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Induction Cooking: How It Works

What *Is* "Induction Cooking"?

Here's the Basic Idea

"Cooking" is the application of heat to food. Indoor cooking is almost entirely done either in an oven or on a cooktop of some sort, though occasionally a grill or griddle is used.

Cooktops--which may be part of a range/oven combination or independent built-in units (and which are known outside the U.S.A. as "hobs")--are commonly considered to be broadly divided into *gas* and *electric* types, but that is an unfortunate oversimplification.

In reality, there are several very different methods of "electric" heating, which have little in common save that their energy input is electricity. Such methods include, among others, coil elements (the most common and familiar kind of "electric" cooker), halogen heaters, and induction. Further complicating the issue is the sad habit of referring to several very different kinds of electric cookers collectively as conventional ceramic hobs even though there can be wildly different heat sources under those smooth, glassy tops.

As we said, cooking is *the application of heat to food.* Food being prepared in the home is very rarely if ever cooked on a rangetop except in a cooking vessel of some sort--pot, pan, whatever. Thus, the job of the cooker is not to heat the *food* but to heat *the cooking vessel*--which in turn heats and cooks the food. That not only allows the convenient holding of the food--which may be a liquid--it also allows, when we want it, a more gradual or more uniform application of heat to the food by proper design of the cooking vessel.

Cooking has therefore always consisted in generating substantial heat in a way and place that makes it easy to transfer most of that heat to a conveniently placed cooking vessel. Starting from the open fire, mankind has evolved many ways to generate such heat. The two basic methods in modern times have been the chemical and the electrical: one either burns some combustible substance--such as wood, coal, or gas--or one runs an electrical current through a resistance element (that, for instance, is how toasters work), whether in a "coil" or, more recently, inside a halogen-filled bulb.

How does an induction cooker do *that?*

Put simply, an induction-cooker element (what on a gas stove would be called a "burner") is a powerful, high-frequency electromagnet, with the electromagnetism generated by sophisticated electronics in the "element" under the unit's ceramic surface. When a good-sized piece of magnetic material--such as, for example, a cast-iron skillet--is placed in the magnetic field that the element is generating, the field transfers ("induces") energy into that metal. That transferred energy causes the metal--the cooking vessel--to become hot. By controlling the strength of the electromagnetic field, we can control the amount of heat being generated in the cooking vessel--and we can change that amount *instantaneously*.

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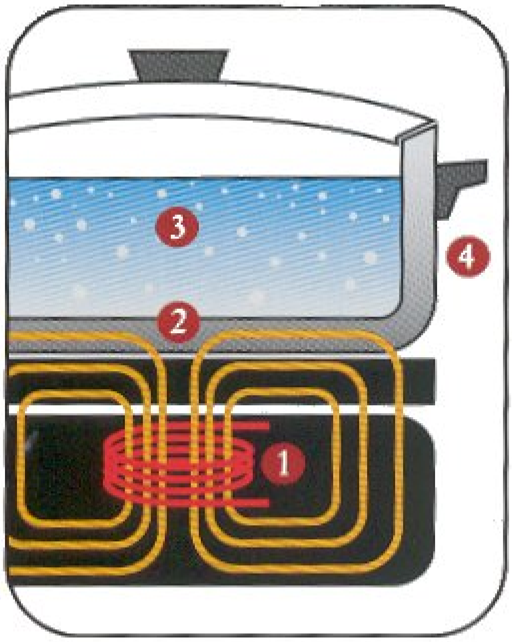
(To be technical, the field generates a loop current--a flow of electricity--within the metal of which the pot or pan is made, and that current flow through the resistance of the metal generates heat, just as current flowing through the resistance element of a conventional electric range's coil generates heat; the difference is that here, the heat is generated ***directly in the pot or pan itself****, not in any part of the cooker.)*



How Induction Cooking Works:

1. The element's electronics power a coil that produces a high-frequency electromagnetic field.
2. The field penetrates the metal of the ferrous (magnetic-material) cooking vessel and sets up a circulating electric current, which generates heat.
3. The heat generated *in the cooking vessel* is transferred to the vessel's contents.
4. Nothing outside the vessel is affected by the field--as soon as the vessel is removed from the element, or the element turned off, heat generation stops.

