Figure 1: Most manufacturers will have implemented automation and control into their processes to some extent, even without being fully aware of it

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Roadmap to Energy Efficiency

Making pharmaceuticals sustainable is a trending topic, yet some companies are slow to take up energy-saving technology. Modern manufacturing already uses industrial automation in a wide variety of areas, so applying this to achieve greener, more efficient production is the obvious next step

Martyn Williams and Andrea Grall at COPA-DATA

Energy is a hot topic in the UK, both in the boardroom and in parliament. Discussions about what generation method is most sustainable, how much energy should cost and how businesses can reduce their usage make media headlines on a daily basis. According to the Carbon Trust, offices, factories, schools and hospitals make up 18% of the UK's CO_2 emissions and use 300TWh of energy every year (1). That amount is nearly the same as the primary energy supply of Switzerland.

Governments across the globe are considering alternative energy sources that would allow them to become self-sufficient, while some companies are embarking on a journey of their own to make operations more energy-efficient. Putting aside a recent price reduction, it is fair to say that energy costs have been steadily rising for the majority of the last two decades (2). This is a problem for both energy-intensive sectors – like metal processing – and industries that use up fewer energy resources, such as pharmaceutical and chemical.

As the supplies of natural resources become more and more limited, the market increasingly competitive and legislation stricter, manufacturers are starting to look for sustainable ways to reduce the amount of energy they use.

Why Go Green?

There is an almost absurd discrepancy between how easy and rewarding it is for pharmaceutical manufacturers to become more energy-efficient and how slow most companies have been to take advantage of energy-saving technology. In fact, in the majority of cases, legal requirements and standards are the main reason businesses adopt energy efficiency measures.

If you are wondering how much your company can save by becoming more energy-efficient, you might find the answer is not always clear cut. However, bear in mind the Carbon Trust estimates that any organisation could slash the energy bills of manufacturing operations by as much as 20% just by implementing simple, inexpensive measures, such as using variable-speed drives, fixing leaks in compressed air systems and cleaning refrigeration condensers.

Remember, this is just the low-hanging fruit. Companies that implement and maintain an energy management system (EnMS) can typically save another 10-20% on energy within the first five years.

Automation Evolution

Automation and control are important aspects of modern manufacturing, and it is fair to say that almost every business in operation today has implemented automation to some extent, even without being fully aware of it.

Industrial automation refers to the use of control systems and information technologies to handle processes and machinery in a production environment. The initial reasons for implementing industrial automation were to increase productivity and implicitly reduce the cost associated with human operators.

However, as industrial automation evolved, additional advantages became obvious: the error rate in manufacturing dropped considerably, resulting in higher quality products. Manufacturing lines also became more flexible, safer and able to provide greater information accuracy.

This final point is crucial in the energy debate. The first step of the energy efficiency journey involves gathering relevant production data that will allow a business to identify where losses are happening and which processes are energy-intensive. To collect and analyse the data manually would be a nightmare,

Figure 2: One of the main characteristics of industrial automation is the variety of products used within just one system

but by using industrial automation systems and relevant software, the task is completed accurately in real-time.

Compliance and Efficiency

There are numerous ways of using energy in a more efficient manner. Legal requirements and standards are becoming increasingly strict, so companies of all sizes from across the industry have started thinking about what they have to do to comply with the new generation of regulations.

Germany is one of Europe's energy efficiency pioneers and has pledged to reduce its CO_2 emissions by 40% by 2020, compared to 1990. The rest of the EU follows closely: in 2012, the Energy Efficiency Directive (EED) established a set of binding materials to help all its members secure a 20% cut in energy usage by 2020. To achieve the target, each European country was meant to transpose the Directive's provisions in its own national laws and standards by June 2014.

In the UK, the EED was implemented with the help of the Energy Savings Opportunities Scheme (ESOS). 2015 is a crucial year for the project because it marks the first official deadline.

ISO 50001

The ESOS scheme is now mandatory for large UK enterprises from any sector, including pharma. However, smaller companies that want to reap the benefits of energy efficiency, or large firms that want to go beyond compliance, can implement the International Organization for Standardization's (ISO's) *Energy management systems – Requirements with guidance for use*, or ISO 50001. The standard is applicable regardless of the company's size. As opposed to the ESOS scheme, which is only applicable and relevant within the EU, ISO 50001 is recognised internationally.

The pharma industry is already one step ahead of other sectors in implementing ISO 50001 because of its similarity to ISO 9001 and ISO 14001. ISO 9001 has formed the backbone of pharmaceutical quality management for years, and remains a standard that is well-implemented and enforced. To some extent, ISO 50001 can be viewed as an extension to the ISO 90001 and ISO 14001 methodology, making it even easier to implement ISO 50001 when a company already has another ISO standard under its belt.

The ISO estimates that ISO 50001 could influence up to 60% of the world's energy use. The novelty of the scheme comes from its specific purpose – enabling organisations to establish the systems and processes necessary to improve energy performance, efficiency, use and consumption. The ultimate aim is to reduce greenhouse gas emissions, environmental impact and energy costs of organisations.

When a company embarks on an ISO 50001 journey, its success depends on the commitment of all levels and functions within the organisation, especially top management.

