



AURORA THEATRE BURNSIDE HIGH - OPA & MAGNUS



**Burnside High School,
Christchurch, New Zealand**

The Aurora Center is a state of the art, multi-purpose venue designed to seat 700 people. The venue is air-conditioned using a MWH900 with three OPA705 ECO's and two OPA370's. Utilising the innovative MAGNUS inverter in-line single pass heat pumps for boiler/electric heater bank replacement, these systems combine variable capacity inverter compressor and BLDC pump technologies to provide around 300kW of heating and cooling while efficiently maintaining a constant supply water temperature under the widest possible range of ambient conditions, ideal for Christchurch conditions.

Solution & Application



Theatre



BMS



Hot Water
Heat Pump



OPA
Systems



Energy
Savings

Key outcomes

- ✓ Space heating using MAGNUS/OPA integrated system application
- ✓ **ECO Air Cooled Packaged Units** – A responsive and adaptive solution, the unit can adjust its own cooling or heating capacity in accordance with changing loads.
- ✓ **MAGNUS Fresh Air Tempering Heating** – Suited to large space applications, ideal for school theatres.
- ✓ **Improved Efficiency with Effective Inverter Part Load Operation** – Using the inverter compressor, as the load is met, significantly reduces energy consumption by turning itself down.
- ✓ **MAGNUS In-line System Technology** – allows for substantial efficiency gains over traditional installations. This is achieved through a precise control of heated water supply for optimised heat transfer by the application.
- ✓ **Quiet Operation**

Our solution

An integrated custom system designed to provide on schedule, automatic space heating and cooling.

- **HVAC Systems installed with complete BMS control**
- **MAGNUS MWH900** – A four fan air tempering hot water heat pump including a programmable control system designed to provide space heating to the theatre. This 73kW Hot Water Heat Pump pre-heats the mixed return air/fresh air to achieve 10°C on temperature to 3 x OPA705's. The MWH900 was applied to the system design for its reliability to maintain a supply water temperature of 40°C ~55°C utilising an inverter compressor range of 6.2kW ~ 90kW.
- **ECO Air Cooled Packaged Units** – Combine a large commercial floor space and constantly changing cooling or heating loads and you will have a climate control challenge that temperzone's air cooled package units are designed to handle even in the extremes of summer and winter.
- **Each Unit has fitted a Siemens Controller** – The controller controls the unit and its associated return fan, motorised dampers, and heating water valves depending on the mode of operation. Each unit includes one LCD back-lit display for temperature adjustment and after hours function, mounted on the face of the mechanical section of the switchboard.
- **System Stop/Start via time schedule.**
- **Automatic Heating & Cooling Control** – The system provides automatic control of heating and cooling according to space demand as measured by existing space mounted sensors. The fan speed modulates based on the heating and cooling requirements. For heating or cooling duties below 50% the fan speed is set to 50% (adjustable). Above 50% duty the fan speed ramps in parallel with the heating/cooling duty. The associated spill/return air fan is controlled via a VSD match the supply fans.
- **EC Type Supply Fans** – Suitable for 10-V input from controller.
- **Free Cooling/Economiser Mode** – Demand for cooling is measured by space temperature sensors which compare the outdoor air temperature to the return air temperature. If the outdoor air is cooler than the indoor air temperature by 1.5°C, fresh air and return air dampers modulate to meet the cooling demand based on the available outside air temperature. Should the space temperature not be controlled sufficiently using free cooling the unit shall be allowed to enter cooling mode in addition to the free cooling.
- **Air Quality Control** – Return air duct mounted CO2 sensor for CO2 control in conjunction with the space mounted CO2 sensor. The fresh air damper maintains 750ppm CO2.
- **Heat Up Mode** – System is on a start-up program prior to occupancy - 1 hour to occupancy time.

Precision Load Response Technology

High levels of comfort and energy savings can be provided regardless of climatic conditions. The use of variable capacity compressors allow a precise load variation response.

- **Compressors** - Continuous modulation enables wide capacity range.
 - 2 Compressors = 20 - 100%
 - 4 Compressors = 10 - 100%Modulating compressors have the ability to continue to operate at high ambient conditions without faulting.
- **EC Fans**
 - Variable speed EC fans giving optimum control of operational and standby air-flow. Constant airflow can be achieved independent of return air and fresh air damper openings or filter resistance.
 - Superior fan efficiencies with EC fans.
 - Increased energy savings at part load conditions with variable 0-10VDC control.
- **Electronic Expansion Valve**
 - Increased efficiencies by lowering head pressure and optimum feeding of heat exchanger coils.
 - Dry Mode and Super Dry Mode can only be achieved by temperzone ECO units as they utilise optimised Dual Electronic Refrigeration Valve control.
- **Variable Outdoor Fans**
 - Increased energy savings at part-load conditions with integrated speed control.
 - High fan reliability with soft starting and low air noise (quiet mode for sensitive application).

GENERAL INFORMATION

Customer

Burnside High School

Location

Burnside, Christchurch, New Zealand

Project

Aurora Theatre

Date of installation

2017 - 2018

SYSTEM DESCRIPTION

Outdoor Units

MAGNUS MWH900 - 73kW Space Heating

- R32 Low GWP Refrigerant
- Low capital investment
- No need for buffer tanks
- Reduction required in pump power
- Reduction in piping required
- Most efficient energy design
- Reliable long life system
- Low service/maintenance requirements
- Compact design



OPA705 - 69.7kW x 3 Units

OPA370 - 39.1kW x 2 Units

- Reverse Cycle - heating & cooling
- Dry & Super Dry Mode
- Dehumidification Performance
- Dual Electronic Refrigeration Valve control (IP Protected)
- Simple control technology - easy to use systems
- High levels of comfort and energy savings can be provided regardless of climatic conditions
- Variable capacity compressors allow for a precise load variation response
- EEV's for high response levels to current load conditions
- 2 & 4 Compressors
- Achieves up to 60% energy savings

