Energy is the largest expense for many industrial facilities. Consumption by manufacturers worldwide is projected to increase from 186 quadrillion BTU in 2010, to over 245 quadrillion BTU in 2030, according to the US Department of Energy. New government and industry initiatives will create more difficult energy management challenges for manufacturers.

But there also is good news to share - energy offers some of the greatest opportunities for cost savings. Moreover, compared to other cost-cutting initiatives, energy management efforts often deliver the fastest payback. Manufacturers can find substantial savings if they know where to look.

### Identifying the opportunities

Before implementing the required energy management technology and underlying infrastructure, companies should assess overall consumption to identify real opportunities for potential savings. In many cases, the first step for a plant manager may be to simply understand where and how much energy is consumed. This analysis requires that all incoming energy sources are monitored and reviewed. This may seem daunting, but there is more good news.

#### Specialists

There are energy management experts who understand industrial processes and know how to uncover energy-savings opportunities. They provide guidance through the selection and implementation process, help companies focus on the right goals and best available technologies, and play a key role in helping manufacturers understand tariff structures and how energy bills are calculated. Pairing in-house expertise with outside energy management consultants can produce the best recommendations for a successful energy management strategy.

#### Energy data

Many companies already collect and profile the necessary energy data. Many manufacturers already have systems in place that collect the necessary energy management data but aren’t using the information in that way. The next step is to use that information to make meaningful correlations between energy consumption and production.

### Energy in 3-D

Traditionally, industrial energy consumption was seen one-dimensionally as an unavoidable and unmanageable cost of doing business. However, managing energy is actually a three-dimensional challenge: Minimise, economise, and optimise. Manufacturers can minimise energy usage by taking advantage of more efficient equipment or scheduling production intelligently to minimise energy-intensive changeover procedures.

They also can economise energy costs by managing where, how, and when energy is used in order to harness it when it is least expensive, such as during off-peak times. Further, they can optimise energy use so as to achieve production goals in the least expensive, most profitable way while balancing the many variables inherent to manufacturing. In other words, manufacturers can actively manage energy as one of many inputs to the overall production equation.

While electricity is the main example discussed, there are many different types of energy consumption in manufacturing such as petroleum, natural gas, coal and renewable. Regardless of the type of energy being consumed and the purpose, manufacturers have an opportunity to change their behaviour with regard to how they view energy consumption in their facilities.

### Less energy through intelligent motor management

Electric motors drive most production output and consume the most electricity in the plant. Therefore, improved motor-control performance and efficiency means greater overall production efficiency. Fortunately, today's advanced motor-management solutions can yield immediate, measurable bottom-line savings.

For example, variable speed drives can help significantly reduce the energy used in manufacturing processes, particularly those that involve fans or pumps with changing flow rates. In fact, using variable frequency drives to lower speed or flow by just 20% can reduce energy use by up to 50%.

In any manufacturing process that requires less than 100% of the designed speed, manufacturers should consider integrating variable frequency drives for both low- and medium-voltage applications. They can help significantly reduce energy costs and, when properly applied, help eliminate valves, increase pump-seal life, reduce power surge during start-up, and contribute to a more flexible operation.
That was the case for Amtex, a Latin American developer of various chemical products, when it decided to modernise the production system at its plant in Columbia. The plant—which produces CMC, an anionic polymer created from cellulose—has an 8 200 ton production capacity. The production system suffered inefficiencies because of increased energy consumption, leaks, oil spills in the hydraulic couplers, and production downtime. As part of its upgrade, the company installed variable frequency ac drives on its production reactor and on its CMC mill, helping to reduce electrical usage by about 15%, improve production output by 6%, and increase reactor uptime.

New intelligent motor control centres (MCCs) also are helping manufacturers capture and utilise valuable process and energy data. Today’s MCCs monitor motor current and thermal capacity, perform protective troubleshooting functions, and provide detailed diagnostics to help avert downtime. When properly deployed, these intelligent MCCs are capable of providing users more detailed information over longer periods of time, including critical motor energy usage and performance data.

More cost-effective energy when consumption is measured

At the core of an effective monitoring programme is a network of digital power-monitoring devices that capture and communicate power-consumption information. These devices are used to measure electrical parameters associated with a specific bus in a facility’s electrical distribution system. This allows plant managers to gather detailed information on power consumption in different areas of their facilities, on specific machines (such as refrigeration compressors), and even on individual product lines.

In addition to usage data, managers have access to power-quality information that can improve productivity and lengthen equipment life, further enhancing profits and efficiency. Each department is seldom aware of its consumption on a daily, weekly or even monthly basis. By simply metering consumption, small opportunities for improvement can be identified. Added together, these provide a significant impact on energy usage, resulting in immediate financial savings.

By developing an integrated energy management programme based on accurate consumption and spending patterns, and demand profiles, companies can calculate power-consumption costs among various production lines. With more accurate information reflecting actual production costs, managers can make more informed business decisions.

Optimal energy by turning data into knowledge

Energy management software can serve as a centralised database for all energy parameters that can be accessed within a facility or across multiple facilities in various locations, using a standard Web browser. Being able to ‘see’ a problem often gives additional meaning to the information derived from the data, and in turn leads to the proper corrective actions. Armed with this insight, manufacturers can see how energy consumption affects production capabilities—positively or negatively—and can begin to make more strategic energy management decisions.

Energy management software allows companies to model their energy profiles by measuring peak demands and quality parameters; determine demand patterns; correlate energy consumption to weather patterns; aggregate loads; and calculate energy costs by business group, department or site. This modelling approach can help save a significant amount of money because solutions can be verified before committing capital expenditures for new systems or equipment.

Once energy models of consumption and trends are identified and charted, the possibilities are endless for manufacturers to maximise their energy savings. By tracking energy consumption patterns over time, a facility can use historical data to verify utility bills, negotiate better rates, and identify opportunities for demand management.

Case in point: One leading food and beverage manufacturer quickly found that negotiating the lowest electricity rate required precise information about its power-usage patterns, such as peak-power demand, time of peak-power demand, and how often its various plants drew power at the maximum rate. Armed with load-profile data compiled from a power-monitoring system, the company was able to renegotiate its agreement with its utility—reducing its annual energy costs by up to 10%.

The information generated from monitoring software can be trended and correlated to exogenous factors, such as local temperature and humidity, and can provide the highest level of utilities-management available. Systems that track usage for the entire enterprise allow employees at all levels of the organisation to have a common understanding of energy use. This can help focus efforts on improvement potential and drive consistent organisational behaviour in achieving sustainable production goals.

Conclusion

Performance pressures on manufacturing companies today are greater than ever. They have to do more with less, and do it faster. But while manufacturers have large energy demands, they also have large opportunities for savings. Technologies and expertise are available that allow manufacturers to take control of their energy costs and protect their business from energy market fluctuations. The key is identifying the energy management goals, developing a corresponding strategy, and putting the technology in place that enables manufacturers to accurately monitor, analyse and control energy consumption and quality.

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