Plan-Do-Check-Act

The core principle of ISO 50001 is its 'Plan-Do-Check-Act' (PDCA) continual improvement framework.

Planning refers to conducting an energy review or audit, similar to the ESOS audits. A company must establish the baseline, energy performance indicators, energy objectives and targets, as well as its action plans.

The 'Do' step refers to implementing the energy management action plans, while the 'Check' stage includes monitoring and measuring processes that determine energy performance, and verifying the data against the energy policy and objectives. The final step, 'Act', involves taking actions to continually improve energy performance and the EnMS.

Even more so than ESOS, ISO 50001's PDCA mentality means the improvement process is ongoing. Every change in processes must be monitored and evaluated. If the results show a long-term reduction in energy, the change becomes the norm until the next evaluation. This corporate culture makes businesses more flexible and energy-focused.

Energy Management Systems

So what exactly is an EnMS, and how can it make pharmaceutical manufacturers and packaging companies more energy-efficient? In a nutshell, it is a set of related elements contributing to an energy policy or leading to energy objectives. Processes and procedures that help an organisation set and achieve its energy objectives are also part of the EnMS.

To truly reduce energy consumption, companies should implement an EnMS that allows them to analyse energy usage across activities and sites, using relevant measurement data. This is where an energy data management system (EDMS) comes in.

A prerequisite of energy efficiency is the automated collection, compression and analysis of valid, relevant data from various sources, using an EDMS. The system should also be able to automatically generate valid reports that form the basis for remedial action in the energy process. Industrial automation systems help companies extract data from production lines in real-time, allowing energy managers to identify where most energy is being used and where the potential savings are.

An EDMS is usually integrated into the control system of the production line. To gather energy consumption data for different processes, the control system is usually able to communicate with drives and interfaces. This means that, on a production level, the relevant drives need to be connected to the programmable logic controllers.

One of the main characteristics of industrial automation is the variety of products used within a single system. Any one production facility usually integrates numerous generations of sensors, drives and meters produced by different original

Figure 3: The first step of the energy efficiency journey is gathering relevant production data that will allow a company to identify where losses are happening, and which processes are energy-intensive

equipment manufacturers. Because of this diversity, it can often be difficult to collect, archive and analyse datasets. Fortunately, open systems that connect all kinds of drives and meters are already available for companies that want to implement a reliable EDMS.

Choosing the Right EDMS

Identifying the most appropriate EDMS solution can be difficult, but luckily, there are a few characteristics that are crucial – regardless of the company size or its field of activity. Before anything else, an EDMS must be easy to implement in a functioning system without causing any costly downtime or production disruptions. Other critical features should include:

Open Connection
A good EDMS should be open, meaning it must be able to collect and process data from the entire equipment infrastructure in a seamless way. This allows users to request targeted queries from any sensor, meter, measuring device or machinery.

An integrated EDMS needs to be able to connect to a wide range of data sources, software, integrated automation and IT architectures, including process control, utilities and building automation systems. For example, technology built into machines – like pumps, motors or heating systems – directly influences the amount of energy consumed. An EDMS can run a diagnosis during non-productive time.

Scalable System
Secondly, an EDMS must be scalable. As the business grows, the system should allow easy integration of new devices or machines. It should also allow the simple creation of new reports and straight-forward addition of extra users.

To achieve ISO 50001, an EDMS also has to consider the entire company – from office buildings to transport – as well as the production line.

Flexible Reporting
Another important feature is flexibility when it comes to the reporting function of an EDMS. The ability to generate

immediate reports according to the user's needs is crucial, and displaying information in a clear way carries a lot of weight.

Easy Access
The ability to access historical data easily is also critical, because it helps managers make energy-saving decisions. In addition, easy access to performance indicators and reports should be available directly at the human-machine interface, whether on a PC, tablet or mobile.

High Security
Finally, the system has to be secure and allow several user verifications, without becoming tedious.

Working for Everyone

Regardless of whether it is used for mandatory compliance schemes like ESOS or more advanced energy efficiency standards like ISO 50001, a reliable EDMS is crucial for businesses that want to reduce their energy usage. An EDMS can help the entire team – from machine operators up to the chief executive officer – to better understand a company's energy consumption, maintain records and make decisions concerning energy usage.

This brings us to a final point about embarking on an energy-saving journey: the people. Energy management initiatives will only succeed if all the relevant team members are on board and understand what the company wants to achieve. Without ownership and vision, even the most advanced EDMS can only have limited impact on energy consumption.

Long-Term Goals

Looking at the current international climate, it is clear that mandatory environmental requirements and industry standards are becoming ever-more rigorous, and the pressure to conform is always increasing. Now is the best time for businesses to make a move and turn energy efficiency into a competitive advantage while they still can.

Easy wins are important, but they will not get you very far, especially in the competitive world of pharmaceuticals. Long-term energy efficiency cannot be achieved without an EnMS. Regardless of whether a company is just trying to comply with schemes like ESOS, or going further to gain an ISO 50001 certification, it is likely that EMDS will soon become a requirement in European countries. The good news is that the original investment can often be recovered in the first year; the other thing to bear in mind is that help is never far away.

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