(Image courtesy of Induction Cooking World)

There is thus one point about induction: with current technology, induction cookers require that ***all*** your countertop cooking vessels be of a "ferrous" metal (one, such as iron, that will readily sustain a magnetic field). Materials like aluminium, copper, and Pyrex are *not* usable on an induction cooker. But all that means is that you need iron or steel pots and pans. And that is no drawback in absolute terms, for it includes the best kinds of cookware in the world--every top line is full of cookware of all sizes and shapes suitable for use on induction cookers (and virtually all of the lines will boast of it, because induction is so popular with discerning cooks). Nor do you *have* to go to top-of-the-line names like All-Clad or Le Creuset, for many very reasonably priced cookware lines are also perfectly suited for induction cooking. But if you are considering induction and have a lot invested, literally or emotionally, in non-ferrous cookware, you do need to know the facts. (Check out our page on **Induction Cookware**.)

Newer technology is coming along that will apparently work with *any* metal cooking vessel, including copper and aluminium, but that technology--though already being used in a few units of Japanese manufacture--is probably several years away from maturity and from inclusion in most induction cookers. If you are interested in a new cooktop, it is, in our judgement, *not* worth waiting for that technology.

(The trick seems to be using a significantly high-frequency field, which is able to induce a current in any metal; ceramic and glass, however, are still out of the running for cookware even with this new technology.)

There is also imminent a "zoneless" type of induction cooktop: the De Dietrich line has been distributing prototypes to selected dealers, and supposedly will release the product to market in April or so. Some far-from-objective material can be found in this this article (PDF file) from *The Kitchen & Bathroom Designer* magazine of February 2006. Initial reports from the field suggest that the unit, at least in its prototype form, is not yet ready for prime time (surprising from that company): two issues cited by a leading dealer were low power, owing to their use of circular magnet shapes, which allow air pockets under the glass, and that the unit's necessarily complicated control system does not always recognize when two similar-size pots are shifted about. Well, we will see what we will see. Doubtless, the bugs will be squashed soon enough, and this promises to be an exciting development in the inexorable advance of induction--a "cook anywhere" surface like a griddle, except hot nowhere but under the pots and pans!

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Now Let's Take a Closer Look

(In this part, we use a little math--but don't shudder, it's all just arithmetic!)

First, let's define some terms. ***Energy*** is a *quantity*: it's like a gallon of water. In cooking, we aren't really concerned with actual energy--we want to know at what *rate* a cooking appliance can supply energy. It's like, say, a garden hose: if it can only produce a dribble of water, it doesn't matter to us that if we let it run day and night we could eventually fill many buckets. What we want to know is how forcefully that hose can spray--how many *gallons a minute* it can put out--because that's what does useful things for us in some reasonable amount of time.

So, in discussing cooking appliances, we normally talk about energy *flow rates*, which are just like the water flow rates expressed in "gallons a minute"--that is, we want to be able to know at what *rate* we can pump heat into the cooking process. For gas, energy *content* (quantity) is traditionally measured in "British Thermal Units" (**BTU**), and so the flow rate of gas energy is given in **BTU/hour**. For electricity, energy content is normally measured as "kilowatt-hours" (kWh) and the flow rate is just kilowatts (**kW**).

(Let's restate that, because it often confuses people, being sort of "upside down". A kilowatt is *not* a quantity, it's a *rate,* like "knots" to measure speed at sea--there are no "knots an hour", knots *are* the speed, and kilowatts *are* the electrical energy-flow rate. To measure total energy--as, for instance, your electric-supply company does, to know how much to bill you--we multiply the flow rate, kilowatts, by the time the flow ran, hours, to get "kilowatt-hours" of energy. So **BTU/hour** and **kilowatts** are both measures of energy *flow rates*, not of energy itself.)

The energy in gas and the energy in electricity just happen to be measured in different-sized numbers, but they're measuring the same thing. It's like miles *vs.* kilometres: we can say a place is about 5 kilometres away, or that it's a little over 3 miles away, but the actual distance we'd have to walk or drive is the same. We can easily convert from miles to kilometres if we know how many of one make up the other. Likewise, we can easily convert from BTU/hour to kilowatts (or vice-versa). There are just about **3,400 BTU to a kWh**--or, more exactly, about 3,413. (Keep in mind that a kilowatt is 1,000 watts: 1 kW = 1000 W).

