Cost-Saving Energy Solutions for Food Businesses

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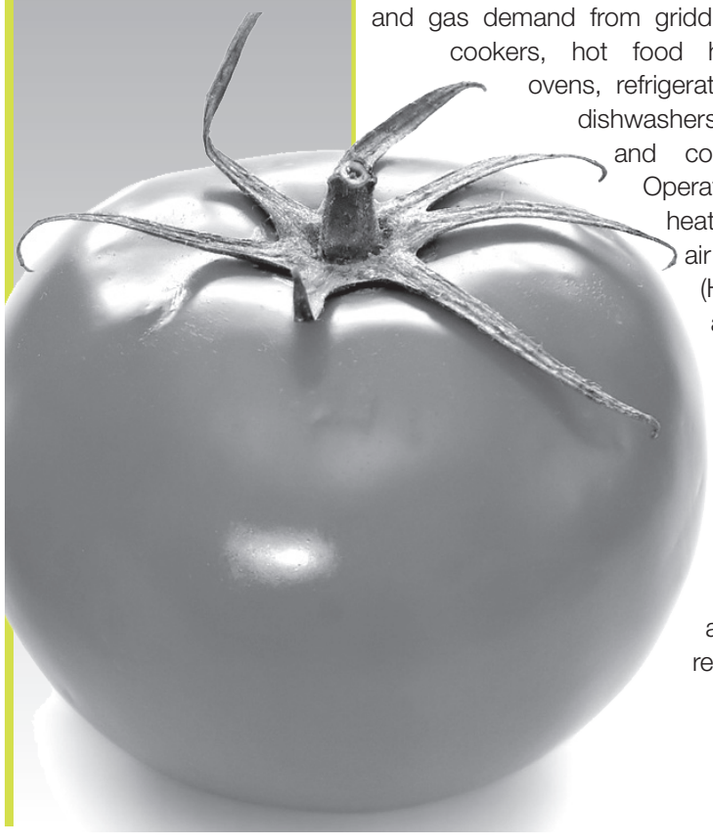
Adjusting the defrost cycle of refrigeration equipment can result in a significant energy and cost savings. One restaurant owner was able to save $800 annually by shortening the defrost cycle from 70 minutes to 15 minutes.

Restaurants, coffee shops and grocery stores serve as hubs of commerce and social activity in many downtown commercial districts and can be a key ingredient for a viable rural community. Many of these businesses have a substantial opportunity to lower overhead costs and increase their profit margins by replacing equipment and reducing energy costs. Making changes like sourcing locally, re-using food waste and considering renewable energy are also possible solutions for long-term sustainability.

Energy Intensity of Food Businesses

Food-based businesses are energy-intensive businesses, using large amounts of electricity and natural gas for cooking, food processing and refrigeration. For example, about 24 percent of energy in restaurants is used for cooking.

Virtually every aspect of running a food-based business is affected by energy and energy prices. They face high energy costs due to electricity and gas demand from griddles, fryers, steam cookers, hot food holding cabinets, ovens, refrigerators and freezers, dishwashers, ice machines and commercial ovens. Operating costs for heating, ventilation, air conditioning (HVAC), hot water and lighting are also a substantial percentage of energy expenses, and the price of transportation fuels affects the cost of deliveries and waste removal.



Efficiencies with Replacing and Operating Equipment

Energy savings can be achieved simply through operation and management changes of equipment. Higher upfront costs for upgrading to more energy efficient equipment can be a deterrent for business owners on a tight budget. However, federal, state and utility incentives can often offset or exceed the up-front cost of high-efficiency equipment. In addition to cost, reliability is a key requirement in both restaurants and grocery stores. Energy efficient equipment is generally comparable and often superior in quality to standard equipment.

Many Iowa utilities offer incentives ranging from $25 to $2,000 or more for convection ovens, fryers, hot food holding cabinets, ice machines, refrigeration, steam cookers, conveyor ovens, ventilation and other high-efficiency equipment purchased by businesses.

Refrigeration

To improve the energy efficiency of existing refrigerators:

- Make sure that reach-in refrigerators and freezers are placed away from the wall. Space between the wall and the coils is needed to prevent heat buildup near the coils which will help prevent the unit from working harder and using more energy.

- Minimize defrost frequency and length. Most food-based business need to defrost no more than 15 minutes, four times daily.
- Replace strip curtains. Strip curtains alone can reduce outside air infiltration by 75 percent.
- Periodically clean the condenser and evaporative coils on refrigerators and freezers. Dust often builds up on the coils, blocks air flow across the coils, and reduces refrigeration efficiency.

