Energy Efficiency in Restaurants: A Best Practices Guide

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Background

The average profit margin for restaurants is between three and six percent. Since profit margins are small, minimizing operating costs can be the difference between profit and loss. Although fixed expenses like labor, rent, and food represent the biggest operating expenses, restaurant owners can save on utility costs to improve profitability.

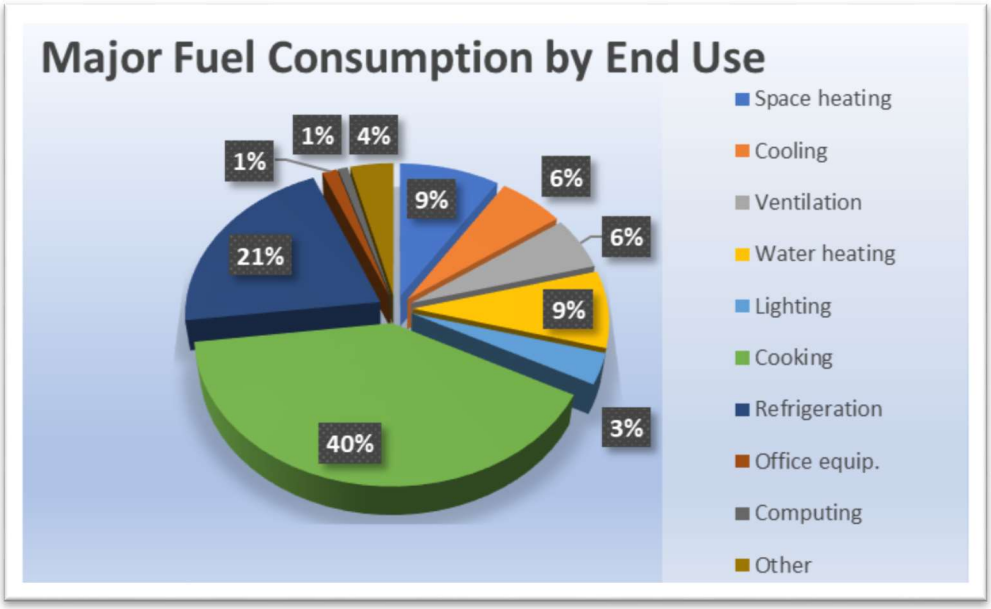
Efficiency Smart has prepared this guide to highlight typical energy-saving opportunities for restaurants and to help restaurant owners plan for future energy efficient upgrades.

Energy Use in Restaurants

The Department of Energy regularly collects energy use data for multiple business sectors and compiles a report every few years. Known as CBECs data, this information is used to compare and evaluate individual buildings against national averages.[1]

Efficiency Smart uses CBECS data to create a profile of energy use for an average restaurant. Total average energy use is broken out into end-use categories reported as annual Kilo British Thermal Units (kBTUs) per square feet as follows:

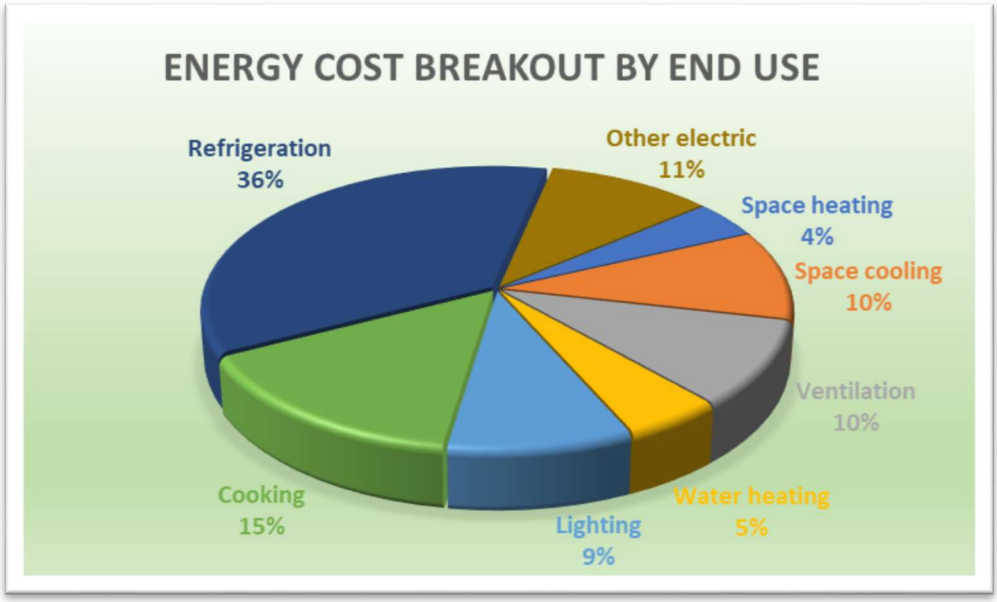
- Space heating 27.2 kBTUs
- Cooling 18 kBTUs
- Ventilation 17.2 kBTUs
- Water heating 25.3 kBTUs
- Lighting 10.2 kBTUs
- Cooking 120.9 kBTUs
- Refrigeration 62.4 kBTUs
- Office equipment 4.1 kBTUs
- Computing 2.7 kBTUs
- Other 11.7 kBTUs



As seen in the chart above, cooking represents the highest energy use with 40 percent of the total energy consumed.

[1] CBECS stands for "Commercial Buildings Energy Consumption Survey," and is compiled by the U.S. Department of Energy. CBECS is a national sample survey that collects information on the stock of U.S. commercial buildings, their energy-related building characteristics, and their energy consumption and expenditures.

It may appear that cooking represents the largest cost saving opportunity since it's the top consumer of energy. However, the results displayed on this chart can be deceiving. Energy use is shown in kBTUs, so there is no distinction regarding the source of the BTUs or the cost. Since natural gas—the fuel source for cooking and heating—is a low-cost source of BTUs, cooking is not the costliest energy expense for restaurants.



As the chart above shows, refrigeration represents the largest energy expense for restaurants.

