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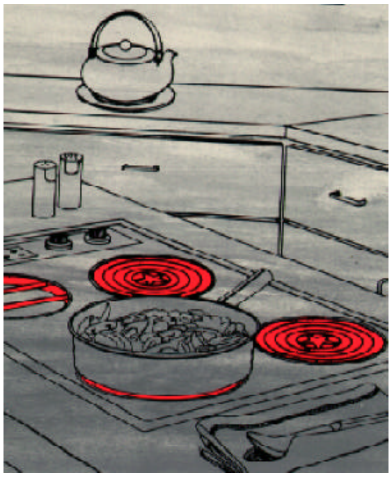

COOKTOPS AND COOKWARE

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This booklet describes what is new in cooktops and cookware. It provides information that will help the consumer make wise purchase decisions and describes the energy efficiency of cooktops and cookware.

NEW COOKTOPS

Consumers have many choices in new cooktops. Halogen, induction, and solid-disk cooking units are all relatively new cooktop systems.

The newest cooking system on the market is the **halogen light** cooktop (see Figure 1). The control, speed, and responsiveness of the halogen unit makes it somewhat similar to cooking with natural gas.

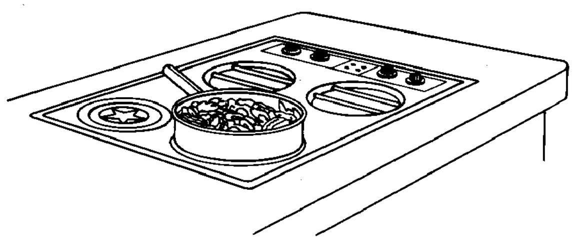

Figure 1. Halogen Cooktop.

When the halogen cooking surface is off, it looks like a heat-resistant, glass-ceramic cooktop, but that is where the similarity ends. The surface is made of a new glass-ceramic material known as vitro-ceramic or Ceran produced in West Germany. The surface does not yellow with age and is easy to clean and maintain. This material is also used in other smooth cooktops such as the induction cooking unit.

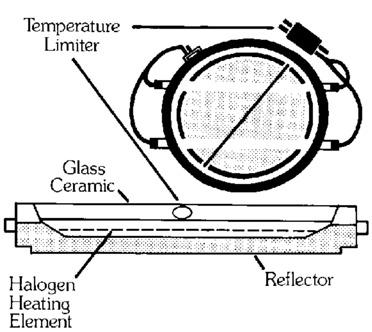

Figure 2. Cross-Section of Halogen Cooktop.

Here's how the halogen cooking unit works. The halogen heating element is composed of tungsten halogen lamps located underneath the glass ceramic (see Figure 2). A specially developed reflector directs the heat upward through the ceramic surface. Temperature limiters prevent heat surges and protect the elements from overheating and damaging the cooktop surface.

When turned on, the halogen lamps appear to produce virtually instantaneous heat and a glowing red light that can be seen through the translucent ceramic cooktop surface.

In addition to the halogen element, the system may also have a resistance coil element located around its outer edge that adds and distributes heat to further ensure even heat distribution.

Induction cooktop heating elements (see Figure 3) appear as circular patterns on ceramic glass. When turned on, a magnetic field is created that induces current and instantly generates heat into a magnetic cooking utensil (see Figure 4). Only the cookware, which must be magnetic, and the food get hot—not the entire cooking surface. Since the cooktop surface is flat and stays cool to the touch, most spills can be cleaned up with a damp sponge.

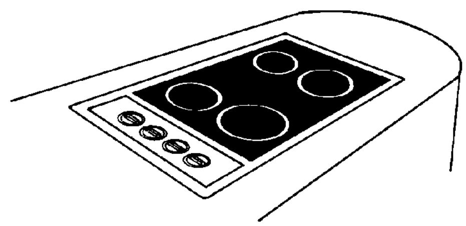

Figure 3. Induction Cooktop.

The intensity of the magnetic field can be adjusted to regulate the heat being generated in the cookware. Because very low temperatures can be maintained, even chocolate can be easily melted without burning.

Some induction cooking systems have a safety feature that automatically shuts off power or emits an audible signal when a non-magnetic cooking utensil or a small magnetic object (less than 4-inches) is left on the cooking surface.

