This circular includes information on the various features available on current models of ranges, microwave ovens, and range hoods and gives hints on the use and care of the appliances. It is one in a series on buying home appliances.

Ranges

When selecting a kitchen range, there are many alternatives to consider. Besides choosing between a gas range and an electric one, you are faced with a variety of range sizes, shapes, and styles. But that isn’t all. Performance, price, cleanability, color, and other special features offer additional choices.

SIZE

The size of a range is an important consideration, which needs to be dealt with fairly early in the selection process. The 30-inch-wide range is purchased most often, but ranges vary from 20 to 40 inches in width. There may be four to six burners or cooking units on the range top. In a two-oven range, the ovens may be side-by-side or one oven may be in the base and the other at eye level.

The advantages of having an eye-level oven may outweigh the disadvantages common to an oven above the cooking surface. Homemakers view being able to see the food without bending down, appliance appearance, and having two ovens in the wall space required for a one-oven range as advantages. Some of the disadvantages are as follows:

1. Heavy items have to be lifted from shoulder height.
2. Hot temperatures are right at face level.
3. It is necessary to reach over the burners to use the oven.
4. Large pots may not fit on the back burners.

5. Condensation may drip from the range with the bottom of the upper oven.
6. The door of the eye-level oven is in a dangerous position as the door swings open.
7. The oven is less efficient because it has less insulation.

CONVENTIONAL RANGES — GAS VERSUS ELECTRIC

Burners. Most cooking is done on the surface of a range. Homemakers generally have preferred gas burners to electric units because the heat is immediately full strength when the burner is turned on and may be cut off immediately. In addition, the heat control on a gas burner is a dial that permits infinite heat settings. Newer electric units, however, are able to compete with gas burners. They, too, have dial control knobs, which allow you to select any heat level, and high-speed units, which heat fast because a double amount of electricity passes through them when they are first turned on.

Thermostatically controlled burners and units are available on gas and electric ranges. A thermostatically controlled burner or unit uses a heat-sensing disk to monitor the temperature of the bottom of the cooking utensil. The disk, about the size of a silver dollar, is located in the center of the burner or unit and is backed by a spring that holds it in contact with the bottom of the utensil. When the desired temperature of the utensil has been reached, the fuel supply is cut off. As soon as the temperature drops below the selected temperature, the fuel is again supplied.

In some electric ranges, the portion of the unit that heats up can be adjusted because the unit has three individual electric coils. If a utensil is 4 inches in diameter, only the center coil is heated; the two inner coils heat enough area for a 6-inch utensil; all three coils heat the entire unit for a utensil that is 8 to 10 inches in diameter.
Gas thermostatically controlled burners are available in two arrangements. Both are quite satisfactory. The burner either cuts off completely when the selected temperature is reached as an electric unit does, or a small flame maintains the selected temperature.

Ovens. Ovens in gas and electric ranges are about equal in performance and convenience. The convenience of gas ovens has been improved as a result of the American Gas Association's requirement that all gas ranges have automatic ignition to receive their approval.

Broilers. Broilers in gas ranges are usually located below knee level, although some are at waist height. The broiler may be located in a drawer above the oven, below the oven, in the oven, or in a separate compartment at the side of the oven. Broiling with gas is usually done with the door closed. Electric broiling is done with the door open, except in some electric ranges that heat the by-products of broiling to a temperature high enough that they turn into a clear gas, which is removed through small holes above the broiler and out through a vent above the oven door. The feature that allows broiling with the door closed makes working at the range surface while broiling food in the oven more comfortable.

Cost and efficiency. A gas range used in the home is approximately 40 to 60 percent efficient, compared with the typical electric range, which is 60 to 70 percent efficient. In other words, more heat is lost into the room with a gas range than with an electric one. Although public utilities can best quote the relative costs of gas and electricity for individual localities, a testing organization has suggested a rule of thumb for comparison purposes. The rule is that gas for cooking will prove cheaper than electricity if the cost per therm (typically 12 cents per therm) is less than 12 times the cost of electricity per kilowatt hour (typically 4 cents per kilowatt hour). In other words, gas is usually cheaper.

