


Energy efficiency's automation lens



euautomation



If there is one objective manufacturers around the world need to take seriously this year, it's improving energy efficiency and sustainability. Regardless of an organisation's size and field of activity, the commitment to more efficient energy use is a burning demand in industry.

In the midst of international summits and governmental policies, companies from across the industrial spectrum are beginning to understand the importance of saving energy, reducing carbon footprint and developing more eco-friendly products and processes.

The obvious benefits of energy efficient manufacturing include reduced operational and production costs, increased competitiveness, environmental gains and improved consumer welfare.

This special report analyses how industrial automation can help manufacturers become more energy efficient. It also analyses the industry impact of the European Union's Ecodesign Directive, the Energy Savings Opportunity Scheme (ESOS) and relevant ISO standards.



Eco-driven design

In 2009, the European Union revised its Ecodesign Directive. The framework ensures designers of energy-using (EUPs) and energy-related products (ERPs) reduce the energy consumption and environmental impact of these products.

EUPs use, generate, transfer or measure electricity. The label includes anything from boilers to computers, transformers, motors or fans. ERPs are products that don't use energy, but can contribute to saving it, for example windows, insulation material or taps.

Estimates show that over 80 per cent of a product's environmental impact can be determined during the design phase. Ecodesign ensures products have a reduced environmental impact and lower energy consumption throughout their lifecycle, while maintaining the same levels of functionality.

Despite inevitable criticism, often related to common household items like hair dryers and kettles, the directive has helped reduce energy consumption in a multitude of areas. Take lighting for example. It might come as a shock to many, but lighting accounts for between a fifth and a quarter of general electricity consumption globally. By replacing the more traditional, inefficient incandescent light bulbs used in domestic, office and street lighting, up to 39 terawatt-hours (TWh) can be saved every year in the EU alone.

According to the European Commission, the first 13 measures of the Ecodesign directive will result in annual savings by 2020 equivalent to more than 12 per cent of the electricity consumption of the EU in 2009.

When it comes to industry, the potential for energy saving is staggering. It is well-known that induction motors use about 30 per cent of all the electricity generated in the world, which means they have great potential for energy savings. In fact, simply by estimating the right size and capacity of a motor, you can save up to 10 per cent on electricity consumption.

Controlling the motor speed in a variable speed application using a variable speed drive (VSD) can further increase the energy savings to as much as 60 per cent. These numbers make it clear that, simply by correctly estimating and controlling electrical motors, manufacturers can reduce their energy consumption.

As motors have evolved, manufacturers have managed to achieve better efficiency. The International Electrotechnical Commission constantly updates its international standard defining the energy efficiency classes of single speed, three-phase motors. The standard has also been adopted in the European Union and UK and is known as the BS EN 60034-30:2009.

According to the 640/2009 regulations of the Ecodesign directive, starting June 2011, motors manufactured in and operating in the EU have to meet at least the efficiency level IE2 (High efficiency).

From January 1, 2015, IE3 (Premium Efficiency) became mandatory for motors from 7.5 to 375 kW. The next phase starts on January 1, 2017, when IE3 requirements extend to all motors between 0.75 and 375 kW; with one exception: IE2 motors can still be bought, but only if installed with a VSD.

This exception should be enough to demonstrate just how important VSDs are for industry. Not only would fitting a VSD allow manufacturers to minimise the costs of complying to new Ecodesign regulations and future proof operations, it also brings enormous energy savings, reduces motor wear by using soft start and stop technology and opens up new technological opportunities.

In terms of industrial automation, VSDs also allow an additional level of communication between the motor and the control system, resulting in valuable information, such as operating or maintenance data. This also allows manufacturers to identify where and how the greatest energy savings can be made.

Although the Ecodesign directive only applies to the European Union, it accurately reflects other international standards. In fact, it is a relatively late adoption of energy-saving techniques. Looking strictly at electric motors, the United States paved the way by introducing a law on IE2 classification in 1997 and one on IE3 in 2010. Mexico, Australia, India, China and Brazil also introduced the IE2 class as a regulatory requirement.

The Ecodesign directive highlights the importance of product design when it comes to energy efficiency and continues the global race to make manufacturing eco-friendly. Manufacturers that fail to get on the bandwagon in the next couple of years will find themselves overwhelmed by energy costs and unable to engage on the global market.



ESOS:

Continuous assessment

As is always the case with megatrends, energy efficiency brings with it a complex, and sometimes bewildering body of legislation and directives. Energy efficiency is not the goal; it is a basic principle that should guide the actions of governments, organisations and individuals everywhere. Continuous assessment of what has been achieved and what can still be done is essential, which is why ISO standards and energy efficiency directives are constantly under revision.

The same level of periodic assessment is now being required of organisations around the globe, particularly large energy users. A recent example from the United Kingdom is the Energy Savings Opportunity Scheme (ESOS). The scheme originated from the EU's Energy Efficiency Directive that came into force in 2012. One of the articles of the directive requires every member state to introduce a mandatory energy auditing scheme for large enterprises.