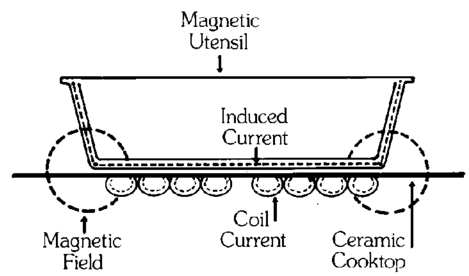

Figure 4. Induction Cooktop and Magnetic Cookware.

Induction systems are energy savers because only the cooking utensils and the food are heated, so less heat is lost. In addition, induction cooking uses less energy when compared to other cooking systems. According to the American Council for an Energy-Efficient Economy, energy consumption can be cut 10 to 20 percent by using an induction cooktop rather than a conventional coil system.

Another relatively new cooking system is the **solid-disk** cooktop (Figure 5). Solid-disk cooking units have been used in European kitchens for years. Several American manufacturers now offer the solid-disks in a variety of ranges and cooktops.

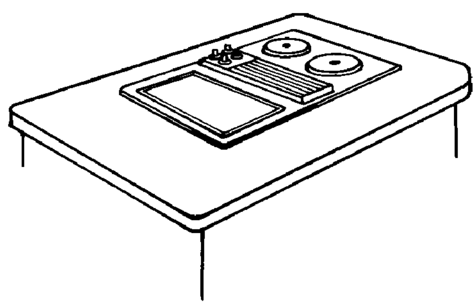

Figure 5. Solid-Disk Cooktop.

Electric resistance wires are embedded in insulation beneath the solid-disk. Heat spreads through the cast iron disk and is conducted to the cookware placed on it (see Figure 6).

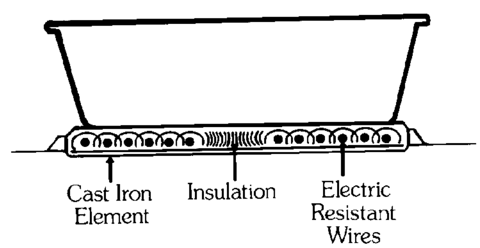

Figure 6. Solid-Disk Cooktop and Cookware.

The cast iron surface has a burned in noncorrosive coating. The surface is slightly raised above the cooktop and is surrounded by a stainless steel spill ring. The spill ring is sealed to tempered glass, stainless steel, or porcelain-enamel covered steel cooktop material. Spills flow away from the hot cooking element so burned-on food can be avoided.

Some models are thermostatically controlled. These have a silver disk in the center of the element. Others have thermal limiters identified by a red lacquer dot in the center of the element. A third type is a lower-wattage version with neither a limiter nor a thermostat.

Because the solid disk is made out of cast iron, the cooking surface shares many of that materials qualities including gradual heating, evenness of cooking, and good heat retention. Once heated, the element retains heat, and cooking can be completed with the power turned off. Energy savings can, therefore, be achieved by taking advantage of the retained heat. A disadvantage of the solid disk is that it uses more energy than the conventional coil system.

TRADITIONAL COOKTOPS

The most common cooking element is the electrical **conventional coil** cooktop (see Figure 7). The conventional coil system has been popular for a long time. It is generally less expensive to purchase and gives good cooking performance. Its chief disadvantage is cleaning the drip bowls. However, some of the newer models have tilt-back surfaces that make cleaning the bowls easier.

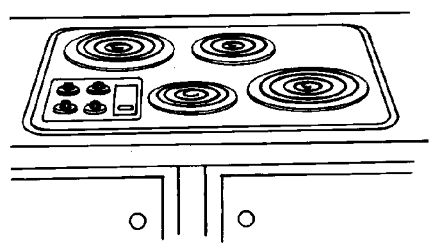

Figure 7. Conventional Coil Cooktop.

Each conventional coil element is made out of an electric resistance wire encased in metallic tubing filled with an insulating material. The tube is shaped into a coil and flattened for good contact with cookware (see Figure 8). Some coil elements are thermostatically controlled to prevent overheating.