Oven and Griddle

Many food-based businesses regularly use griddles and ovens to cook. To reduce energy costs:

- Reduce idle time. Cutting idle time by three hours per day can reduce operating costs by $250 annually.
- Cook with the oven fully loaded whenever possible and select an energy efficient model to save up to 50 percent on operating costs.

Commercial Dishwashers

Dishwashers are expensive to operate due to their energy and water requirements. To reduce operating costs:

- Run fully loaded dish racks. Running full racks and reducing the number of wash cycles can save hundreds of dollars annually.
- Check rinse pressure. If the pressure gauge is showing more than 25 psi, the machine is probably using more water than necessary. Most dishwashers require only 20 psi.
- Use conveyor-style dishwashers in auto mode. Doing so saves electricity by running the conveyor motor only when needed.

Lighting

Lighting can be replaced with more efficient lamps. Examples of replacements:

- Change incandescent lights to compact fluorescent bulbs (CFLs). CFLs give off less heat than incandescent lighting, reducing the amount of energy required by box coolers and air conditioning equipment.
- Replace inefficient tubular fluorescents for substantial savings. T-12 fluorescent lighting and magnetic ballasts should be replaced with T-8 or T-5 lamps with an electronic ballast for greater efficiency.
- Replace conventional exit signs with LED signs. A typical exit sign with two 20-watt incandescent bulbs can cost substantially more to operate than the electricity required by an LED exit sign. Incandescent bulbs have to be replaced, on average, almost two times per year.

Heating, Ventilation and Air Conditioning (HVAC)

Energy costs for heating, ventilating and cooling food-based businesses can be a substantial opportunity to reduce costs and increase profit margins:

- Most ventilation controls use a manual on/off switch that operates the fans at either 100% speed or not at all. These inefficient ventilation controls can be replaced with demand ventilation controls that automatically vary fan speed based on cooking load and/or time of day. These systems provide only the amount of ventilation needed at any given time and can cut energy costs in half.
- Clean and maintain equipment. Dirty air filters and heat transfer coils can reduce the efficiency of HVAC equipment.
- Install energy efficiency controls. Programmable thermostats and energy management systems can substantially reduce energy costs.
- Use circulation fans as an alternative to air conditioning. Use of efficient circulation fans can allow food-based businesses to reduce energy costs by four to five percent for every degree the thermostat is set back.
- Replace old heating and cooling equipment with properly sized high-efficiency equipment.

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Outfitting an entire commercial kitchen with a suite of ENERGY STAR qualified equipment could save around 300 million BTUs of energy and about $3,600 per year.

Reducing Demand Charge

Food-based businesses often operate in peak hours of electricity demand. By reducing energy usage during peak periods, a business can reduce the monthly demand charges from some utilities.

- Schedule the ice maker to operate during off-peak hours.
- Use energy management devices to control the operation of equipment such as water heaters, air conditioners, electric space heating units and refrigerating equipment. Interruption of equipment operation for 10 to 30 minutes can help flatten the energy demand of the food-based business when the utility grid is overloaded or when electricity prices are high, resulting in lower energy costs.
- Use high efficiency motors in food preparation equipment (e.g. mixers, slicers, and grinders).

(See Resources for Commercial Kitchens and Restaurants at the end of this publication for more information and references.)

Procurement and Waste Management

When thinking about energy efficiency, how a business sources its food products and how they handle their garbage may not be the first things that comes to mind. However, it's important to remember that it took energy to grow, make and deliver everything that is served or sold, and it takes energy to haul the waste away to the landfill or recycling center. By implementing procurement and waste management strategies, a business can be "greener" by reducing their overall energy demand while potentially saving money or gaining valuable marketing advantages in the process.

Locally Grown Food: Energy and Cost Considerations

"Food miles" is a concept popularized through research done at Iowa State University's Leopold Center for Sustainable Agriculture in 2001. The term food miles refer to the distance a particular food travels from field to plate. The research found that, on average, produce traveled 1,514 miles to reach major Midwest terminal markets. As produce is sourced from increasingly distant places, the energy needed to produce and deliver crops to a consumer increases. This is especially true for perishable products which require fast transport and more frequent deliveries.

However, issues surrounding energy use in food production are more complicated than the analysis done in the food miles study alone. For example, food miles do not take into account the actual production methods used to produce an individual perishable product. The price of locally-sourced foods is not necessarily cheaper, but in the future the local food prices may be more stable if fuel prices spike dramatically. There are other reasons to procure local foods. There is evidence that consumers are willing to pay more for locally sourced produce for a number of reasons:

- Real or perceived environmental benefits
- Freshness
- Flavor — many heirloom varieties are only available locally because of transportation and spoilage issues

For these and other reasons, local food does present opportunities to increase the value of fresh produce. This has drawn attention from many retailers who are looking to differentiate themselves by offering an option that has an increasing consumer market.