Superficially, then, comparing cooking technologies looks easy: can't we just look at the rated kW or BTU/hour of a cooktop, and simply convert one kind of measure to the other to compare them? Nope. The complication is that the various technologies are **not all equally effective** at converting their energy content into ***cooking*** heat; for example, gas delivers significantly less than half its total energy to the actual cooking process, while induction delivers about 85 to 90 percent of its energy.

That means that if we have a gas cooker capable of putting out X BTU/hour, converting that X to kilowatts does *not* tell the story--because a lot more of that X is wasted energy that doesn't do any cooking than is the case with induction. To truly compare the cooking power of a gas cooker and an induction cooker, we indeed need to first convert one measure to the other, say BTU/hour to kilowatts; but we then need to slice off from each unit's nominal output the amount that does *not* get used for cooking.

(Think again of garden hoses: if we have two hoses and each is getting, say, 5 gallons a minute pumped into it by the water tap it's screwed onto, are they the same? Not if one has a pinhole leak while the other has a gaping rip. The amount of water that comes out the nozzle to do whatever we need done will differ drastically from one to the other. Induction cooking has a pinhole leak, maybe 10% to 15% of the raw energy it takes being wasted; gas cooking has the whacking great rip in it, the average unit wasting **over 60%** of the raw energy it consumes.)

So, to see how induction compares to its only real rival, gas, we have to make the following calculation:

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$$\textbf{BTU/hour} = \textbf{kW} \times \textbf{3413} \times \mathbf{E_{ind}/E_{gas}}$$

That last term there--$\mathbf{E_{ind}/E_{gas}}$--is simply the *ratio* of the two methods' real efficiencies: $\mathbf{E_{ind}}$ is the energy efficiency of a typical induction cooker and $\mathbf{E_{gas}}$ is the energy efficiency of a typical quality gas cooker.

The snag comes when we try to find reliable figures for those efficiencies. It is remarkable how much misinformation there is (especially on the internet), largely from well-meaning but ignorant sources who do not understand the issues, or are simply repeating what they read elsewhere (from someone else who does not understand the issues). For example, the energy-efficiency values quoted by various induction-cooker makers range from a low of 83% to a high of 90%, while values given for gas cooking run, depending on the source, from 55% down to as little as 30%, nearly a 2:1 ratio.

Fortunately, in the last few years some standardized data from disinterested sources have become available, so we no longer have to rely on figures from parties with an axe to grind. The U.S. Department of Energy has established that the typical efficiency of induction cooktops is 84%, while that of gas cooktops is 40% (more exactly, 39.9%)--figures right in line with the range of claims made for each, and thus quite believable.

Using those values (and sparing you the in-between steps), we can say that gas-cooker BTU/hour figures equivalent to induction-cooker wattages can be reckoned as:

$$\textbf{BTU/hour} = \textbf{kW} \times \textbf{7185}$$

It is worth noting that the testing method that established the induction data used, in essence, a slab of ferrous metal as the "vessel". It reliably established what might be called a "baseline" efficiency, and that is why we use it throughout in evaluating energy equivalencies. It remains as a possibility that particular items of induction equipment--and, for that matter, of cookware--may be a bit more or less efficient than the baseline. There are at least plausible reports that some makes, coupled with some items of cookware, can achieve true efficiencies close to 90%. On this site, we do not use that value because we do not yet know of any *definite*, *reliable data*, but you should keep it clear in your mind that when we discuss the gas heating-power equivalencies of induction units, we are using what should be considered rather conservative numbers; chances are that many induction units are actually somewhat *more* powerful (in BTU/hour equivalents) than we set forth.

Perhaps the most useful way to use that datum is to see what good gas-cooker BTU values are and work back to what induction-cooker kW values would have to be to correspond. But what *are* good gas-cooker BTU values? Here too, opinions will vary. Here are some representative quotations from cooking-focussed Usenet discussion groups:

"Gas: the more standard 9,000 or 10,000 Btu/hr or the high power 15,000 Btu/hr ranges . . . ."

"Yeah sure it is a 15,000 btu cooktop, but I presently own a . . . cooktop that is 12,000 btu. They both seemed to perform about the same which is disappointing."

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"In general, I question what you are getting in the 'pro' style stoves other than looks. The better conventional home ranges already offer one or more burners at 12k btu. Adding that last 3k btu by going 'pro' doubles the price for a marginal increase in output."

