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Pulling the Plug on High Utility Bills: Ways to Control Energy Costs in Your Startup

by Robert N. Rossier

In the restaurant business, you fight for every penny. Save a nickel here, and a dime there, and it can add up quickly, making the difference between a banner year and staggering to the finish line at the end of the fiscal year.

In this magazine, we've highlighted inventory control methods and keeping an eye on food costs. We even cautioned you about the perils of employee nibbling, when a large green olive costs about 10 cents. Well, a much more insidious form of nibbling is energy costs. As long as the lights are on and the equipment running, you figure everything is hunky-dory. Still, wouldn't it be nice if some of the money that went out the door to your utility providers could go into your bank account? It can if you look at your energy consumption habits and make a few changes.



Illuminating Changes

Lighting generally runs from 8 percent to 14 percent of a restaurant's total energy costs, but it's an area where operators can easily make cost-saving changes. A quick look around most any restaurant reveals gross inefficiencies that are easily remedied. Since the unwanted byproduct of inefficient lighting is thermal energy -- or heat -- cutting the energy demand for lighting scores double savings by reducing the energy needed for air conditioning as well.

Lighting efficiency varies dramatically depending on the particular technology used. Incandescent lights, while common and inexpensive to purchase, are about the worst when it comes to efficiently converting electricity into light. Although more expensive to purchase, technologies including fluorescent, halogen, metal halide and high-pressure sodium all offer much higher efficiency in terms of light produced per watt of energy used. By replacing old bulbs and fixtures, and updating with more efficient lighting technology, restaurants can greatly decrease the costs of lighting. (See ["Efficiency of Common Light Sources"](#) below.)

Even if fluorescent lighting is already installed, older fluorescents could still be consuming much more energy than necessary. Newer fluorescent lights called "T-8s" have electronic ballast, and are much more efficient than the older "T-12s" with their magnetic ballasts. Efficiency improvements have been made in other types of lighting, too, including the ever-popular MR16 halogen spotlights found in abundance in many restaurants. A more efficient "infrared restricted" version of this bulb (the MR16IR) is available that cuts the energy consumption from 50 watts to 37 watts per bulb -- an additional 26 percent energy reduction. The IRs cost about \$2 more per bulb than the standard MR16s, but the cost can be spread out by simply upgrading to the more

efficient bulbs as the old ones burn out.

Newer technology is also available to reduce the operating costs for exit signs, which burn 24 hours a day. Standard exit signs typically use 40-watt incandescent bulbs, but can be replaced with high-efficiency LED (light-emitting diode) exit signs that consume a mere five watts. Over the course of a year, the energy savings can easily top \$25 per sign.

The downside of lighting upgrades is the purchase price of the bulbs and fixtures. That said, the cost for upgrading to a more efficient light source will in many cases be paid back in less than four months through reduced energy consumption. In addition, since many of the more efficient bulbs also last longer, the higher per-bulb cost is more than offset by longer life. For example, where a compact fluorescent light (CFL) will cost three to five times as much as an incandescent bulb providing the same illumination, it will also last three to eight times as long, making it less expensive in the long run, even before the energy savings of 75 percent to 80 percent. Remember, too, that while an incandescent bulb's life can be dramatically shortened by heat, vibration and voltage variations, these factors don't significantly shorten the life of a CFL.

Frequently unoccupied areas such as hallways, storerooms and storage closets offer more opportunities to shave dollars off lighting expenses. In these areas, consider the use of occupancy sensors to automatically turn the lights on and off. Likewise, motion detectors on outdoor security lighting can take some of the sting out of security costs.

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Cooking Appliances

Cooking appliances themselves take from 24 percent to 43 percent of our total energy budget. While it might seem unlikely that corners can be cut on cooking energy, the truth is that many restaurant operators haven't considered the energy costs associated with normal kitchen protocols. Once again, reducing the demands of cooking appliances can have double savings or more. The less heat those appliances waste, the less cooling is required. For items that require a vent hood, the savings can be even greater. Running the vent hood means heating or cooling the makeup air, and that can be an expensive proposition.