Applying dollar amounts to these percentages, a typical 5,000-square-foot casual dining restaurant would incur the following annual energy costs (total average annual energy cost $28,031):

- Refrigeration $10,056
- Cooking $4,218
- Space Cooling $2,901
- Ventilation $2,772
- Lighting $2,527
- Water heating $1,372
- Space Heating $1,190
- Computers, office equipment, and other electric uses $2,949

Opportunities for Energy Savings in Refrigeration Systems

Refrigeration in restaurants typically consists of a walk-in cooler and/or freezer, reach-in commercial refrigerators and freezers, small reach-in coolers, ice machines for beverage service, and food prep tables with refrigerated well storage. Each of these presents an opportunity for energy savings.

Walk-in Coolers

Walk-in coolers are used for longer-term storage, typically for frozen food products. These consist of two components:

- An insulated box that houses the food product and the evaporator
- An exterior or roof mounted condensing unit

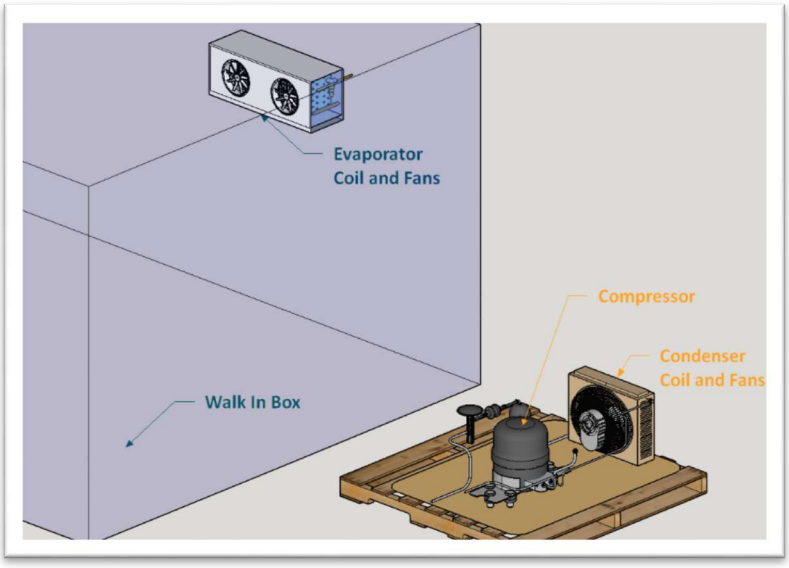
These components work as a system to pull heat out of the walk-in box through a heat exchanger coil located in the evaporator. They then reject the heat to the outside through the condenser unit.

Walk-in cooler showing exterior of the insulated box

The evaporator, located in the back of the inside of the box, includes a fan, a heat exchanger (the coil with refrigerant) and a metering device (the expansion valve). Together, these components work to remove heat from inside the box. Each component has a distinct purpose:

- The heat exchanger has the refrigerant running through it to absorb heat inside the box
- The fan promotes heat transfer from the box to the refrigerant by moving air across the coils
- The refrigerant absorbs the heat from box and then flows out to the condenser unit
- The expansion valve modulates the amount of refrigerant flowing through the coils to maintain the desired inside temperature

Walk-in cooler refrigeration cycle components



Walk-in cooler showing evaporator unit inside

Evaporator unit fans

The evaporator unit fans can be upgraded with high-efficiency fan motors that run 24/7. This would result in annual energy savings of $60 - $175 per motor (based on motor size), with an estimated installed cost of approximately $130-$175 per motor. The simple payback[2] for this upgrade is 0.5 to 2.1 years.

Fan speed controllers

Fan speed controllers can be added to existing evaporators which would result in up to 80 percent energy savings. These fans typically cost $500 - $600 per year to operate at full speed. These controllers may operate as high/low, which would result in 50 to 60 percent in energy savings. In combination with installing electronically commutated motors (ECM), these controls reduce fan energy by nearly 80 percent. Fan speed controllers typically cost less than $250, resulting in a simple payback of less than a year.

Smart defrost

Smart defrost control can also be added to existing evaporator units. Walk-in boxes and evaporator coils build up ice over time and defrosting helps to remove it[3]. Typically based on a timer setting, the refrigerant will stop flowing to allow the box to warm up enough to melt the ice build-up. Defrosting can occur as often as four times daily for half an hour. This process, while necessary, often wastes energy as the box is cyclically heating up and then cooled back down. This increases the daily energy use by as much as 30 percent.

Smart defrost substitutes the timer function with sensors. This limits the defrost cycle to only when necessary, typically resulting in a 40 percent reduction in defrost mode. Energy savings can be $100 annually with an estimated installed cost of $500. The simple payback for this is 5 years.

[2] Simple payback is calculated as the implementation cost divided by the annual cost savings and expressed in years.

[3] In some evaporators, there is an electric resistance coil at the heat exchanger to prevent ice build-up.

