# Why Induction Heating is a Green Technology





Experience the Excellence."



#### Induction is a Green Technology



While induction heating is not a new technology, it is a green technology. It does not consume fossil fuels, nor does it produce any hazardous emissions or carbon dioxide (CO2).

When compared to gas heating, induction offers a safer, cleaner, and more comfortable work environment. Compared to torch heating, induction is flameless and introduces less heat into the workplace.

## What is Induction Heating?

Induction heating is a fast, efficient, precise, repeatable, non-contact method for heating metals or other electrically conductive materials.

An induction heating system includes a power supply which converts line power to an alternating current. This current is delivered to a workhead and work coil creating an electromagnetic field within the coil. The work piece is placed in the coil where this field induces a current, generating heat in the work piece. The water-cooled coil is cool to the touch and is placed around or adjacent to the work piece. It does not touch the work piece and heat is generated by the induced current flowing in the work piece.

The work piece can be a metal such as steel, copper, aluminum or brass, or a semiconductor such as carbon, graphite, or silicon carbide. Non-conductive materials such as plastics or glass are inductively heated using an electrically conductive susceptor, typically graphite.



## So Why is Induction a Green Technology?

#### Induction heating is better for employees and the environment.

Along with the environmental benefits, induction heating offers many benefits to your employees and business, as it eliminates smoke, waste heat, noxious emissions, and loud noise.

#### Many processes that produce emissions can be converted to induction heating including:

- Flame preheating · Gas fired oven heating · Welding torches for joining
- Flame brazing
- Flame melting
- Flame hardening 
   Flame shrink fitting





#### **Induction Heating is a Safer Technology**

In addition to the improved air quality that comes with induction heating, there are other significant employee safety benefits. They include:

- **Reduction in risk of contact burns:** Since induction heats only a zone of the workpiece, there are limited hot areas which lessens the risk of employee contact. This significantly reduces the risk of contact burns when compared to the outside of ovens or exhaust systems from gas heating.
- Zero explosive gases: Induction uses electricity for the energy source. This eliminates the handling of high-pressure explosive gases. Often these gases are transported in a hot crowded environment which increases the risk of catastrophic failure.
- No Ultraviolet (UV) Exposure: Unlike flame heating, induction releases no UV into the environment. This eliminates the risk of UV damage that can occur to the skin and eyes of employees from flame heating sources.

Of course, with induction heating there are safety considerations. Proper installation, signage, employee training, personal protective equipment and lockout procedures can help mitigate risk.





#### **Induction Heating is More Efficient**

Induction is a uniquely energy-efficient heating process that converts 70-90% of the energy consumed into useful heat. When compared to electrical ovens, which are generally only 45% energy efficient, induction heating has two times the overall efficiency. Gas oven efficiency is typically only 25-30% energy efficient, indicating induction can be up to three times as efficient. Since induction requires no warm-up or cool-down cycle, start up and shutdown heat losses are eliminated. The repeatability and consistency of the induction heating process make it highly synergistic with energy-efficient automated systems.

## Induction Supplies More Consistent Output than Oven Heating





The use of constant flow induction heating results in significantly higher efficiency than batch oven heating. Losses in both energy and time due to oven loading and unloading are eliminated with induction heating. Induction enables a consistent flow of parts which is even more critical if onward steps in the manufacturing process require heated parts. This reduces the heat loss from the part when it reaches the next step thus increasing the overall efficiency of the cycle. This overall savings is not only realized in production efficiency but also results in the better use of heating energy.

#### **Induction Versus a Gas Oven is Cost Effective**

Production				
1,050	pcs			
Oven Inputs Cycles Parts/cycle * @		Starts Start Demand * 💿		
50	pcs	350	KBtu/nr	
Cycle Period ^	sec	Starts ^ 👔	/day	
Cycle Demand * 🔊		Start Period * 👩		
166	kBtu/h	1,800	sec	
Induction Inputs Power * @ 25	kW/part	Cycle Time * 📦 10	sec	
Heating Costs Gas (\$/MMBtu) (2) \$10.00 5.00	25.00	Electric (\$/kWh) \$0.11 0.10	2.00	CO2 (\$/ton)  \$40.00 0.00 100.00
Describe second second				
Results per day Gas Oven		Electric Oven		Induction Heating
Results per day Gas Oven Energy Used 322 kWh		Electric Oven Energy Used 322 kWh		Induction Heating Energy Used 74 kWh
Results per day Gas Oven Energy Used 322 kWh Cost \$ 13.55		Electric Oven Energy Used 322 kWh Cost \$ 35.41		Induction Heating Energy Used 74 kWh Cost \$ 8.09
Results per day Gas Oven Energy Used 322 kWh Cost \$ 13.55 CO2 Produced 128 lbs		Electric Oven Energy Used 322 kWh Cost \$35.41 CO2 Produced 0 lbs		Induction Heating Energy Used 74 kWh Cost \$ 8.09 CO2 Produced 0 lbs
Results per day Gas Oven Energy Used 322 kWh Cost \$ 13.55 CO2 Produced 128 lbs Results per year		Electric Oven Energy Used 322 kWh Cost \$ 35.41 CO2 Produced 0 lbs		Induction Heating Energy Used 74 kWh Cost \$ 8.09 CO2 Produced 0 lbs
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In this scenario, a client using an oven switches to induction. The environmental benefits are considerable. Given the inputs you see here, induction heating saves 128 pounds of CO2 per day and over 46,899 pounds per year. This is the equivalent of removing five internal combustion engine cars from the road.

