Energy Management Systems, Restaurants, and ROI

Energy has historically been considered an "uncontrollable" cost by most food service businesses. With the possible exception of lighting, most forms of energy consumption in restaurants and other businesses are nearly invisible, and many of the invisible forms of energy consumption are far more expensive than lighting, especially when it comes to restaurant operations. Energy can often be in the top 3 to 5 costs for a restaurant. The challenge is that historically, there have been few, if any, tools available to seize this opportunity for cost control.

The good news is that cost-effective and comprehensive energy management technologies that can help control, identify, and eliminate excessive and unnecessary forms of energy consumption, drive down operating costs and improve profitability are becoming available to restaurant owners and other businesses operating in small commercial facilities. These new energy management systems provide the ability to remotely control HVAC, gather detailed, real-time data for each piece of energy consuming equipment, and generate intelligent, specific, real-time guidance on finding and capturing the most compelling savings opportunities. The systems may also include other functionality such as refrigeration temperature monitoring (think food safety), water and gas monitoring, and lighting automation, all of which enhance the value proposition that an energy management system can deliver.

Although there is much promise in these technologies today, many owners and operators can probably tell you a story about the energy related technology that was in fact too good to be true or a total bust. In our experience, to avoid the bad and the ugly and focus on the good, one needs to better understand these technologies, their value to an organization, and how they can be effectively deployed to improve an operation's profitability. To help in this effort, there are three key questions that should be answered before embarking on a new energy management system project:

- Who should be involved in the use of these systems?
- Where are the opportunities for saving money?
- When should the customer expect to reap savings?

Who should be involved in the use of energy management systems?

An energy management system can provide value across the span of an organization's staff, so it's important to have different groups engaged in the use of the system to reap maximum benefit.

Finance / Owner

Because an energy management system can bring visibility, detail, and benchmarking to one of the top operating costs for restaurants, it's important to have the finance office involved in the use of the system. Often, the main internal sponsor of an energy management implementation can be the CFO or

franchise owner because one of the primary results of the system is an improvement to the bottom line for a company.

Managers / Operations

Many of the savings reaped from an energy management system are driven by process and operational changes, so it's critical to have engagement with operating managers who have the authority to set policy and procedures and to manage staff operating critical energy-consuming devices. In particular, it is important that both the person who is responsible for implementing the operational improvements AND that person's direct supervisor are engaged in using the system -- so, both regional and store managers should be involved. Moreover, as with any initiative, success is usually doomed if the people at the very top of the organization don't make it clear that the initiative is a priority.

Systems / Facilities

Finally, whoever in the organization has responsibility for facilities or equipment management should be engaged in the project. The energy management system can help track critical equipment performance and provide the necessary data for making intelligent decisions about equipment maintenance and upgrade programs.

Where are the opportunities for saving money?

An energy management system can be a very effective tool for identifying and eliminating areas of excessive energy spending, and there are a number of different categories of wasteful consumption where the platform can make a significant impact.

Off-hours consumption

In a typical restaurant operation, the "off-hours" period can be an opportunity for cutting back on excessive energy spending. It is not uncommon for expensive loads, such as make-up air and exhaust fans, to frequently be left running all night when the restaurant is closed. Some of the staff may be new or have not yet had proper training on all aspects of restaurant operations. Managers have multiple competing demands for their attention. People forget. Ineffective off-hours management of even a modest number of devices in a restaurant can result in thousands of dollars in lost profits every year per store.

A modern energy management system can provide insight into energy consumption patterns, can calculate the costs of running equipment in the off-hours to highlight the magnitude of the waste, and can send alerts to management when equipment has been left running too late or is turned on too early. By bringing this level of visibility into off-hours consumption, a modern energy management system can greatly facilitate implementation of robust operational practices that ensure equipment is only running when it needs to be.

