



5 Minute Guide 2.3



energy+

Turn energy savings into business power

Motors, pumps and fans

This 5 Minute Guide examines three key equipment items widely used in the chemicals and plastics industries: motors, pumps and fans. It reveals many things that you can do to improve the energy efficiency of these items in your business.

Motors

Motors are widely used to drive pumps, fans, compressors and other equipment. There are more motors per square metre on chemicals sites than in any other industry¹. Investing in motor efficiency makes sense given the total cost of supplying electricity to a motor can overtake the motor purchase price in just two weeks².

There are five actions that you can take to make sure your motors are operating as efficiently as possible:

- ✓ **Sizing:** check the rating on the motor nameplate and compare it against the load. If poorly matched, consider replacing with smaller high efficiency versions.
- ✓ **Control systems:** set up procedures to inform staff of times when a motor can be switched off, or implement an automatic control system. Motors are sometimes left operating needlessly, as staff may not realise the function is not required.
- ✓ **Varying speed:** consider installing variable speed drives on motor systems where speed or load is variable. This will reduce energy use at times when the full capacity of the motor is not required. For example, reducing the motor speed by 20% reduces the operating cost by up to 50%³.
- ✓ **Maintenance:** carry out regular maintenance on motors used to drive pumps and fans. This can reduce energy consumption by as much as 10%. Maintenance programs should consist of lubrication schedules, cleaning, belt tensioning and alignment checks.
- ✓ **High efficiency:** if your existing equipment is reaching end-of-life, think about future options for high efficiency motors and correct sizing. High efficiency motors offer a 3-4% reduction in energy consumption for similar cost⁴. Combined with choosing the correct (and often smaller) size, this makes for a significantly lower operating cost.

For more details on **choosing new energy efficient equipment**, refer to PACIA energy+ Topic #3: Equipment replacement and process consolidation.

Figure 1: Energy cost for a 100kW motor at \$0.12/kWh

Operating time	Electricity cost
1 hour	\$13
24 hours	\$320
1 month	\$9,740
1 year	\$116,880

Source: Energy Efficiency Best Practice Guide: Pumps and Fans p6, Sustainability Victoria, 2009

Pumps and fans

Pumps and fans are used widely throughout Australian industry and account for about 40% of the motive energy used (that is, the energy used to drive movement). Potential energy savings in pump and fan systems can be as much as 50% through improved efficiency in operation, configuration of the equipment and optimisation of the system as a whole.

When looking to improve the energy efficiency of pumps and fans, always start with an assessment of the need and the opportunities to reduce demand:

- ✓ **Switching the system off:** ensure the system is only operating when you need it and not left on when the plant is in standby.
- ✓ **Operating duty cycle:** check that automatic controls are set for minimal operating periods as conditions may have changed since they were last set.
- ✓ **Flow rate/pressure (load):** use bypass lines or a throttling valve to reduce the flow rate and pressure in the system to the minimum necessary to meet your operational requirement.
- ✓ **Leaks:** check the system for leaking fluid or air. Leaks represent unnecessary extra work being performed by the pump or fan, which means wasted energy and costs.



Energy savings
in pump and fan
systems can be as
much as 50%.

Once you have ensured that the demand is optimised, shift your focus to the operational efficiency of individual pumps and fans. Figure 2 outlines some of the opportunities to reduce pump energy use.

Figure 2: Techniques to lower pump energy use

Energy savings method	Savings
Replace throttling valves with speed controls	10-60%
Reduce speed for fixed load	5-40%
Install parallel system for highly variable loads	10-30%
Replace motor with a more efficient model	1-3%
Replace pump with a more efficient model	1-2%

Source: Energy Efficiency Best Practice Guide: Pumps and Fans p13, Sustainability Victoria, 2009

Four key actions to improve efficiency are:

- ✓ **Load matching:** ensure the pump or fan motor is appropriately sized for the load. A large proportion of motors are at least 20% oversized for the load and consequently use more energy than is required.
- ✓ **Speed control:** introduce a speed controller or a variable speed drive on the motor to control the flow rate. Reducing fan speed by 20% can immediately reduce energy consumption by nearly 50%.
- ✓ **Flow efficiency:** change or trim the impeller to improve pump/fan efficiency.
- ✓ **Maintenance:** undertake proactive, regular maintenance. This will help you avoid losses in capacity and efficiency, which increases pump/fan loading and energy use.

Beyond these key actions, a system-wide assessment can be undertaken. This means reviewing your overall operations to identify whether liquid and/or material flows are efficient, and whether there are flat spots or bottlenecks that cause pumps and fans to operate inefficiently. Addressing these issues can optimise the flow of the system and more efficiently deliver on operation needs.

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

- 1 Chemicals sector: Introducing energy saving opportunities for business p10, Carbon Trust, 2012
- 2 Based on the assumption of a 45kW motor with a purchase price of \$1,750 running continuously, with an average electricity price (including network charges) of \$0.12 /kWh will consume \$977 of electricity every week. In this scenario, the electricity cost will overtake the purchase price in 1.8 weeks.
- 3 Chemicals sector: Introducing energy saving opportunities for business, p10, Carbon Trust 2012.
- 4 Chemicals sector: Introducing energy saving opportunities for business, p10, Carbon Trust 2012.

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



Plastics and Chemicals Industries Association
Sustainability Team
03 9611 5400
info@paciaenergyplus.org.au