Additionally, while the energy intensiveness of local produce can vary depending on production practices, there are opportunities to reduce spoilage through quicker and more frequent delivery. Losses due to spoilage or shrinkage can often equal the net profit of the average supermarket store. Local foods have the natural advantage of geography. Because moving perishable items to market with minimal handling and transport allows for the possibility of less spoilage, they often prove to have a significant advantage.

Being Wise about Waste

The famous architect and writer R. Buckminster Fuller once said, "Pollution is nothing but the resources we are not harvesting. We allow them to disperse because we've been ignorant of their value." Many businesses are beginning to recognize the value of wisely managing their "waste stream." In the case of food-based businesses, this includes a large amount of food scraps and other biodegradable materials as well

Food scraps make up over 14% of garbage hauled to landfills in the United States.

Examples of food waste recycling in Iowa include:

- **Green RU in Blairsburg is a composting business that picks up food scraps from restaurants around central Iowa, including Big City Burgers in Downtown Des Moines.**
- **The City of Dubuque has instituted a food-waste composting project, and is the first city in Iowa to offer a curbside food scrap recycling program.**
- **Iowa colleges like Grinnell and Coe have partnered with local farmers to compost cafeteria waste.**

as used cooking oil and fryer grease. All of these organic materials can potentially be recycled locally and turned into energy or compost, while reducing garbage-hauling fees.

Some businesses, including the retail giant Walmart, are adopting a "food waste hierarchy as recommended by the US EPA." By using this system, a business attempts to first reduce waste and then finds secondary uses for all or part of its remaining organic waste. Higher value uses are at the top of the priority list. Smaller businesses can also do their own waste audit and take advantage of this type of waste management planning to reduce their environmental "footprint" and to reduce the cost of garbage removal.

The food waste hierarchy includes:

- Source reduction: Establishing buying habits to reduce spoilage and waste are the simplest and most effective strategy.
- Feeding hungry people: Businesses can partner with local food pantries or other charities to use surplus food to help those in need.
- Feeding animals: By partnering with a local farmer, food scraps can be fed to livestock.
- Energy production: Food waste can potentially be turned into energy when used as a feedstock for an anaerobic digester. Local biodiesel producers can convert waste grease into high quality motor fuel.
- Composting: This can be done on-site or waste can be picked up by a local farmer or other composting operation. Food waste can be made into a high-quality fertilizer. If a restaurant or grocery store sources food from local farmers, the compost removal can occur in the same timing as food delivery.

Waste stream management can be labor intensive, but if a business puts together an efficient plan, educates employees about the benefits of the new routines and establishes good working relationships with partner organizations, waste reduction can be cost effective, save energy and provide positive publicity.

Food waste recycling is in its infancy in Iowa, but it's a field that is growing fast and offers a great deal of promise for new, green business partnerships in Main Street Iowa communities.

Conclusion

One of the measures of quality of life in a community is access to good food. Because of more and more competition from big box stores and fast food chains, locally-owned food businesses need to seek every opportunity to improve their bottom line and maximize marketing. A strategic approach to energy efficiency, renewable energy and other green solutions can add to these efforts.

Resources

Commercial Kitchens and Restaurants

The Commercial Food Service Equipment Incentive Finder tool provides commercial food service (CFS) equipment manufacturers, dealers, distributors and purchasers with information about rebates for ENERGY STAR qualified CFS equipment available from utilities and other energy-efficiency program sponsors. www.energystar.gov/index.cfm?fuseaction=CFSrebate.CFSrebate_locator

"ENERGY STAR for Restaurants" provides guidance on selecting energy efficient cooking appliances, refrigerators, ice machines, lighting, heating, cooling and ventilation equipment, water, and waste management equipment. www.energystar.gov/index.cfm?c=small_business.sb_restaurants

The "ENERGY STAR Commercial Kitchen Package for Businesses and Operators" provides buying guidance, case studies and guidance on commercial kitchen equipment. www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=CKP

The Food Service Technology Center (FSTC) is funded by Pacific Gas & Electric. This resource provides a series of best practices including "green sheets" which provide detail information on energy savings through equipment upgrades. www.fishnick.com/

Focus on Energy provides technical bulletins and savings analysis tools for full serve, quick serve, and tavern oriented restaurants. www.focusonenergy.com/business/commercial-business/restaurant/

Grocery and Convenience Stores

Focus on Energy provides tools and resources for grocery and convenience stores to improve energy efficiency and provides technical bulletins and savings analysis tools. www.focusonenergy.com/Business/Commercial-Business/Grocery/

The ENERGY STAR program provides guidance on energy efficiency retrofits and qualifying products. www.energystar.gov/index.cfm?c=grocery.sb_grocery

A commercial building initiative of the Northwest Energy Efficiency Alliance, Better Bricks champions the guiding principle that commercial buildings should be designed and operated with energy top of mind. One focus area is improving energy efficiency of grocery stores. www.betterbricks.com/grocery-stores

Energy Star

EPA introduced the ENERGY STAR label in 1992 to recognize energy-efficient computers. Since then, the label has grown to identify energy efficient products including equipment designed to the rigorous expectations required in food-based businesses. Qualifying products, projected energy savings and commercial food service incentives can be found in the ENERGY STAR database at www.energystar.gov/index.cfm?c=products.pr_find_es_products.