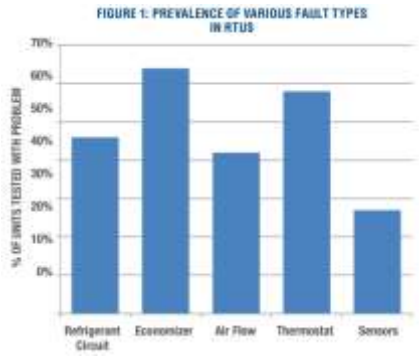
Management of equipment use versus business volumes

As with off-hours energy consumption, there are many pieces of energy-intensive equipment in the restaurant's kitchen, such as heat lamps, toasters, and Panini presses that can be turned down or turned off during quiet periods. An energy management system can help evaluate consumption patterns and target the most cost-effective pieces of equipment to manage during lulls over the course of the day.

Inefficient HVAC and Refrigeration Equipment

A survey of commercial HVAC equipment revealed that more often than not, HVAC equipment is not operating as efficiently as it could be, due to faults in a variety of components, including:

- Refrigerant circuit
- Economizer
- Air flow
- Thermostat
- Sensors



An energy management system can reveal problems with HVAC and refrigeration systems by identifying problematic operating patterns, such as compressor short-cycling, continuous operation of compressors, compressor failure, and by finding aberrations in expected supply and return duct air temperatures.

Inefficient Programming of Thermostats

Installing programmable thermostats and keeping on top of the different heating and cooling set points across each day and between seasons is the single most cost-effective way to automate energy savings. Heating and cooling costs are typically a restaurant's largest energy cost, and programmable thermostats are substantially less expensive than any other kind of energy automation.

Unfortunately, many restaurants use their programmable thermostats the same way many people use them at home: they don't program them. Programming the thermostat can be cumbersome, so it can be difficult to implement schedule changes or seasonal changes. Set points are constantly over-ridden, with a tug-of-war between the staff's desired temperature settings and the customers' desired settings. The result is HVAC equipment typically running harder and longer than necessary, wasting precious profits.

Having a staff trained on the use of the programmable thermostats and having a thermostat that is convenient (e.g., internet connected for remote control) and intuitive to can go a long way to optimizing the use of heating and cooling systems, balancing comfort and energy savings.

Early warnings of equipment problems

Equipment can reveal much about its performance through its energy consumption patterns. If there are problems – e.g., a broken belt on a fan or a clogged vent in an exhaust system – equipment may use substantially more or substantially less energy than it was designed to consume. An energy management system can be configured to automatically recognize aberrations in consumption patterns and proactively send out text and email alerts to management. Because of this, an energy management system's on-going analysis can help prevent "black swan" events -- catastrophic failure of critical equipment.

Management of energy demand spikes

Most commercial properties, including restaurants, incur so-called "demand charges" from their electric utilities. Demand charges are established when electricity consumption spikes, usually for 15 to 30 minutes. The utility will charge based on the magnitude of the customers' demand spikes, as measured in kilowatts, not kilowatt-hours. The greater the spike, the greater the demand charge. (See here for a more detailed explanation.)

An energy management system can detect spikes in electricity consumption and either send out warnings with enough time for restaurant managers to do something to reduce the magnitude of the spike or, more likely, reveal overtime what changes could be made on a daily basis to systematically reduce the likelihood of higher demand charges. For example, managers may set the thermostat back by 2 degrees or turn off their ice machine from 3pm to 4pm during the summer to reduce the total demand from the restaurant for the duration of the spike.

Modeling the savings

How do these different opportunities break-down in terms of savings potential? Below is a model of a typical restaurant with a range of typical expected savings for each category of savings opportunity:

Assumptions			
Avg monthly electricity cost	$ 4,000		
Annual electricity cost	$ 48,000		
% Demand / kW related	$ 4,800	10%	
Annual kWh Consumption Cost	$ 43,200		

