
ABB DRIVES AND MOTORS

30 top tips to tackle HVAC challenges

No.09 - Energy efficiency



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Not all drives count energy use, CO₂ and money...

Today's variable speed drives (VSDs) offer a wealth of features and smart functions that enable users to optimise the efficiency of pumps, fans and other motor-driven applications. For example, onboard counters show exactly how much energy is used compared to direct-on-line (DOL) control methods. The savings are displayed in kWh or MWh. In addition, the drive can show how much carbon dioxide (CO₂) emissions have been saved as well as the financial impact of having a drive installed. This feature is vital in enabling organisations to prove the validity of investing in VSD technology.

Find out more by clicking on the tabs below.



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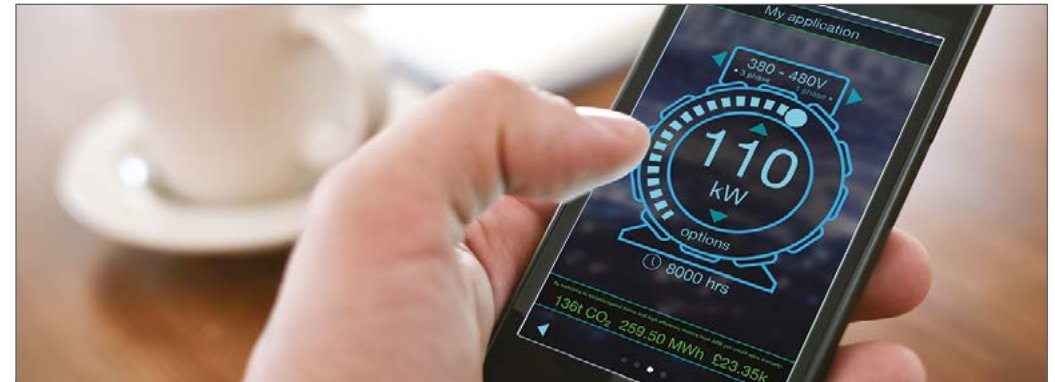
Energy efficiency counters

Energy efficiency counters allow easy monitoring of consumed energy and realised energy savings.

The counters calculate the energy savings achieved using VSDs, compared to equivalent DOL motor control methods. The savings are shown in kWh, MWh, CO₂ emissions and money saved.

In addition, the counters can assist with electricity billing in accordance with Part L2 Building Regulations. This allows verification of energy savings before making investments in capital equipment.

Users can assess their energy needs prior to the installation of VSDs using one of many on-line tools available.



[Click here](#) to download ABB's authorised value provider (AVP) Toolkit App

ABB's AVP Toolkit App calculator helps you to work out exactly how much you can save by replacing a fixed speed damped or throttled centrifugal load with a VSD-controlled solution.

You can specify up to five different applications, including multiples of each type.

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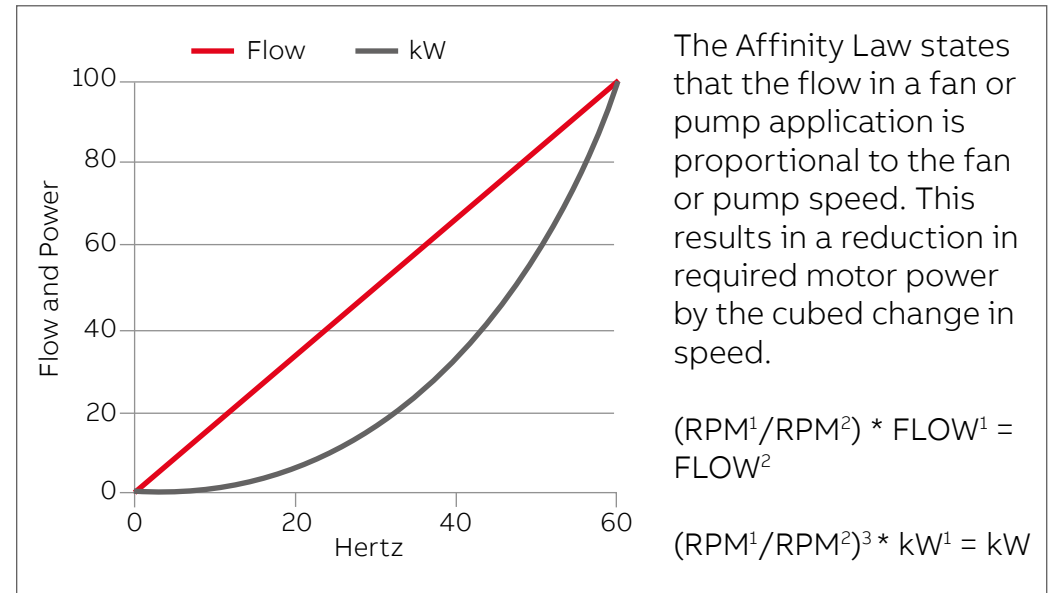
Energy optimisation and efficiency

Today's VSDs feature advanced motor control features, such as energy optimisation (also known as flux optimisation), which help ensure that motors are controlled using the least amount of energy. With energy optimisation, the magnitude of the motor's magnetic field is controlled according to the actual load and across the speed range to minimise energy being used at all points.

