Precision Induction Heating for Tube and Pipe
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 25 years of experience and has installed over 10,000 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. 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.
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
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” (50mm) to 36” (915 mm), with wall thicknesses from Schedule 5 up to 2.5” (64mm).

Hot pipe bending with induction involves placing an induction heating coil around the pipe at the bend point, and heating a 1” (25mm) 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.
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.
Outside and inside temperatures during the annealing process on a 100mm band around the Tool box weld on a 126mm diameter pipe.

**Annealing 126mm Diameter Pipe**

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

**Austenitising 126mm Diameter Pipe**

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

**Tool Post 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 100mm (3.9”) wide band is heated to 700°C (1292°F) to stress relieve the weld area.
- **Austenitization:** A 25mm (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 50mm (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.
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” (203-508mm) 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 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 30m 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)
At Ambrell, we understand that your ability to compete hinges on reducing costs and increasing performance of your manufacturing operations. That’s why we are committed to delivering quality products, innovative solutions, and exceptional customer service designed to maximize ROI.

**When you choose Ambrell as a partner, you will get:**

- A team of induction heating experts that will work with you to understand your unique requirements
- Application testing in our labs to determine optimal equipment specifications and settings for your application
- An expert organization optimized to design and manufacture the most efficient power supplies and coils
- A CE certified system designed, built and tested at our ISO 9001:2008 factory in the United States
- Worldwide support through the Ameritherm companies in the Americas, Europe, and the United Kingdom, as well as by Authorized Ambrell distributors.

Ambrell stands by a firm commitment to provide an induction heating solution to your business along with service and support that goes well beyond the sale. The service department is always on-call for preventative maintenance and timely emergency support. We will be there to maintain operational excellence and be sure our solution continues to meet your needs – now and in the future. With Ambrell, you’ll get timely support before, during, and after the sale.
As a pioneer in solid-state induction heating technology, with a 25-plus year history of innovation, Ambrell provides industry-leading heating solutions. Our equipment, installed in over 50 countries, is supported by our network of dedicated induction-heating experts. With a firm commitment to innovation and continuous improvement, we are proud to deliver quality products and solutions for a variety of industries and markets. Ambrell is an Ameritherm company headquartered in the United States with worldwide operations including Ambrell Ltd. in the United Kingdom, Ambrell SARL in France and Ambrell B.V. in the Netherlands.

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