Agricultural Extension Service ● University of Minnesota

FACT SHEET

CONSUMER INFORMATION
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WANDA OLSON

Energy Consumption of Refrigerators, Freezers, and Ranges

REFRIGERATORS and FREEZERS

The electrical energy consumption of a refrigerator or freezer depends on its size, insulation, type of defrost system, temperature to be maintained inside, and temperature of the room where the appliance is located.

The energy consumption labeling on new refrigerators and freezers gives us information about the relative efficiency of appliances.

The costs in kilowatt hours (KWH) per month under standard test conditions are given on the AHAM (Association of Home Appliance Manufacturers) label, and listed in the Directory of AHAM Certified Refrigerators and Freezers. Appliance dealers may have a copy; single copies are available for 50 cents from AHAM, 20 North Wacker Drive, Chicago, Ill. 60606. Directories are published twice a year. The label on **Automatic Defrost** (often called no-frost) appliances must list energy consumption with and without the use of sweat heaters if a switch is available. (Sweat heaters are small heating elements around the freezer door to keep its cabinet from sweating during hot, humid weather.)

The energy consumption of otherwise similar models is reduced by methods which reduce the use of sweat heaters and increase the effectiveness of the insulation. Insulation efficiency of urethane foam plastic is about the same as Fiberglas when urethane is half the thickness of Fiberglas. The urethane insulation is much thicker in some models.

Figure 1 compares the energy consumption of available manufacturers models of side by side refrigerator-freezers with top mount refrigerator-freezers, 19-21 cubic feet.

Figure 2 compares the energy consumption of available manufacturers models of 15-16.9 cubic feet of freezers of upright automatic defrost and manual defrost and chest manual defrost systems.

WHAT AFFECTS THE ELECTRICAL CONSUMPTION OF YOUR REFRIGERATOR OR FREEZER?

Room temperature where the refrigerator or freezer is located. Refrigerators operating in areas where the temperature is 90° F. will require one-third or more energy than at 70° F. and at 110° F. twice or more energy than at 70° F. Refrigerators and freezers are operating in very warm areas when located next to ranges, heat vents, or pushed into very tight spots. Air circulation space is essential when condenser coils are located on the back. Install refrigerators and freezers only where there is plenty of room for good air circulation.

Operator use. Ice making, food freezing and cooling, and the number and length of door openings all affect energy use. For efficient use of the refrigerator and freezer:

Avoid unnecessary ice making—make only what you need.

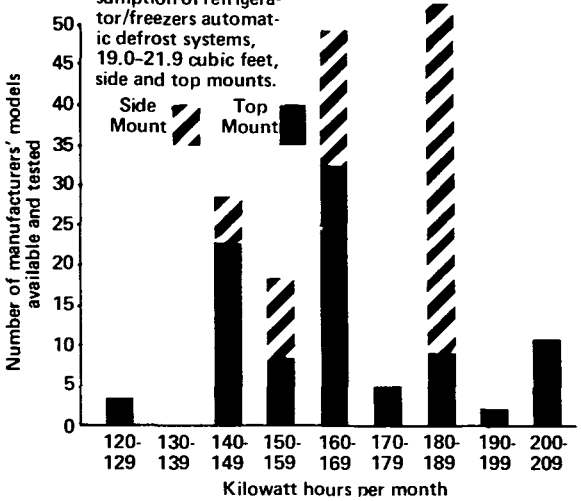
Operate freezer area full—this is as important as selecting the proper size of freezer. It takes the same energy consumption to maintain 0° F. in a half-filled as a full freezer. Don't operate freezers with only a few items in them. Make room for these items in the freezer section of the refrigerator. Heat entering the freezer will cause air temperature to rise quickly and make the motor run oftener.

Defrost frozen foods in the refrigerator if you need to thaw them before cooking or serving. In thawing, the frozen foods will absorb heat, reduce running time of the refrigerator, and save electricity.

Avoid placing extremely hot foods in your refrigerator. These increase refrigerator operating time greatly and warm up foods already there. Cool hot, perishable foods quickly in a pan of water, then refrigerate the food for further cooling.

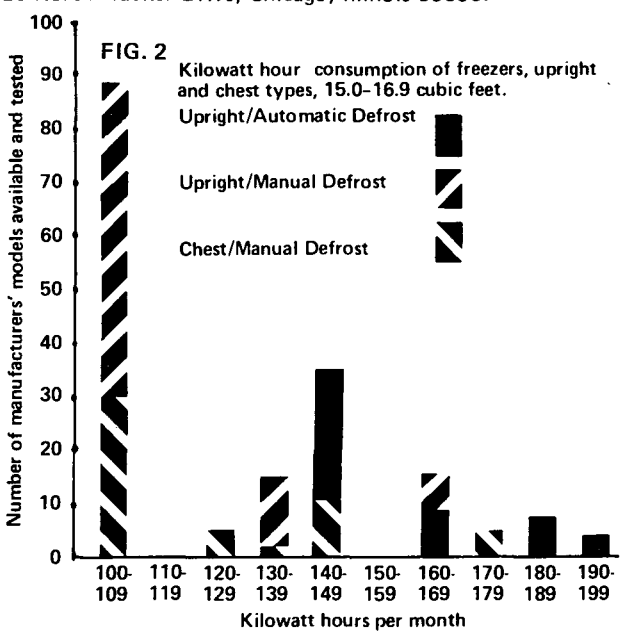
Reduce the number of door openings. This is more critical with refrigerators and upright freezers. When the lid of a chest freezer is open, there is little exchange of air because hot air rises. When the door of an upright opens, cool air moves out and toward the floor. This makes frost collect faster in an upright.