Savings Opportunity	% of the $43,200	$	Savings Potential	Savings $
"Off Hours" Equipment Use	25%	$ 10,800	15%	$ 1,620
Thermostat Control of H/C	25%	$ 10,800	20%	$ 2,160
HVAC/R Equipment Faults	40%	$ 17,280	10%	$ 1,728
"Slow Period" Equipment Use	10%	$ 4,320	10%	$ 432
Demand Charges	n/a	$ 4,800	5%	$ 240
TOTAL $				$ 6,180
Total as a % of Total Spend				12.9%

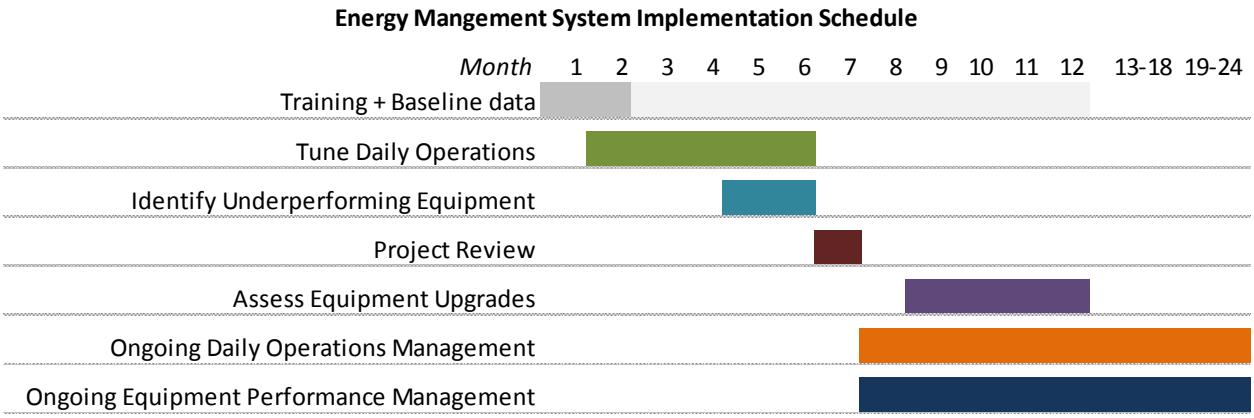
These savings can range by +/- 50%, meaning the savings range is 8-18% in direct energy savings. These savings do not reflect potential savings in gas consumption due to more effective use of thermostats and more efficient operation of HVAC equipment.

There are other savings opportunities as well. Savings from maintenance calls that are avoided due to the remote diagnostics and equipment performance monitoring could add another $1,000 a year in direct savings (benchmarks for service calls are about $350 per call). While the HVAC/R faults require an HVAC technician to resolve, we find that those issues can be addressed with minimal incremental cost to the existing R&M contract that is already "bought and paid for" in year 1 of the program. Other cost reduction modifications to that contract are possible in future years as well.

When should the customer expect to achieve savings?

A system to help manage energy costs is just like any other business tool or system in that it requires: some effort to set up, some effort to get people trained and using it, and a time period over which the system moves from "new and different" to "how we do things." In this way the benefits from the system build over time rather than arriving all at once.

To be successful, the improvement of business processes that an energy management system can drive should be laid out in advance and approached at a reasonable pace. None of this is to say that implementing a modern energy management system is difficult – it is not. But expecting your next month's utility bill to magically go down by 20% is a recipe for disappointment. Like any "project", some project management is required to maximize the benefits available. Here is a sample deployment schedule, or project plan, for a modern energy management system.



Months 1-2: Training + Baseline data

During the first two months after an installation, an energy management system will gather baseline data on the magnitude of energy consumption and energy consumption patterns for each circuit in a restaurant. This data characterizes "as-is" operations and equipment performance and will be the basis for identifying operational and equipment performance improvement opportunities.

In addition, all parties involved in the use of the energy management platform should be trained and become familiar with the use of the system during this period.

Months 2-6: Tune Daily Operations

By viewing energy consumption patterns, management can identify the "low-hanging fruit" opportunities for recapturing lost profits from relatively easy operational changes. The low-hanging fruit opportunities include analyzing off-hours energy consumption and taking corrective action to ensure equipment is running only when it needs to be.

