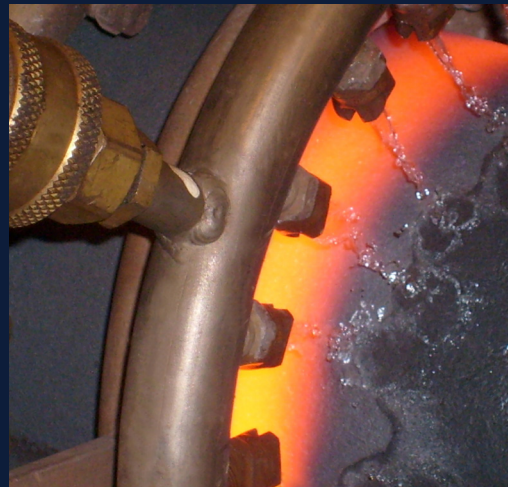


Induction Heating Solutions for Tube and Pipe



Experience the Excellence.™

A Smarter Heating Solution

Induction heating is the preferred solution for tube and pipe manufacturers looking for more effective, cost-efficient heating technology. Whether you are involved in hot bending, weld stress relieving, heat treating, coating or brazing, induction heating may be the ideal approach for your operation.



Advantages of Induction Heating

- Rapid heating saves time and improves productivity
- More control with the precise, even heating of part – or all – of the tube
- Clean, non-contact process minimizes the introduction of heat into the local environment
- Energy efficient when compared to other common heating methods

Why Ambrell Induction Heating?

Ambrell has more than 30 years of experience and has installed over 15,000 systems in more than 50 countries. Manufacturers around the world know they can count on us for quality products, versatile solutions, and fast, responsive support after the sale.

Your specific application will be analyzed and tested in the nearest Ambrell Applications Lab, also known as THE LAB. There is no charge, and you will receive a system recommendation designed to deliver the best possible solution for your heating requirements. The equipment is easy to use, robust and reliable, and extremely cost efficient.

For tube and pipe heating applications, there is no better choice than induction heating. And for induction heating, there is no better choice than Ambrell.

Tube and Pipe Coating Curing

Ambrell induction heating solutions are fast, efficient choices for all stages of the curing operation.

In preparation for coating, induction heating is used to remove surface moisture from pipes, preheating the pipe to the correct temperature for coating.

Then – depending on the type of polymeric coating applied – the tube or pipe is heated to 150-300 °C (302-572 °F) for curing the coating.

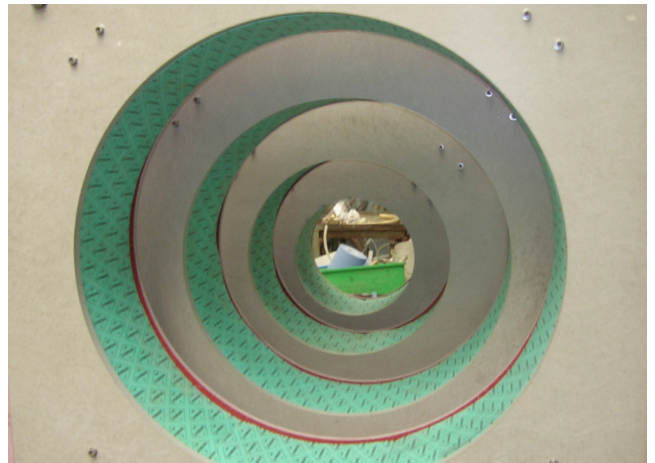
In addition to requiring less floor space than traditional furnaces and ovens, induction systems offer ergonomic benefits, are environmentally friendly, and have the unique capacity to selectively heat only portions of a tubular product.

Beyond these operational benefits, induction heating also delivers a higher quality coating solution.

Unlike furnaces that rely on heating the coating first, induction heats the metal substrate beneath the coating – curing the coating from the inside out – leaving the surface soft and allowing solvents to evaporate and any outgassing to occur.

Removing coatings to recover tubes and pipes for re-coating is another common use for induction heating. Typically, the pipe is heated to about 200 °C (392 °F), which breaks the bond between the surface and coating, allowing the coating to be peeled off. Using this method is more environmentally friendly than alternative methods of burning off or grinding off the coating.

When converting from barrel furnaces to induction heating, existing handling equipment can still be used. However, with induction, there is the advantage of fast, controllable, energy efficient heating that results in improved quality and energy savings.



