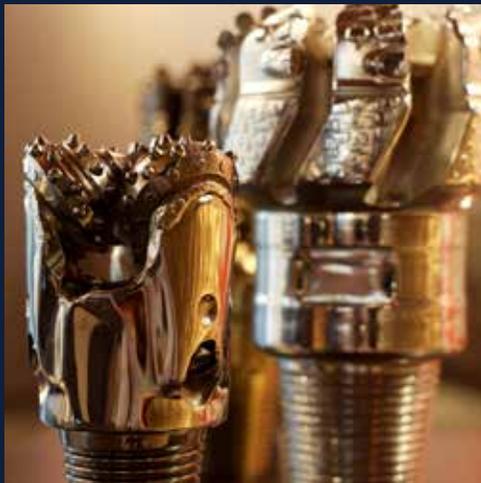


Improve Safety and Efficiency When Brazing PCD Inserts in Drilling Tools



Ambrell[®]
INDUCTION HEATING SOLUTIONS



Experience the Excellence.[™]

Induction Preheating for Brazing or De-brazing Offers Numerous Benefits:

- **Safety:** no preheating with open flame or hot furnace
- **Better efficiency:** instant on, instant off, no long flame or oven heating
- **Throughput:** induction heating reduces preheat time
- **Better quality** with braze temperature control
- **Repeatability:** you can count on a precise, consistent quality braze every time
- **Easy integration** into a lean manufacturing process
- **Small footprint:** frees up valuable factory floor space

Whether you're concerned with safety, manufacturing efficiency, throughput, or part quality, induction heating is the ideal preheating method for your PCD bit brazing process.



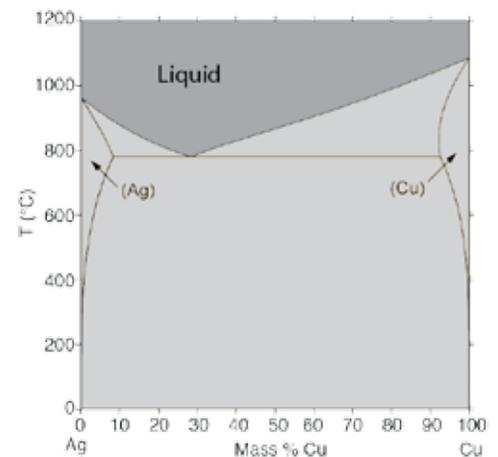
Oil and Gas Well Drill Bits

In down-hole fixed-cutter, rock, or hammer drill bit manufacturing and rebuild 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 (PCD) or tungsten carbide insert (TCI).

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

Drill bits come in a wide range of sizes with diameters ranging from 8-20" (203-508 mm). 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 trim the temperature of each individual joint to 790 °C (1454 °F) to flow the braze.

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.



The PCD 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.



Fixed Cutter Inserts

Hammer Bit Inserts

Rock Bit Inserts

Photos of the inserts courtesy of U.S. Synthetics, Orem, UT.

Brazing Diamond or Carbide Inserts Onto Down-Hole Drill Bits



Reducing the Risk of Injury

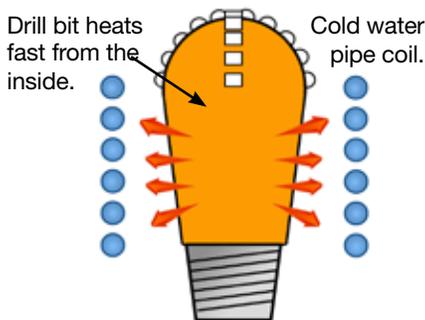
Preheating down-hole drill bits to 600 °C (1100 °F) for insert brazing is often achieved by an open flame torch or by placing the bit into a large gas fired oven. Both methods of heating are time consuming and involve risk of injury to the operator by exposure to an open flame or the moving of hot drill bits. Using induction eliminates the use of gas torches or ovens in the preheating process and allows for the final PCD brazing without moving the drill bit.

Improving Efficiency and Reducing Costs

Induction heating generates the heat within the drill bit so it heats from the inside. Both torches and ovens heat from the outside, are not as efficient and take much longer to preheat the drill bit. Heating a drill bit to 600 °C (1100 °F) often will take two hours with torches or in an oven compared to 30 minutes using induction.

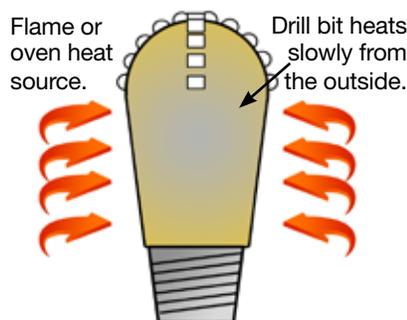


Induction Preheating



Drill bit is safely preheated to 600 °C (1100 °F) in a quarter of the time, and with instant on/off heating.

Flame or Oven Preheating



Preheating with torches or ovens expose operators to hot inefficient heat sources.



Why Ambrell?

Induction heating is an ideal method for brazing. Ambrell has over 10,000 systems installed in more than 50 countries, and many of them are brazing application installations. It's our most common application – used daily in many different industries

around the world. Ambrell induction systems offer unique versatility enabling the preheating of multiple drill bit sizes in the same coil set up.

Ambrell Induction Heating Systems at a Glance

Ambrell offers a wide power and frequency range with its EASYHEAT™ and EKOHEAT® systems. Whether the drill bit you are brazing is large or small, Ambrell can help you maximize cost efficiencies and productivity.

Ambrell 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.



EKOHEAT 30 and 45 and 50 kW

Used in preheating smaller drill bits for insert brazing.

EKOHEAT 125 and 250 kW

Used in preheating the larger down-hole drill bits for insert brazing.



Systems Include:

- Ease of integration into production processes with a remote workhead – up to 30 m in some systems
- Wide frequency range allowing heating of more drill bit sizes with the same induction heating system
- 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)

About Ambrell

Founded in 1986, Ambrell Corporation 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 a superior customer experience.

We are headquartered in the United States with operations in Europe including locations 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 9001:2008-certified. Over the last three decades we have expanded our global reach through an extensive distribution and OEM network and today we have more than 10,000 systems installed in over 50 countries.



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