How to implement motor power optimisers

Electric motors are less efficient when they run at low load because of energy loss – some from mechanical causes like bearing friction, some voltage dependent. On a motor running at less than 50% load, a power optimiser could save you between 5% and 15%.

The business case

The cost of installing a motor power optimiser depends on its size. A 1.5kW optimiser – the type often found in a commercial freestanding fridge-freezer or refrigerated display case – would cost around £150 to install.

If the average running load on the motor were only 375W, or 25% of full load, you would save around 15%. Over a year, with the fridge running continuously, you'd save 490kWh. With an electricity price of 7.9p/kWh (including Climate Change Levy), that would work out at an annual saving of £38 and a payback period of 3.9 years.

The technology

Motor power optimisers, also known as load sensing optimisers, are solid state devices that automatically monitor the load on an electric motor. Under low load conditions, they reduce the voltage.

There are devices for both single – and three-phase AC motors, and you need one for each motor you want to control. Most are designed to be hardwired into the motor's electrical supply, but you can also get plug-in devices for small, single-phase loads served by standard 13amp plugs – domestic fridges and freezers, for example.

Applications

To be cost-effective, motor power optimisers are best with motors that run continuously or for long periods, and that work at less than 50% full load.

Typical applications include:

- retail fridges, freezers and process refrigeration plant that are in frequent use.
- air conditioning equipment in continuous operation – in a computer machine room, for example.
- manufacturing machines with cyclical loads and long periods of low load operation or idling – some presses or grinding machines, for example.

Savings are usually greatest on old, small, single-phase motors that tend to be less efficient.

You shouldn't use motor power optimisers on motors with inverter variable speed drives, including VRV air conditioning systems.

Considerations	Comments
Maximum motor load	Expressed in kW or amps per phase. You can usually find this information on the motor's nameplate. If not, most suppliers will provide a free survey.
Typical operating load	This will help you work out what savings you could expect. Use a meter that measures true power (kW), rather than operating current. For hardwired loads, you'll need an electrician to install the test meter. Ask your supplier to confirm the level of savings you'll make, based on the measured operating load.
Single- or three-phase supply	
IP enclosure standard	Extra enclosure protection may be needed for wet, dusty or hazardous environments.

Specification checklist

The table above lists the main points to discuss with your supplier when specifying a motor power optimiser.

Commissioning procedure

- Hardwired devices need to be electrically tested. Your electrician should give you a minor electrical installation work certificate (reference IMN2).
- The typical motor operating load should be measured before deciding whether to install a motor power optimiser. Your equipment supplier should then confirm the level of savings to expect, and may provide a performance or savings warranty.
- After installation, the running load measurements should be repeated (using a true kW power meter) to check the optimiser is achieving what it should.

Common problems

The only problem tends to be a disappointing level of savings. This is usually because the measurements of the motor operating load weren't accurate.

Finding a supplier

A web search is the best way to find a supplier for motor power optimisers, but do ask for references from similar applications before committing yourself.

Check your supplier's savings estimates to ensure that:

- existing motor operating loads are based on true power (kW) measurements – not just electric current measurements or nameplate ratings.
- the assumed annual operating hours are realistic
- the assumed electricity price is accurate – and don't forget to add on the Climate Change Levy.

Whenever possible, ask your supplier for a savings warranty.