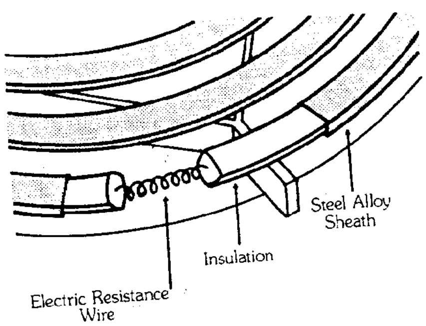

Figure 8. Cross-Section of Conventional Coil Cooktop.

Another cooktop that has been around for a long time is the **glass-ceramic** cooktop. Glass-ceramic cooktops are smooth, good looking, and easy to clean.

When turned on, heat is radiated by electrical heating elements beneath the glass-ceramic surface. Heat radiates to the glass-ceramic surface, where it is transferred to the cooking utensil by conduction and some radiation (see Figure 9).

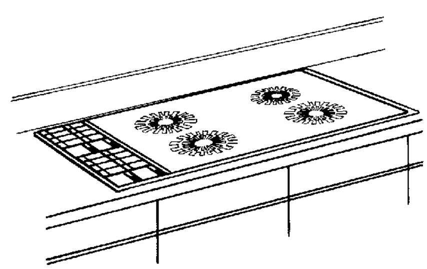

Figure 9. Glass-Ceramic Cooktop.

Some glass-ceramic cooktops have thermostatically controlled elements. The units turn off and on to maintain a precise temperature, or a thermal protector cuts off or reduces current flow to prevent overheating.

Glass-ceramic cooking surfaces tend to be slower than the other cooking systems, except the solid disk. Like the solid disk, the glass-ceramic surface retains heat well. Energy savings can be achieved by turning the controls off and using retained heat to finish cooking.

Gas-powered cooktops are available in two-and four-burner units with many options (Figure 10). All new gas cooktops have pilotless ignition systems that are designed to ignite with an electrical spark. This eliminates the costs of a continuous burning pilot light.

New gas cooking systems are easier to clean. Some ranges have sealed burners so food does not collect beneath the burners. On other new ranges, the top lifts up or off so burners can be removed easily. On all models, the knobs, burner bowls, and cookware supports can be easily removed for cleaning.

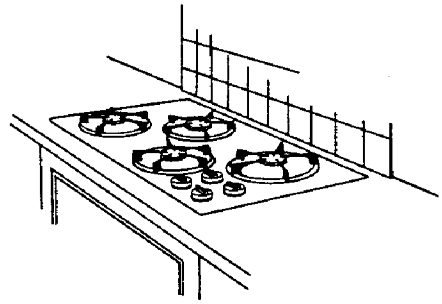

Figure 10. Gas Cooktop.

ENERGY EFFICIENCY OF DIFFERENT COOKTOPS

Jenn-Air, a well-known manufacturer of appliances recently conducted extensive cooktop and cookware research. A variety of cookware of different materials, bottom thickness, and bottom flatness were used to prepare a variety of food items.

Results indicate that when induction, solid disk elements, glass-ceramic, and conventional coil cooktops were compared, the induction cooking system was found to heat the fastest. The solid-disk element used more energy than the conventional coil element when cooking with the same flat-bottom, heavy-gauge cooking utensil. When the cookware bottom was not flat, the solid element also used more energy than the conventional coil unit. In addition, the solid-disk element units required more time for cooking than the conventional coil elements.

QUESTIONS TO ASK ABOUT COOKTOPS

1. Does the warranty on the cooktop cover the entire product? Only certain parts? Is labor included in the warranty?
2. Who is responsible for repairing the product? The dealer? A service agency? The manufacturer?
3. Who pays for what under the warranty? Parts? Labor? Shipping charges? Travel charges?
4. How long does the warranty last on the entire cooktop? On individual parts or assemblies?
5. If the cooktop is out of use because of a service problem or if it has to be removed from the home for repair, will a substitute cooktop be provided? By whom?
6. What type of cooking system is in the cooktop?
7. How does the cooking surface compare with other types in speed of heating?
8. How easy is it to clean the heating element and cooktop surface?
9. Is there retained heat available to continue cooking after the element is turned off?
10. How even is the heat distribution of the heating element?
11. Does the manufacturer approve of canning food on the cooktop?
12. Does the heating element have a thermal limiter or temperature limiter to protect it from overheating?
13. Does the heating element have a thermostat control on the heating element for precise temperature control?
14. What are the finishes used for the cooktop surface and the cooking element itself?
15. If a glass material is used, what is it made of and how easily is it heated and cleaned?

