

Power For Productivity

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Over the last ten years, manufacturers have aggressively attacked product costs. Survivors in today's global economy have improved productivity, driven down labor costs, cut cycle times and reduced the cost of purchased material. However, one major cost component typically has been overlooked, or considered immune from control: the electricity that powers production. Managing electrical costs may be the last great frontier for significantly reducing the cost of production.

That frontier is opening wider today with the advent of utility deregulation. New Hampshire, Pennsylvania, California and Rhode Island have already enacted legislation and begun moving toward deregulation. Other states will follow. Unprecedented opportunities to save money will become available to companies that understand and can control energy usage.

Low-cost power monitoring and control technology from Cutler-Hammer will enable companies to take advantage of these savings. Using information from these systems, companies can negotiate better rates in an open, deregulated energy market and develop new strategies to dramatically reduce energy costs.

Deregulation Sets The Stage

Deregulation is a result of the Federal Policy Act of 1992. State and Federal rate structures will be replaced by competitive market-based pricing.

A critical element of the act is that it requires the relatively few utility companies that own power and transmission lines to open them to any company that wants to "rent" capacity in order to transport, or "wheel", power from a supplier in one part of the country to a consumer in another region. Since regulated rates can vary by as much as 400 percent from one part of the country to another, deregulation could result in significant savings for consumers that are located in high-energy-cost regions.

Small power distribution companies will be able to negotiate with suppliers and compete with larger, full service utilities, to sell and deliver energy to consumers for a lower price. To facilitate this buying and selling process, power brokers are emerging who can analyze customer needs and supplier capabilities and facilitate the transactions.

Consumers Gain New Options

What will this mean to consumers? In an open, competitive energy market, unrestricted by geographical boundaries and regulated rates, users will be offered a bewildering array of purchasing options and rate structures, not unlike what occurred following the deregulation of the telephone and airline industries.

Unanswered questions are emerging from this deregulation process:

- Will market-based electricity rates actually translate to lower energy bills for consumers?
- Will power be reliable and consistently available upon demand?
- Will power quality be negatively affected?

To negotiate the best rates and guard against unexpected power reliability and quality issues, consumers will have to gain a better understanding of their energy requirements. They must know, for example, whether or not their operations can tolerate an occasional interruption of power. Can production be shifted to off-peak times or a partial load interruption be successfully accommodated? Will power outages or lower power quality damage equipment, escalate maintenance costs and lower productivity?

Companies that know their energy profiles ---where, when and how they consume power --- will be able to knowledgeably negotiate better rates for the type and amount of power they require. For example, a manufacturer could purchase one block of power for the day shift from one provider, another amount for an off-peak shift at a lower rate from a second provider and contract for supplemental power for unusual demand situations from a third.

A company that can control energy usage in various sections of the enterprise, can also negotiate better energy rates by participating in power interruption programs, turning off non-essential loads, such as lights or air conditioning, during peak usage periods at the utility provider's request. This is to the provider's advantage since it can then guarantee that all of its customers' critical needs can be met with the finite energy resources available to it.

Automation Boosts Energy Costs

Electricity plays an integral role in all business operations, from the production floor to the board room. Over the years, a lot of human labor and knowledge has been replaced by electric motors and computers, increasing productivity, product quality and profitability. This same equipment has significantly boosted the amount of energy required by an enterprise and escalated the cost of electricity as a percentage of total product costs.

Electricity now is one of the largest manufacturing costs in some industries. For example, the major automotive companies pay global energy bills averaging a billion dollars a year. In the glass industry, after raw material, electricity is now the second highest cost, exceeding the cost of labor.

Previously, electric bills seemed immune to management control. It was virtually impossible to identify how or where electricity was actually being used. While companies developed strategies and technologies to contain and reduce all other operating costs, they lacked the means to measure or control electrical costs. External utility meters told them only the total amount of energy that had been used and the rate was set by the utility. Like death and taxes, electrical costs were considered fixed and not subject to control. Charges were distributed equally across all departments, so no one department had incentive to find ways to reduce energy. Those who did try had little success because it is difficult to manage what you can't measure.