In many restaurants, the first thing that happens when the cook staff arrives is that everything gets turned on. After all, nobody likes to wait around (particularly customers) for things to warm up. But timing is critical, and many appliances really won't be needed until much later.

For example, for a restaurant operating three deck ovens, it usually isn't necessary to turn them all on at once. Although they may be needed to meet the peak demand, chances are that peak isn't immediate. By staggering the times at which the second and third ovens are turned on, substantial energy savings can be achieved. The same goes for deep-fat fryers, conveyor ovens, steamers and other items. To develop a more energy-efficient kitchen protocol, take note of the time needed to warm each appliance to operating temperature, and then stagger the turn-on times to more closely match the actual need. For equipment like conveyor ovens that need only a few minutes to warm up, waiting until demand increases before turning on more equipment is a simple strategy for savings.

Even the small "plug loads" that most operators tend to ignore, while individually small, can add up to a sizeable energy drain. Items like coffeepot warmers, plate warmers, steam tables, heat lamps and conveyor toasters should be left off until shortly before needed.

In some cases, it makes more sense to replace older appliances that consume more than their reasonable slice of the energy pie.

“ . . . Creating a checklist of when to turn on

For example, a newer dishwasher might not only clean better, but might also use less hot water in the process. Likewise, switching from an electric fryer to a gas-fired model may save on energy costs, and the faster recovery time might boost productivity at the same time. A new cooler or refrigerator might be much more efficient than an older model with degraded cooling capacity and poor insulation. To help make good choices regarding energy consumption, look for appliances that have earned the EnergyStar ratings, and check the energy consumption data for comparison.

equipment will save energy dollars. ”

Timing isn't everything when it comes to energy use, but it can have a significant effect. In many regions, rates are determined in part by a consumer's peak energy demands, and some utilities offer sliding rate schedules to help lessen the peak demands on electricity generation. By shifting schedules to lower the peak demands, the rate paid for energy can sometimes be reduced. Cooking schedules obviously can't be changed to take advantage of low energy rates, but some items of equipment can just as easily be operated at less costly times.

Icemakers are a great example. Nobody wants to run out of ice, but cranking out the cubes in the middle of the day when the kitchen is in full swing can easily jack up the peak energy demand. A better strategy might be to stock up on ice during the off-peak times. Likewise, defrost cycles for refrigeration equipment can be set for off-peak times to take advantage of lower rates. Also pay attention to the door heaters designed to minimize condensation on coolers and display cases. If these are not equipped with moisture sensors, or the ambient air is not overly humid, it may be possible to save energy by turning off the door heaters.

Hot Water

Water heating is kind of a wild card in the overall energy equation, accounting for anywhere from 10 percent to 27 percent of a restaurant's total demands. Still, some simple strategies can help cool energy consumption. First, take steps to decrease the hot water demand. For example, installing low-flow, prerinse spray nozzles can reduce the hot water demand for dishwashing. In some cases, the hot water supply temperature can be reduced. Dishwashers typically require 140-degree Fahrenheit (F) water, but handwashing water need only be 110 to 120 degrees F. There's precious little point to heating up water, and then mixing it with cold water to bring the temperature back down again.

In addition, heat loss from storage tanks and supply lines increases with increasing temperature, thus reducing the overall efficiency of the hot water supply system. Reducing the water temperature by 10 degrees F can reduce water heater energy demands by 3 percent to 5 percent. While it might seem reasonable to heat the water to a higher temperature to avoid running out too quickly, a more economical approach for the long run might be to add more water heating or well-insulated storage capacity.

Another cost-saving measure is to limit the heat loss from hot water storage and distribution systems through liberal application of insulation. Although many newer hot water heaters are well-insulated to begin with, older models may be bleeding your energy budget. A hot water heater that feels warm to the touch can probably benefit from installing an insulation jacket. Likewise, hot water pipes -- especially those that run through cool areas -- should be insulated to limit heat loss. Pipe insulation is readily available, inexpensive, and doesn't require a professional to install.