Walk-in cooler defrost cycles: timed vs. adaptive/smart defrost

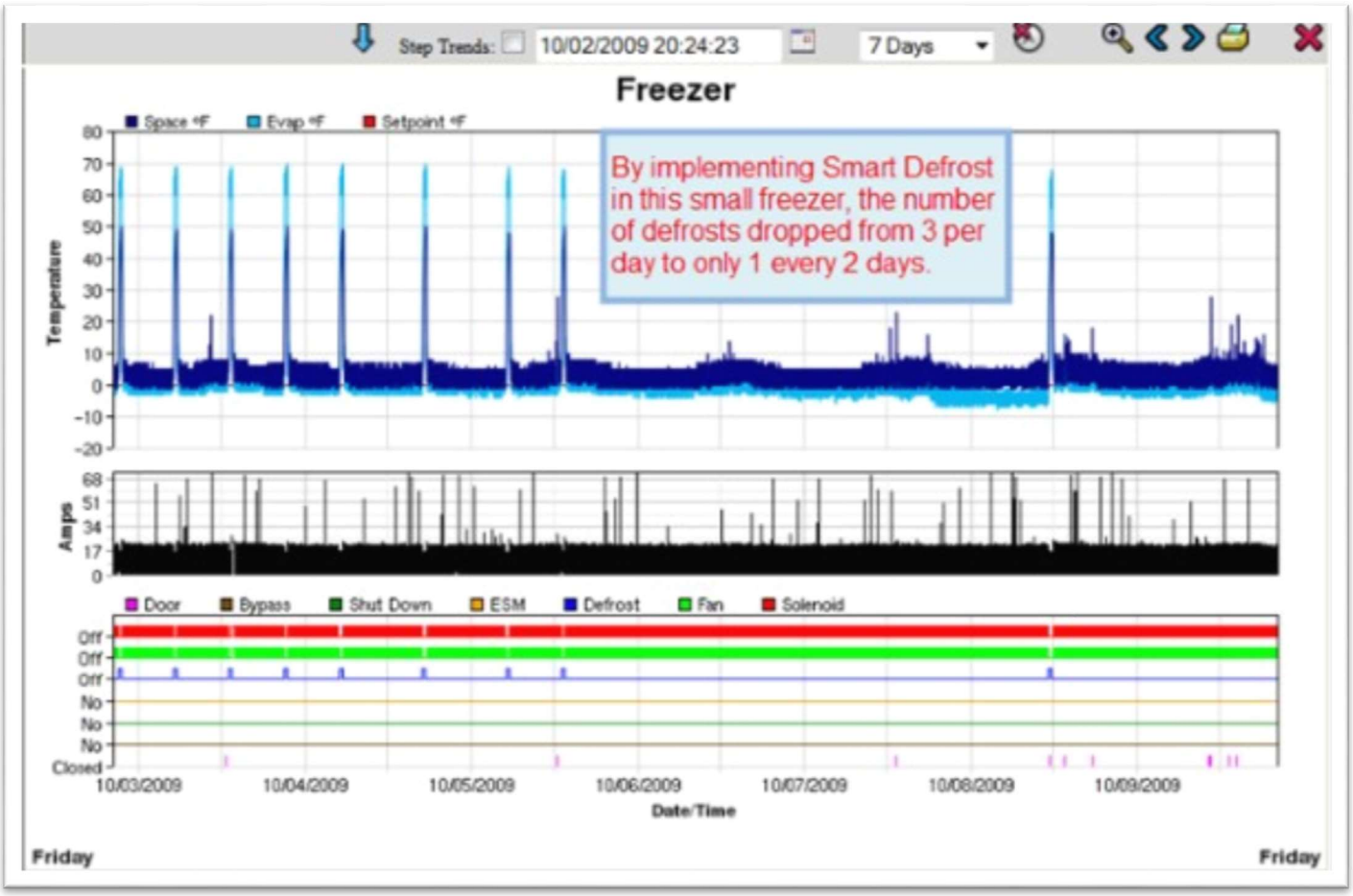


Fig 1. McCormick, Dan. smart_defrost. October 19, 2017. Walk-in Cooler/Freezer Electric Defrost 101: Efficiency [Part 3]. https://www.nrminc.com/blog/walk-in-coolerfreezer-electric-defrost-101-efficiency-part-3/.

High Efficiency Evaporator or HEEVaps

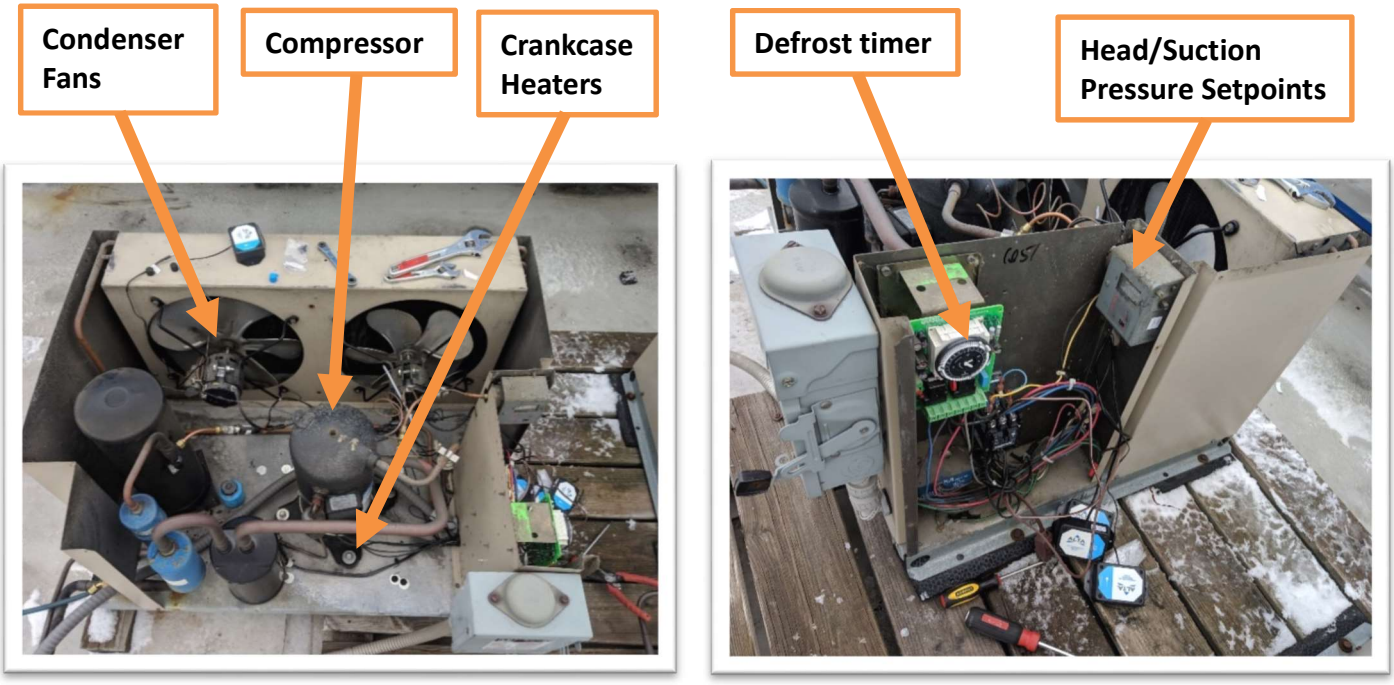
It may make sense to replace the entire evaporator with a high-efficiency version (sometimes called HEEVaps) when components have reached the end of their useful life.

