

ENGINEERING CASE STUDY
Gas Dryer
Low Pressure – High Flow

1. INTRODUCTION

This system was designed to condition the temperature and humidity of a low pressure, gas supply and consisted of the following items:

- A Gas Cooler/Reheat vessel package.
- An Air Cooled Chiller package and Storage tank and pump package to supply chilled water to the cooling heat exchanger in the Gas Cooler/Reheat vessel package.
- A hot water pump skid package to supply heated water to the heating heat exchanger in the Gas Cooler/Reheat vessel package.
- Electrical cubicle supplied and fitted to the Storage tank and pump package to control the chilled water system and hence the gas supply temperature.
- Electrical cubicle supplied and fitted to the heating skid package to control the hot water system and hence the gas supply humidity.



Low Press Heat Exch Skid

2. PROCESS DETAILS

INLET GAS PROPERTIES			
Gas composition	CH4	>90%	
	Inert gas	<10%	V/V
	H2S	<7.0	mg/m3
	S	<50.0	mg/m3
Temperature		5 to 35	°C
Pressure		35 to 50	Kpa(g)
Dew point of incoming gas		5 to 30	V/V
OUTLET GAS REQUIREMENTS			
Relative humidity		80	%RH
Temperature control range		5 to 40	°C
AMBIENT DESIGN CONDITION			
Temperature		-7.6 to 46	°C
Humidity		40 to 80	% RH

- The Cooler/Reheat vessel package is the only item to be located within a hazardous area. A other items are located outside this area.
- The vessel design pressure was 155kPag
- The design temperature for the vessel was 55°C.
- The maximum pressure drop through the heat exchanger assembly should not exceed 200 Pa.

3.0 EQUIPMENT DETAILS

3.1 GAS COOLER VESSEL assembly consists of:

- ❖ Design of Vessel complying with AS1210.
- ❖ A 316 stainless steel vessel assembly with removable top cover for access to clean the internal heat exchanger and other components as necessary.
- ❖ A tube and fin type heat exchanger with chilled water on the tube side and gas passing over the fin side. This heat exchanger is constructed fully of 316 stainless steel.
- ❖ The reheat element is also a tube and fin type heat exchanger with hot water on the tube side and gas passing over the fin side. This heat exchanger is constructed fully of 316 stainless steel.
- ❖ Inlet and outlet ducts are constructed of 316 stainless steel and are 500mm diameter with ANSI # 150 flanged connections.
- ❖ A condensation collection sump at the bottom of the vessel with a ball float type condensate drain trap fitted.

3.2 WATER CHILLING UNIT

A Water Chilling Unit is used in lieu of a cooling Tower Package to ensure the humidity of the exit gas is below 80% RH. This is achieved by regulating the quantity of cooling water to the Gas Cooling coil

	Water Chilling Unit
Application	Air Cooled
Refrigerant	R407C
Compressor Number & type	2 x Semi-Hermetic
Capacity Control	4 steps (0-25-50-75-100)%
Ambient Design Temperature	46.00°C
Chilled Water Supply Temp.	5.00°C
Chilled Water Return Temp.	10.00°C
Condenser fans (Axial)	4 x 2.00 kW
Max. Working Ambient Temp. ^(a)	47.00°C
Weight	2030 kg
Dimensions L x W x H (mm)	3495 x 2188 x 1989
(a) When the chiller's maximum ambient working temperature is exceeded the "unloading" system capacity control is activated enabling the chiller to continue operating but at a reduced capacity.	



Water Chiller – Air Cooled

3.3 PUMP AND TANK SKID

The skid is pre-piped and pre-wired in our factory to the Air Cooled Chiller. It is disassembled before shipping and marked for easy assembly on site by others. The skid includes the following equipment:

- ❖ 1 x 5,000 litre chilled water storage tank. The tank is of mild steel construction with a fixed lid and manhole access. The tank is painted inside and out with a special two pack, epoxy seal system. The tank is insulated all over with polystyrene, vapour sealed and clad.
- ❖ An Automatic Dosing unit with dosing pumps for biocide and inhibitor are fitted.
- ❖ To circulate between the tank and the chiller is a long coupled, end suction, pump.
- ❖ To circulate between the tank and the Gas cooling coil is a long coupled, end suction, pump.
- ❖ Interconnecting piping, valves, gauges and insulation as necessary between the items on the skid and the chiller.
- ❖ A hot dipped, galvanized steel base to mount the equipment.



Tank, Pump, Pipework Skid

3.4 HEATING SKID PACKAGE

The Heating skid package provides the reheat facility to ensure the required maximum humidity of 80% is achieved. This package consists of:

- ❖ Electric resistance, in-line heater bundle in stainless steel shell and complete with overheat thermostat.
- ❖ To circulate between the heater skid and the Gas Cooler Vessel reheat coil is a long coupled, end suction, pump.
- ❖ Interconnecting piping including a strainer, two check valves and all necessary valves.
- ❖ An RPZ valve to provide make-up water for the skid with pressure reducing valve
- ❖ Pressure relief valve to preclude over-pressurising the system.
- ❖ A galvanized steel base to mount the equipment.

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