

ENERGY-EFFICIENT COMMERCIAL COOKING

Cooking appliances account for about 12 percent of the electricity bill in a typical restaurant.¹ The table below provides an estimate of cooking electricity costs for sit-down and fast-food restaurants. Even if food preparation is a relatively small part of the activity at your facility, energy-efficient cooking appliances can reduce energy costs. Fortunately, there are also ways to save without making substantial capital investments. As a general rule, commercial cooking operations can be grouped into the major categories of ovens, stovetops, fryers and broilers. This fact sheet focuses on energy efficiency opportunities in these major groups of appliances.

Annual Cooking Electricity Cost

| Facility Type | Annual Cost Per Square Foot |
|-------------------------|-----------------------------|
| Sit-down Restaurant | \$0.47 |
| Fast-service Restaurant | \$0.82 |

Electric cooking has several advantages for commercial users in addition to energy efficiency including:

- Ease of cleaning resulting in lower labor costs
- Less heat resulting in lower air conditioning bills
- Enhanced employee comfort and satisfaction potentially leading to less turnover
- Improved heat controls with superior low heat control
- The safety of electricity as an energy source
- Faster cooking with microwave, convection and flashbake ovens, and induction cook tops
- Stable energy costs with costs going down through 2003

Oven Related Energy Saving Opportunities

Opportunities of improving the energy efficiency of oven operations include:

Fill the oven – Whenever possible, try to schedule oven use so that it will be full.

Limit oven preheat times – Preheat ovens no longer than the manufacture’s recommendation – usually 10 to 15 minutes. Letting the oven preheat longer than needed increases energy cost. A high preheat setting will not heat the oven any faster but it may overheat the oven leading to wasted energy.

Maintain oven seals – Make sure the seals around oven doors are in good shape, and seal snugly with the face of the stove. Worn or loose-fitting seals allow heat from the oven to escape. Clean out debris at the stove bottom, especially in the front where the door seal meets the stove. The accumulated material can prevent the door from sealing well.

Efficiency of Ovens

| Cooking Method | Cooking Efficiency (%) | Energy Factor (%) |
|---|------------------------|-------------------|
| Microwave | 57.5 | 57.5 |
| Electric, standard | 12.1 | 10.9 |
| Electric, self cleaning | 13.9 | 10.2 |
| Electric, self cleaning, convection | 17.1 | 13.4 |
| Gas, pilot light | 5.9 | 3.5 |
| Gas, electric ignition | 6.1 | 5.8 |
| Gas, electric ignition, self cleaning | 7.1 | 5.8 |
| Gas, electric ignition, self cleaning, convection | 8.7 | 7.4 |

Notes: Cooking efficiency is the fraction of the energy supplied to the unit that heats food during a typical cooking cycle. Energy factor is the ratio of energy that is effectively used to heat food to the total energy used.

¹ APS study of electricity use in 14 different building types in the Phoenix area.

Use ceramic or glass pans – Using ceramic or glass pans will allow food to cook at an oven temperature 25°F lower than would be needed for metal pans.²

Choose an efficient oven – The efficiency of ovens varies widely with how they’re operated, but there are general comparisons that can be made. The following tables provide a comparison of the efficiency and relative operating cost of the different types.² You may find that the type of oven you’re using isn’t as economical as you thought.

Maximize use of microwave ovens – They are the most efficient, fastest and lowest cost. Use them where ever possible. They heat only the food and save significant energy compared to standard ovens. Microwave ovens operate even more efficiently if the inside is kept clean.

Convection ovens – Convection ovens use fans to circulate hot air around food as it cooks. The motion of the air increases the rate at which heat is transferred to the food. As a result, convection ovens cook more quickly and at lower temperatures to achieve the same result as conventional ovens. According to one manufacturer³, convection ovens cook in 10 percent less time at 25°F lower temperature. Convection ovens can also be loaded more fully than conventional ovens due to the increased circulation leading to additional productivity improvements. The U.S. Department of Energy estimates convection ovens are 23 percent⁴ more efficient than conventional ovens.

Flashbake® ovens – Flashbake® ovens use a combination of intense visible light from halogen bulbs and infrared energy to cook food. It produces the browning effect of conventional ovens but it cooks almost twice as fast. Unlike conventional ovens, it isn’t necessary to leave these ovens on during non cooking times to maintain oven temperature. They only operate when actual cooking is taking place – no preheating is needed. Because of these advantages, Flashbake® ovens are being used in commercial kitchens to increase productivity.

Stovetop Related Energy Saving Opportunities

Opportunities for improving the energy efficiency of stovetop operations include:

Use pressure cookers – For a given burner setting, pressure cookers cook at higher temperatures because the pressure they produce raises the boiling point. The higher temperature allows the cooking to be completed faster, reducing energy costs by about two thirds. Compared to a warped bottom pan, a pressure cooker may use only 25 percent of the energy.

Use flat-bottomed cookware on electric elements and closed-top cooktops – The contact between cookware and the cooktop or electric element is important for efficiency. Flat-bottomed cookware on an electric element will use only about two thirds of the energy as a warped piece of cookware.²

Use equipment that fits the burner – Pots and pans should be one inch larger in diameter than the burner they are resting on. Matching pots and pans to burners will save energy dollars since more of the burner’s heat will be absorbed by the cookware.

Use lids – Lids keep heat in cooking equipment. It is estimated that cooking with a lid increases efficiency by 8 – 14 percent.² Using lids can produce big savings for no additional investment.