Pre- and Post-Weld Heating

With the use of more thin-wall steel alloy pipes in today's oil and gas pipelines, manufacturers and installers are turning to the fast, accurate and uniform heating of Ambrell induction heating systems.

During the process of butt welding, induction heating is commonly used to preheat the joint area to 150-200 °C (302-392 °F) to prepare the area for a consistent quality weld. After welding, the joint area is heated to 600-650 °C (1112-1202 °F) for thermal stress relief of the weld area.

Traditional gas flame and resistance heating systems are often impractical when these higher temperatures are required. Not only are they too slow to meet the cycle times demanded by the industry, but also the heating can be inaccurate and can lack uniformity around the full circumference and bandwidth of the weld joint.

Other benefits of induction heating include:

- Variable control over temperature/time parameters
- Minimal damage to factory coating, and no deleterious surface residues
- No open flames or exposed heating elements
- Reduces energy costs, and eliminates the need for large gas storage area



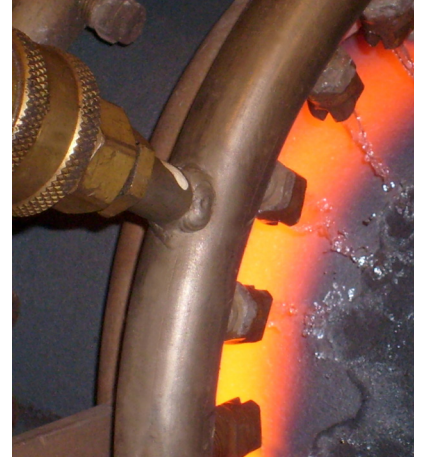
Hot Pipe Bending

Induction heating is the preferred heating method for bending of larger thicker walled pipes. This is due to the focused narrow band heating offered by the induction process with the resulting higher quality bends with lower ovality and wall thinning than other bending methods.

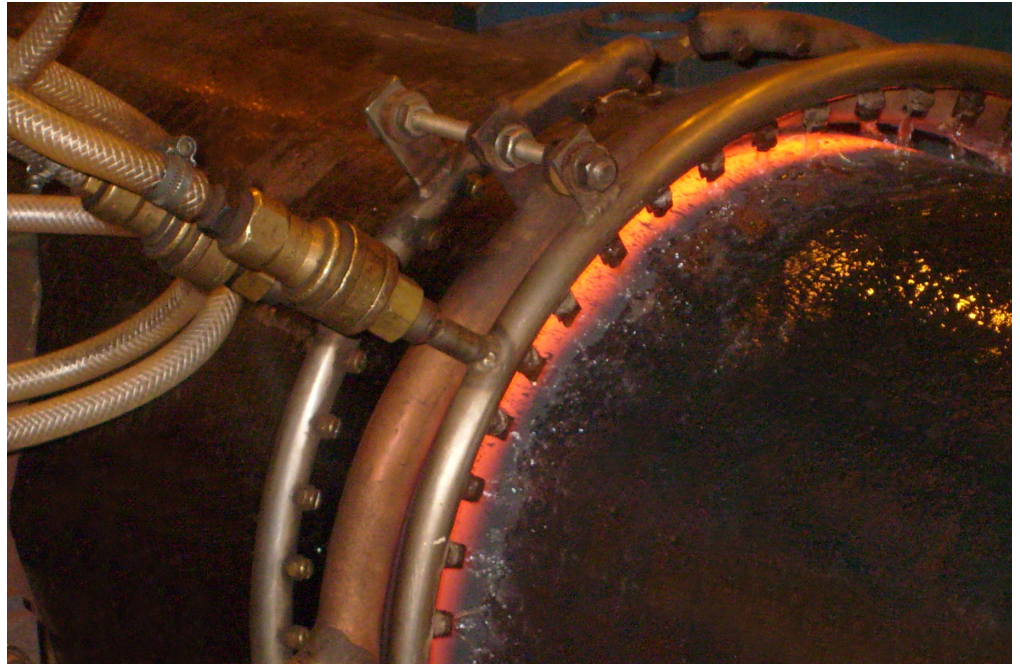
Because of this quality and accuracy, induction hot pipe bending is the preferred alternative to traditional fit-and-weld procedures, and can help companies meet the rigorous safety demands of the chemical and energy industries.