Dishwashers can also put a big demand on hot water systems. For continuous fill-and-drain-type dishwashers, consider investing in a gray water heat recovery system. This is essentially a water-to-water heat exchange that draws heat energy from the draining water to preheat the incoming supply water, thus reducing the energy needed to heat water.

HVAC

Heating, ventilating and air conditioning (HVAC) is another heavy hitter in the energy department, drawing from 14 percent to 24 percent of a restaurant's total energy demands. While most energy reductions also help reduce the total heat load, and thus reduce the energy needed for cooling as well, inefficient HVAC systems and wasteful operating practices can make this a much more expensive proposition than necessary.

The first stop here is the thermostat. Sources at the Washington State University Cooperative Extension Energy Program recommend the use of conservative set points for cooling and heating to reduce energy consumption while maintaining comfort. This source recommends 76 degrees F for cooling, and 68 degrees F for heating, noting that each degree of additional heating or cooling can cost an additional 4 percent to 5 percent in energy costs. That's just for starters. Installing an inexpensive programmable thermostat to automatically set back temperatures during non-business hours can save considerably on heating and cooling costs.

Many restaurant owners can save on energy costs by installing a "variable-flow makeup air system" for their HVAC system. Building codes set the minimum makeup air required for maximum occupancy, but reducing the makeup airflow when the house isn't full can often save a bundle in air conditioning costs. For systems that draw constant makeup airflow regardless of demand, consider installing a control system to vary the makeup airflow based on time or carbon dioxide levels -- an indirect measure of how many people are actually in the building.

Another big cost center in the HVAC realm is the kitchen ventilation, particularly the vent hoods. Again, makeup air for a vent hood carries with it a hefty price in terms of makeup air cooling or heating. Significant savings can often be realized by not turning on appliances (and their respective vent hoods) until needed. Even more savings can be realized by installing an electronically controlled vent hood system, which varies the airflow to meet the demands of the moment. Additionally, you can reduce cooling costs by adding ceiling fans that circulate air in a room. Providing some gentle air movement will allow temperatures to be increased (remember that energy savings!) without discomfort to customers and employees.

Sometimes an old, tired air conditioning system can be costing you more than you realize. Newer systems are much more efficient, and can save a bundle in direct energy costs. In some cases, alternative technologies are available that are more efficient. For example, a desiccant system that removes humidity from makeup air might be more economical in some climates, reducing the load on the central air conditioning system for mechanically cooling makeup air.

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In addition to these cost-saving measures, restaurant operators should make all the same improvements that a wise homeowner would make, including adequate insulation for walls and ceilings, maintaining weather stripping and window caulking in good condition, and upgrading old, inefficient windows.

Sharing the Costs

Oftentimes, it's the upfront costs of adding energy-saving technology that prevents restaurant owners from improving their energy efficiency, but don't fall into that trap. Many upgrades and improvements are inexpensive and effective, and will pay for themselves in very short order. Moreover, many utility companies offer businesses rebates and other incentives to offset the costs of more expensive upgrades and energy conservation projects. For example, Connecticut Light and Power offers rebates of up to \$25,000 per year for businesses installing occupancy sensors. Some utilities offer interest-free loans for small businesses to install energy-

conservation technologies such as high-efficiency HVAC systems. Other programs will rebate the cost difference for installing high-efficiency systems for new construction. Incentives offered by local utility companies for making these upgrades can often help keep more cash in your pocket on a monthly basis.

Restaurants are notorious for their high energy consumption. By paying close attention to operating procedures, and making a few modest investments in more energy-efficient technology, more than a few watts can be shaved off that energy bill. No matter how you look at it, that's money in your pocket.

-- [Restaurant Startup & Growth](#)

Energy Conservation

If you think your utility bills are too high, you're probably right. Use the following checklist to identify items that may be wasting energy, and ways to reduce your total energy consumption.