SMOOTH-TOP RANGES

Smooth-top ranges are presently available in electric models only, but work is continuing on the development of gas smooth-top ranges. The glass ceramic surfaces on smooth-top ranges can withstand knocks and bumps without breaking, have high heat strength, are scratch resistant, and are resistant to most acids.

Even though these surfaces are strong, hitting them hard enough can break them into splinters or cobweblike patterns. The surface should not be exposed to temperatures exceeding 1,300° F., such as might occur when a utensil with a concave bottom traps air under the pan or when a burner is operated with no utensil on it. Over a period of time, scratches occur on the surface because of abrasion from cooking utensils.

Another disadvantage is that the surface should be cleaned after each use; otherwise, sugar may carmelize and cause minute chipping, spillovers may stain the surface, and metal that rubs off pots and pans may soak into tiny pores in the surface of the range.

A manufacturer of glass ceramic cook tops has produced one with a thermostat in three of the four burners. This range requires special utensils, which are purchased with the range. Most other smooth-top ranges can be used with any flat-bottomed, straight-sided utensil.

The efficiency of the standard smooth-top range with conventional heating elements is lower than that of a conventional electric range. It may take three times as long for a smooth-top range to heat 2 cups of water as it takes a conventional electric range. The surface also takes a long time to cool.

Smooth-top ranges have printed designs on the surface that mark the location of the heat, but there is very little visual indication that a unit is hot when it is on. A "hot" light that goes off only after the surface is cool enough to touch is a safety feature found on some manufacturers' current models.

INDUCTION RANGES

Another type of smooth-top range is the induction, or cool-top, range. On this range, the cooking utensil is heated, and it in turn heats the food. The range surface stays cool or at most only gets heat that is transferred from the heated pan.

In a conventional range, a coiled wire (nichrome) heats up as it resists the flow of electricity through it. As more electricity flows, more heat is produced. In the cool-top range, electricity is converted into a high-frequency current that produces current in the bottom of any metallic pot or pan that has magnetic characteristics. Steel and iron utensils are good for this purpose and are commonly used on induction ranges. Heat control is both very sensitive and immediate in an induction range.

CONVENIENCE FEATURES

A rotisserie and an automatic meat thermometer add convenience. A rotisserie is a built-in motor that rotates a spit inserted through the food. The heat source is the broiler. An automatic meat thermometer is a probe that is inserted into the meat and then connected to a control in the oven wall. The control is set to the desired internal temperature of the cooked meat. A bell or buzzer indicates when the probe senses that the meat has reached the preset temperature. Temperatures above 325° F. may damage the probe; the thermostat should be set no higher than for roasting temperatures when the probe is being used.

CLEANING FEATURES

Removable control knobs make it easy to clean the knobs themselves as well as the panels under and around them. If the range has push buttons, it is better if there is enough space between them to clean with a cotton swab.

The oven in a range can bring no end of grief and despair if a homemaker is extremely fastidious. This is because manufacturers usually make the oven walls a light gray — you can see the dirt. Because of this cleaning problem, one of the two automatic cleaning systems now available is featured on most new ranges. These are
the pyrolytic and the catalytic cleaning systems, available in both gas and electric ranges.

**Pyrolytic (self) clean.** In a pyrolytic clean oven, the oven interior is heated to 700° to 1,000° F., and cooked-on foods are essentially burned up and converted to a clear gas (carbon dioxide and water vapor), which is vented out of the oven. The cleaning cycle takes 1 to 2 hours—the higher the cleaning temperature, the shorter the cleaning time. Two or more hours of cooling are needed before the oven is ready to be used again. Ovens that have a pyrolytic clean feature lock at around 600° F. to prevent the door from being opened. Opening the door would allow air to rush in and possibly cause an explosion when oxygen suddenly becomes available at high temperatures.

