

ENGINEERING CASE STUDY
INERT GAS DRYER – BURRUP PENINSULA

1. INTRODUCTION

This Air Chiller Unit was an adaptation of our standard design.

The basic model has been manufactured by Heuch in Australia since 1970 and holds current design approval to Australian Standard AS1210-1997 for a Class 3 vessel for use in all Australian States.

Normal manufacture utilises copper heat exchanger tubing however the design was upgraded for stainless steel tubing within the heat exchanger for this application.

The inspection service of Lloyds Register for third party inspection was included for the vessels in accordance with the client's requirements.



Burrup Peninsula – Western Australia

2. PROCESS DESCRIPTION

The Gas Dryer consists of two main modules: -

- a) A water cooled condenser module complete with a reciprocating, open drive compressor, liquid receiver, filter-drier, control panel, etc
- b) An evaporator module consisting of a horizontal shell and tube heat exchanger. The main shell is carbon steel and utilises 316L stainless steel tubes

The Heuch automated refrigerated gas dryer unit operates at constant dewpoint (at pressure) at varying flows up to its rated capacity.

An advanced feature of the unit is the capacity control system, which continuously and automatically adjusts the cooling effect in relation to the load.

The heat exchanger is designed to cool compressed gas to the required temperature in a single stage.



Gas Dryer Package

3. PROCESS DETAILS

The unit uses the principle of refrigeration to reduce the dewpoint of the gas being dried to a value where the majority of the entrained water vapour is condensed into a liquid and is ejected to waste in this form.

Saturated compressed gas enters the refrigerant/gas inlet channel and the gas flows horizontally through the enhanced tubes and rejects heat to boiling refrigerant inside the shell.

Moisture separation occurs within the tubes and the gas, together with the precipitated condensate, flows into the exit channel.

Process Details continued

The mist and water droplets coalescing on a stainless steel filter effect mechanical separation. These then flow to the bottom of the channel, where rejection to waste occurs via a condensate discharge system.

REFRIGERATION

Liquid refrigerant at normal condensing pressure and slightly sub-cooled flows from the liquid receiver, through the filter unit, the liquid line solenoid valve, the sight glass to the thermostatic expansion valve which meters refrigerant into the shell bottom of the refrigerant/gas heat exchanger.

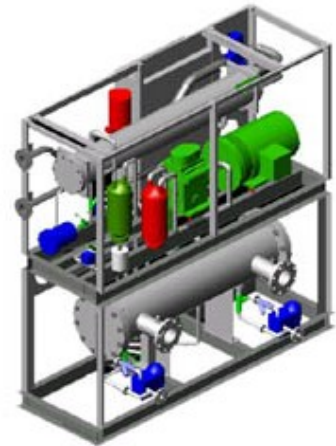
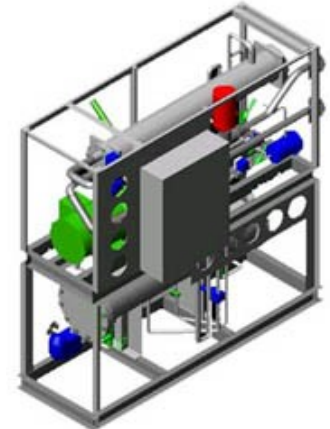
In so doing, a small proportion of "flash gas" is formed and causes the bulk of the liquid refrigerant to fall to the evaporating temperature and pressure, which exist in the refrigerant/gas heat exchanger shell.

Heat, transferred from the gas being cooled, causes the liquid refrigerant within the refrigerant/gas heat exchanger to evaporate and pass in gaseous form into the suction line to the suction side of the compressor.

The gaseous refrigerant is compressed to discharge pressure conditions and flows through the discharge line via the oil separator to the condenser where it is desuperheated and condensed by rejecting heat to the gas stream via the water-cooled condenser.

An automatic, pressure operated stainless steel water valve varies water quantity proportionally in order to achieve a near constant condensing pressure.

The liquid refrigerant returns to the liquid receiver from whence it commences another cycle.



4.0 PERFORMANCE DATA

Parameter	Units	
Fluid to be cooled		Inert Gas
Flow	Nm ³ /hr	1576
Inlet RH	%	100
Inlet temperature	°C	45
Inlet pressure	bar A.	9.123
Outlet temperature	°C	15
Allowable pr drop	mbar	60
Condensate	kg/hr.	10.85
Refrigerant		R-22
Mechanical Design Pressure	bar g.	23.5, 14.0, 23.5