HHEVaps include a controls package and ECM fans, fan motor controls, an electronic expansion valve (EEV), and smart defrost. This new evaporator and controls package results in more consistent box temperatures, reduced maintenance costs, increased energy efficiency, and remote monitoring capability. This product is fairly new, so the costs and savings may vary per project. It would be a fair assumption that the simple payback is two years or less.

Condensing unit

Outside the walk-in box is the condensing unit. The condensing unit is the high side assembly of the refrigeration system. It includes the compressor, condenser, fan motor, controls, and a mounting plate. It serves as a heat exchanger to cool down and condense the incoming refrigerant vapor from the evaporator into liquid. It uses a fan for blowing outside air through the heat exchanger section to reject the heat that was collected in the box.

Rooftop condenser unit components



Replacing individual components inside the existing compressor unit provides an opportunity for energy savings. High efficiency options include:

- Floating head pressure controls (approximately $100 annual electric savings)
- Variable speed condenser fans (approximately $40 annual electric savings)
- Economizer controls (approximately $430 annual electric savings)

Another option is to replace the entire compressor unit with a high-efficiency condensing unit (HECUs). In addition to all the high-efficiency components and controls listed above, these units include integrated controls. HECUs are precisely sized based on these upgrades to perfectly match the new cooling load. This results in the following benefits:

- Increased energy efficiency
- Maintenance savings
- Better equipment reliability

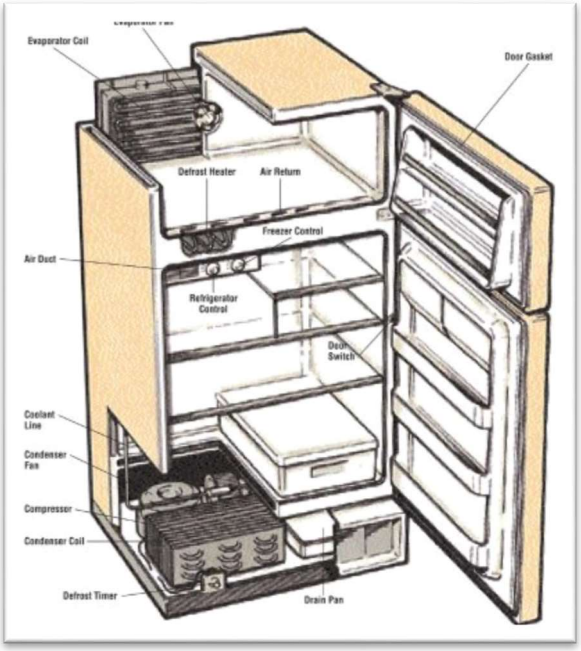
For a typical restaurant-sized 10’ X 10’ walk-in freezer, replacing the existing evaporator unit with a HECU would result in an estimated annual savings of $750. The cost of these units is $2,850 - $3,300. Simple payback ranges from 3.8 to 4.4 years.

Self-contained Equipment

Reach-in commercial refrigeration is the most common refrigerated food storage and is in virtually every food service establishment. Reach-in refrigerators and freezers are available with glass doors or solid doors. Each door type affords a unique set of advantages. Glass door units provide the added ability to merchandise products while the solid doors completely conceal them. Refrigerated prep tables are the perfect option for assembling sandwiches, salads, burritos, pizzas, and more. These products have a refrigerated well storage of prepped ingredients, keeping them cold and fresh.

All these refrigerated units fall into the category of “self-contained” equipment because the condenser section is attached to the unit itself (usually tucked away in the lower back of the unit).

Reach-in cooler/refrigerator with condenser located on the bottom of unit



The refrigeration components compete for useable freezer space and, therefore, are compact with very few user-serviceable parts. But new equipment is much more energy efficient than older equipment. On average, ENERGY STAR® certified[4] commercial refrigerators and freezers are 20 percent more energy efficient than older models. These models are designed with components such as ECM evaporator and condenser fan motors, hot gas anti-sweat heaters, or high-efficiency compressors, which will significantly reduce energy consumption and utility bills.

Energy savings figures[5] for the following ENERGY STAR certified commercial products:

- Solid door refrigerators can save more than $30 annually
- Glass door refrigerators can save nearly $45 annually
- Solid door freezers can save more than $55 annually
- Glass door freezers can save more than $100 annually

Hydrocarbon refrigerants

New self-contained refrigerated units that use natural hydrocarbon refrigerants are even more energy efficient than ENERGY STAR certified units. These can be up to be 50 percent more energy efficient than traditional CFC refrigerants. Over 85 percent of self-contained units are available with natural hydrocarbon refrigerants as an optional upgrade.

[4] ENERGY STAR is a symbol for energy efficient products and is a trusted entity that is supported by the U.S. Government. Energy Star Certified products are determined by the standards set by the Environmental Protection Agency (EPA) or the Department of Energy (DOE).

[5] https://www.energystar.gov/products/commercial_food_service_equipment/commercial_refrigerators_freezers

Natural hydrocarbon refrigerants provide more efficient cooling due to their high latent heat of evaporation. Hydrocarbons such as ethane, propane, or butane are great natural refrigerants and are one of the most eco-friendly and cost-effective options to cool and freeze.

Maintenance

One of the easiest and most cost-effective ways to reduce the cost of refrigeration is to maintain the equipment properly. Efficiency Smart recommends servicing the refrigeration equipment (compressors and controls) to not only extend the remaining useful life but also to maximize energy efficiency. This service and tune-up should include the existing compressors for both the walk-in units and the self-contained units.

Professional refrigeration contractors typically perform tune-ups upon request as part of routine service and are best qualified to do this work. However, restaurant owners or their staff may be able to complete some tasks.

