

Gaining Financial and Operational Efficiencies in a Tough Electrical Market

Robert Zak, Powerit Solutions

ABSTRACT

As the cost of doing business continues to skyrocket and competitive threats increase both at home and abroad it has become increasingly imperative for industry to find ways to reduce expenses. Yet many costs, such as energy, are seen as largely uncontrollable. Manufacturers require certain resources to conduct operations and often believe there is little room to affect price, particularly in monopoly situations like those that are common among energy providers.

But in actuality energy is a controllable cost and there are several ways to manage this expense. Industrial users can take advantage of demand control, demand response, and/or energy efficiency using automated load monitoring and control to not only lower electricity costs, but also to generate revenue and even get reimbursed for the purchase of energy-saving equipment.

Yet only a small fraction of industrial users take advantage of these money-saving options. Probably the most prevalent reason is the belief that manufacturing's complex processes cannot be altered and even if they could the perceived risk to production does not outweigh the benefits. Another contributing factor is lack of clear information about what solutions and programs are available. Many industrial users simply aren't aware of their options or they assume none exist.

This paper explores the opportunities available for industrial users of all types to control their energy consumption and, by extension, the costs associated with that consumption. It will detail not only the programs and methods, but also the tools and technology that can make participation a success.

The Current Situation

Industry is the backbone of the American economy. It employs millions of workers, generates significant tax revenue, and supplies the goods that help people around the world lead more productive, healthy, and enriched lives. Industry is also a significant drain on our energy resources and is often singled out by utility companies with surcharges and other penalties for heavy usage, particularly during peak times.

How do we reconcile the need for industry to provide the goods necessary for daily life with limited energy supplies, rising costs, and an increasingly fragile environment? Is it fair, or even practical to ask industry to shoulder the burden? And is it really just their burden? Any costs incurred will likely be passed on to the consumer, in whole or part, making it everyone's problem.

The Options

One answer is to utilize alternative energy sources. Wind, hydro, and solar power appear to be attractive answers to a shrinking energy supply. Renewable energy is sustainable and considered ecologically friendly. But green solutions are not without consequences. Dams

disrupt fish and other wildlife, while wind farms are a blight on the countryside and can be dangerous to nearby bird populations. Even the production of photovoltaic cells, which often utilize hazardous materials such as arsenic and cadmium, can lead to health and safety concerns. That is not to say continued R&D should not be aggressively pursued, but given current costs and efficiencies, “green” generation solutions are not necessarily the primary answer at this time.

What about efficiency efforts? Shouldn’t industrial organizations take steps to operate in a responsible manner? Without a doubt. But there are crucial differences between industrial and commercial operations. In a commercial building operations are relatively simple, usually revolving around lighting and environmental controls. A mistake in adjustment might lead to some temporary human discomfort. But a manufacturing facility doesn’t have the same leeway when it comes to manipulating complex processes. Mistakes, even minor ones, could be devastating. So while industry should make every effort to operate efficiently, by installing energy-conserving lights and equipment for example, there are limits to what can be expected.

The Solution

The answer, today anyway, lies in controlling demand and generating energy efficiencies. At this point in time the only truly green, cost-effective, guaranteed way to save energy and its associated costs is by controlling when, how, and how much of it is used.

If control over demand can be achieved utility companies won’t need to build additional power generators, which benefits the environment. By reducing overall customer loads they can avoid buying expensive power on the spot market, costs of which are often passed on to customers. Meanwhile, industrial users will see a reduction in peak demand charges as well as financial incentives for participating in lucrative demand response programs. For example, some programs pay participants simply for committing capacity whether it is ever needed or not. This is in addition to payments for successfully participating in actual demand response events.

There are several options industrial organizations can take advantage of to control their demand. These choices will likely increase as utility companies continue to tap into the concept of demand-side management and develop more ways to participate – and perhaps greater disincentives for those who don’t.

Demand control is one such concept. Demand control is the process of understanding where, when, and why costly energy spikes occur and taking measures to reduce them or shift them to non-peak times. The costs associated with peak demand can be significant. They can account for as much as 40% of an industrial user’s electricity bill. Avoiding these spikes can reduce the overall bill by as much as 20%.

Demand response is another concept that is being implemented by utility companies across the country. The goal of these programs is to reduce system-wide demand during peak times. Demand response programs pay users to reduce their electricity consumption at certain, yet-to-be-determined times in the future. For example, on an unusually hot summer day a utility company might notify its demand response participants that it needs to tap into some of their capacity. This amount is predetermined at the start of the contract. If the manufacturer can successfully deliver the agreed-upon amount it will receive compensation. This can lead to sizeable financial rewards for industrial users while alleviating stress on the grid.