Initial opportunities for savings also include updating thermostat programming for more effective use of HVAC systems.

For those companies managing a portfolio of restaurants, the baseline data will enable benchmarking of their facilities. Which restaurants have the best practices in terms of energy use? Where are the worst practices? Which functional areas (e.g., HVAC, refrigeration, lighting, etc.) are driving the biggest problems? Through benchmarking, management will be able to prioritize which restaurants represent the largest opportunities for savings and can focus their efforts accordingly.

In order to sustain the operational improvements established during the first phases of an energy management system implementation, restaurant management can implement energy cost controls. These controls can include establishing or updating opening and closing procedures for each store, establishing or reinforcing temperature set point on thermostats, and training staff in any changes.

In addition, the energy management system can be configured for email or text alerts that can be sent out to reinforce proper hours of operation of critical equipment.

Months 4-6: Identify Underperforming Equipment

In parallel with implementing new or enhanced energy cost controls and operational improvements, management will be able to identify problematic equipment during this period. An energy management system can tag equipment exhibiting problematic energy consumption patterns (e.g., a roof-top unit short cycling, or a refrigeration compressor running continuously) and alert the facilities/maintenance team accordingly.

With this information, the facilities/maintenance team can revise equipment maintenance schedules and establish equipment alerts to highlight under-performing assets.

Month 7: Project Review

During the seventh month of deployment, it is very useful to schedule a review of the energy management system implementation to ensure all appropriate management feedback loops are in place, celebrate successes, and to reinforce areas that need improvement.

Months 9-12: Assess Equipment Upgrades

Some energy management systems can measure the exact cost of running a piece of equipment. Based on the data collected during the first six months of implementation, is there a case for upgrading equipment to more energy efficient models? What is the real-world performance of the EnergySTAR refrigeration equipment, HVAC equipment, and lighting in which you've already invested? Just how costly is that "old dog" equipment that you know needs to be replaced sooner or later? Which equipment should we use in our soon-to-be constructed new restaurant?

By providing actual run-time costs, an energy management system can give management the data it needs to tackle these questions. Rather than projecting the ROI for replacing a piece of equipment using estimates of its energy consumption, one can now use the facts for how much energy the equipment uses now, which reduces the risk of not achieving your ROI.

Months 7 – Onward: Ongoing Daily Operations & Equipment Performance Management

Studies have shown that in the absence of active energy management, buildings can lose up to 80% of energy efficiency gains achieved via audits or retro-commissioning within the first two years after efficiency measures have been implemented. This so-called "energy drift" can be prevented by incorporating an energy management system into ongoing operational practices in restaurants. In the same way restaurants have systems for tracking inventory and labor costs, it is now possible to track and improve energy cost performance.

In addition to making sure all the operational and equipment improvements implemented during the first 6 months are continuing to be effective, restaurant management teams should consider implementing longer lead-time changes in broader operating policies that can save energy. Examples of this type of business optimization include water vs. chemical sanitation, the sequence of food preparation that determines how much food warming is required, or the re-balancing of HVAC systems.

Also, it is critical to verify savings from new maintenance and / or capital equipment upgrades. Has new equipment performed according to spec? Are the equipment upgrades delivering their anticipated savings? Are the service providers delivering improved maintenance and therefore equipment performance?

Finally, an energy management system can deliver on-going analysis that can help prevent catastrophic failure of critical equipment through early detection of abnormal energy consumption patterns, which can often indicate problems with equipment.

Conclusion

Before implementing an energy management system, it's important that you have a plan which clearly articulates who should be involved in the use of the system, how the tool will be used to save money, and when you should expect to reap benefits from the use of the system.

With a modest amount of planning, an energy management platform can be a powerful tool for boosting profits in restaurants by cutting energy consumption and improving the performance of critical equipment. And by bringing visibility to what has historically been an invisible cost for restaurants, it is finally possible to move energy from an "uncontrollable" cost to a "controllable" cost.