User tasks:

1. Check temperature and defrost frequency settings. If the temperature is set too high, your food will spoil. If the temperature is set lower than necessary, the unit will work too hard and can shorten the life of your system. Do not defrost more often than needed.
2. Clear space around the equipment. Air flow blocked by debris or stacks of items can put a strain on the unit, causing it to run inefficiently and even overheat. Reduced air flow can also increase power consumption.
3. Be vigilant about turning off the lights in walk-in coolers and freezers. Lights can generate heat that forces your equipment to work harder and use more energy to keep it cool. A best practice is to use LEDs inside coolers and freezers.
4. Clean the inside of all units. Remember not to use steel wool, bleach or caustic chemicals, which can damage the finish. Be sure to consult the owner's manual and follow the manufacturer's instructions.
5. Check for cold air leaks. When hinges, latches, strikes, gaskets or seals are in poor condition, the door of your units may not be airtight. Test the door gasket by closing a dollar bill in the door. There should feel some resistance when pulling on the dollar bill. The door is not sealing properly if the dollar bill is easily removed. If so, call a professional for advice and repair.

Professional refrigeration service tasks:

1. Inspect and clean each unit's condensing and evaporator coils. A buildup of dirt and grime impedes the flow of heat through the coils, which causes the unit to lose efficiency. This should be done with a commercial condenser coil cleaner.
2. Check compressor and fan motor operation. If the compressor fails, then a new unit is likely required. If it's working too hard, a technician can find the cause and fix it before the unit fails.
3. Inspect all parts for wear. A commercial refrigeration service expert can spot degrading parts and replace them before it causes the entire unit to fail.
4. Clean fan blades. Dirt and grease on the fan blades cause drag that slows down the motor.
5. Clean gaskets, lubricate hinges, and repair any air leaks. Gaskets need to be clean to form a tight seal, and hinges should be regularly lubricated to keep doors closing properly. Cracks or holes in the exterior walls will also cause the unit to lose cool air and work harder. If parts need to be replaced, your refrigeration professional can install more efficient versions, such as automatic spring hinges.
6. Check refrigerant levels. If your equipment is leaking refrigerant, it's an EPA violation as well as a repair issue. Your technician will determine where the leak is and repair it before recharging the refrigerant.
7. Check electrical connections. Loose wires can often cause unexpected equipment failures.
8. Calibrate thermometers. Regularly test and calibrate thermometers to ensure equipment complies with health regulations.

The above services and tune-ups could result in electrical cost reduction of 5 to 10 percent, or $500-$1,000 annually. Most of these steps should be part of a preventative maintenance service contract. Keep in mind that attempting to do repairs yourself could void your equipment warranty.

Below is a link to a video that describes these tasks in greater detail:
https://powerhousedynamics.com/resources/webinars/restaurant-refrigeration-tune-webinar/

Opportunities for Energy Savings in Cooking

The cooking process is an essential function of the restaurant business. Cooking is primarily accomplished with natural gas (where available) due to its stable and controllable nature, and its low cost compared to electric and delivered fuels. Most restaurants have natural gas available for cooking and heating, but electric ovens, griddles, and fryers are also used in commercial restaurants.

In a typical 5,000-square-foot casual dining restaurant with natural gas, cooking results in 15 percent of the total energy costs or $4,218 annually. BTUs are delivered to the food through the conversion of the fuel (natural gas) by burning to generate heat. The heat then cooks the food. From a thermodynamic standpoint, there is simply no way to cook food with less heat. However, cooking equipment can be more energy efficient with the addition of insulation, gasketing and seals, sophisticated temperature controls, and other minor improvements to the cooking appliance.

The ability for an appliance to heat up quickly allows the user to begin cooking right away. It also allows the appliance to “idle” at a lower temperature than it otherwise could. For example, a standard commercial steam cooker uses 1,200 watts of energy in the idle mode, whereas the most energy-efficient model uses just 259 watts. Over the course of a year, the most energy-efficient steam cooker saves $260 compared to the standard version.[6]

The best way to save energy using existing kitchen equipment is to use kitchen appliances more effectively. For example, implementing an equipment start-up and shut-down schedule and turning appliances off when not in use. For multiple-compartment steamers, unused compartments can be turned off during slow periods as most steamers can be preheated within 20 minutes. The secondary compartments can be turned off without significantly impacting food service operations.

New Appliances

When purchasing new kitchen appliances, choose ENERGY STAR certified commercial kitchen equipment to save energy without sacrificing features, quality, or style. ENERGY STAR certified equipment uses less energy and water than conventional commercial food service models.[7]

[6] Source: https://www.energy.gov/eere/femp/purchasing-energy-efficient-commercial-steam-cookers

[7] Source: https://www.energystar.gov/products/commercial_food_service_equipment

Convection ovens

ENERGY STAR certified convection ovens are approximately 20 percent more energy efficient than standard models. ENERGY STAR certified combination ovens are about 30 percent more energy efficient, and ENERGY STAR certified ovens use up to 20 percent less energy than standard ovens.

Fryers

Fryers are also common in restaurants. High-efficiency, ENERGY STAR certified fryers use up to 35 percent less energy and have shorter cook times and higher production yields. This results in better food appearance and quality.

Griddles

ENERGY STAR certified griddles are 10 percent more efficient than standard models and deliver uniform temperatures for more consistent food. Some of these models allow the user to pre-select the griddle surface temperature. This matches the heat with the cooking requirement, saving energy.

Steam cookers

Steam cookers are used for batch-cooking large amounts of food. Although generating steam is energy intensive, an ENERGY STAR certified steam cooker uses significantly less energy. These cookers are up to 50 percent more efficient and use 90 percent less water.

Hot food holding cabinets

Hot food holding cabinets are another piece of equipment worth upgrading. ENERGY STAR certified models use 70 percent less energy, lose less heat, and prevent food from overheating by maintaining more consistent temperatures.

