



## 5 Minute Guide 2.5

**energy+**

Turn energy savings into business power

# How to make existing industrial buildings more energy efficient

This 5 Minute Guide examines opportunities to improve the energy efficiency of industrial buildings through the use of more efficient equipment and materials.

The energy use of industrial buildings in the chemicals and plastics industries is likely to form a small part of overall business energy use. The energy used to operate machinery and equipment is usually greater than that used to heat, cool and light the building.

However many options to improve the energy efficiency of existing industrial buildings are often available at relatively low cost. It is therefore worth exploring opportunities to save energy and reduce your business costs through building improvements.

## Heating, ventilation and air conditioning

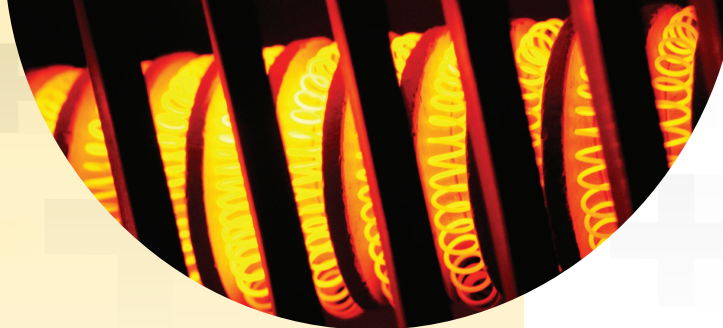
Maintaining the temperature of the industrial building space will ensure a comfortable working space for staff, but may also be critical for the production process. It is important to consider the interaction of heating and air conditioning together with the role and impact of natural ventilation in a building.

To achieve the greatest efficiencies, it is important to understand your heating and cooling needs, and how your current equipment operates as a system. This will be influenced by:

- Production cycles
- Process temperatures
- Building fabric
- Zoning of functions within the building
- Seasonal temperature changes



Many options to improve the energy efficiency of existing industrial buildings are **often available at relatively low cost.**



**Energy use by heating, ventilation and air conditioning (HVAC) systems should be closely managed in line with the operational needs and seasonal impacts. They can be reduced by:**

- ✓ Effectively controlling heaters and air conditioners through the simple application of timers to control operation. Regularly check thermostats to ensure operation at an efficient set-point (for example, 19-21°C for offices, 16-19°C for workshops and 10-12°C for store rooms). This can save you up to 10% of associated your energy costs.
- ✓ Introducing radiant heaters instead of space heaters. This improves the comfort level for people in the building by providing direct heat where it is required, rather than heating large unused spaces that are subject to air leakage. Where space heating is used, consider the introduction of recirculation fans in the ceilings to move warmer air down to ground level.
- ✓ Ensuring that ventilation fans are not left operating when they are not required. This is most effectively achieved by interlocking them to an automated HVAC system, which will synchronise fans to the needs of the factory.
- ✓ Fitting shutters to ventilation, exhaust and extraction fans to seal them when they are not in use.
- ✓ Using air conditioning only when ventilation does not eliminate heat gain.
- ✓ Ceasing the use of systems that control relative humidity. Controlling relative humidity is energy intensive. If you must do it, make the minimum and maximum humidity set-points as wide as possible.
- ✓ Segregating areas of the factory that have different heating and cooling needs, and managing each of them as separate zones within the HVAC system.
- ✓ Checking for other heat sources in the building that are working against the HVAC systems. For example, if lighting creates heat, that heat must then be removed by the air conditioning system.
- ✓ Undertaking regular maintenance of all HVAC equipment to ensure it is operating at peak efficiency. For example, cleaning heat exchangers, fins and filters reduces the energy load on the equipment.

## Building fabric

Building fabric is the term for the walls, doors, windows and roofs of your buildings. There are some simple strategies that will ensure your building is not working against you in your bid to reduce energy use:

- ✓ Insulating the roofs, walls and windows to prevent heat loss or gain to the external environment. This is the most cost-effective activity that can be undertaken to the building fabric.
- ✓ Stopping draughts and ensuring doors and windows seal properly.
- ✓ Physically separating areas of the factory that have different heating and cooling needs with doors, such as PVC curtains, air locks or air curtains in storage and cooling areas.
- ✓ Applying cool roof paint to your existing roof. A cool roof is one that reflects the sun's heat and emits absorbed radiation back into the atmosphere at a higher rate than standard materials. This reduces the amount of heat held and transferred to the building below, leaving it cooler and at a more constant temperature. In turn, the load and utilisation of the air conditioning system is reduced.
- ✓ Installing solar photovoltaic (PV) panels on the roof and using the electricity generated to offset your daytime power use.



