Center for Energy and Environment

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Organization Background

The Center for Energy and Environment (CEE) is a non-profit 501(c)(3) organization that works to promote the responsible and efficient use of natural and economic resources. CEE accomplishes this mission through research, program development, delivery and evaluation, financing and public policy initiatives. Often, small customers are left out of utility energy programs because they cannot afford to participate. Energy Intelligence is a no-cost service offered by CEE that gives small businesses the opportunity to participate in an energy efficiency program .

"I've always wanted to learn how everything works in a business, but with my regular job duties and routines, I never really had time to explore all the opportunities that were hiding in plain sight. It was refreshing to have an internship dedicated to finding just that - opportunities – and with them, knowledge of energy savings that can be applied to practically every engineering workplace." ~ TR

Project Background

CEE's Energy Intelligence (EI) program works with small businesses to help them save energy. The program is no-cost to businesses and funded through Xcel Energy, which builds the cost of the program into its utility rates. Xcel is required by law to set aside a portion of its budget for rebate and energy-saving programs, and MnTAP partnering with CEE was a great way to help companies find the opportunities and the rebates they have effectively been paying for all along.

The focus of EI is to identify energy savings that can be achieved through operational and behavioral changes, matching energy use with production activities. Businesses can take advantage of rebates through Xcel Energy and be introduced to technologies they might not have had time to consider. EI usually finds around 8% energy savings for each of the businesses they assist by using interval meter data. Interval data works by recording the pulse/smart meter data of each business and showing the consumption and kW draws in 15-minute intervals. This data allows EI to find opportunities in baseloads and peak periods. By combining this approach with an intern in the field, EI was able to find unique opportunities at each business that they might not have been able to identify without the extra set of eyes and hands.

Incentives To Change

By looking at more specific ways of saving energy at each company, the intern found that companies could save up to 30-40% of their total annual energy bill by implementing identified solutions. Over the course of the project, it became apparent that with experience the amount of time the intern spent at each site can be reduced – and savings per unit of time spent increased dramatically. Since the EI program is renewed with Xcel based upon results and energy saved, working with student interns can help sustain and perhaps even help expand the program by increasing its effectiveness.

SOLUTIONS

Project Approach

Part 1: Initial Walkthroughs

At each site, an initial walkthrough was conducted with energy management staff to identify work patterns and where the company uses energy. From this initial walkthrough, a list of possible opportunities were identified for the intern to explore and identify feasibility and viable savings.

Part 2: Gathering Information

After the initial walkthrough, the intern gathered more in-depth information including lighting counts, fixture identification, compressor loading and unloading, wattage and cycling times. Consulting with employees who have first-hand knowledge of the machinery and equipment was helpful in identifying patterns and possible opportunities. Research was also conducted on tailored savings opportunities, such as UV-LED curing, electroplate bath covering and injection mold sweat prevention. Throughout the process, vendors were contacted and re-contacted as needed.

Part 3: Writing and Presenting Reports

After gathering all information, the intern synthesized it in a report and calculated the financial savings, cost, payback, and energy savings. The goal was to identify opportunities with a short payback by minimizing costs and maximizing energy reduction. Some things, such compressed air leaks, can be fixed with very little cost. Others, such as dehumidification or UV-LED curing, have large upfront costs but proportionally large future energy savings. After the reports were finalized, they were presented to the company for implementation decisions.

Summary of Assessments

Five energy audits were conducted at companies in industries including printing, electroplating, constuction, injection molding, and millworking. While there were many different industries, there was often cross-over in major opportunities, such as lighting and compressed air. Often, sites can switch from 32 W fluorescents to 25 W of the same variety – or even use 15 W LED screw-in bulbs that are compatible with the existing fixtures. There were some restrictions on light levels, but all sites in this study have over-lit shop areas, meaning there is a potential for de-lamping, reducing fixture counts, and adopting task lighting as needed. As for compressed air, four of the five sites in this project had significant leaks. Since compressed air is ten times more expensive than electric energy, compressed air savings in any form are significant. In addition to addressing leaks, sites can often turn down their air pressure set-point levels to save a portion of the compressor's energy consumption.

There were other savings opportunities that are applicable to many sites, such as motor replacement (including adopting variable frequency drives (VFDs)), improving exterior lighting, and installing motion sensors.

In addition, there were savings opportunities unique to each industry. For example, for a printing facility, UV curing can be retrofitted or replaced with UV-LED curing. In electroplating, hot baths can be insulated with floating covers (such as "hexies") and bath heater timings can be modified to save money during off-hours by turning equipment off when it is no longer needed.

Recommendation	Annual Reduction	Annual Savings	Energy Savings
Compressor optimization, LED lighting, UV curing	264,000 kWh 830 therms	$24,000	46%
Compressor optimization, LED lighting, insulation	125,000 kWh	$11,900	31%
Compressor optimization, LED lighting, motion sensors	86,000 kWh	$10,140	25%
LED lighting, motor replacements, process improvements	22,440 kWh 600 hours downtime	$102,500	11%
Compressor optimization, LED lighting, VFDs	290,000 kWh	$25,000	36%