Cumulative kitchen appliances savings potential

Total energy savings can be significant when all cooking equipment is ENERGY STAR certified. It can be tempting to purchase standard or used kitchen equipment, but the initial purchase price is only part of the total cost of ownership.

Purchasing all new ENERGY STAR certified equipment for a restaurant kitchen using natural gas would result in $1,137 in annual savings compared to standard equipment, and $1,669 in annual electric savings for an all-electric kitchen. The table below details the saving potential by fuel source and equipment type.

		Equipment					
		Standard Fryers	Large Vat Fryers	Hot Food Holding Cabinet	Convection Ovens	Combination Ovens	Steam Cookers
Fuel	Electric	$150	$225	$375	$82	$912	$150
	Gas	$400	$475	$175	$100	$312	$150

Opportunities for Energy Savings in Space Cooling

Most casual dining restaurants have air conditioning in the dining areas to provide cooling and space comfort. In a freestanding building, air conditioning is typically provided by a rooftop air conditioning unit (RTU) that also has the capability of providing space heating from a furnace section. For space cooling, the RTU employs the refrigeration cycle to create cool air which is then blown into the interior space from a fan. The warm air is pulled out of the space and into this RTU from a return air duct. The RTU can either cool this return air or exhaust it. The RTU also can use outside air for space cooling when the outside air is cold enough—this is known as “free cooling” or an economizer.

Rooftop air conditioning unit

The cooling section of the RTU consists of a cooling coil, refrigerant, condensing unit, and the fan that blows outside or return air across the coil to cool the air. These components are generally not replaceable with anything but the exact same replacement part. Therefore, upgrading an existing unit isn’t an option. However, proper maintenance is essential for keeping the existing RTU running as designed and at its most efficient. Timely replacement and cleaning of air filters can improve air flow by 10-15 percent and result in reduced fan energy use. Ensuring that the economizer controls and dampers are working properly will also result in energy savings as mechanical cooling can be bypassed to use outside air.[8]

RTUs have an expected useful life of 20 years and must eventually be replaced. RTUs are typically available as standard-efficiency and high-efficiency versions. The standard-efficiency version barely meets current building codes for energy efficiency but is still approximately 15 to 20 percent more efficient than a 20-year old unit. A high-efficiency version is typically 5-10 percent more efficient than code requirements. This high-efficiency version RTU results in approximately $1,000 in annual savings compared to the standard-efficiency version for a typical 5,000-square-foot restaurant.

[8] Recent studies conducted by the HVAC industry indicate that economizers were working as designed in only in 30 percent of the RTUs examined.

Opportunities for Energy Savings in Ventilation

Ventilation is the process of exchanging or replacing air in any space to provide high indoor air quality. This involves temperature control, oxygen replenishment, and removal of moisture, odors, smoke, heat, dust, airborne bacteria, carbon dioxide, and other gases. In a restaurant, fresh air is brought into the space through the RTU and is exhausted through both the RTU and the kitchen exhaust.

Kitchen exhaust hood

Kitchen exhaust is typically a hood located over the cooking surface (stove and fryers) and is connected with ductwork to an exhaust fan located on the roof. Kitchen air is pulled by the fan up and out of the space along with grease, smells, and other pollutants.

The removed air needs to be replaced—sometimes called makeup air. There are specific makeup air units (similar to the RTU) that pull in fresh tempered air from outside the building to replace existing air that cannot be recirculated and is exhausted. In some cases, the space cooling and heating RTU also serves as the makeup air unit with the fan running continuously and outside air dampers locked in the open position (ideally only during occupied hours) to bring in fresh outside air. Additionally, any air that is brought in from outside needs to be conditioned (cooled, heated, dehumidified, etc.). This requires additional energy inputs. The need for ventilation naturally results in an increase in fan energy and cooling/heating energy.

The exhaust hood doesn't have to run continuously or at full speed all the time. The amount of air that is exhausted is generally proportional to the amount of cooking that is being done at any given time. The exhaust hood itself is sized to exhaust the required amount of air if every burner on the stove, fryer, etc. is being used simultaneously. However, this is rarely the case. Typically, the kitchen is in heavy cooking mode only 55 percent of the time, while the other 45 percent of the time is spent on food prep and light cooking.

This presents an opportunity to reduce the amount of air being exhausted 45 percent of the time. Controls can be added to the kitchen exhaust hood that allows the fan speed to be adjusted based on actual exhaust air needs. As the graphic below illustrates, without these controls (the red line) the make-up air unit and the exhaust hood ran at full speed from 8:00 a.m. to 6:00 p.m. After the controls (the blue line) were installed, the fans followed the cooking load, resulting in reduced fan energy and heating and cooling loads.

