

ENGINEERING CASE STUDY

Adelaide University

1. INTRODUCTION

Heuch Pty Ltd was engaged by Munters Australia to provide engineering and equipment support for the installation of a new environmental chamber to be constructed at Adelaide premier university for ongoing research and development programs involving athletes and various other personnel.

The equipment was manufactured in Melbourne where it was matched to a master system by Munters. Heuch personel attended site for the commissioning and testing after installation by University contractors.

Continuous site monitoring during this period was provided by direct connection between the unit controller and the Heuch Service network. This allowed for quick and effective tuning of control loops and allowed Heuch Service Engineers ready accessment of potential problem areas by the monitoring software.

2. PROCESS DESCRIPTION

The installed equipment controls the room temperature anywhere between -10°C and $+40^{\circ}\text{C}$.

A single Semi Hermetic refrigeration compressor with a Variable speed drive and electronic discharge bypass provided 0% to 100% unloading as required. This arrangement provided the maximum possible capacity turndown.

The equipment was split up into four separate sections and the following details this arrangement. There was a fan/coil unit, a packaged air-cooled refrigeration unit, an electrical control cubicle and an air distribution sock for the room.



Package unit before installation

3. PLANT FEATURES

This package consisted of

- ❖ A vapour tight housing made of 100mm sandwich panel. The housing had inlet and outlet flanges as removable panels to provide access for filter removal and general maintenance.
- ❖ A return air roughing panel filter.
- ❖ An evaporator coil with aluminium fins, copper tube and aluminium frames. This also allowed for a defrost cycle, as necessary, for operation at 0° and $+5^{\circ}\text{C}$ room temperatures with high humidity.
- ❖ A centrifugal belt driven fan to circulate $1650\text{m}^3/\text{hr}$ of air with a three phase TEFC, tropic proof, 4 pole motor to provide at least 300pa external system resistance.
- ❖ The air-cooled condensing unit was supplied on a common skid base and consisted of a large air-cooled condenser, compressor assembly and all necessary refrigeration components.

The compressor is speed controllable between 750 and 1750 RPM with electronic discharge bypass used to further reduce the cooling capacity and give full capacity control over the full operating temperature range.

The Air Cooled condenser with multiple fans and epoxy coated fins will be cycled in response to the compressor discharge temperature.



A replaceable filter/drier with upstream service valve was installed to allow for pump down of the refrigerant for ready servicing.

The following mechanical safety devices were incorporated to protect the equipment in the event of a fault condition: Compressor Low Refrigerant Pressure, Compressor High Refrigerant Pressure, Compressor High Discharge temperature, Compressor oil pressure

The electrical cubicle houses all the electrical equipment and has a Heuch DDC on board to communicate with the clients input/outputs.

A control cubicle constructed of heavy gauge sheet steel suitably braced to maintain rigidity and complete with hinged, lockable access doors weather proofed to at IP55 standard. The cubicle encloses all electrical controls and DDC control. A document pocket is fitted in the door.

The cubicle contained the following equipment.

- Mains isolator c/w door interlock and handle
- Plant Running lamp
- Start and Stop switch
- PLC c/w digital display.
- Air Inlet temperature
- Control circuit breakers
- Power transformer: 240V to 24VAC
- Control relays
- Compressor motor starter and speed controller.
- Condenser fan motor start contactor and circuit breaker/overload
- Evaporator fan motor start contactor and circuit breaker/overload
- Terminal strip for all external connections that are to be made from the cubicle.

A DDC controller to control all functions including:

- Defrost initiation, termination, drip and fan delay times.
- Discharge bypass valve modulation.
- Compressor speed regulation.
- Condenser pressure regulation via fan cycling.
- Fault condition monitoring, logging and annunciating.
- Operating condition logging.
- Communication control with your equipment.



Basic Refrigeration Unit



Control Panel back plate