

Show Me the Money, Products, and Services that Provide Documented Energy Savings and ROI

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SUMMARY:

A flat economy puts tremendous pressure on manufacturers to aggressively find ways to lower variable costs. Focusing on energy consumption is ideal, as this is sensitive to sharply increased energy prices and regional energy shortages. In this context, automation suppliers have an opportunity to offer products and services that have measurable return on investments (ROI), which are justifiable capital improvements for manufacturers. This is especially important now, since factory automation suppliers' are facing a downturn in traditional industrial markets in 2001, leading them to aggressively seek new market and revenue opportunities. The

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challenge for automation suppliers is to provide manufacturers with metrics on their products and services to determine ROI. This is the only way manufacturers can justify retrofitting what is not broken.

ANALYSIS:

ARC continuously searches for ROI success stories from manufacturers while also challenging automation suppliers to practice what they preach at their own manufacturing facilities by using their own automation products to reduce energy consumption. This case study focuses on one of Rockwell Automation's North American manufacturing facilities for their Presence Sensing Business. Located in Manchester, New Hampshire, the primary utility in the area, Public Service of New Hampshire (PSNH), which is part of the Northeast Utilities System, performed a facility energy audit and identified two critical areas where retrofitting equipment would provide a ROI of within one year:

1. **Air compressors:** Air compressor retrofits involve adding a variable frequency drive and an optional pressure transducer to existing equipment.
2. **Lighting:** Retrofitting the lighting system by upgrading lamps and ballasts.

Rockwell Automation is also eligible for PSNH rebates based upon their actual energy saving performance. ARC has been seeking to identify energy providers and utilities that offer local manufacturers energy auditing services and rebate programs. Energy suppliers are in a unique position of providing an objective analysis to minimize a manufacturers risk on capital expenditures. By recommending operational changes, specific technologies, and additional services they are able to shorten the ROI on expenditures targeted at energy savings.

Variable Frequency Drives Provide Energy Savings

PSNH took some measurements to evaluate the performance of the 75HP air compressors. First running at a fixed frequency of 60 Hz, then adding an Allen-Bradley 1336 variable frequency drive (VFD) to lower the motor frequency to 46Hz, the minimum thought possible to maintain the required 90-PSI. The PSNH readings indicated a savings of 15.2 KWH. At a rate of \$0.0915 per KWH and 8,760 hours per year, an annual energy savings of \$12,183 is derived before any rebates by just adding a VFD. To take full advantage of each VFD, the Manchester facility will incorporate a pressure transducer manufactured by Omega Engineering that allows each drive to operate closed loop, ensuring that each VFD runs at the minimum frequency required to maintain 90 PSI in the compressor, thus providing additional energy savings.

Rebates Shorten the ROI Even Further

The PSNH account manager for the Manchester facility worked closely with Rockwell Automation to document each step taken to save energy. This resulted in rebates totaling in excess of \$18,000, further shortening the ROI time. In addition, PSNH provided the facility with a list of recommendations for each employee to further reduce energy costs. For example, one tip that affects all desktop PC users is that by just turning off the computer each night saves \$88 per year in energy costs per PC. Although these small energy savings tips do not result in tremendous cost reduction by themselves, collectively they add up to some substantial saving without making any sacrifices.

Simple Lighting Retrofits Produce Substantial Energy Savings

The Manchester facility lighting system covers over 135,000 square feet with 822 fluorescent lamps and ballasts that were retrofitted. Older 174-watt T-12 lamps were replaced with new 109-watt T8 lamps that emit same number of lumens thereby reducing the wattage on each the fixtures by 65 watts. In total, the plant reduced the energy demand by nearly 54 Kilowatts per hour (KWH). At a rate of \$0.0915 per KWH and 4,600 hours per year, an annual energy savings of \$22,488 is derived. Also, during peak demand an additional \$0.0710 is added to the rate. Assuming 2,080 hours per year of peak demand rates results in additional annual energy savings of \$7,890. In summary, a facility of this

size will save \$30,379 annually on lighting costs alone before any rebates by just changing lamps and ballasts.

Many Other Types of Energy Saving Strategies Are Available

Another challenge for Rockwell Automation was to reduce electric power costs at their Landerhaven facility in Mayfield Heights, Ohio. This facility consists of 467,000 square feet of office and lab space, and are all electric buildings that use about 40MW per year in electricity totaling over \$3 million in annual energy costs. The company's objectives were to track electric energy consumption, verify utility billing, prepare for deregulation,

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and to identify power quality problems. To accomplish this, the Rockwell Automation Power and Energy Management Solutions group (PEMS) installed a Load Profiling & Cost Allocation System. As a result of installing this system, the performance impact included the ability to gather energy data that was used to renegotiate lower energy rates, monitor power quality to pinpoint utility voltage problems, and perform demand trending to manually limit energy demand during peak summer hours. The financial results include a three-year cost savings of \$406,000 from renegotiated energy rates alone and with an installed system cost of \$150,000, a ROI payback in less than 14 months.

Energy Saving Strategies Are Being Deployed by Various End Users

Water departments are frequently deploying various energy saving strategies that typically lead to more efficient operations as well. An example of a challenge that many water departments face is solving motor and pump shutdowns caused by unbalanced power. Simply adding a new motor controller can eliminate these problems and save the associated labor costs of technicians manually resetting the pumps, which are often located on remote sites. Motor control reduces current unbalance and the pump control reduces motor torque, protecting pipes and valves from sudden water surges and hammering. Another example is converting low service raw water pumps to high service pumps by adding variable frequency drives, improved efficiency motors and soft starters. This will reduce the occurrence of water main breaks, resulting in more reliable water service, as well as energy costs resulting in an ROI of typically less than one year. Other benefits include reducing pump start-ups for longer pump life and more constant water flow that results in better water treatment and chemical dispersion.

Paper mills are typically challenged to develop an emergency load shedding system for on-site generators to avoid mill-wide downtime, damage to equipment, and time intensive restarts. The objective for these mills is to eliminate as many unplanned plant-wide shutdowns per year while disconnecting from the utility and shedding loads within a

certain number of cycles after losing utility power. Installing a Load Management Control System (LMCS) typically prevents a plant-wide shutdown and allows the plant to maintain production. The cost of an LMCSs can exceed \$350,000, however they typically have a payback after two operations. Assuming three outages per year provides a ROI of 150 percent in just one year.

Another energy savings strategy of manufacturers is to install demand management systems to reduce electric power costs, avoid demand limit rate increases and avoid curtailment clause enforcement. For example, installing one of these systems in a bar mill can substantially reduce manpower costs in substations, decrease furnace delays by a wide factor, and typically result in a ROI of less than six months. Other benefits include improved voltage regulation, power factor and reduced voltage sags as well as help in managing real-time power purchases on the spot energy market.

RECOMMENDATIONS:

- Automation suppliers must practice what they preach at their own manufacturing facilities, maximizing their potential energy savings by applying their own products and services where possible and apply additional products and services that provide a ROI of about a year or less.
- End users should look at their capital and expense budgets as potential investments, rather than costs, and look to creatively apply energy-saving products and services in all areas that can pay for themselves within a year and provide many years of cost savings and efficiency benefits afterward.
- Utilities must aggressively audit their major energy users and provide economic incentives to invest in products and services that result in energy savings and reduce the need for the utility to have to invest in additional power generating capacity, at least in the short-term.

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