The last tool for controlling demand is energy efficiency. Unlike conservation, such as working in a darkened or chilly room, energy efficiency refers to doing the same, or even more

work with less energy. A by-product of demand control and demand response is often energy efficiency as industrial users develop new strategies and ways of operating to meet those particular objectives.

The Challenges

So if demand control, demand response, and energy efficiency are the solution why isn't every industrial organization in America employing one, two, or all three of these energy and cost saving measures? The simple answer is that many users don't think they can. Manufacturing involves endless, coordinated, and complex processes, many of them proprietary. These processes are the life-blood of the organization and many companies don't think they can be altered.

Even if they can, the risk is often perceived as too great. The potential benefits simply do not outweigh the penalties that would accompany any disruption to operations. And how would this manipulation be undertaken? Not manually. Assuming a plan could be developed there are limits to the changes that can be made without automation, particularly with the oftentimes short notice given for demand response events or an impending peak in usage. By shedding only the easiest loads a user will not be taking full advantage of the savings opportunities. For instance, if only a small number of kilowatts are made available for a demand response event or are not available consistently the user will receive a smaller payment or perhaps none at all if the minimum cannot be met.

The economic climate is another factor impacting many business decisions. Many manufacturers are facing reductions in production, layoffs, and other financial challenges. Even those that are weathering the current economic storm are being conservative with capital expenditures and that conservatism is likely to continue to be a factor in 2010 budgets.

There is also a lot of confusion over the programs available from utility companies. Do industrial users even know what programs exist? Not necessarily, according to Garth Ramseier, President of Anchor Warehouses Services, a commercial cold storage provider in California. "They don't, and that is a problem. You're kind of searching blind unless you can find some recommendations."

The numbers support the hypothesis. More than 4.5% of annual operating expenses in energy-intensive industries are spent on energy¹ and yet less than 1% of all commercial and industrial companies use automated technology to measure and manage their use of technology².

The Answer

Fortunately, solutions exist to address all these concerns. Not surprisingly, the answer lies with technology. As previously mentioned, manipulating complex processes to achieve significant savings in consumption and costs is difficult, if not impossible to do manually. It reduces the scope and types of loads that can be shed, which means that success is limited, even with the best of strategies and tactical plans.

Automation must be introduced into the equation. Industrial users already utilize factory automation to be more efficient and to trim production costs so this is a comfortable concept. A

¹ 2007. *EIA Annual Energy Outlook*: p. 47 c.1; also see p.69 c.1

² 2004. *AMR Data Summary & Report*, 9th edition

key to adoption will be technology that seamlessly interfaces with existing legacy systems, not only integrating with them, but also extending their functionality.

Another key element of this technology is that it must include a level of intelligence beyond basic automation with functionality that overcomes the previously described limitations of manual intervention or generic system control.

Such technology must connect with many loads in order to take maximum advantage of potential savings. It must have access to near-real-time data in order to analyze and predict events. It must be rules-driven to manage an infinite variety of industrial processes, limitations, and thresholds – each varying from organization to organization. And it must be able to take direct control of the loads so that no human intervention is required.

Cost-savings can also be found in construction and installation. Products built to industrial standards must stand up to even the most challenging manufacturing environments. Wireless input/output eliminates the need to run costly conduit, which can be disruptive and time-consuming. Wireless technology also provides access to hard-to-reach places, which means there are fewer limits to the number of loads that can be controlled, increasing the potential for savings even more.

Financing options including renting, renting to own, and leasing provide attractive alternatives for technology purchases. Financing increases purchasing power and lowers the initial upfront investment. Since financing does not impact cash reserves investments can be made when the time is right, even if yearly spending has concluded or budget was never identified. Depending on the circumstances, users can even realize immediate positive cash flow and/or take advantage of tax benefits through bonus and accelerated depreciation and possibly investment tax credits.

Such technology could overcome the barriers that until now have kept industry from being more active in demand management. It allows industrial users to manipulate their previously untouchable processes. Monitoring systems, sophisticated algorithms, and split-second controls greatly reduce the likelihood of error, which safeguards operations. And it allows them to shed fundamental loads – those functions essential to productivity – which will generate far greater savings than could ever be achieved by reducing only ancillary loads.

This technology allows a previously uncontrollable cost to be controlled. Up until now production facilities ran in the manner they had to, or thought they had to, and paid the costs imposed by their utility companies. It was no different than raw materials or other costs over which they had no control. But now, by being able to aggressively manage a resource that represents nearly 5% of operating expenditures³ they can not only cut costs, but also gain competitive advantage. In manufacturing many companies can make a widget. It's the company that makes the widget most efficiently that wins the market.