MATCHING COOKWARE WITH COOKTOPS

Today, consumers should not only know about cooktops but also how cooktops interact with cookware. Selecting the correct utensil for a cooking surface is important for the best cooking results.

When cooking on a **halogen** unit, use metal cookware to help maintain the beautiful appearance of the cooktop. Cookware made of glass-ceramic is not recommended for halogen cooktops, which have a glass-like surface. Imperfections on the glass-ceramic cookware can scratch the cooking surface.

Magnetic cookware such as cast iron, magnetic steel, and magnetic stainless steel is necessary with an **induction** cooktop. Copper and aluminum are not magnetic unless a magnetic material is sandwiched between the layers or clad onto the bottom. If a household magnet clings to the bottom of the cooking utensil, it can be used for induction cooking.

The **conventional coil** system will accommodate large canners and woks and is tolerant of poor cookware such as pans with warped, non-flat bottoms. However, like the other cooking systems, the conventional coil system performs best when cookware is sized to fit the element and has a flat bottom.

The manufacturers of **solid-disk elements** recommend using “virgin” cooking utensils which have never been used before. One of the virtues of solid-element cooking is that cooking utensils are less likely to warp; bottoms that start out flat stay flat.

Manufacturers of all cooking surfaces recommend flat cookware. This is especially important with solid element and glass-ceramic cooktops because they are the least tolerant of non-flat cookware. They may require up to 30 percent additional cooking time for non-flat cookware.

CHARACTERISTICS OF QUALITY COOKWARE

Good Conductivity. To work effectively, cookware should be made of a material that conducts heat quickly and evenly. The speed with which a material conducts heat is not only affected by the material but also by its thickness. Thin materials conduct heat quickly while thick materials conduct heat more slowly.

Many believe a material’s ability to conduct heat quickly is one of the most important considerations in choosing cookware. This bar graph (Figure 11) shows copper to be the fastest conductor of heat; aluminum is second. Glass-ceramic and heat-resistant glass are the slowest conductors of heat.

Copper cookware should be lined with another material, such as stainless steel or tin so the food will not come into contact with the copper. Copper cookware is lined because some foods interact with copper to form toxic substances.

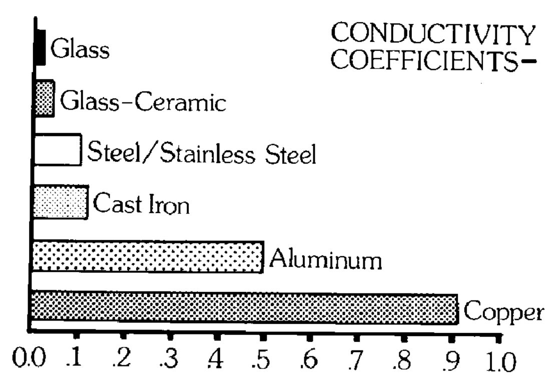

Figure 11. Conductivity of Metals.

Aluminum is considered a fast conductor of heat. Although its conductivity is only half that of copper, it is four times that of iron or steel. Aluminum cookware is made by stamping, drawing, or casting and comes in a variety of gauges (thin, medium, and thick).

Cast-iron cooking utensils have been around for a long time. Iron is heavy, brittle, and rusts unless protected. It is a slow conductor of heat. However, once heated, it tends to retain heat evenly for some time after the heat source is turned off.

Steel cookware is iron with carbon dissolved in it. It is lighter and stronger than iron but still rusts. Steel is an uneven conductor of heat.

Stainless steel cookware is created by adding chromium and nickel to steel. Stainless steel will not rust. Generally, stainless steel cookware is not magnetic unless some magnetic material has been added during production. While stainless steel is easy to clean, durable, and resistant to corrosion, it can warp and develop hot spots.

Glass-ceramic cookware is made by transforming glass into a crystalline material, that can withstand sudden temperature changes. As cookware, it is a poor conductor of heat. Like heat-resistant cookware, glass-ceramic cookware has the advantage of not reacting with food acids and alkalines.

