# HVAC

**HVAC** is a combined delivery system for heating, cooling & ventilation in public buildings

It can be the **single biggest** user of energy in commercial buildings **(up to 60%)**

Basic efficiency improvements can generate **significant savings** in energy consumption

## WHAT IS HVAC?

HVAC is the overall delivery system for heating, ventilation & cooling of commercial buildings. It generally consists of mechanical equipment that includes a supply air fan (sometimes a return air fan), heating & cooling coils and a series of ducts and dampers that direct air to the various parts of the building and draw return air back to be recycled and mixed with fresh outside air before it recirculates. When combined these components control and regulate internal building temperature, humidity and air quality.

## TECHNICAL ASPECTS

HVAC is often the highest single consumer of energy in a commercial building. Because of this, the smallest of improvements to energy efficiency can have a significant impact on energy savings.

Modern Direct Exchange (DX) HVAC systems can typically achieve 50% greater overall efficiency than equivalent capacity units over 20 years old. They do this with more efficient heat pump technology which varies refrigerant flow through highly efficient compressors which results in a high Energy Efficiency Ratio (EER).

Modern HVAC system features like full economy cycles which allow the introduction of full outside air as the first stage of cooling, electronically controlled (EC) plug fans which are more efficient fan motors that can vary the fan speeds in accordance with building load, and more advanced direct digital control systems, also bring large energy efficiency savings.

Good digital controls, like a Building Management System (BMS), allow the HVAC system to respond better to the needs of the building users. This will typically include temperature set-points and thermostats for each area, a 365 day clock for timed switching of heating and cooling, as well as changing temperature set-points across the whole year. A good BMS will also monitor a building closely to make sure it's performing as it was designed, provide regular updates to facility managers and maintain a comfortable and energy efficient workplace.

## WHAT ARE THE BENEFITS?

Energy savings from upgrading HVAC systems are often significant, adding to business productivity and reducing overheads. The typical energy savings from HVAC upgrades are 30-50%, depending on the age and state of the existing system. Given that HVAC can be 50% of a business's total energy bills, upgrading HVAC can deliver 15 to 25% overall savings in annual energy expenditure for businesses.

This reduction in electricity consumption will normally translate as a reduction in carbon dioxide emissions and a tangible environmental improvement that facility managers can clearly identify by carefully monitoring energy bills.

The other benefits of HVAC upgrades relate directly to the health of the workforce. Cleaner air handling and distribution systems and increased fresh air through economy cycles have been observed to improve productivity of staff, decrease absenteeism and improve staff retention. This means big wins for management in terms of productivity and a happier and healthier workplace.

## HVAC IN ACTION AT THE BRUNSWICK TOWN HALL AND LIBRARY

The chiller upgrade at Brunswick Town Hall and Library replaced the two older chillers with two new 200kW efficient units from Europe. Not only did the project deliver large energy savings for the Council and community, but also increased the amount of area that is air conditioned to include the library as well – this keeps the books cool all summer!
The Brunswick Town Hall originally had 2 out-dated chillers that could not vary their output, used large amounts of electricity and struggled to keep the building comfortable all year round. In addition, the library was experiencing very uncomfortable temperatures during the hot summer months; however the site didn't have a large enough electricity connection to expand the air conditioning into the library as well.
As a solution Council replaced the two chillers and the air handler and added cooling coils to provide cooling to Library. The new system of two chillers in stages allows the chillers to modulate output from 25% to 100%. With 2 x 200kW, the maximum capacity can also keep the building cool and comfortable during the hottest days as well.
The estimated energy savings are large.
The total estimated annual cost savings is approximately $20,000, without including the avoided additional costs of infrastructure upgrades. This is based on electricity savings of approximate 166,000 kWh per year, and translates to a reduction in Council's greenhouse gas emission of approximately 218 tonnes of $CO_2e$ per year.
The project involved an investment of $196,000, with a return on investment of approximately 10%, or a simple payback of 10 years.

## THINGS TO AWARE OF

- Full economy cycle dampers are still not 'standard' and can be retrofitted to existing systems.
- Variable speed drives are a great energy efficiency feature on large fans, this is often not possible with direct exchange systems.
- Identify the ducting installation R value, as existing duct work often has a low R value and retrofitting more insulation may be a good opportunity.
- Beware of air leaks in joints, blocking air leaks in an HVAC system is very effective and cost effective.

## CHILLER AT THE BRUNSWICK TOWN HALL

BEFORE

AFTER

Australian Government

COMMUNITY ENERGY EFFICIENCY program

Moreland City Council

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