based on the equation **Thermal efficiency = (1- (Total BTU contained in the vent stream / Total BTU content in the inlet gas stream coming into the NRU and downstream of all fuel gas extraction or draw points)).** This calculation is based on total volumes of gas streams and does not mathematically allow for fuel gas consumed by compression or other fuel gas users.

The inlet gas design specifications will be as follows:

1. Contain carbon dioxide (CO2) of not more than 450 ppm by volume;
2. Have an inlet pressure of not less than 700 PSIG and a temperature not greater than 120°F;
3. Be devoid of free condensate, foreign solids (including, but not limited to, mercury, glycol, and hydrogen sulfide);
4. Shall be provided with minimal volumetric fluctuations.
5. Minimum design Inlet Flow Rate : 3.00 MMSCF/D
6. Maximum design : 15.00 MMSCF/D
7. The design basis for the NRU is as follows:

|  |  |  |
| --- | --- | --- |
| **DESIGN BASIS** | | |
| **Inlet Gas:** | |
| Inlet Flow Rate | 15 MMSCF/D |
| Inlet Gas Pressure | 700 PSIG |
| **Site Conditions:** | |
| Maximum Ambient Temperature: | 120°F |
| Minimum Ambient Temperature: | 0°F |
| Design Wind Speed: | 90 mph |
| **Facility Inlet Gas Analysis:** | **Component – mole percent** |
|  | **(+/-15% of stated percentages with the exception of carbon dioxide and nitrogen where ranges are given)** |
| Nitrogen | 20 -30 % |
| Carbon Dioxide | 0.01 – 0.045 |
| Methane | 61.83 |
| Ethane | 9.37 |
| Propane | 4.07 |
| I-Butane | 0.43 |
| N-Butane | 1.12 |
| Pentane Plus | 0.76 |
| Water | 0.00 |
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