Of all cooktop materials, heat-resistant glass, which may be transparent or translucent is the slowest conductor of heat.

Gauge. Along with the conductivity of the materials used in the cookware, the gauge or thickness of the material is another feature that determines the quality of cookware and cooking performance.

When looking at the gauge or weight of a cooking utensil, the thickness of its bottom is most important. Generally, a thin bottom conducts heat quickly but unevenly. In contrast, a thick-bottomed cooking utensil conducts heat slower, but more evenly, reducing hot spots. The thicker the bottom material, the more heat retained, and the greater the possibility of even cooking performance.

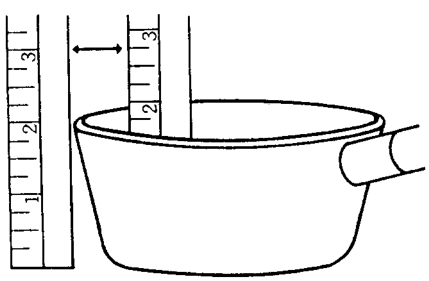

Figure 12. Checking Thickness of Cookware's Bottom.

One way to check the thickness of the bottom of a utensil is to use two rulers (see Figure 12). Place the cooking utensil on a flat surface. Place one ruler inside the cooking utensil and one on the outside. The difference between the height of the ruler measurements at the top is the thickness of the bottom. Use this test to compare cooking utensils.

Sandwiched Metals. Another way to improve the conductivity of cookware is to sandwich metals that are good conductors of heat with other metals (Figure 13). This can be done so there are as many as five layers of metals.

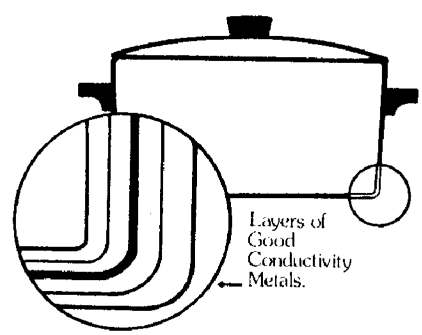

Figure 13. Metals Sandwiched Together.

Plating. Another example of how metals can be combined to improve conductivity is to plate or clad a good heat-conducting material onto the bottom of cookware (See Figure 14). An example is copper clad onto the bottom of stainless steel cookware.

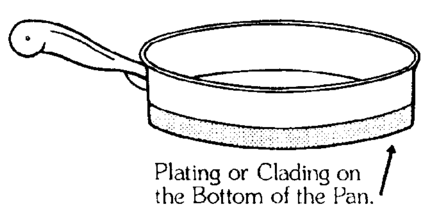

Figure 14. Plating.

Smooth, Flat Bottoms. Smooth, flat-bottomed cookware is important to good cooking performance and is recommended by all cooktop manufacturers. The flatter the cookware's bottom surface when heated, the better it will receive heat from the element and conduct it to the food. Some types of high-quality cookware are not flat until they are heated; otherwise, they are concave. Shorter cooking times and energy savings can be realized when cooking with flat rather than non-flat cookware.

A utensil may have a perfectly flat bottom, but if it is improperly cared for, it can become warped. A practice that warps cookware is to run cold water into the utensil when it is hot or by leaving an empty pan on a hot element.

Correct Size. For good cooking performance, the diameter of the cookware should closely match the size of the heating area. Cookware should not extend more than 1 inch beyond the heating area.

If cookware is too large, the heat is distributed unevenly, cooking time is increased, and more energy is used. Also heat can be trapped under the heating element, causing the element to build up heat (see Figure 15).

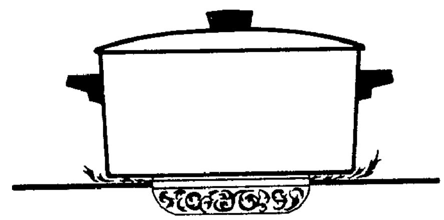

Figure 15. Cookware Too Large for Heating Element.

This build-up of heat may shorten the element's life or damage the surface around the element.

When a cooking system is thermally limited, a too-large cooking utensil will cause the unit to cycle off and on, reducing the cooking speed and the life of the heating element.

