

## 750 STPD Air Separation Unit



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## 1. Executive Summary

### 1.1 Plant History & Features

- Plant built by MG Industries in 1996.
- Plant shut down in 2019.
- Technology: Cryogenic Air Separation.
- Plant kept under a nitrogen purge.

### 1.2 Production Capacity

- 750 STPD of LOX.
- 2,063 STPD of LIN.
- 36 STPD of LAR.

## 2. Process Description

This process liquefies air and separates the nitrogen, oxygen, and argon from each other through a cryogenic distillation process. First, air compressors suck air out of the atmosphere, but before the air enters the air compressors, it passes through filters to prevent contamination. Then the air enters the air compressor for pressurization, and then water and carbon dioxide are removed from the compressed air to prevent the formation of ice or dry ice during cooling, as nitrogen, oxygen and argon turn into a liquid at extremely low temperatures and turn any water or carbon dioxide molecules into a solid.

Then, Air is cooled to -180 C, near its liquefaction point, and cools down further as it expands in the Cold Box, which has high pressure and low-pressure separation columns. This extremely cold air is pressurized and goes through a series of columns. By means of the separation column, the air is separated into its components. The liquid mixture of products trickles down to meet the rising stream of gas.

The liquid collects on the trays of the column, and is penetrated by the vapor bubbles from beneath. Here it is oxygen preeminently, with its higher boiling point (-183 degrees C), which condenses out of the stream of gas. The drops of liquid, on the other hand, give rise for preference to evaporating nitrogen, with its lower boiling point of -196C. Gaseous nitrogen collects, in consequence, at the top of the separation column, while liquid oxygen collects at the bottom of the column. The oxygen at the bottom is vaporized, while nitrogen in liquid form is introduced at the top of the column.

Argon builds up in the low pressure in the low-pressure tower since its liquefaction point is between that of nitrogen and oxygen. High purity argon is produced by the removal of the two to three percent oxygen present in the crude argon in a "de-oxo" unit; which is a small multi-step set of processes, which chemically combine the oxygen with hydrogen in a catalyst-containing vessel, and then removes the resultant water (after cooling) in a molecular sieve drier. The resulting oxygen-free argon stream is further processed in a "pure argon" distillation column to remove residual nitrogen and unreacted hydrogen.

### 3. Utility Consumption

| Utility              | Quantity         |
|----------------------|------------------|
| Electricity          | 1.26 KwH/100SCFH |
| Cooling Water Makeup | 210 GPM          |
| Firewater            | 1200 GPM         |
| Potable Water        | 20 GPM           |
| Process Water        | 70 GPM           |
| Sanitary Sewer       | 10 GPM           |
| 200 PSIG Steam       | 2500 lb/hr       |

### 4. Highlights of Major Equipment

| Asset Description                   | Manufacturer Name |
|-------------------------------------|-------------------|
| Main Air Compressor A               | COOPER            |
| Main Air Compressor B               | COOPER            |
| O2 Compressor A                     | Atlas Copco       |
| O2 Compressor B                     | Atlas Copco       |
| Direct Contact Aftercooler          |                   |
| Deoxo Skid                          |                   |
| Emergency Generator A               |                   |
| Emergency Generator B               |                   |
| Transformer #1 13.4 KV - 4160 V     |                   |
| Transformer #2 4160 V - 480V        |                   |
| Transformer #3 MAC Auto             |                   |
| Transformer #4 MAC Auto             |                   |
| MAC A Intercooler 1                 |                   |
| MAC A Intercooler 2                 |                   |
| MAC B Intercooler 1                 |                   |
| MAC B Intercooler 2                 |                   |
| LAR HP Pump                         |                   |
| LOX HP Pump #1                      |                   |
| LOX HP Pump #2                      |                   |
| LP LOX Storage                      |                   |
| LIN Storage                         |                   |
| LAR 1 Storage                       |                   |
| LAR 2 Storage                       |                   |
| HP LOX Storage A                    |                   |
| HP LOX Storage B                    |                   |
| HP LOX Storage C                    |                   |
| O2 Back up Pipeline Steam Vaporizer |                   |
| LOX/LIN Dump Vaporizer              |                   |
| LAR Dump Vaporizer                  |                   |

|  |               |
|--|---------------|
| Mole Sieve Skid                                |               |
| AE-300 Atmosphere O2 Analyzer - Control Room   | Teledyne      |
| AE-400 Atmosphere O2 Analyzer - Argon Building | Teledyne      |
| AE-500 ppm CO2 - Control Room                  | Rosemount     |
| AE-910 ppm O2 - Control Room                   | Teledyne      |
| AE-912 ppm O2 - Control Room                   | Teledyne      |
| AE-920 ppm THC - Control Room                  | Teledyne      |
| AE-1000 %O2 Analyzer - Control Room            | Teledyne      |
| AE-1010 %O2 Analyzer - Control Room            | Rosemount     |
| AE-1100 ppm O2 - Control Room                  | Teledyne      |
| AE-1120 %H2 Analyzer - Control Room            | Teledyne      |
| AE-1130 Dewpoint Analyzer - Control Room       | Panametrics   |
| AE-1200 %O2 Analyzer - Control Room            | Teledyne      |
| AE-1210 ppm N2 in Argon - Control Room         |               |
| AE-2800 Atmosphere O2 Analyzer - Truck Room    | Teledyne      |
| AE-2930 Dewpoint Analyzer - Truck Room         | Panametrics   |
| AE-2940 ppm N2 in Argon - Truck Room           |               |
| AE-2950 ppm O2 - Truck Room                    | Teledyne      |
| AE-2980 ppm THC - Truck Room                   | Teledyne      |
| AE-2990 ppb O2 Analyzer - Truck Room           | Teledyne      |
| AE-2910 % O2 Analyzer - Truck Room             |               |
| Cold Box - A                                   | MG Industries |
| Cold Box - B                                   | MG Industries |
| Air Expander                                   |               |
| Truck Scale                                    |               |
| Cooling Water Pump #1                          | Gould         |
| Cooling Water Pump #2                          | Gould         |
| Cooling Water Pump #3                          | Gould         |
| DCAC Pump 1                                    | Gould         |
| DCAC Pump 2                                    | Gould         |
| Chill Tower Pump 1                             |               |
| Chill Tower Pump 2                             |               |
| Water Cooling Tower - Cell #1                  |               |
| Water Cooling Tower - Cell #2                  |               |
| Water Cooling Tower - Cell #3                  |               |

***For more details or to discuss this plant, contact:***

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