"Well the look is ok. The extra 3k is nice but would not justify the extra expense. Actually it is a splurge to get any of the pro style ranges."

OK, none of that *proves* anything, but it *looks* like we can fairly say that:

- the average home gas-cooker burner is about 10K BTU/hour;
- serious home gas-cooker burners are about 12K BTU/hour; and,
- deluxe home gas-cooker burners are about 15K BTU/hour.

So, based on our calculations above, to correspond to:

- "average" home cooking power, an induction cooker element would have to be about 1400 watts (1.4 kW);
- "serious" home cooking power, an induction cooker element would have to be about 1700 watts (1.7 kW); and,
- "deluxe" home cooking power, an induction cooker element would have to be about 2000 watts (2 kW).

Considering that even the old, now-long-gone, first-generation Sears and GE units each had 1400-watt elements, and that most or all newer models have more firepower yet--some up to as much as 3,500 watts!--induction cooktops clearly have the same (sometimes much more) heat-generating ability as do even the best home gas-cooking units. Note that anything much above 12,000 BTU/hour seems to be generally considered, even by *serious* home chefs, as overkill, yet that's less than 1,700 watts for an induction element. Our personal experience with an older unit with just 1400-watt elements is that it heats at least as well as the typical home gas-based sort of unit.

(Depending on what and how and for how many you cook, sometimes heavy "firepower" elements can be useful: heating a huge stock-pot of liquids can take a while on anything but the strongest elements. But for most people most of the time, 1.7 or 1.8 kW elements are probably ample; moreover, if you're not "most people", you probably already have a pretty good idea, in numbers, of the firepower you want or need.)

Keep in mind that there are differences of opinion about these matters, which we will both explain and comment on when the time comes. First, though, here is a summary of the key points.

Favourable:

Instant Adjustment

To serious cooks, the most important favourable point about induction cookers--given that they are just as (or more) "powerful" at heating as any other sort--is that you can adjust the cooking heat *instantly* and with *great precision*. Before induction, good cooks, including *all* professionals, overwhelmingly preferred gas to all prior forms of electric cooking for one reason: the substantial "inertia" in ordinary electric cookers--when you adjust the heat setting, the element (coil, halogen heater, whatever) only slowly starts to increase or decrease its temperature. With gas, when you adjust the element setting, the energy flow adjusts ***instantly***.

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But with induction cooking the heat level is *every bit* as instantaneous, and as exact, as with gas, yet with none of the many drawbacks of gas (which we will detail later). Induction elements can be adjusted to increments as fine as the cooker maker cares to supply, just like gas, and--again very important to serious cooks--such elements can run at *as low a cooking-heat level as wanted* for gentle simmering and suchlike (something even gas is not always good at). Someday, perhaps not so many years away, the world will look back on cooking with gas as we today look on cooking over a coal-burning kitchen stove.

No Wasted Heat

With induction cooking, energy is supplied *directly* to the cooking vessel by the magnetic field; thus, almost all of the source energy gets transferred to that vessel. With gas or conventional electric cookers (including halogen), the energy is *first* converted to heat and only *then* directed to the cooking vessel--with a lot of that heat going to waste heating up your kitchen (and you) instead of heating up your food. (*The striking image at the left shows how precisely focussed heat generation is with induction--ice remains unmelted on an induction element that is boiling water!*)

As a comparison, 40%--less than half--of the energy in gas gets used to cook, whereas with induction 84% percent of the energy in the electricity used gets used to cook (and the rest is *not* waste heat as it is with gas). There are two important heat-related consequences of that fact:

- **cooler kitchens**: of course the cooking vessel and the food itself will radiate some of their heat into the cooking area--but compared to gas or other forms of electrically powered cooking, induction makes for a *much* cooler kitchen (recall the old saying: "If you can't stand the heat, get out of the kitchen."); and,
- **a cool stovetop**: that's right! The stovetop itself *barely gets warm* except directly under the cooking vessel (and that only from such heat as the cooking vessel bottom transfers). No more burned fingers, no more baked-on spills, no more danger with children around. (*The photo at the right--one of several similar ones to be found on the web--shows, like the one above, how only the cooking vessel does the actual cooking.*)

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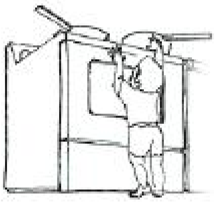
Safety



We have already mentioned that the stovetop stays cool: that means no burned fingers or hands, for you or--especially--for any small children in the household. (*In the image at the right, you can see a pot boiling water on an induction unit while a dollar bill between the pot and the cooktop surface is unsinged.*) And for kitchens that need to take into account special needs, such as wheelchair access, nothing, but nothing, can beat induction for both safety *and* convenience (see the paragraph farther below).

