Induction Cooking for the Commercial & Residential Kitchens

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What is Electromagnetic Induction?

- Discovered by Michael Faraday in 1831
- It is the production of an electromotive force across an electrical conductor in a changing magnetic field.
- Many applications, including electrical components, motors, generators and cookware.
How does Electric Induction Cooking Work?

- An electrically charged copper coil underneath the hot top surface creates an oscillating electromagnetic field.

- This field induces an electrical current in the cookware that excites its molecules = resistive heating

- The cookware becomes the heat generator, making the appliance very energy efficient!

- Without cookware in the electromagnetic field, no energy is consumed nor heat produced.
How Does It Differ From Conventional Coil Electric Range Tops?

- Traditional range tops use “resistive” heating elements which heat as electrical current passes through them.
- Heat is transferred to the cookware through conduction - the contact of the cookware with the heating element.
- Heating element is slow to heat up and remains on when cookware is removed.
What about Electric Ceramic/Glass Range Tops?

- A Glass or Ceramic surface protects the resistive coil beneath making it easier to clean.
- Heat is this transferred to the cookware through *radiation* – electromagnetic energy transfers heat form the element to the cookware.
- Just like a conventional electric range top, the heating element is slow to heat up and remains on when cookware is removed.
What about Gas?

- Characterized by an open flame underneath a metal grate
- Heat is transferred to the cookware through conduction as well as convection and radiation
- Very poor efficiency - most heat is lost between the burner and cookware
Gas Cooking: Indoor Air Quality Concerns

Most residential hoods do a poor job of removing gas byproducts from the kitchen.
... and what is Energy Efficiency exactly?

Efficiency (%) = \frac{\text{Energy into Water (Btu)}}{\text{Energy into Cooktop (Btu)}}

A Measure of Useful Work!
Residential Hot Tops
How do they Compare? *Performance*

<table>
<thead>
<tr>
<th></th>
<th>½ gallon Water Boil Efficiency (%)</th>
<th>Boil Time (min)</th>
<th>Temperature Response (°F over set pt)</th>
<th>Saute Time (min)</th>
<th>Saute Efficiency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Induction</td>
<td>86</td>
<td>10</td>
<td>1.0</td>
<td>7</td>
<td>50</td>
</tr>
<tr>
<td>Resistance &amp; Radiant</td>
<td>70</td>
<td>16</td>
<td>5.0</td>
<td>7</td>
<td>38</td>
</tr>
<tr>
<td>Gas</td>
<td>31</td>
<td>19</td>
<td>1.7</td>
<td>7</td>
<td>23</td>
</tr>
</tbody>
</table>
How do they Compare? **Purchase Cost**

<table>
<thead>
<tr>
<th></th>
<th>Electric Coil</th>
<th>Electric Ceramic</th>
<th>Induction</th>
<th>Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic</td>
<td>$300</td>
<td>Basic: $600</td>
<td>Basic: $1,200</td>
<td>Basic: $400</td>
</tr>
<tr>
<td>Premium</td>
<td>$400</td>
<td>Premium: $3,000</td>
<td>Premium: $5,000</td>
<td>Premium: $6,000</td>
</tr>
</tbody>
</table>

**$300 - $400**

**Basic: $600**

**Basic: $1,200**

**Basic: $400**
How do they Compare? **Operating Cost**

- **Electric Coil**: $45/year
- **Electric Ceramic**: $45/year
- **Induction**: $40/year
- **Gas**: $30/year
Try before you buy!

Residential Countertop Induction Cooktop (115V)
• 1300, 900, 600 watt settings
• Programmable
• Timer
• $65!
• Provided via muni & CCA loaner programs
Commercial Kitchen Induction Appliances
Multiple Applications

- Hot Tops/Ranges
- Woks
- Griddles
- Rerecallizers & Holding
Shanghai Restaurant Show: Full Induction Suite!
# Commercial Induction Rangetop Field Study

<table>
<thead>
<tr>
<th></th>
<th>Baseline Electric</th>
<th>Baseline Gas</th>
<th>Induction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily Energy Use</td>
<td>18.2 kWh</td>
<td>1.5 therms</td>
<td>7.4 kWh</td>
</tr>
<tr>
<td>Annual Energy Cost</td>
<td>$1,460</td>
<td>$600</td>
<td>$595</td>
</tr>
</tbody>
</table>

@ $0.22/kwh & $1.10/therm
“I love my Induction Cooktops! Cool, Easy to Clean, and Fast!”
Matt Greco, Owner

Real World - Real Chefs: Salt Craft, Pleasanton
<table>
<thead>
<tr>
<th>Pros</th>
<th>Cons &amp; Misconceptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Energy Efficient</td>
<td>• Higher purchase price - True</td>
</tr>
<tr>
<td>• High productivity</td>
<td>• Requires proper cookware - True</td>
</tr>
<tr>
<td>• No standby energy use</td>
<td>• No flame for a visual cue – True, <em>but</em> some incorporate LED lighting feedback</td>
</tr>
<tr>
<td>• Low radiant heat</td>
<td>• <em>Not as fast as gas</em> – A misconception</td>
</tr>
<tr>
<td>• Safe</td>
<td>• Durability – <em>Like all appliances - it depends on how well it is treated</em></td>
</tr>
<tr>
<td>• Easy to Clean</td>
<td>• Utility requirements for high voltage models – True</td>
</tr>
<tr>
<td>• Highly responsive temperature control</td>
<td></td>
</tr>
<tr>
<td>• Programmable</td>
<td></td>
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