

Why do it and how do you start?

Within commercial and industrial sectors, there's a legitimate need to better understand, regulate and conserve energy. Personnel in plants and facilities charged with maintaining building systems and processes are increasingly tasked with seeking out and implementing technologies to improve the energy efficiency (and thereby increase the profitability) of their organizations.

To accomplish this, these individuals first need a way to uncover operational inefficiencies, recognize waste and identify hidden maintenance issues. For example, many of us drive our cars from home to work each day. In some cases, this daily commute becomes so routine that because the car is still getting us where we want to go, we don't realize that it's now using more fuel to do so. In some cases, all we would need to do to correct this is check the engine or the tire pressure.

Similarly, in buildings, plants and other industrial facilities, there are instances where a production machine might still be turning out widgets, but is requiring more energy than previously to do so. Or an old compressor might still be performing effectively as part of a cooling system, but is using 20% more power than it did in the past.

Circumstances like these occur more often than you'd think. And that's exactly the point. In

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cases where you're not monitoring power consumption, there's no way to know that air handler, for example, is drawing excessive power. Subsequently, you never discover that the underlying reason is because the equipment's bearings are wearing out.

Here's another scenario. A piece of machinery—*let's say, a pump motor or a conveyor*—is still functional, but you notice it's "running a little rough." You overlook it, because after all, it's still working and getting the job done. Since you're not monitoring energy, you may fail to discover the unit isn't properly lubricated, which, in turn, forces the machine to work harder, run rougher and use more power.

In each of the above situations, a relatively simple maintenance issue causes a decrease in operational efficiency and a corresponding, ongoing and costly increase in power consumption—not to mention the probable premature failure of the equipment as a result of neglect.

The question is how can energy monitoring help an operation uncover these types of maintenance issues so they can be addressed and corrected and, in turn, save money?

From hypothetical to real-world

Consider the real-world example of the Mariah Meat Packing Plant (Mariah). The company needed an explanation for its extremely high utility bills and devise a solution to cut costs. Mariah implemented an energy-monitoring system that connected to the plant's electric meters, as well as to its most critical line of business equipment—*its refrigeration systems*. The data gathered by the energy-monitoring hardware made Mariah's management team aware that refrigeration accounted for two-thirds of the plant's total electrical consumption. But more important, specific problems with the refrigeration system's freezer coils were discovered.

These coils had their own automatic defrosting system. Periodically, hot refrigerant was blown through the cold coils so ice buildup on the surface would melt and evaporate. The hot gas for this procedure came through piping; old automatic valves at each coil regulated the defrosting process. The valves weren't working properly, and the hot gas continuously leaked to the coils in the freezers, thereby introducing a tremendous amount of heat. To counteract this, the refrigeration system was kicking on and running almost constantly—*ironically using much of its capacity just to support itself.*

In the end, the information provided to Mariah management as a result of energy monitoring helped the company identify a major maintenance issue and then quickly authorize and execute

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much-needed repairs that ultimately reduced utility costs and increased profits.

Seeking the right solution

It's important to understand that monitoring energy usage in a plant like Mariah (or in any commercial building or facility, for that matter) is different from doing so in a home. As an industrial-sized solution, large building management systems (BMS) could certainly get the job done, but would most likely be overkill and more than most facilities personnel would probably want to take on—particularly when one considers the complexity and cost of a typical BMS.

An alternative would be an industrial-grade "out-of-the-box" hardware appliance that can monitor, gather and distribute energy data in real time. It should have the ability to connect to utility meters, load panels and any manufacturing machines specific to the business, along with common building maintenance systems like lighting and HVAC chillers, fans and compressors. The data gathered by the monitoring system should provide sufficiently high levels of granularity so users can generate detailed reports and observe changes in each asset's individual power draw. And the monitoring hardware should be Web-capable to allow monitoring and alarming via the Internet and mobile devices.

Well intentioned as they may be, energy-management initiatives are sometimes hastily conceived and then handed down to maintenance personnel with vaguely stated objectives like, "Cut our energy costs by 15%." Frequently, those responsible for implementing the necessary technologies and meeting the stated goals have little idea where to begin and limited understanding of the facility's power needs, usage trends or the technologies and jargon used in the electrical industry. As a result, energy-monitoring solutions with complicated installations and configuration are even more problematic.

What's needed in most cases is more of a plug-and-play solution that will allow maintenance personnel and others in the organization to understand the facility's consumption quickly and with minimal hassle.

Taking control

Most monitoring applications eventually evolve into control applications. Energy monitoring is no different, as it very often leads to energy management. It makes sense that once you understand your overall usage patterns, which of the individual machines in your facility are the heaviest consumers, how your consumption fluctuates and what types of changes are needed, you would want to make adjustments in order to make operations more energy conscious.

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To facilitate this, in addition to being simple to install and use, your energy-monitoring hardware should also be compatible with your control and automation systems. Then, after you've aggregated and evaluated a volume of energy-related data, you'll be ready to manage energy as well as monitor it. At that point, your acquired energy data can be used to adjust control systems—those that are responsible for everything from building management equipment (e.g., boilers, chillers, dampers) to production machines

—so everything can be made to run smoother and more efficiently.

MT

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More About Opto 22 Solutions

The OptoEMU Sensor is an energy-monitoring appliance that connects to facility equipment using relatively inexpensive .333 VAC CTs. The hardware has multi-port, multi-input features that allow it to connect to individual load panels and subpanels, accept pulsed inputs from building utility meters and sub-meters and also support standard Ethernet and serial communications to building automation systems utilizing Modbus/TCP and Modbus. The hardware has been touted as an out-of-the-box appliance specifically designed for plant managers and maintenance engineers that are seeking ways to reduce energy consumption. And because the Sensor is based on the same technology as Opto 22's standard line of

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automation systems, users are able to expand their capabilities to gain equipment management and control functions simply by adding a few additional components.

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