Special precautions are taken so that the temperature of the range exterior should not exceed 172° F., the upper limit set by Underwriter’s Laboratory. These precautions include extra insulation, shields that reflect the heat, an air space in the door, and cool air forced around the oven by a small fan. An oven with a pyrolytic clean feature may be about ½ cubic foot smaller than a conventional oven because of the extra insulation. A pyrolytic clean oven uses approximately 85 percent of the energy consumed by a conventional oven for the same cooking tasks.

Major spills in the oven should, of course, be wiped out as they occur. The manufacturer’s directions will indicate which parts of the range may be cleaned in the oven. Oven racks can usually stand the high temperatures. They may turn a bluish color, but rubbing them with steel wool will bring back the shiny finish. Some burner drip pans and second oven panels have been designed for oven cleaning.

The rim around the door of the oven should be cleaned by hand before the cleaning process is started because the surface of the door outside the seal does not reach temperatures high enough to clean itself. Any splatters left there will be cooked on and will be very difficult to remove.

The pyrolytic clean feature adds about $50 to $75 to the cost of an electric range, or $80 to $100 to the cost of a gas range. Depending on the cost of electricity, the total cost of pyrolytically cleaning an electric oven is approximately 8 to 12 cents; for a gas oven, 3 to 5 cents.

In a research study on attitudes about the pyrolytic clean feature, the average owner used the cleaning feature every five or six weeks after the novelty wore off, which is no increase over the frequency of cleaning an oven by hand.

As an energy consideration, the owner of an electric pyrolytic clean oven should consider using the feature during off-peak hours, which in most localities would suggest the night-time hours.

**Catalytic (continuous) clean.** The catalytic cleaning process takes place continually whenever the oven temperature is 350° to 500° F.—most of the time the oven is in operation for baking. The liner panels of the oven contain a chemical catalyst, which is mixed into the enamel coating. The catalyst promotes oxidation (burning) at a low temperature. Any food spills in the oven (carbon compounds) combine with oxygen from the catalyst to produce carbon dioxide, which is released into the air.

Fat spatters hit the oven liners and spread out because the liners act like blotters. Fat is oxidized much more quickly than spillovers from casseroles or pies. Thus, it is wise to anticipate spillovers from certain foods and place a pizza pan or aluminum foil tray on the rack just below the food.

The catalytic cleaning process adds approximately $30 to the retail cost of a range.

Chemical oven cleaners should not be used on the liners of either the pyrolytic or the catalytic clean ovens because they can damage the special porcelain enamel finish of the pyrolytic clean oven and may affect the catalyst of the catalytic clean oven.

**SAFETY**

The Underwriter’s Laboratory (UL) seal and the American Gas Association (AGA) blue star on a range insure consumer safety in many ways. The UL seal insures that a factory sample of the appliance is safe from fire, electrical shock, and related accident hazards. The AGA blue star indicates that the range meets the safety standards established under the rules and procedures of the American National Standards Institute.

The Association of Home Appliance Manufacturers and the American Gas Association revised their industry standards for appliances, emphasizing safety. Some of the revisions for ranges include eliminating the electric convenience outlet on the range; locating the burners toward the back; installing double-activated controls, which must be either pulled or pushed before a temperature can be selected; and finally, decreasing the surface temperature of the range through better air circulation around the oven, baffling (heat shields) to separate the oven from the range frame, and insulation.

**Microwave Ovens**

In microwave cooking, high-frequency energy called microwaves is generated by a magnetron tube, passed through a wave guide, and distributed throughout the range by a fan (stirrer). Microwaves enter food and cause the food molecules to vibrate, producing heat.

The biggest advantage of microwave cooking is, of course, speed. However, because only one kind of food is cooked at a time, the total cooking time for a meal can be as long as the time for cooking a meal with a conventional range. In a study at Kent State University, preparing a meal by combining the use of a conventional range and a microwave oven* required the least time.

*“Microwave oven,” the common name for this appliance, would be more accurately termed “microwave cooking appliance” because the microwave oven performs the same cooking tasks as the conventional range.
The main disadvantage seems to be that the browned appearance that we have come to expect in many foods is impossible or very difficult to obtain with microwave cooking.

