



ENGINEERING CASE STUDY
GAS DRYING PROCESS –DECEMBER 2006

1. INTRODUCTION

A third Party supplied Gas Cooling Heat Exchanger using flooded, R134A refrigerant as the cooling medium with the vessel is located in an electrically zoned, hazardous area. An Air Cooled Refrigeration plant was located in a non-hazardous area about 7m away to provide the cooling capacity for the heat exchanger.

The refrigeration plant was controlled by a Plant monitoring system and operated by remote PLC.

The main assemblies were supplied as two separate items for installation by others on site to Heuch requirements. The installation was commissioned by Heuch, Factory trained technicians.

The ends of the vessel are flanged to allow for periodic cleaning of the process gas stream. The vessel is insulated in closed cell insulation and protectively clad.

2. PROCESS DESCRIPTION

The Heuch Split System Refrigerated Gas Dryer is designed to remove entrained moisture from the once through gas stream without reheat or reclaim. The Gas leaves at or slightly above +5°C.

The Process Section of the plant is an electrically hazardous area. The plant installation required specialist engineering to comply with the hazardous area requirements.

The process cooling demand varies and as such the unit is required to operate with varying gas loads ranging from 0% to 100%.



Figure 1: Stainless Steel Evaporator Module

3. PROCESS DETAILS

Refrigerant	R134A
Compressor Type	Open, Reciprocating
Evaporator Type	Shell and Tube, Hazardous Area
	AS1210 Class 3
	All 316L Stainless Steel
Refrigeration	Air Cooled, Remote Unit, safe area
Design Ambient	+4°C to +46°C

4. PLANT FEATURES

The plant features a custom built Refrigerated Pressure Vessel. The split system arrangement is employed for installation of the one module inside the electrically hazardous area and the other module to house all electrical components of the refrigeration system outside the hazardous area.

The Evaporator Module is a horizontal Shell & Tube Evaporator mounted on a galvanised steel skid base and engineered for location in an electrically hazardous area. The heat exchanger is fabricated from Stainless Steel 316L and is insulated and clad. The exchanger is designed to cool the process air to the required dew point temperature in a single stage.

The Condensing Unit Module is a packaged unit that houses the reciprocating semi-hermetic compressor, refrigerant receiver, air-cooled condenser, ancillary equipment and instrumentation.

The automated dryer operates at constant dew point (at pressure) at varying flows up to its rated capacity. An exclusive feature of the unit is the capacity control system that continuously and automatically adjusts the cooling effect to match to required 0% to 100% variation in cooling load.



The system consisted of:

1. A Refrigerated Condensing Unit on its own skid frame containing:
 - ❖ Condensing Unit Module
 - ❖ An Accessible-Hermetic, reciprocating compressor with cylinder unloading and vibration eliminators.
 - ❖ A large combination oil separator/reservoir with return line including filter, solenoid valve, sight glass and shut-off service valves.
 - ❖ A refrigerant bypass system with service shut off valves, solenoid valve and insulation.
 - ❖ An Air-Cooled condenser with epoxy coated fin and tube bundle.
 - ❖ A large liquid receiver with inlet and outlet shut-off service valves for full pump-down capacity.
 - ❖ Liquid line assembly including a removable core drier, solenoid valve, shut-off service and refrigerant charging valves.
2. A vessel assembly complete with insulation, cladding and all necessary refrigeration valves and controls including:
 - ❖ Oil skimmer assemblies with control valves, sight glasses, solenoid valve (hazardous rated) and shut-off service valves.
 - ❖ Refrigerant Unloading Valve assembly including shut-off service valves, control valve
 - ❖ Liquid line assembly including shut-off service valves, sight glass/moisture indicator and Liquid Level Control valve.
 - ❖ Suction line assembly including shut-off service valve, oil skimming injection system and insulation.
 - ❖ Refrigerant pressure transmitter, intrinsically safe
 - ❖ Discharge Pressure fan control.
3. Local marshalling box where all instruments are terminated.

The instrument control & electrical system is specifically engineered for integration into the facility's control system. The refrigeration instruments supplied at the condensing unit were: discharge pressure transmitter, discharge pressure switch, discharge temperature transmitter, suction pressure transmitter, return vapour temperature transmitter, oil pressure transmitter, oil pressure switch