Furthermore, because its energy is transferred only to relatively massive magnetic materials, you can turn an induction element to "maximum" and place your hand flat over it with no consequences whatever--it

will not roast your non-ferrous hand! (Nor any rings or bracelets--the units all have sensors that detect how much ferrous metal is in the area that the magnetic field would occupy, and if it isn't at least as much as a small pot, they don't turn on.) And, while an element is actually working, all of its energy goes into the metal cooking vessel right over it--there is none left "floating around" to heat up anything else. (*The image at the right shows a hand--wearing a metal ring--harmlessly touching a full-on induction element, while a metal utensil lies equally harmlessly on another, emphatically demonstrating those points.*)

Moreover, gas--induction's only real competition--has special risks of its own, not all of which are as well known as they perhaps should be. While the risk of a gas flame, even a pilot light, blowing out and allowing gas to escape into the house is relatively small, it does exist. But a much bigger concern is simply gas itself, even when everything is working "right". Use any web search engine and enter the terms *gas health risk cooking* and see what you find (really: do try it right here); if, for example, you visit the Gascape web site, you may never again want to even enter a house with gas laid on (take some time to really poke around on this site--you may be shocked). And, of course, *all* combustion releases toxic carbon monoxide.

Ease and Adaptability of Installation

Unlike most other types of cooking equipment, induction units are typically *very* thin in the vertical, often requiring not over two inches of depth below the countertop surface. When a cooking area is to be designed to allow wheelchair access, induction makes the matter simple and convenient. (*In the image at the left, notice how the induction cooktop is scarcely any thicker than the actual countertop.*)

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Ubiquity

It is an obvious but still very important fact that induction cookers *are* powered by electricity. Not every home actually has a gas pipeline available to it--for many, the only "gas" option is propane, with the corollary (and ugly, space-taking, potentially hazardous) propane tank and regular truck visits. But everyone has clean, silent, ever-present electricity.

Cleanliness

Burning gas has by-products that are vaporized, but eventually condense on a surface somewhere in the vicinity of the cooktop. Electrical cooking of any kinds eliminates such by-products.

Unfavourable:

The Cooking Vessels

The most obvious and famous drawback to induction cooking has already been mentioned: it only works with cooking vessels made of magnetic materials. The commonest such materials used for cooking vessels are stainless steel and cast iron. Cookware suited for use with induction cookers, from the extreme high-quality end down to thrift-store modest, is readily available; but if you already have a stock of mostly expensive aluminium or copper or glass or Pyrex cookware and little or no cast iron or stainless, you might be up for a cookware investment.

On the other hand, if you have a significant quantity of non-ferrous cookware that is ***not*** terribly expensive, you can replace it--possibly with much better stuff!--as part of the process; cast iron is by no means "spendy" cookware. If you have ever seen the inside of a real restaurant kitchen, you will surely have noticed that most or all of the cookware is either cast iron or nice, shiny stainless steel (and most restaurants still use gas because the energy cost--which matters to them as it does not to a residential kitchen, because it's on all day long--is lower). Steel is most cooks' preferred cookware material for many good reasons outside the present scope of this site (and recall that enamelled steel cookware also works beautifully on induction).

(Note that *not all stainless-steel cookware works equally well* on induction units; much depends on how the maker has assembled the layers of metal of which the pot or pan is made. **Do not** assume that all cookware labelled "stainless steel" will work on an induction unit--but almost all makers whose products *do* work, which includes a lot, will proudly say so in their advertising material or specifications.)

As we noted elsewhere, technology to allow use of *any* metal cookware--even copper and aluminium--is in the pipeline, but there are definite problems with getting sufficient power levels with that technique, so it will likely be many years before units with it start showing up in the mainstream (if they ever do). So, for now, the need for ferric cookware does remain.

(To see what constitutes good cookware for induction, see our page on **Induction Cookware**.)

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Inadequate Power?