The manufacturers of this technology can not only provide product, but some can even assist with identifying and evaluating programs, rebates, and incentives available from utility companies such as demand response programs. Industrial users should seek out vendors with applicable expertise in their specific industry as they will have knowledge of the processes and equipment typically utilized and can share best practice information based on past projects.

³ 2007. *EIA Annual Energy Outlook*: p. 47 c.1; also see p.69 c.1

An Industrial User's Experience

Anchor Warehouse Services is a commercial cold storage provider serving growers in California's Central Valley. Anchor provides pre-cooling and SO₂ gassing services to maintain the optimum quality of all types of perishable produce including avocados, kiwis, quinces, table grapes, and citrus.

Anchor operates three state-of-the-art facilities. These facilities were designed to maintain the highest level of product quality and include enclosed docks and hallways for environmental control, rapid cooling capabilities, and certified rooms for organic produce.

Like many companies, Anchor was facing rising energy costs that included high peak demand charges. Reducing these costs was important if the company hoped to maintain competitive advantage.

But, Anchor believed they had few options when it came to manipulating their internal processes. The complexity of admitting produce into the facility that had recently been in fields as hot as 100+ degrees and pre-cooling it in a matter of a few hours is immense. Time, temperature, and humidity are just some of the many factors that must be carefully managed, often with little or no room for variance. For instance, garlic can withstand no more than a sudden half-degree in temperature change or it will be ruined.

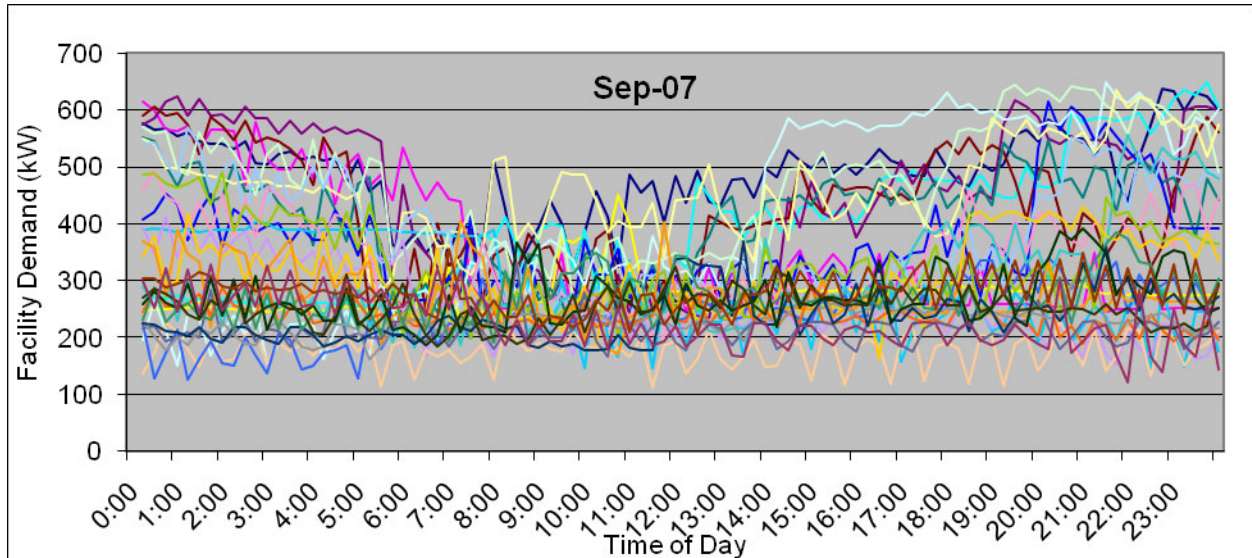
Then there was the dizzying array of programs available from the local utility company. When Ramseier tried to learn more about direct response programs he concluded that, 'utilities are a little bit like government agencies in that they're very bureaucratic. Even when you read their material it's hard to know what you're actually going to see back on the rebate.'

So Anchor decided to get some help. For its technology needs they turned to Powerit Solutions, a provider of Intelligent Energy Management Systems for commercial and industrial businesses.

Powerit Solutions conducted an in-depth audit of the facility, taking note of processes, equipment, and any special installation needs. In less than two months a hardware system was installed with software configured to Anchor's exact specifications and consumption reduction goals.