CONSTRUCTION

The walls of microwave ovens may be aluminum, stainless steel, or acrylic plastic.

A microwave oven needs a properly fitting door with a good seal to confine the microwaves. Four types of seals are used:

1. Metal-to-metal seal. This is the simplest type of seal. The two metal surfaces must be kept free of spilled foods or foreign matter, such as paper towels, to prevent microwave leakage.

2. Mesh seal. This type has good sealing qualities, but also collects grease and dirt, giving it a poor appearance.

3. Choke seal. In this type, the microwaves cancel one another when they reach the seal.

4. Dielectric choke seal. This is a better version of the choke seal. Carbon black is added to absorb any microwaves that have not been cancelled.

Since October 6, 1971, microwave ovens have been required to have at least two safety interlocks. One of these interlocks must be concealed to prevent tampering with it.

TIMING AND COOKING SPEED

Microwave cooking is measured by time only, not by oven temperature or weight of the food as is in a conventional range. The timer can be set for a specified number of minutes, and some ovens have additional timers for seconds. The oven may be turned off by turning the timer to zero, turning off the master switch, or by opening the door.

Most portable, counter-top, 2,450 megahertz* microwave ovens operate on 120 volts. Their efficiency is only 30 to 50 percent. Thus, if the range has a wattage input of 900 to 1,800 watts, the output may be only 400 to 875 watts. The higher the output, the faster the cooking process. Differences in wattage output are the main reason that recipes from one manufacturer usually cannot be prepared in a microwave range from another manufacturer without some adjustment. Manufacturers are now beginning to move toward a standard 650±50 watt output.

Microwave ovens with a control that allows the user to select more than one wattage setting offer one way of controlling cooking speed. A low wattage output is useful in preventing juicy fruits from boiling over and in producing better custards.

Another way to regulate the wattage output is through a timer that turns the energy on for 30 seconds and then off for 30 seconds. This is especially useful in thawing frozen foods.

* The commonly accepted frequency for microwave cooking is 2,450 megahertz. Microwave ovens are classified according to the frequency of the microwaves used.

BROWNING FEATURES

A portable or built-in microwave oven may have a broiling element for browning foods. If the broiling element is supplied with 120 volts, the browning takes place after the microwave cooking. If it is supplied with 240 volts, the browning may take place simultaneously.

For the microwave oven that has no browning feature, the manufacturer may offer a tray containing a material that will absorb microwave energy. When the tray reaches searing temperatures of 450° to 650° F., the food will brown.

Some microwave ovens have a temperature-sensing probe. One end is inserted into the food, and the other end is attached to an outlet in the wall of the appliance. Controls indicating desired internal temperature and cooking speed are activated. When the predetermined temperature is reached, an audible signal is given and the oven turns off automatically.

Some manufacturers produce a combination microwave-conventional oven in a free-standing range. These are usually 915 megahertz.

UTENSILS FOR MICROWAVE COOKING

Some utensils can cause problems in microwave ovens. Metal utensils may reflect the microwaves back to the magnetron tube, which can damage it. Operating the microwave oven empty can also damage the magnetron tube. In addition, metal trim on china may cause arcing, which occurs when the microwaves jump from one point to another. This will damage the china. Melamine and polystyrene absorb microwaves, taking energy away from the food itself and possibly damaging the utensils by overheating.

Paper is useful in cooking meats because it absorbs fat. The use of paper is limited, however, in a microwave oven with a browning element because the paper would be set on fire. Glass is an excellent material in which to roast, bake, or cook foods with liquid. Clear plastic wrap is useful as a cover for food to prevent moisture from evaporating and to distribute the heat generated by the cooking food.

Round utensils produce more even cooking than square utensils do because food in corners heats to higher temperatures than food in the rest of the utensil.

If there is a question about using a particular utensil in a microwave oven, a test recommended in Robert V. Decareau's The ABC of Microwave Cooking may be used. Place the dish in question and a heat-resistant glass cup containing 1 cup of water in the oven for 1½ minutes. If the dish gets hot, it is absorbing energy. If the water in the heat-resistant glass cup is hot and the dish is cool, then the dish is said to have "low lossiness" and may be used in the microwave oven.