*This is **not** a valid negative*--but we list and discuss it here because there are so many falsehoods and misunderstandings floating around on this matter. As we clearly showed, with hard numbers, induction cooking units are every bit as powerful and often *more* powerful, than gas units. To recap, a top-line "semi-professional" home gas range for serious cooks might have burners each rated at 15,000 BUT an hour--but that is only about 2 kW for an induction element. As you will see elsewhere on this site, many modern induction units have capacities well *above* that number (some have up to 3.5 kW). Any concern over the adequacy of the "cooking power" of induction units is simply silly.

Radiation Hazards?

(Owing to the length of quoted material involved in our discussion, we have put this topic on a page of its own; but we do not think it an issue, even for those with imbedded cardiac devices--still, read about it.)

Noise

Induction itself is a noiseless process. The energy fields are, however, generated by electronic equipment; if the maker is putting a fair amount of power in a small space, it may thus be necessary to include a small fan to move cooling air over that electronics. In some cases, the fan may make more noise than some people will be comfortable with. (That seems more likely for small freestanding countertop units than build-in cooktops, but that is by no means a set rule.) Regrettably, there are no data whatever available about unit noise levels, so if you are concerned about this issue, you need to actually see (well, hear) a unit in operation--either that, or be sure you can return a unit for full credit if it is too noisy for you. I emphasize that I do not think this to be a common problem, but I do know it can occur.

Unavailability

Until recently, at least in North America, the remaining drawback to induction cooking was one not inherent in the process, but rather a consequence of the then-present state of the market: that drawback was simple unavailability. (Units have for some time been available from overseas via "self-importing", but few were or are aware of that fact.) In the last year or two, however, availability has boomed. We discuss makers and their units on a separate page of this site, but there is now a real spectrum of available units. Importing can still make excellent sense, but--for the timid--quite a few units are now available domestically in North America (and more and more are coming along).

Electricity Failures

If the electricity supply to your home is interrupted, you will be unable to cook; gas supplies can be interrupted, too, but such interruptions are normally somewhat less likely than electricity interruptions. If the electricity where you are frequently goes out for hours at a time, the loss of cooking ability may be an issue for you. Most people living in such circumstances will have provided themselves with a backup, such as a propane-powered emergency generator--but if that's you and you have no backup, factor the matter into your decisions.

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No "Char" Flames

For those to whom charring such items as peppers in an open flame is important, the lack of such a flame is a drawback. (It is, of course, one shared with all non-gas cookers.) But nowadays, most good ovens--gas certainly, but probably even electric--can do an acceptable job of charring food.

Neutral Or Hard to Reckon

Energy Costs

Energy-cost differences are hard to reckon because the prices of gas and the price of electricity these days are highly volatile, even relative to one another, *and* vary considerably from locale to locale even on the same day at the same hour (and, of course, by season, too). But in any event, this is not a really large factor. Let's look at some numbers:

Assume that you are using an induction cooker and have two elements, each 2kW, each running at *maximum* (a hefty load of heat indeed) for a full hour. At the present U.S.A. national-average electricity cost of about 9.3 cents a kWh, you will have used about 37 cents' worth of energy. To accomplish the same heating with gas, using the efficiency figures we supplied before, you would need to have burned up 28,740 BTU; at the U.S.A. national-average cost of $1.03 a "therm" (100,000 BTU), you'd have burned about 30 cents' worth of energy. The cost difference, in this cost snapshot, and assuming a goodly amount of energy usage, is 7 cents. And that is based on an energy use--a sold hour of two elements at maximum power--that is scarcely representative of every meal a family cooks; a more realistic premise might be, given the cost numbers, about half that usage, or something between 3 and 4 cents a meal.

Granted, pennies here and pennies there can add up--but to what? Even assuming a family that eats in for 3 meals a day every day of the year (*not* a very realistic assumption), one would be looking at perhaps $38 a year; so, for real life, maybe $30 a year extra, two to three dollars a month. That is just not money worth talking about.

(It may also be worth noting that the relative costs of electricity and gas are quite likely to keep shifting shift in favour of electricity over the years, albeit probably not drastically.)