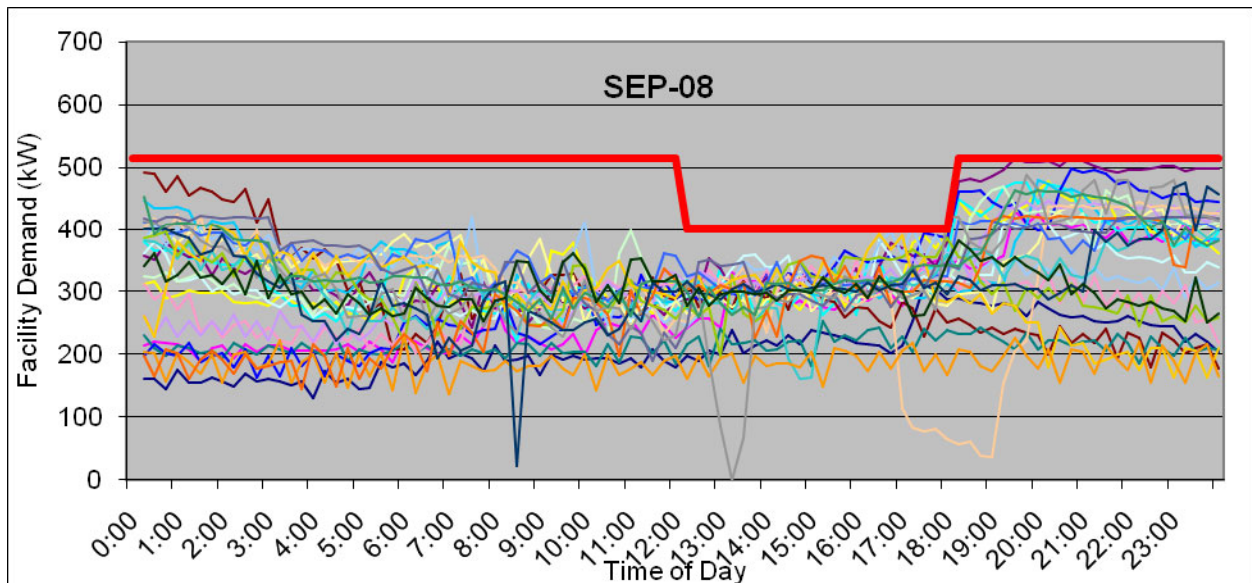
Anchor attacked the energy problem on all three fronts – demand control, demand response, and energy efficiency. With the help of intelligent, automated technology their consumption and cost savings were impressive. Peak demand was reduced by 35%, while demand response capacity was maximized by reducing overall consumption to as little as 16% during demand response events. This means 84% of Anchor's capacity was available to the grid during those critical times. Combined demand management and energy efficiency measures resulted in a 17% reduction in their overall utility bill – all while production increased by 15%. This is the truest definition of efficiency—doing more with less.

Figure 1. Anchor Warehouse’s Energy Consumption Before Automated Load Management



Source: Anchor Warehouse Services Utility Data September, 2007

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Source: Anchor Warehouse Services Utility Data September, 2008

Perhaps the most astonishing metric Anchor has to date is that they achieved an immediate return on investment. This is because their local utility company paid for the entire cost of the \$100,000 system.

Rather than dealing directly with the utility company to participate in their demand response program, Anchor retained the services of EnerNOC, a demand response aggregator serving commercial, institutional, and industrial customers, as well as electric grid operators and utilities.

By participating in a demand response program Anchor agreed to reduce consumption of power at some unspecified time or times in the future. Even with the software system continuously controlling and monitoring facility loads, Ramseier was concerned that, ‘because we’re handling perishable goods, at times we could be in a situation where we just can’t participate in a demand response event.’ Because EnerNOC aggregates available power from a number of participants, they could replace Anchor’s committed amount with excess capacity from other program members and Anchor would not incur any penalties for non-participation.

In Summary

There is little doubt that both industry’s consumption of energy and the associated costs will rise for many years to come. In order to remain competitive industrial manufacturers must make controlling these costs a strategic initiative. By utilizing the latest technology advancements, by taking advantage of the many incentives, rebates, and discounts available, and by tapping expert knowledge to provide direction and best practices industrial users can realize significant savings including:

- Reducing peak demand charges by as much as 40% while reducing overall electricity bill by as much as 20%
- Achieving additional cost savings through energy efficiencies
- Generating revenue via demand response payments
- Leveraging rate schedules such as Real-Time-Pricing that had previously been considered too risky
- Extending life and value of legacy systems for increased ROI
- Gaining greater visibility into energy usage for more profitable decision-making
- Receiving free or partially paid for energy management equipment
- Taking advantage of attractive equipment financing options