SAFETY

Ever since microwave ovens were first introduced, there has been great concern over the possible leakage of microwaves around the door. Microwave standards (Public Law 90-602, the Radiation Control for Health
and Safety Act passed by Congress in October, 1968) state that radiation leakage from microwave ovens cannot exceed 1 milliwatt per square centimeter, measured 2 inches from the oven prior to factory release, or 5 milliwatts per square centimeter thereafter. Every microwave range manufactured after October 6, 1971, must carry a label stating that the federal standard has been met.

One of the major causes of microwave leakage is soiled door seals. Every owner should read the instruction book with the microwave oven and follow its directions for cleaning the door seal.

Some of the waves that are beyond the visible light rays, such as X-ray, gamma, and cosmic, are ionizing, which means that they can cause chemical changes in the structure of cells of the body. Other waves, such as infrared, radio, television, and microwave, are nonionizing. The only proven effect that nonionizing rays have on the body is thermal. In other words, if they hit the body surface near nerve endings, there is a sensation of heat. Radiation effects diminish by the square of the distance from the source. If the user stays an arm's length away from the microwave oven, there should be little need for concern.

Currently manufactured pacemakers have very selective filters that make them highly insensitive to external electrical interference, such as from gasoline lawnmower ignition systems, electric razors, mixers, carving knives, and television sets, and to interference from microwaves. Braille dials are available on microwave ovens for the blind.

Range Hoods

Even the tastiest meal is more enjoyable to prepare if odors, grease, smoke, water vapor, and heat are removed from the kitchen. A range hood or exhaust fan is ideally suited to this purpose.

Range hoods are either vented or nonvented. A vented range hood will send all the pollutants out-of-doors through ducts. The best route is the shortest and straightest one — the fewer elbows the better. The offending air can be sent through the ceiling and the roof, through a wall, or through the eaves. The blower parts of the motor should be easy to remove so that grease can be cleaned off and motor bearings can be oiled.

A nonvented range hood operates by means of filters that remove smoke, grease, and odors, but not heat or moisture, from the circulated air. The effectiveness of a nonvented range hood depends on the air movement and the efficiency of the filters. A combination of three filters is ideal — aluminum mesh, fiber glass, and charcoal. The aluminum mesh traps grease and should be washed every two to four weeks in hot water with detergent. The fiber glass filters smoke, grease, and odor. It may be washed two or three times and then replaced. The charcoal removes odors and should be replaced every 6 to 12 months.

The two main types of blades used in exhaust or hood fans are the propeller and the centrifugal blowers. The centrifugal blower fan blade operates more quietly and more efficiently than the propeller fan blade.

The range hood should cover the entire cooking area. It should be placed so that the bottom edge of the hood is not more than 30 inches from the range surface.

The Home Ventilating Institute provides information on tags attached to range hoods, certifying the amount, or volume, of air moved through the range hood in cubic feet per minute (c.f.m.) and the sound-level rating of the range hood. The Institute, under the U.S. Department of Housing Administration, recommends that a range hood have a minimum of 40 c.f.m. per linear foot of range surface for a range placed against the wall, or 50 c.f.m. per linear foot if the hood is located over a range in a peninsula or island. The minimum recommendation is based on use by a small family with the fan operating at full speed. Fans with two or three speeds allow increased air movement during periods of heavy demand, such as when deep fat frying, and a low speed with less noise for periods with lighter demand.

Noise level is indicated in sones. One sone is equivalent to the noise produced by a refrigerator when operating. The Home Ventilating Institute sets limits of 9 sones for kitchen fans of up to 500 c.f.m. capacity.

For More Information

For more information on buying ranges, microwave ovens, range hoods, and other appliances, check your local library for the following publications:

- Consumer Reports
- Consumers' Research Magazine

Read the manufacturer's instruction manual before using any new appliance.
Notes

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