Ambrell induction heating systems are available in the frequency and power levels to optimally heat any pipe for hot bending. Typically, induction hot bending is used on pipes with diameters from 2" (50 mm) to 36" (915 mm), with wall thicknesses from Schedule 5 up to 2.5" (64 mm).

Hot pipe bending with induction involves placing an induction heating coil around the pipe at the bend point, and heating a 1" (25 mm) section of the pipe to 1000 °C (1832 °F). With the pipe at temperature, pressure is applied by a bending arm to bend it into the desired shape. Air and water quenches are used before and after the heat zone to promote bending solely at the hot zone.



Induction heating is the preferred heating method for bending larger thick-walled pipes used in the chemical and power generating industries.



Drill Pipe Heat Treatment

Drill Pipe Manufacturing

Ambrell supplies induction heating systems to companies that manufacture oil and mineral drill pipe to meet the requirements of API 5DP and GOST R 50278.

Induction heating offers many benefits over flame or resistance heating during the manufacturing processes in drill pipe heat treating and welding of the tool posts onto the pipe ends, including:

- **Consistency:** Heat is generated within the part for precise, rapid, even heating
- **Quality:** Temperature variations that are seen in flame heating are eliminated
- **Productivity:** Faster heating enables single-part processing
- **Safe:** No exposed flame for a safer working environment
- **Economical:** Heat is applied only where it is needed

Upsetting or Forging Process for Wall Thickening

Drill pipe ends are thickened by heating the pipe end to 1100 °C (2012 °F) before forging. Induction is often used to heat multiple pipes in a single channel coil, or sequentially in a multi-position coil that produces one pipe-end every 150 seconds. These heating methods provide the time required for the heat to travel through the pipe wall, yet meet the 180 seconds floor-to-floor cycle time.



Ambrell induction heating systems allow the depth and rate of the heating to be precisely controlled, delivering the ideal temperature and timing for each step in the process, while meeting the 180 seconds floor to floor time cycle.

Tool Post Welding Heat Treating

After friction or arc welding of the tool post to the pipe end, the weld and surrounding pipe is brittle and requires a three-step heat treating process to toughen the joint area:

- **Stress Relief:** A 100 mm (3.9") wide band is heated to 700 °C (1292 °F) to stress relieve the weld area.
- **Austenitization:** A 25 mm (1") wide band is heated to 900 °C (1652 °F) for austenitising. The temperature through the pipe wall must be consistent prior to quenching.
- **Through-Tempering:** A 50 mm (2") band around the weld joint is heated to 675 °C (1247 °F) for through-tempering to produce the correct drill pipe toughness.

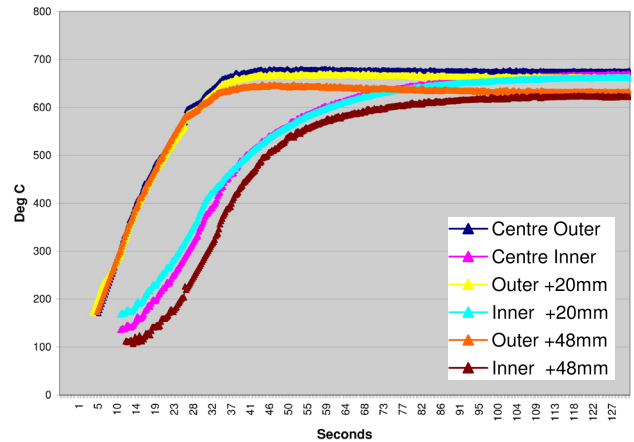
Heat Treating Ends of Thin Walled Mineral Drill Pipe

Both the internal and external threaded ends of mineral drill pipes are heat treated and surface hardened to provide a tough tube-end and to minimize wear during the repeated connecting and disconnecting during the drilling process.



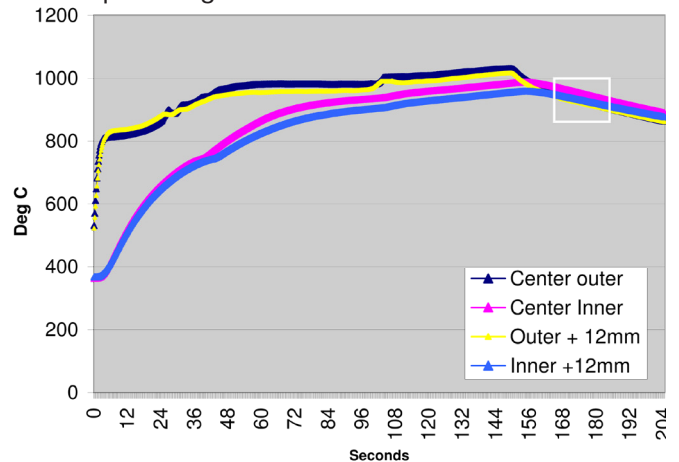
Annealing 126 mm Diameter Pipe

Outside and inside temperatures during the annealing process on a 100 mm band around the Tool box weld on a 126 mm diameter pipe.