Purchase Costs

It's hard to say that induction units are "comparable" to gas cookers when their prices start at well over a thousand dollars: nonetheless, we will say it. The reason we do is because one needs to be careful to compare apples to apples, and the conventional 30-inch slide-in kitchen stove is an orange in this analogy. It is not always true that "you get what you pay for", but it *is* always true that you don't get what you don't pay for. An induction unit is so clearly superior, in so many ways, to any other form of cooking that it is hard to exaggerate the differences. One can say that a Chevy and a Rolls Royce are both "cars"--vehicles that take a given number of passengers from Point A to Point B--but there are valid reasons for the difference in their prices.

Moreover, a cooker--ordinary, fancy gas, induction, whatever--is a very long-term investment. The cost difference between a simple, inexpensive plain kitchen stove and a decent or better induction unit is not much when averaged out over the likely lifetime of such a unit.

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More to the point, though, is "apples to apples": if one compares prices for induction units with those of good or better quality gas cookers, they are thoroughly competitive. In very round, rough numbers, one can today get a sound, induction unit for perhaps $1300, and a top-quality one for perhaps $1800 (U.S. dollars), delivered cost. (You can also spend much more, but that's another matter that we'll go into elsewhere on this site.) In the May 2005 issue of *Consumer Reports*, the price for their least-expensive 30-inch electric cooktop (a plain-vanilla "smoothtop" type) was $450; but their preferred model was $700, and the spectrum ranged up to $1300. For 36-inch gas cooktops, their recommended units ran from $650 to $900, and their top-rated pick was $1,400 (and one European-name-brand unit was $1,800). So the current prices of induction cooktops are by no means wildly out of line with considerably more ordinary types of cooktops. And, needless to say, the costs of the so-called "semi-professional" or "deluxe" cooking units are far higher.

Vessel Sizes

Cooking vessels at the extremes of size--the very small and the very large--occasionally raise issues. Because the auto-detect feature that all induction units have is meant to assure that things from cooking implements (such as metal tongs or spoons or ladles) to jewellery (rings or bracelets) will not activate an element, the detectors are often set rather conservatively, so much so that on some units very small pots or pans will not be detected. But that is scarcely a major issue: one need only (we speak from extensive experience) set the smaller pot or pan inside a slightly larger one (especially practical as one is rarely if ever seeking really intense heat for anything that would go in such a miniscule pot or pan).

At the other extreme--things like griddles or fish poachers that are well over 12 or 14 inches in at least one dimension--also present issues; but we list this as "neutral" because those issues are not substantively different from induction to, for example, gas. An induction element heats a cooking vessel placed on to the width of the element--just as with, for example, a gas burner. If one places a 12-inch-diameter skillet on a 9-inch induction element, the actual heat generation will take place in a 9-inch-diameter zone in the pan bottom; likewise, if one places the same skillet on a same-size gas burner, so also will the heating be limited to the size of the burner diameter. Heated cookware will do one of two things, depending on its construction (see out page on **cookware** for more detailed explanations): vessels designed to accommodate rapid changes in cooking temperature, such as clad stainless-steel cookware, will be correspondingly rapid in spreading heat throughout their total cooking area; vessels intended for even-temperature cooking, such as cast iron (enamelled or not), will be slower to achieve temperature equilibrium, but once well heated will hold temperatures pretty even and constant across their total cooking area.

On any cooking technique whatever, heat is only delivered or supplied within the diameter of the zone--gas burner, induction element, heater coil, whatever. Any vessel nontrivially larger than that zone will invariably be a *little* less hot at the outer edge of the cooking zone. That is a fact of life independent of the cooking technology, and is thus neither a plus nor a minus for induction compared to other methods.

A related issue is large cooking vessels of unusual shapes, like griddles and grills, such that they cannot readily be heated by a single element (of *any* sort of cooking technique). Such vessels are normally used on cooktops by "bridging" two elements: that is, placing the vessel (usually an elongated one) so that it lies across two heating zones. Contrary to some urban mythology, there is no reason bridging cannot be done on an induction cooktop as readily as on any other cooktop. The results will be no less, and no more, satisfactory, regardless of heat source. If the vessel conducts heat rapidly, as clad stainless steel does, it will probably have definite hot spots, with cool spots between; on the other hand, a heavy slow conductor of heat, such as cast iron, would probably achieve a more even and steadier temperature. Again, those things are so regardless of the actual source of heat, induction or other.