Measure, Then Manage

In the last decade, Cutler-Hammer has been a leader in developing intelligent devices and systems that are capable of monitoring, measuring, protecting, coordinating and controlling the distribution of power within an enterprise. Our IMPACC systems can include metering devices, protective relays, circuit breaker trip units and motor starters, all of which can communicate information over a noise immune network to a central location for remote monitoring, alarming, trending and control. About 2000 IMPACC systems have been installed in plants, airports, refineries and commercial buildings.

Software has also been developed that can analyze energy usage and power quality. It can coordinate energy loads, turning lights and equipment off and on to manage total power usage. It can even be used to predict maintenance requirements and churn out energy bills for individual departments or machine processes, billing back actual power usage expenses.

These intelligent metering and monitoring systems can be a low cost, fast return-on-investment purchase for a company that wants to understand its energy usage better in order to negotiate improved rates, reduce usage and manage production more efficiently.

For example, one of our glass producing customers used its IMPACC system to understand the actual amount of electricity drawn by seven different production processes. It was then able to determine which process would be the most cost-effective for the production of specific glass products.

Another company decided to schedule a power-hungry process for a late shift when other equipment would not be running. This also enabled it to negotiate a lower energy rate based on lower peak demand requirements.

A third company saved a million dollars a year by agreeing to an interruptible energy plan with the local utility. This was the result of its ability to effectively manage energy loads, turning non-essential equipment such as HVAC or lights off on demand. It also found it could maintain demand levels by turning some equipment off when starting up a production line or other high energy drawing processes.

Simply displaying energy usage on a meter monitor at the equipment level helped another company save money. The machine operators were motivated to shut equipment down between runs because they could actually monitor how much energy was being used each day.

Our own plant in Asheville installed an IMPACC system in early 1997. Its energy bills had been running nearly \$45,000 a month. In the first six months after installation, the Asheville plant has been able to reduce its energy costs by \$40,000. IMPACC helped plant engineers identify wasteful practices, shift loads in order to level demand and do preventative maintenance. Shop supervisors began turning off area lights after a shift when they were shown the cost savings that would result. The use of large electric ovens was moved to later shifts when total energy demand is lighter. Maintenance technicians are able to spot abnormal conditions on the IMPACC screens and service equipment before it breaks down. The return on investment in Asheville is expected to be less than two years.

Protecting Against Poor Power Quality

The same power monitoring systems that are used to measure and manage electricity usage can also protect companies from many power-related problems that can cause unplanned downtime and higher maintenance costs.

The electrical and electronic equipment that can boost productivity can also generate power disturbances and distortions. Poor power quality can burn out motors, cause computer data to be lost, destroy machinery and shut down entire production facilities. The capital cost of equipment replacement can run in the tens of thousands of dollars, yet the largest concern is still process downtime.

Power management systems monitor power quality, detect disturbances and provide warnings before equipment fails. That is why one Houston oil refinery installed a plant-wide monitoring system. It wanted to reduce energy bills, but the primary driver was avoiding downtime caused by poor power quality. An hour of downtime in that facility could cost the refinery five million dollars.

In 1995, one-third of all electricity in the United States was consumed by microprocessor-based equipment and that portion will grow to two-thirds over the next few years. For example, more than 20 million personal computers are sold in the United States each year. Power quality problems and issues are going to become an increasingly important manufacturing issue.

Electronic switching in automation equipment and electronic motor drives generates non-linear, non-steady-state disturbances in the steady-state force of utility power supplies. These disturbances can trip breakers, overheat motors and cause equipment malfunctions.

Electrical disturbances do not only affect the equipment that generates them. They can also flow down the power lines to nearby equipment and even neighboring facilities, causing damage there as well. This will create another potential cost factor for companies that generate high harmonics. Utility providers are beginning to penalize those customers that generate the disturbances. Conversely, they will begin to charge higher rates to customers that demand guaranteed clean power.

The era of energy deregulation ushers in the potential for unprecedented cost savings. But it will also bring new attention to how consumers actually manage their energy usage.

As manufacturers begin to analyze how, when and where they are using electricity, using available metering and monitoring tools, and as they begin to understand how power quality and reliability issues impact their businesses, they will be able to take fuller advantage of these new opportunities.

Armed with information, companies will be able to negotiate better energy rates and reduce energy consumption. They will also be able to manage production more efficiently and reduce unnecessary downtime. Finally, they will be able to take advantage of the last great frontier for taking costs out of manufacturing: managing the electricity that powers production.