ESOS calls for large UK undertakings to carry out energy usage assessments every four years. A large undertaking is defined as an organisation that employs at least 250 people or has an annual turnover in excess of 50 million euro. Companies that met these qualifications before December 31, 2014 need to comply with the new regulation.

An ESOS assessment is a four step process. It involves a calculation of the total energy consumption of buildings, industrial processes and transport. The next two steps refer to identifying areas of significant energy consumption and evaluating energy saving opportunities. The final step is to store relevant data and notify the scheme administrator.

Each organisation must appoint a lead assessor to carry out and oversee all energy audits. The first confirmation of ESOS compliance needs to be submitted to the Environment Agency before December 5, 2015 with regular updates every four years after that.

To avoid duplication in existing regulation and requirements, ESOS is aligned with other energy assessment schemes like ISO 50001. Organisations that have already undertaken energy audits to ESOS standards or align themselves to the Carbon Trust Standard can use existing records to support ESOS compliance. The point isn't to make organisations do things twice, but to build on existing energy practices that work.

On another positive note, expert support and detailed guidance is available for companies that need to comply with ESOS, with the best starting point being the Environment Agency website.

Once again, ESOS revealed the potential for energy efficiency is astounding. Initial evaluations estimate the scheme to have a £1.6bn net benefit for the UK over the next 15 years, primarily felt by businesses through lower energy bills. This is a conservative estimate, calculated on an average of 0.7 per cent saving on energy bills. In reality, the savings have proven to be significantly higher than that.

If ESOS proves anything, it's that processes and mechanisms are now being put into place to make companies more energy efficient. ISO 14001 and ISO 50001 are frameworks for organisations that want to develop a policy for more efficient use of energy and continually improve energy management. Although they are highly regarded certifications and are required by certain industry branches, the standards have not yet been made mandatory.

ISO 50001:

Beyond compliance

For organisations that want to go beyond compliance and see the true value of energy management, ISO 50001 is a viable route, although it is more expensive and time consuming than ESOS or Display Energy Certificates (DEC).

ISO 50001 enables organisations to follow a systematic approach to achieving continual improvement of energy performance. The standard helps establish, implement and maintain a system and relevant processes and procedures within an organisation. ISO 50001 is unique standard in the ISO family because it goes beyond improving the effectiveness of a system and aims to enhance energy performance – and this is where organisations can truly reap the benefits.

The major components of ISO 50001 are also more complex than those of similar schemes like ESOS. They include, but are not limited to establishing management responsibility, an energy policy, an energy action plan, performance audits and management reviews. These tools ensure an organisation has a much more complex framework that allows it to develop a policy for more efficient energy use, fix realistic objectives to meet the policy, use data to better understand energy consumption, measure results and continually improve energy management.

It's probably fair to say that while ESOS is proof an organisation is compliant with energy efficiency standards, ISO 50001 ensures energy management is at the very heart of the business.

Regardless of what level of compliance a manufacturer decides to go for, it is crystal clear that new energy management standards and legislation are reshaping industry. Certifications like ISO 14001 and ISO 50001 are becoming more and more important for businesses that want to become, and be perceived as, industry leaders, responsible corporate entities and sustainable endeavours. More than fostering sustainability, energy efficiency also helps lower operation and maintenance costs and optimises processes and products.



euautomation

euautomation.com

Energy efficiency

Through industrial automation

Navigating the maze of ever-changing directives and legal terminology can be tough, but luckily resources and specialists are never too far away. What manufacturers need to be asking themselves is how to become more energy-efficient.

Industrial automation is able to offer solutions to achieve high productivity and energy savings, while also monitoring and recording the process. The first step is an in-depth analysis of existing systems and processes. Organisations should realistically evaluate what savings can be achieved by modernising existing systems and what new investments need to be made.

Intelligent measurement technology, process automation and electric drives technology are only some of the solutions for skilful energy management. The road to energy efficiency starts with the basic principles of energy storage, energy recovery and optimised processes and products.

When discussing the core technologies that can help the manufacturing sector become energy efficient, integrated communication is first on the list. This refers to creating components that can be connected in an open architecture, components able to gather real-time information and take instructions from intelligent control systems.

Secondly, advanced control methods like Programmable Logic Controllers (PLCs) should monitor, diagnose, increase system efficiency and solve problems. The data gathered and stored should then be analysed and used to make further enhancements to the system.

The technologies necessary for implementing intelligent industrial automation systems are already available and their capabilities are always improving. Accurate sensors and measurement devices, control and monitoring methods, Ethernet or other Internet-based industrial communication standards, as well as simple, safe user interfaces are already in operation.

These intelligent automation solutions have been tried and tested. Some, like VSDs, should really be on the verge of becoming the norm but in reality are still only used in around ten per cent of applications, according to an estimate from GAMBICA, the UK trade body for automation. To gain a competitive advantage, comply with ever more demanding environmental regulations and set up more flexible, sustainable operations, manufacturers must get on board the industrial automation train before it is too late.



euautomation

euautomation.com