On glass-ceramic cooking surfaces, a cooking utensil that is too large in diameter can cause the glass to overheat and break.

Cookware that is too small for the heating element can waste energy because heat is lost into the kitchen. Small cookware also increases chances of spill-overs.

Finish. Some of the most common finishes of cookware are natural metal, fused porcelain enamel, and anodized aluminum, which can influence cooking performance and ease of cleaning. Fusing porcelain enamel onto steel or iron makes it more attractive and easier to clean. Cookware fused with porcelain enamel will not rust unless chipped. Anodizing aluminum can enhance aluminum's good performance. The dark-colored, anodized surface absorbs radiant heat and makes the cooking utensil harder.

Fluorocarbons, under such names as Teflon II and Silverstone give a smooth, anti-stick finish to the inside of cookware. If not scratched, these finishes make cleaning easier.

The color and texture of the finish also have some influence on cooking performance and speed. Dark-colored, rough textured cookware absorbs more radiant heat than highly polished cookware. However, the color of the cooking utensil is more important in the oven than on top of the range.

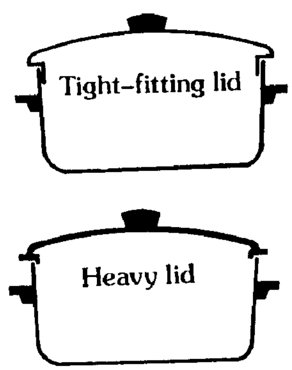

Figure 16. Types of Lids.

Tight-Fitting Lids. Lids should fit firmly and snugly. Some lids interlock with cooking utensils and some sit flat on the lips of cookware (see Figure 16). Lids that sit flat must be heavy enough to provide a good seal. Tight-fitting lids hold in steam, thus less water and energy are used during cooking.

Durable Handles. Cookware handles should also be considered. If a handle is made of a material that will melt, look for a flame guard between the handle and the cookware (see Figure 17). This guard will protect the handle from the heat of the cooking element.

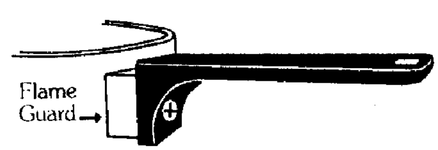

Figure 17. Flame Guard on Handle.

Metal handles may be oven-safe but they can get too hot to pick up without using a potholder.

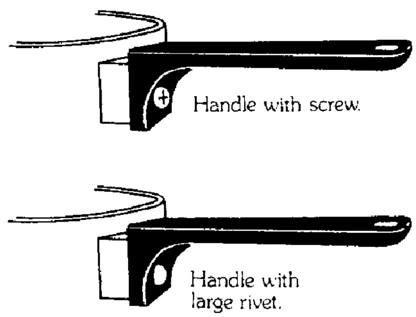

Figure 18. Types of Handles.

Check to see that handles are securely fastened. Handles that are bolted or screwed may loosen, but can be easily tightened (see Figure 18). Rivets on inexpensive cookware are often weak spots, but large rivets provide long-lasting attachments.

A handle should be secure enough to easily lift a cooking utensil full of food. It should also fit the user's hand comfortably, especially on large, heavy utensils.

The handle weight should not cause an empty cooking utensil to tip toward the handle.

QUESTIONS TO ASK ABOUT COOKWARE

1. Does the warranty cover the entire product? Only certain parts?
2. Who is responsible for repairing the cookware? The dealer? A service agency? The manufacturer?
3. Who pays for what under the warranty? Parts? Labor? Shipping charges? Travel charges?
4. How long does the warranty on the entire cookware last?
5. Does the manufacturer have a toll-free information number?
6. What types of cookware are recommended for the different cooktop units?
7. What kind of metal is used in the cookware, how fast does it conduct heat, and how even is the cooking?
8. Are methods such as plating, cladding, or sandwiching different metals used to improve the conductivity of the cookware?
9. What is the gauge and thickness of the cookware bottom?
10. What kind of finish is used on the cookware? Is it durable?
11. Will the cookware be flat when heated?
12. What kind of lid does the cookware have? Interlocking or sit on the top?
13. If the handle is made of a material that will melt, does it have a flame guard?
14. Are the handles securely fastened with bolts or large rivets?

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