From: http://theinductionsite.com/

Although that is the present state of the art, soon induction will have a clear advantage; expect to see "cook anywhere" induction cooktops--meaning that the entire surface is a cooking "zone". On such units, an "element" will be defined by the size and shape of a actual cooking vessel placed on the surface: the entire cooktop will be underlain by a very large number of small "micro-elements", and those micro-elements lying under a vessel will be activated. Grills, griddles, fish poachers, super-large skillets--all will be heated uniformly merely by being placed anywhere on the cooktop. This is not guessing or "futurology": demonstration units that actually work that way have been built and demonstrated by a well-known maker; they still have some small flaws to be worked out, so it may be a year or two before such equipment hits the mainstream, but it's definitely not far off. (We ourselves, were we planning a new kitchen now, would not wait for this development; it's nice, and doubtless defines the long-term future of the art of not only induction but all cooking, but at bottom it's really not some revolutionary advance, and a year is a year.)

Get Others' Opinions

If you would like to take a current look at what is being said on Usenet about induction cooking, here are some direct links. Each will do a real-time Google Usenet search for the word *induction* used in any discussion; the difference between the two is that one will search one set of groups--all those with the word ***cooking*** anywhere in their name--and the second another group, all those with the word ***food*** anywhere in their name (of course, there will be some overlap between those two sets of results, notably **rec.food.cooking**):

- **"cooking"** groups (such as **rec.food.cooking**, **alt.cooking-chat**, and **alt.creative-cooking**)
- **"food"** groups (such as **rec.food.cooking** and **rec.food.equipment**, an especially relevant group)

The searches will present their results in reverse chronological order (newest first). Using these links gives you a set of results over which we have no control at all, so it's as unbiased as it gets (the *selection* is unbiased: many of the *posters* will be highly biased one way or another--see the text immediately below for examples of what we mean).

Cracked Pots

No, not the cookware you might use, but the crackpots who post nonsense about subjects about which it is manifest that they are sorely uninformed, thus creating false worries in the minds of those who expect authoritative-sounding posts to actually be authoritative. As some wit once remarked, "There is no harm in being a fool; harm lies in being a fool at the top of your lungs." And the internet, whether the web or Usenet, is chock full of cracked pots apparently willing to be fools at the tops of their lungs about induction cooking and induction equipment.

We used to have here a little selection of cracked-pot postings, with our explanatory comments appended, but there's really little point to it now. Once, when so little was generally known about induction in North America, cracked pots could get away with posting ignorant (and usually snotty) nonsense about the inferiority of induction and the supposed vast superiority of gas--but those days are gone now.

Not that there aren't likely to still be a lot of cracked pots out there--this *is* the human race we're talking about--but hard, factual data is now readily adduced. One could, for example, if given to being tediously supererogatory, compile a long laundry list of top-rank chefs and restaurants that use, and extravagantly endorse, induction equipment, as a sort of "Take that!" to those who insists that "the pros" use nothing but gas; but there would be no point except to prove a willingness to scan a lot of web pages, because so very *many* top chefs and restaurants would make that list.

The old guff seemed to be especially based on the purported weakness of induction units beside gas cookers; today, to anyone who can read without moving their lips, that scarcely rises even to the level of being humorous--it's just so silly. Remember:

BTU/hour = kW x 7185

Most household units have at least 2.2 kW elements, and many have 3.2 kW; that is *very conservatively* equivalent, for gas cooking, to 15,800 BTU up to just about 23,000 BTU. *That* is cooking power, and it's commonplace in home units. Nuff said, hm?

Summing Up

Although this site is about the clear superiority of induction to any other method of cooking, we really have tried to give as balanced a picture as possible. If it seems to you, after reading this page that we have skewed towards the favourable that is only because induction really *is* immensely superior. Its sole consequential drawback is its inability to work with certain kinds of cookware--which is not an inherent flaw, because it works with the very best--but which can be a drawback is you are at present heavily invested in incompatible cookware. (The easiest test in the world is to take any magnet--a refrigerator-decor type works fine--and see if it will cling to the bottom of a piece of cookware. If it doesn't, or if it clings very weakly, that item of cookware will not work on an induction cooker. If you're shopping for cookware that you want to be able to use on an induction unit, now or in the future, just take such a magnet along with you. Or, if you're buying off the web, make sure the product description says the item is induction-compatible, or ask for a written or emailed statement that it is, with full refund privileges.)