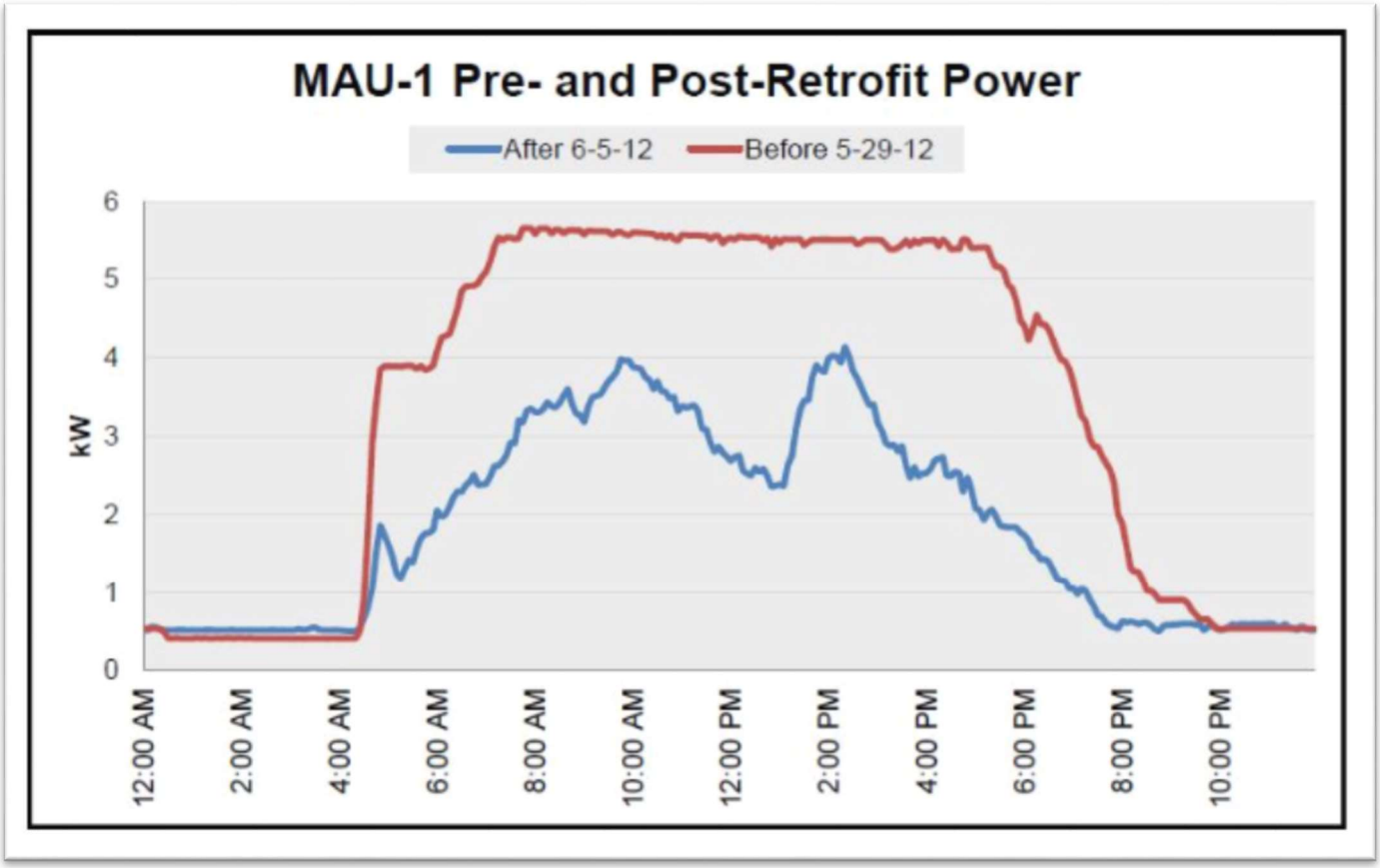


Fig 2. Allison Sternad, MILITARY BASE RETROFIT CASE STUDY, accessed June 15, 2020, https://melinkcorp.com/blog/intelli-hood-military-base-retrofit-case-study-2.

Potential energy savings depend on individual kitchen cooking patterns and hood sizes. The cost of these hood controls is about $7,000 - $15,000, and typically results in a simple payback of 5 to 10 years.

Opportunities for Energy Savings in Lighting

Restaurants have a wide variety of lighting types, which are usually a combination of general service lighting in kitchens and decorative/ ambiance lighting in the serving and dining areas. Typically, there are overhead fluorescent 2'X4' or 4' or 8' strip lighting in kitchens, and sconces, wall washing fixtures, and track lighting in the dining areas. Upgrading to LED versions can result in 30 to 50 percent in energy savings.

There are currently five choices available to replace standard 4' fluorescent lighting, which is the standard lighting source in commercial kitchens. Each has its advantages and disadvantages. Maintenance costs also plays an important factor as labor is a principle driver of the overall investment. The options are:

1. Direct fit or "plug and play," which use existing electronic ballast as the driver
2. Direct wire that bypass the ballast and run off full line voltage
3. LED Retrofit kits, which replace both the ballast and the lamps (and sometimes the lamp holders as well)
4. Hybrid linear LEDs, which start as a direct fit but can later be used as a direct wire when the ballast fails
5. Replacing the entire fixture with a new LED luminaire as the price is now more competitive with TLEDs and retrofit kits

Linear LED lamps (TLEDs), LED fixtures, and LED Retrofit kits can vary significantly in quality, fixture/lamp life, and cost. The industry is still relatively new with manufacturers entering and exiting the market frequently. In order to help sort through these products, the Department of Energy established the Design Lights Consortium (DLC) as an independent, industry-based organization to self-regulate the LED lighting industry. DLC qualified products meet a high standard and are independently tested for quality.

There are also direct replacement LED bulbs for most screw-in and plug-in incandescent lamps and CFLs. Screw-in LED lamps use 70 to 80 percent less energy than incandescent lamps. Some experimentation may be required to find the right LED replacement for specialty lamps and fixtures, as there is such a wide range of LED products with variations in color and quality.

Opportunities for Energy Savings in Water Heating

Commercial kitchen equipment can use a lot of water and have a significant operating cost. Water efficiency for commercial kitchen equipment is especially important because high-volume applications typically use mostly hot water. Ensuring that commercial kitchen equipment uses water efficiently affords both significant water and energy savings.

In a typical restaurant, kitchen water heating accounts for $1,321 in energy costs annually.

Commercial kitchen equipment that uses hot water includes:

- Dishwashers
- Steam cookers
- Pre-rinse spray valves
- Food disposals

Cost savings can be realized in two ways: upgrading to more efficient equipment or maintaining and operating the existing equipment as efficiently as possible.

Commercial Dishwashers

Retrofit and replacement options

- Install dishwashers with rack sensors to allow water flow only when dishes are present
- Check volume of service to size the dishwasher appropriately, considering the energy tradeoff associated with increased tank heat that may be required for larger machines
- Purchase high-efficiency commercial dishwashers that are ENERGY STAR certified

Operations and maintenance

- Repair or replace any broken components and repair any leaking connections
- Encourage operators to run the dishwashers only when they are at full capacity and to hand scrape food before loading dishes
- Operate dishwashers at the minimum flow rate and set the rinse cycle to the minimum time per the manufacturer's specifications
- Observe final rinse pressure to ensure it is within manufacture recommendations, typically 20 ± 5 psi (If the pressure is too low, the dishes may not be rinsed and sanitized properly. If it is too high, they will require more than their rated amount of water.)