The cost savings of induction heating compared to a gas oven are often considerable too, and the difference compared to an electric oven is typically even more significant. The cost variables depend on local rates, so we recommend using our **Energy Calculator** to apply your current rates.

Induction heating wastes little heat due to the direct transfer of energy to the work piece, resulting in significant energy savings.



To see what the savings might mean for you, check out green-energy.ambrell.com on our website.









#### **Our Commitment to Sustainability**

The United Nations has several sustainability goals, and our solutions are in alignment with those goals. Goals 12 and 13 are worthy of particular emphasis when assessing the benefits of induction heating for sustainability:

- 12 Responsible Consumption and Production: Our induction heating solutions increase energy efficiency and reduce pollution, thus helping manufacturers achieve this sustainability goal. And, at our facility, we have implemented energy efficient lighting, motion detectors, programmable thermostats, and we participate in sortable recycling to maximize yield.
- **13 Climate Action:** Induction replaces inefficient and sometimes pollution-laden solutions like torches/flame and gas ovens, which benefits the environment. This is in alignment with a "Green Transition" and "Investing in More Sustainable Solutions."

## Is Induction Right for My Process?

Now that you have learned about the environmental benefits of induction heating that can result in utility savings, the question becomes is induction right for you? Induction is particularly ideal when you have a high-volume process that requires consistent part quality. That said, there are many scenarios where induction can be optimal.

Ambrell has a best-in-class applications laboratory called THE LAB, where induction heating expert Dr. Girish Dahake and his team conduct complimentary parts testing and system sizing to ensure induction will work for you and your process. You simply send in your parts and process requirements, and THE LAB will perform feasibility testing. You can watch it live, or we will record testing and send you a report and video.

#### Free Application Testing From THE LAB



Our Applications Laboratory – known in the industry as THE LAB – is where we solve our customers' most challenging heating applications every day.

Dr. Girish Dahake, Sr. Vice President of Global Applications, leads a worldwide team of elite engineers who are uniquely qualified to assist you with your heating process needs. Under the guidance of Dr. Dahake, our engineers have evaluated thousands of applications in THE LAB, so it's likely we have already assessed an application similar to yours.

Ambrell's team of engineers is world-renowned for producing extraordinary results. Our innovative and effective induction heating solutions consistently deliver performance excellence in one application after another. It's why THE LAB is the gold standard in the industry.

Have our team of expert engineers design and test the optimal solution for your application, free of charge. All it takes are three easy steps:

- 1. Send us your parts and process requirements
- 2. Our engineers will analyze your parocess and heat your parts to develop the right solution for your specific application
- 3. You will receive your parts back for inspection as well as a video of the heating process of your parts, and a laboratory report with a system recommendation

We also invite you to visit THE LAB where you can experience our state-of-art testing facility, which is fully equipped with Ambrell induction heating systems and hundreds of proven coils. In addition, you can interface with our engineers and see first-hand how they design prototype coils and develop effective solutions to maximize the efficiency of your heating process. With a Reputation for Delivering Extraordinary Results, Our Applications Laboratory is the Gold Standard in the Industry.







"Induction heating is a precise, repeatable and efficient method of heating. However, in order to maximize the benefits of induction, it's critical to have the correct system and coil design. Our global team of highly-skilled engineers look forward to assessing

your application and making the right recommendation for your process."

Dr. Girish Dahake, Sr. Vice President, Global Applications

For more information, contact us today at +1 585 889 9000 or visit thelab.ambrell.com



#### About Ambrell

Founded in 1986, Ambrell Corporation, an inTEST Company, is a global leader in the induction heating market. We are renowned for our application knowledge and engineering expertise. In addition, our exceptional product quality and outstanding service and support are at the core of our commitment to provide a superior customer experience.

We are headquartered in the United States with additional operations in Europe including the United Kingdom and the Netherlands. All Ambrell products are designed, engineered and built at our manufacturing plant in the United States, which is an ISO 9001-certified facility. Over the last three decades we have expanded our global reach through an extensive distribution and OEM network, and today we have more than 17,000 systems installed in over 50 countries.



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