Austenitising 126 mm Diameter Pipe

Through curie heating with inside and outside pipe 900 °C temperatures consistent before quenching.



Brazing Diamond or Carbide Inserts onto Oil and Gas Well Drill Bits

Oil and Gas Well Drill Bits

In drill bit manufacturing operations, multiple tool inserts (typically between 40 and 60) are individually brazed onto a single drill bit. These inserts may be a polycrystalline diamond compact (PDC) or tungsten carbide inserts (TCI).

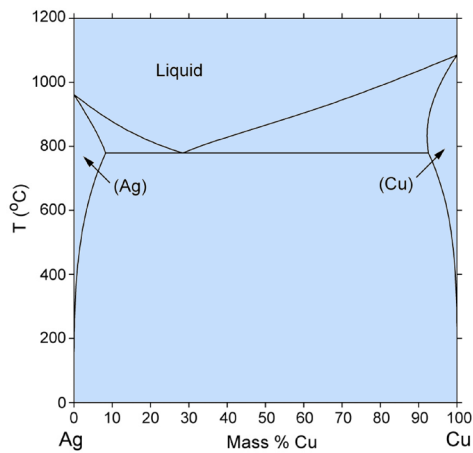
Induction heating is an excellent technique for pre-heating the drill bit to 600 °C (1100 °F) in preparation for the torch brazing of the diamond inserts.

Drill bits come in a range of different sizes ranging from 8-20" (203-508 mm) diameter. It takes 10-30 minutes for the heat to fully soak through the drill bit, which prepares the insert area for the brazing process. The torch is then used to raise the temperature of each individual joint to 790 °C (1454 °F) to flow the braze.

The PDC or TCI inserts are the cutting portion of the drilling tool, so they will wear out with use. Induction heating is used in the reclaiming process to heat up the drill bit, which allows the inserts to be removed for rebuilding the drill bit. (The inserts image is courtesy of U.S. Synthetics, Orem, UT.)



The insert's brazing silver and copper "eutectic alloy" has a melting temperature of 790 °C (1454 °F), well below the melting temperature of silver or copper. This lower melt temperature prevents overheating of the diamond bit during brazing, yet still results in a strong joint to the drill bit.



Ambrell Induction Heating Systems at a Glance

Ambrell offers a wide power and frequency range with its EASYHEAT and EKOHEAT systems. So, whether your tube or pipe application is large or small, Ambrell can help you maximize cost efficiencies and productivity.

Ambrell's systems are versatile with multiple capacitor and tap transformer configurations. They offer efficient power conversion, which minimizes energy expenses. They are also user-friendly, offer agile frequency tuning for repeatable heating, and can be easily integrated into your process thanks to their small footprint.

Systems Include:

- Ease of integration into production processes with a portable workhead – up to 30 m in some systems
- Wider frequency ranges allow more tubes and pipes of varying specifications to be heated with the same power supply
- Multiple capacitor and tap transformer configurations for a more versatile system than the competition
- Agile frequency tuning for accurate, repeatable heating
- Efficient power conversion minimizes energy expenses
- Expert coil designs that maximize power delivery and save production time
- User-friendly operator interface in five languages (EN, ES, FR, DE, IT)





Free Application Testing From THE LAB

With a Reputation for Delivering Extraordinary Results, Our Applications Laboratory is the Gold Standard in the Industry.

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 process 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.



"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 is a global leader in the induction heating market renowned for our application and engineering expertise. Exceptional product quality and outstanding service and support are at the core of our commitment to provide the best customer experience in the industry.

We are headquartered in the United States with operations in the United Kingdom, France and the Netherlands. All products are engineered and made at our manufacturing facility in the United States, which is ISO 9001:2015-certified. Over the last three decades we have expanded our global reach through an extensive distribution network and today we have more than 15,000 systems installed in over 50 countries.



Ambrell[®]
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