Choose an efficient stovetop – The tables below provide efficiency and relative cost information for the most commonly available stovetops.² If you’re in the market for a new stovetop, take a minute to consider the energy impacts of your decision. You will pay for that energy for the life of the stove.

Relative Cost of Operation for Ovens

| Cooking Method | Relative Cost |
|-------------------------------------|---------------|
| Microwave | 1 |
| Electric, standard | 4.8 |
| Electric, self cleaning | 4.1 |
| Electric, self cleaning, convection | 3.4 |

Note: Costs are in terms of how much electricity an oven would use for a task relative to a microwave oven. For instance, if it costs \$0.10 to cook an item in a microwave, it would cost approximately \$0.48 in a standard electric oven.

Example Cookware Electricity Consumption

| Cookware | Electricity Use (watt hrs) to bring 1.5 Liters of Water to boil. |
|-----------------|--|
| Warped Bottom | 290 |
| Flat Bottom | 190 |
| Insulated Pan | 80 |
| Pressure Cooker | 60 |

² Source: *Technology Atlas Series, Volume V, Appliances*, E Source, 1996.

³ Source: The DACOR company

⁴ Source: *Technical Support Document: Energy Efficiency Standards for Consumer Products*, U.S. DOE, 1993.



Consider induction stovetops – Induction stovetops have many advantages over conventional stovetops including efficiency, controllability and safety. They heat the pan directly by creating a strong magnetic field, which in turn induces a current in any ferrous (magnetic) pan. The current causes the pan to heat and cook the food. The stovetop stays relatively cool and it is nearly impossible to start a fire by leaving the burner on. No special cookware is required – any magnetic pan will work, although there are pots and pans designed specifically for use with induction stovetops.

Relative Cost of Operation for Stovetops

| Stovetop Type | Relative Cost |
|-------------------------------------|---------------|
| Induction | 1 |
| Electric Resistance (standard coil) | 1.1 |

Note: Costs are in terms of how much it would cost to perform a cooking task relative to an induction stovetop.

Fryer Energy Saving Opportunities

Opportunities of improving the energy efficiency of fryers include:

Limit fryer preheat times – Preheat fryers no longer than the manufacture’s recommendation – usually 7 to 15 minutes. Letting a fryer preheat longer than needed increases energy costs. A high preheat setting will not heat the fryer any faster but it may overheat the fryer leading to wasted energy.

Remove sediment – Sediment should be filtered from the fryer periodically. When sediment accumulates, the energy efficiency of the fryer is reduced.

Clean the heating element -- Clean the heating element frequently. Accumulated debris on the element makes it more difficult to heat the fryer and drives up energy costs.

Check temperatures – Use a reliable thermometer to check the temperature of the fryer periodically. If the temperature is significantly different from the setting, fixing the thermostat could save you energy and improve the quality of the food.

Efficiency of Stovetops

| Stovetop Type | Efficiency (%) | Energy Factor (%) |
|-------------------------------------|----------------|-------------------|
| Induction | 81 | 81 |
| Electric Resistance (standard coil) | 74 | 74 |
| Gas, pilot light | 40 | 19 |
| Gas, electric ignition | 40 | 40 |

Broiler Energy Saving Opportunities

Opportunities of improving the energy efficiency of broilers include:

Minimize preheat time – Follow the equipment manufacturer’s recommendations for preheat times. Excessive preheat time only wastes energy.

Keep them full – Load broilers to capacity whenever possible to use all of the available surface area. If it’s not possible to fully load the broiler, heat only as many sections as needed.

Use infrared broilers – Use infrared broilers as they require no preheat time. Since they respond so quickly, it is possible to turn them off between loads.

Other Kitchen Energy Saving Ideas

Use low heat – Whether cooking on the stovetop or in the oven, using the lowest temperature setting possible can save energy. Lower heat also preserves nutrients, retards meat shrinkage, and preserves color.

Keep stovetops, ovens, fryers, broilers and griddles clean – If your stovetop has reflective pans below the burners, you’ll save by keeping them clean and shiny. The more reflective they are, the more heat will be directed to cookware. Tin foil can be used to provide a reflective surface also. If you have a stovetop with concealed burners, keeping the stovetop clean will help transfer heat to the cookware. The same is true of ovens, fryers, broilers and griddles – the more accumulated debris, the harder it is for the appliance to heat the food, and the more energy will be required to do the job.

Use the appropriate size of appliance for the task – In general, smaller appliances use less energy than their larger counterparts. For instance, if you can use a smaller oven for the task at hand, doing so will save energy. Electric frypans, woks and slow cookers are considerably more efficient than stovetop burners.

Use cold water to operate a food disposer – This saves water heating energy, is usually recommended for the disposer, and helps get rid of grease (grease solidifies in cold water and gets ground up and washed away).

Install an aerator on the kitchen sink faucet – Reducing the water flow saves hot water energy and the flow change isn't noticeable.

Turn off electric burners several minutes before the allotted cooking time – Conventional electric resistance heating elements stay hot for awhile after they are turned off – usually enough to finish the cooking task without using more electricity.

Use a timer – Avoid continually opening an oven door to check food – use a timer instead. Every time the oven door is opened, heat escapes and energy is wasted.

For More Information

Contact the web sites of the U.S. Department of Energy's Energy Efficiency and Renewable Energy Network, and the Commercial Food Equipment Service Association.

For general information regarding electric service for your business, call the APS Business Center at 602-371-6767 or 1-800-253-9407. For an on line analysis of your business energy use visit the APS Web site and take the Energy Survey at http://www.aps.com/aps_services/energysurvey/Default_BUSRES.html?type=b