FIG. 1 Kilowatt hour consumption of refrigerator/freezers automatic defrost systems, 19.0–21.9 cubic feet, side and top mounts.



Taken from "1975 Directory of Certified Refrigerators and Freezers," by Association of Home Appliance Manufacturers, 20 North Wacker Drive, Chicago, Illinois 60606.

FIG. 2 Kilowatt hour consumption of freezers, upright and chest types, 15.0–16.9 cubic feet.



Operator maintenance. Clean condenser fins and coils regularly. They are located either at the back or bottom front of the refrigerator. Dust acts as an insulator and cuts down on efficient operation. Dust with a brush or unplug the refrigerator and use a vacuum cleaner attachment.

Check tightness of door gaskets. These should be replaced if they are not tight (check hinges and latch first). Polyvinyl chloride gaskets are used today and they do not deteriorate as the older rubber gaskets do.

If the refrigerator has a power switch, turn it off in winter when humidity is low and sweating is not a problem. Unplug the refrigerator when not in use because the low wattage heaters that prevent sweating on no-frost models remain on even when the refrigerator is turned off.

If a refrigerator runs constantly, have it checked.

ENERGY QUESTIONS AND ANSWERS ABOUT THE RANGE

Is energy saved by turning the heat down to a low setting to maintain simmer and boil temperatures? Yes. On new electric ranges, small surface units use about 1100-1500 watts on high and the large units use 1800-2600 watts. Low settings that maintain boil use about one-fourth as much electricity as high settings. Low settings that maintain a simmer, 185°-205° F. or below bubbling, use about one-tenth as much as a high setting. Ranges with infinite heat settings continuously cycle off and on at full wattage, but at a low setting that will maintain a low boil it is on only about one-sixth or one-fourth of the time, and on the very low, keep-warm settings, on less than one-tenth of the time.

The amount saved when cooking depends on the actual simmer or boiling time.[1]

The thermostatic unit or burner automatically cycles off and on or reduces energy intake to maintain the selected temperature. Top of the range cooking is an efficient use of energy.[2] It is important that the pans have flat bottoms and fit the size of the unit or burner to avoid wasting heat. Placing utensils on units or burners before turning them on, and with electric ranges turning the unit off 3-4 minutes before cooking is completed, will avoid wasting heat. Even longer cooking on "off" can be done on smooth top ranges.

Do you save energy by using a portable oven appliance instead of a range oven? Portable ovens vary greatly in insulation and this affects energy use. Some studies have shown that portable ovens used about 15 percent less energy than range ovens. Energy savings are greater for short baking times of 30 minutes or less. Savings are very little when the baking time is 1 hour or more. Portable ovens may not be large enough for all purposes. Usually they become an additional appliance because most people have range ovens.

Do you save much energy by baking several foods together or right after each other? Yes. The energy used for each additional food item placed in the oven is small. It probably will not add more than 10 percent. Once the oven is on, it is more efficient to add extra items to the oven than to use additional surface units or burners.

Energy used in preheat is a considerable part of the energy for the total baking. This is illustrated using an electric range in these examples:

rolls about 15 minutes at 400°F.	.5 kWh to preheat
	.3 kWh to bake
	.8 kWh total

If your oven has the high heat (pyrolytic) cleaning feature, this process, when necessary, should be run immediately after the oven is used for baking. This will save much of the energy needed to reach the cleaning temperature.

Do you save energy by baking from a cold start rather than preheating? Yes. The savings may be about 15-25 percent. Baking from a cold start makes little difference in total cooking time except for high temperature short-time baking, (example—biscuits).

Old ovens with poor insulation or those electric ovens in which both bake and broil units are on during "preheat," should be preheated before putting the food into the oven.

Preheat times of portable ovens is much longer than for standard ovens. Preheat portable ovens for cakes, cookies, biscuits and pie shells.

Do range ovens with features such as high heat cleaning (pyrolytic) take more energy? Ovens that are self cleaning by the high temperature method are usually better insulated and operate a little more efficiently during normal cooking procedures. In electric ranges this self cleaning process takes about 3-4 kilowatt hours each time.

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[1] For example, cooking six medium, whole potatoes in ½ cup of water in a covered saucepan takes about three times as much energy on a constant high setting as using a high setting to get a boil and low setting to maintain a boil. The following example illustrates:

1200 (wattage on high) X $\frac{4}{60}$ (minutes on high) = 80 watt hours (minutes in hour)

1200 X 1/5 (low setting X $\frac{30}{60}$ minutes) = 120 watt hours

$\frac{200}{}$ watt hours total cooking or .2 kWh

1200 X $\frac{34}{60}$ = 680 watt hours (or .680 kWh) total if boiling on high

Consider the amount of water you heat when cooking vegetables. In the example, if 1 cup of water is used instead of ½ cup, one-tenth more energy will be needed. On gas ranges comparable savings are made by turning burners to lowest setting to maintain desired temperature. Small gas burners use about 8000 Btu's per hour on high; the larger gas burners 12,000 Btu's on high; pilots burning continuously use about 175 Btu's an hour.

[2] Surface efficiencies of glass-ceramic smoth tops may be less than the surface efficiency of standard electric tops, according to the minimum standards for surface efficiency recommended by the Association of Home Appliance Manufacturers.

Smooth top electric ranges use either heat control units or temperature control units (thermostatic). Studies have found little difference in energy use of temperature control surface units on smooth top ranges and surface units on conventional electric ranges.
