

## ► PROPYLENE (R1270) REFRIGERATION PLANT FOR PROCESS GAS COOLING APPLICATION



Polar Refrigeration awarded a project for a process gas cooling application in Russia for one of the biggest companies for oil and gas exploration.

Main target was to optimize the process control for natural gas fractioning particularly for the deethanization process. For the needed refrigeration cycle has been used as refrigerant R1270 (Propylene).

The plant itself has been designed in several skids ready mounted and internally piped with insulation and wiring to junction boxes.

A further requirement was the selection of the equipment and materials suitable for low ambient temperature of  $-43^{\circ}\text{C}$  in wintertime.

In this project the process gas stream is divided into a stream which is cooled down by an evaporating temperature of  $-7^{\circ}\text{C}$  and a stream which is further cooled down by an evaporating temperature of  $-45^{\circ}\text{C}$ . One compressor for each evaporating temperature has been selected a third one is used as stand-by compressor.

One speciality in this project is the possibility to operate each compressor skid with two evaporating temperatures due to installed two suction lines, one for  $-7^{\circ}\text{C}$  and one for  $-45^{\circ}\text{C}$ , which can be opened or closed automatically. This gives the system highest reliability in case one compressor fails and more flexible operation of the total plant. All skids have been designed for operation in a hazardous zone. (Zone 2 IIB T3)



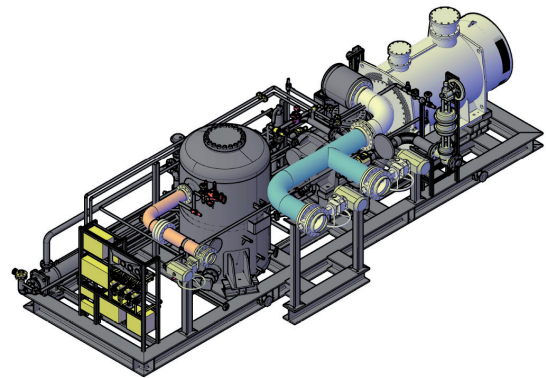
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### Principle

The evaporated refrigerant R1270 from the process gas evaporator skids is sucked off by the screw compressor who works on the corresponding evaporating temperature level. The gaseous refrigerant enters first a KO-drum skid to protect the screw compressor from droplets of liquid. Then gas is compressed and transferred to an air cooled condenser. The gaseous refrigerant is liquefied there and collected into a receiver vessel. From the receiver liquid refrigerant is directed either direct to the  $-7^{\circ}\text{C}$  evaporator or via economizer to the low temperature  $-42^{\circ}\text{C}$  evaporator.

In order to minimize the oil carry over to the system the compressor skid has been equipped with specially designed efficient oil separator that guarantees oil carry over not more than 5 ppm. However, each evaporator is equipped with an automatic operating oil return system. Before the oil returns back to the screw compressor the oil will be separated from liquid refrigerant in an oil rectification unit.

The control logic of central control system is performed by remotely located PLC based on Simatic S7-412H (redundant solution). The compressor skids have explosion-proofed LCP's to operate compressors during maintenance procedures.



### Technical data

|  |  |
|--|--|
| Make of compressor                       | GEA Grasso                               |
| Type of compressor                       | XE-type, screw, oil flooded              |
| Theor. swept volume                      | $7200\text{m}^3/\text{h}$                |
| No of compressor                         | 3 (2 working, 1 stand-by)                |
| Evaporating temperature                  | $-45^{\circ}\text{C}/-7^{\circ}\text{C}$ |
| Condensing temperature                   | $+45^{\circ}\text{C}$                    |
| Refrigerant                              | Propylen (R1270)                         |
| Cooling capacity @ $-7^{\circ}\text{C}$  | 4200kW                                   |
| Cooling capacity @ $-45^{\circ}\text{C}$ | 1500kW                                   |
| Suction pressure                         | 4,7bar(a)/1,1bar(a)                      |
| Discharge pressure                       | 18,4 bar(a)                              |
| Motor rated power                        | 1800 kW (6000V)                          |

### ATEX Specification

|                   |        |
|-------------------|--------|
| Zone              | Zone 2 |
| Group             | II B   |
| Temperature class | T3     |