Lighting

- **Replace inefficient incandescent lighting with newer technology.**
- **Upgrade older T-12 fluorescent lights to more efficient T-8 fluorescents.**
- **Use occupancy sensors in infrequently used spaces.**
- **Use timers for parking lot lighting and restricted access areas.**
- **When appropriate, use task lighting rather than area lighting.**
- **Add reflectors to increase efficiency of lighting when appropriate.**
- **Make efficient use of natural lighting when available.**
- **Use photo sensors or timers to control outdoor night lighting.**
- **Use motion detectors for security lighting as appropriate.**

Refrigeration Systems

- **Set defrost cycles for optimum performance, and adjust defrost times to minimize peak electrical demand.**
- **Keep doors closed when possible.**
- **Put cold stock away quickly before it warms up.**
- **Disarm door heaters if not needed.**
- **Replace lights in walk-in coolers with compact fluorescent models designed for cold use.**
- **Install strip curtains on frequently used walk-in doors.**

Hot Water Systems

- **Add an insulation jacket to a water heater if it is warm to the touch.**
- **Insulate hot water supply pipes.**
- **Consider gray water heat recovery systems for constant-use appliances such as**

dishwashers.

- Reduce demand by installing low-flow spray nozzles.
- Reduce temperature of hot water supply if appropriate. Increase hot water storage capacity if needed.
- Install heat traps (check-valves) on all new water heaters.

HVAC Systems

- Use temperature setbacks appropriate to the season. A 1-degree change in thermostat setting can save 4 percent to 5 percent on energy costs.
- Use programmable thermostats to reduce energy consumption for non-business hours.
- Use ceiling fans to economically improve comfort.
- Keep ventilation diffusers and air intakes free from obstructions.
- Seal leaky ductwork.
- Install solar blinds to reduce excess solar heat gain.
- Ensure adequate insulation is installed in walls and ceilings.
- Update old doors and windows with more efficient models. 3 Replace cracked door seals, and deteriorated or missing weather- stripping and window caulking.
- Install adjustable-flow vent hoods where appropriate.
- Replace constant-flow makeup air systems with controllable-flow technology.
- Replace aging or inefficient HVAC equipment with a high-efficiency system.

Cooking Equipment

- Stagger preheat times for equipment to more closely match demand.
- Monitor plug loads, and turn equipment on only when needed.
- Shift nonessential tasks to slow periods to minimize peak electrical demand.
- Replace older, inefficient equipment with more efficient models. 3 When possible, do baking during off-peak times to reduce peak energy demand.
- Make ice during mornings or evenings, rather than afternoons when energy premiums are in effect.
- Use covers on fryers to minimize heat loss.

Efficiency of Common Light Sources*

| Light Source | Efficiency (lumens per watt**) | Average Lamp Life (hours) |
|---------------------|-----------------------------------|------------------------------|
| Stand. Incandescent | 5-20 | 750 - 1,000 |
| Halogen | 15-25 | 2,000 - 4,000 |
| Compact Fluorescent | 20-55 | 10,000 |
| Tubular Fluorescent | 60-100 | 15,000 - 24,000 |

| | | |
|----------------------|--------|-----------------|
| Mercury Vapor | 25-50 | Up to 24,000 |
| Metal Halide | 45-100 | 10,000 - 20,000 |
| High-pressure Sodium | 45-110 | Up to 24,000 |

***Source: Arizona Public Service**

****The higher the number, the more efficient the light source**

Maintenance Measures

Many operators don't realize that routine cleaning and maintenance can go a long way toward maintaining energy efficiency. Routine cleaning of condenser coils on refrigerators, freezers, coolers and air conditioning units can make a marked improvement in their performance.

The addition of polar refrigerant oil additives (PROA) can improve system performance by clearing refrigerant lines and lubricating seals and other components. Also check that door closures and seals on refrigeration equipment are in good repair, and replace if necessary.

Clean or replace air filters for refrigerators, coolers and air conditioning systems on a regular (monthly or bimonthly) basis, and keep all louvers and vents clear of any obstructions that can impede airflow. Restricted airflow means the compressor must work harder, using more electricity, and causing more wear. Verify that the refrigerant loop is properly charged, and repair any leaks immediately.

Furnaces, boilers, water heaters and air conditioners should all receive periodic maintenance to maintain high efficiency.

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