The greatest energy savings are achieved at partial loads. For example, with 25 percent load there is up to 10 percent total energy efficiency improvement. This directly impacts on operating costs.

Energy optimisation also significantly reduces the motor noise compared to that generated by the switching frequency of a traditional drive.

Allowing the drive to control the process using its internal PID controller brings further savings. With this



feature, the VSD automatically detects changes in the load and then controls the motor back to its ideal speed, thus saving energy constantly throughout the lifetime of an application.

Energy savings can be transmitted via the system's fieldbus to central logging equipment.

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Load analyser

Some VSDs feature a statistical tool that analyses and interprets drive behaviour including process energy efficiency and operation.

The analyser provides information on system maintenance needs and can be used to illustrate and control the system's energy efficiency. It allows users to identify periods of unexpectedly high (or low) load and can point towards system optimisation improvements.



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Adding a VSD to a DOL-controlled motor saves a massive amount of energy. For example, slowing a 30 kW motor down by just 10 percent (5Hz) saves 27 percent energy. That can equate to £3,500 per annum.

Controlling a single 400 kW DOL motor slowed to 70 percent flow with a VSD can save over £25,000 per annum, the cost of the drive being paid back in less than half a year.

Allowing a VSD to control a process using its internal PID controller and a measured value brings the best energy savings of all.



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Frequently Asked Questions

With HVAC applications what is the typical energy saving?

With pumps and fans, AC drives can cut an energy bill by typically 20 to 60 percent, although savings of up to 70 percent are achievable. These savings are far in excess of any other item that can be targeted in buildings (e.g. lighting).

What is the best way to determine the energy saving potential in a building?

An energy assessment identifies the fastest way to save the greatest amount of energy by installing VSDs to replace DOL starting. ABB energy assessments are carried out by an ABB's authorised value provider (AVP) and take approximately half a

day. Firstly, the AVP carries out a detailed assessment of the motor-driven applications at the site. Based on this information, it is then able to make recommendations about which applications offer the greatest energy-saving opportunity.

The combined energy-saving know-how of the AVP network is also available to access at the touch of a few buttons via [ABB's AVP ToolKit App](#).

What is the return on investment of installing VSDs?

VSDs offer a return on investment usually within months on the basis of energy savings alone.



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Frequently Asked Questions

Are on-board energy counters necessary? Surely my energy bill will tell me if I'm saving energy or not?

Your energy bill can only show you total energy use across a site—it cannot show how much energy is being used by each piece of equipment.

Securing management support—and funding—for energy-saving initiatives can be difficult. A VSD with on-board counters shows exactly how much energy the drive is saving compared to DOL control, enabling the return on investment to be proved.

Can on-board counters tell me about the health of my system?

No. The role of on-board counters is to show how much energy the VSD is saving compared to DOL control. However, today's drives are packed with diagnostic tools that monitor torque and current in real time and will generate warnings and messages in the event of a problem, thus enabling the user to take remedial action.



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Frequently Asked Questions

What can I do if I'm not happy with the figures I'm seeing?

Motor-driven systems may not always operate as efficiently as expected despite there being no obvious problems in the wider system. In these instances the performance issue is usually the result of one of the following:

- Predicted efficiencies were based on theoretical conditions that are not achievable in real life
- The way individual components within the electrical system interact with each other is negatively impacting total system efficiency
- Individual components – particularly VSDs and electric motors – have not been optimised

For each scenario, there are steps that can be taken to bring energy efficiency in line with expectations.



For more information, [click here](#)

ABB's System Efficiency Lunch 'n' Learn training session is designed to help customers to improve the efficiency of electrical systems driving pumps, fans and other motor-driven applications by up to 20 percent.

The CPD-accredited course is free to attend and can be delivered at the customer's premises or nearest ABB facility.

This is one of 30 top tips for users of variable speed drives in heating, ventilation and air conditioning applications. To ensure that you receive ALL the tips as they are published, please register your interest by **[clicking here](#)**



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