Regularly check thermostats to ensure operation at an efficient set-point. This can **save you up to 10% of your associated energy costs.**

## Lighting


Lighting can account for up to 7% of industrial energy use. It is a good place to start when looking to reduce energy as the opportunities cost very little to implement. Lighting energy savings of 75–90% can be achieved using natural light and task lighting, together with the most efficient lighting equipment.

When assessing the opportunities for improvement presented by an existing lighting system, the first step is to measure how effectively the existing light levels and characteristics serve their function. There are many opportunities for cost-effective retrofits to existing lighting systems. It is possible to simultaneously increase lighting levels and use less energy if the most efficient technology and practices are used. It can also be a visible activity to engage the broader workforce in improving energy efficiency.

The simple activities that can be undertaken include:

- ✓ *Daylighting*: implement 'daylighting' or natural light strategies to reduce the need for artificial lighting. Open blinds and install skylights or windows. Use window glazing or reflective films to control glare and radiant heat transfer through windows.
- ✓ *Task lighting*: when more light is required than daylight provides in specific areas, introduce task lighting.
- ✓ *Switching off lights*: encourage staff to turn off lights that are not needed, including when they are leaving a space unoccupied. Put up clear signage indicating which switches control the light in each area. This will enable staff to manage lighting and also remind them to do so.

- ✓ *Automatic controls*: utilise automatic controls to turn lights on and off when required. Motion detectors, light-level sensors and time switches are relatively inexpensive and easy to install.
- ✓ *De-lamping*: reduce the number of lamps or fittings in a given area whilst still providing sufficient light for the task at hand. Figure 1 provides the recommended minimum lighting levels as per Australian Standard AS1680.1 (see page 4).
- ✓ *Maintaining lamps*: clean and service lamps, reflectors and diffusers regularly to ensure optimal transfer of light. Most lamps generate less light as they age but continue to use the same amount of energy. As such, lighting levels should be monitored and older lamps changed out when they start to degrade.
- ✓ *Upgrade inefficient lamps*: consider replacing lamps with more efficient equivalents as this simple action will result in significant savings. For example, compact fluorescent lamps (CFLs) and light emitting diodes (LEDs) offer 75–90% improvements in energy efficiency when compared to incandescent globes.



**Lighting energy savings of 75–90% can be achieved** using a combination of natural light, task lighting and the most efficient lighting equipment.





Remember to **refer back to your energy plan regularly**. Go to the PACIA energy+ portal for help in setting up your plan.

**Figure 1: Recommended minimum lighting levels**

Minimum illuminance (lux)	Task difficulty and examples
40	Corridors, walkways.
80	Change rooms, loading bays, bulky storage.
160	Simple tasks. Waiting rooms, rough bench work, general fabrication.
240	Moderately easy tasks. Food preparation areas. Medium woodworking.
320	Moderately difficult tasks. Routine office work.
400	Moderately difficult tasks. Fine woodwork.
600	Difficult tasks. Drawing boards, inspection tasks, fine machine work, fine painting, colour matching.
800	Very difficult tasks. Fine inspection tasks, colour matching of dyes.
1200	Extremely difficult tasks. Graphic arts inspection, extra fine bench work.
1600	Exceptionally difficult tasks. Jewellery, watch making.

Source: AS 1680.1: Recommended Maintenance Illuminances for Various Tasks, Activities or Interiors; Table 3.1

### This is just one piece of the energy efficiency puzzle!

There are many other areas that you should also consider. PACIA energy+ covers the key topics and provides you with the tools and information you need to improve your energy efficiency and reduce costs. PACIA energy+ has been designed specifically for businesses in the chemicals and plastics industry.

**Go to the PACIA energy+ portal for more: [www.paciaenergyplus.org.au](http://www.paciaenergyplus.org.au)**



**Plastics and Chemicals Industries Association**  
Sustainability Team  
03 9611 5400  
[info@paciaenergyplus.org.au](mailto:info@paciaenergyplus.org.au)