Energy Savings Potential and RD&D Opportunities for Commercial Building Appliances. 2009. Department of Energy. apps1.eere.energy.gov/buildings/publications/pdfs/corporate/commercial_appliances_report_12-09.pdf

Putting Energy into Profits: ENERGY STAR® Guide for Restaurants. 2007. Environmental Protection Agency.
www.greenrestaurants.org/documents/Energy_Star_Restaurants_Guide.pdf

ENERGY STAR for Commercial Kitchens: Helping Customers Manage Costs. 2009. www.energystar.gov/ia/products/commercial_food_service/downloads/ES-CFS_Guide_508.pdf

Food Service Technology Center. www.fishnick.com/ventilation/demandventilation/

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LED Exit Signs: Savings Analysis Worksheet. 2004. Focus on Energy. www.focusonenergy.com/files/Document_Management_System/Business_Programs/ledexitsigns_worksheet.pdf

Replacing Fluorescent Lamps: Savings Analysis Worksheet. 2002. Focus on Energy. www.focusonenergy.com/files/Document_Management_System/Business_Programs/flourescentlamp_worksheet.pdf

Zhang, J. et al. 2010. Technical Support Document: 50% Energy Savings for Quick-Service Restaurants. U.S. Department of Energy. www.pnl.gov/main/publications/external/technical_reports/PNNL-19809.pdf

Calculators

The following pages assist in calculating energy savings and payback from different types of improvements typical in food-based businesses:

Life Cycle and Energy Cost Calculators: www.fishnick.com/saveenergy/tools/calculators
Outdoor Air Load Calculator: www.archenergy.com/

Pre-Rinse Spray Valve/Water Cost Calculator: www.fishnick.com/saveenergy/tools/watercost

Food Miles/Local Food References

Pirog, R. 2001. Food, Fuel and Freeways: An Iowa Perspective on How Far Food Travels. Leopold Center for Sustainable Agriculture. www.leopold.iastate.edu/pubs/staff/ppp/

Swenson, D. 2009. Investigating the Potential Economic Impact for Local Foods in Southeast Iowa. Leopold Center for Sustainable Agriculture. www.leopold.iastate.edu/research/marketing_files/seiowa.pdf

Swenson, D. 2006. The Economic Impacts of Increased Fruit and Vegetable Consumption in Iowa: Phase II. Leopold Center for Sustainable Agriculture. www.leopold.iastate.edu/pubs/staff/health/health.htm

Waste Management/Composting
Biocycle magazine www.jgpress.com/biocycle.htm

United States EPA provides information about economically, socially and environmentally beneficial food waste management and the food waste hierarchy.
http://www.epa.gov/osw/conserve/materials/organics/food/

City and County of San Francisco, Integrated Waste Management Board, Restaurant Guide to Waste Reduction and Recycling. www.calrecycle.ca.gov/publications/BizWaste/44198016.pdf

Dana, Rich. 2010, Micro-scale Biogas: A Beginners Guide. ATTRA publication. National Center for Appropriate Technology, www.attra.ncat.org/attra-pub/PDF/biogas.pdf

Diver, Steve. 2002. Notes on Compost Teas. ATTRA Publication. National Center for Appropriate Technology, www.attra.ncat.org/attra-pub/compost-tea-notes.html
Fry, L. John. 1973. Methane Digesters For Fuel Gas and Fertilizer, With Complete Instructions For Two Working Models. The New Alchemy Institute. Available online at: journeytoforever.org/biofuel_library/MethaneDigesters/MD1.html

House, David. 2006. The Complete Biogas Handbook (3rd Edition). House Press
Iowa DNR: Solid Waste Alternatives Program, www.iowadnr.gov/waste/financial/financialswap.html

This publication is part of the

Local Energy Leadership Series

Titles include:

- Energy Efficiency Basics
- Utility Incentives and Services
- Energy Audits and Assessment Tools
- Grants, Loans and Tax Incentives
- Energy Solutions for Food Businesses
- Renewable Energy for Historic Commercial Buildings

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