Commercial Steam Cookers

Retrofit and replacement options

- Purchase ENERGY STAR certified high-efficiency steam cookers or purchase boiler-less (connectionless) commercial steam cookers
- Specifically look for steamers with improved insulation, standby mode, and closed-system design to ensure steamers are used most efficiently
- Select a steamer based on projected use (e.g., balance production demand with steamer production capacity)

Operations and maintenance

- Use batch production instead of staged loading of food pans (continuously opening the door to load and unload food pans) and fill the steamer to capacity if possible, to use less energy and waste less water
- Repair or replace any broken components and repair any leaks
- Remove any deposits that may have developed in the boiler
- Ensure that the steamer is turned to stand-by mode after each use and that it is turned off during long periods of inactivity
- Periodically check for leaks and condition of components for repair or replacement

Pre-Rinse Spray Valves

Retrofit and replacement options

- Replace inefficient models with Water Sense-qualified high efficiency pre-rinse spray valves that are specified to have a flow rate of 1.28 gallons per minute (gpm) or less

Operations and maintenance

- Repair leaks and repair or replace broken or loose parts
- Ensure the hose height is adequate for the user so they don't use alternate faucets that may use more water
- Train users to pre-soak heavily soiled dishes and to manually scrape as much food as possible prior to using the pre-rinse spray valve

Food Disposals

Retrofit and replacement options

- Install a timer that will stop the flow of water after a designated time
- Install a load sensing device that adjusts the flow to a minimum flow rate of 1 gpm when there is no food present in the disposal
- Purchase or replace systems with load sensing disposals that regulate the flow rate based on the presence of food
- Use a food pulper, which grind food waste into a slurry that is disposed as solid waste or is composted, as an alternative to a food disposal (pulper systems often are equipped with a recirculating system that reuses the water to significantly reduce water use)

Operations and maintenance

- Train users to put large food scraps into a composting receptacle or the garbage rather than running them through the disposal
- When possible, shut off the water flow when the disposal isn't in use
- Train users not to pour grease down the disposal because it will clog the system piping over time

- Use a food straining system, which uses virtually no water

Outfitting an entire kitchen with a suite of ENERGY STAR certified CFS equipment could save operators about $5,000 annually (including cooking fuel and water costs).

Opportunities for Energy Savings in Space Heating

Space heating savings are typically limited when natural gas is the heat source. High-efficiency gas furnaces and boilers are available but are not typically used for restaurant applications. If heating is provided by electricity—either electric resistance heat or via heat pumps—upgrading to high-efficiency heat pumps would result in some energy savings. Regardless of the source of the heat, limiting the amount of cold air infiltration into the building reduces the overall heat load in the building and results in energy savings. Infiltration occurs mainly in winter when the air outside is colder and heavier than the air inside. This depends on wind velocity, wind direction, and how air tight the building envelope is.

Reducing infiltration is generally accomplished by sealing cracks and holes in the building envelope. Even more important is making sure that doors and windows close completely and are left open as little as possible during the heating season. This includes altering the deliver process to off-load delivery trucks at the back door before moving the product(s) into the building as quickly as possible. The heat loss through an open door when the outside temperature is 34 degrees Fahrenheit is about 2,155,507 BTUs per hour, or $15 in natural gas lost for every hour the door is open. Over the course of an entire heating season, that could be as much as $950.[9]

Opportunities for Energy Savings in Computer, Office Equipment and Other Appliances

Other electric appliances account for approximately 11 percent of the total energy cost for a typical restaurant. These appliances include the computer and point-of-sale system, office equipment, the store front and neon lighting, cable TV, music systems, and even the irrigation watering system.

Electronics, lighting, and other devices that run for extended hours should be turned off when not in use, including outside of ‘open’ hours. These devices can be put on electronic or mechanical timers to automatically turn lights, appliances, irrigation systems, and motion sensors on and off, saving energy and water.

These timers can be simple time-of-day devices (as shown below) or electronically connected to the building lighting controls or automation system and programmed to turn off and on based on preset operating schedules.

[9] Some of this heat loss is reflected as cooking heat usage in our end-use breakdown as the location of delivery doors is typically in the kitchen area where cooking also provides much of the space heat. So, we are not suggesting that the space heating load can be reduced by 40 percent simply by keeping one delivery door closed. But that the total natural gas usage can be reduced by $15 for every hour that the door is closed when it otherwise would be open.

Time-of-day timer

For a typical casual dining restaurant, these “other” electric uses account for $8 per day in energy cost. If these devices were left on regularly overnight and on holidays, the added energy cost could be as much as $2,400 annually.

Conclusion and Next Steps

Any of these recommendations can be implemented in stages or as funding is available. Efficiency Smart’s rebates are based on annual kilowatt-hours (kWh) savings realized. Efficiency Smart can review projects before you make any purchases to ensure you are purchasing qualified products.

Efficiency Smart is here to help your business reduce its electric costs. Please do not hesitate to contact us with questions.

Appendix

The Role of 4Ts

Efficiency Smart recommends following the 4Ts to save energy: turn off, turn down, tune up, or tear out.

Turning off

Simply turning off a device will result in the biggest energy savings. Building managers and occupants should be diligent about turning things off when not in use. Time clocks, photo cells, occupancy sensors, and day-lighting sensors can be installed inexpensively and often results in significant savings.

Turning down

Lowering thermostats during unoccupied hours, reducing set-points on hot water heaters and boilers, and using dimming ballasts to reduce light levels as appropriate will save energy.

Tuning up

Ensuring that proper maintenance of mechanical and electric equipment is done regularly can also yield significant energy savings. For example, a clogged cooling coil, can reduce cooling output and increase energy consumption by 25 percent or more. Similarly, a routine boiler tune up can increase efficiency by as much as 10 percent.

Tearing out

In most cases this is the last resort option and significant savings must be anticipated before replacement is considered. Efficiency Smart takes into consideration the simple payback from the energy savings for any retrofit project as part of our energy savings analysis service.