Electroheat® Technologies, LLC

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Electroheat Technologies has the resources to provide our customers with a complete state of the art turn key induction heating system. We understand the demands and time restraints in today's economic environment therefore we are equipped to also provide the capability to produce pilot run or the processing of pre-production parts at our facility. What-

INDUCTION HEATING EQUIPMENT

HIGH-FLUX INDUCTION HEATING FOR METAL PRODUCT MANUFACTURING AND PROCESSING

To date, induction heating has only rarely been used for the re-heating of metals in mass production applications due to the low efficiency of energy transfer to the metals during the non-magnetic heating phase. Our experience in high-intensity magnetic fields generated by low-loss conductive composition multi-layer windings has enabled the development of a new high-flux magnetic induction heating technology (CELINE) which represents a real technological leap forward in respect to the current industry processing techniques. Our new technology is characterized by the following:

- Power densities in the range of 4 to 6 MW/m, up to 6 times that of conventional inductors.
- Electrical efficiency of 85% above the curie point instead of the usual 50 to 60% realized by conventional inductors, this represents substantial savings in energy costs.
- Much smaller floor space requirements than conventional induction or furnace heating equipment.
- Robust thermal and mechanical protection devices designed to reduce maintenance costs when operating under extreme conditions.

High-Flux CELINE inductors for re-heating pipes (2 X 3,000 kW - 1 kHz).

The CELINE inductor is well suited for re-heating round or square billets, tubes, then slabs, etc. It may be used to treat all types of steel in the non-magnetic phase, copper or copper alloys, aluminum or aluminum alloys.
In the steel industry, for example, the CELINE inductor offers a modern and efficient method of re-heating before breaking-down or between the stands of the finishing line. It may be used as a "booster" for an existing furnace in order to increase production and optimize energy consumption.

INDUCTION HEATING EQUIPMENT FOR SURFACE TREATMENT

Surface treatment refers to various metals heating operations such as the following:

- Degreasing pickling & drying
- Galvanizing & tinning
- Curing of paints, varnishes & pacification
- Annealing
- Plating
- Applications in this area are numerous:
  - setting off tie cans.
  - polymerization of aerosol tube inner varnish .
  - curing of seals.
  - polymerization of varnish on copper wires and flats.
  - rilsan coating of steel wires, fabric or sheets.

Induction with sealed hydrogen unit for the re-heating of strips before galvanization (2 thyristors inverters of 1,500 kW - 6 kHz.).

When induction heating technology is used, heat is transferred to the outer coating from the inside out, which is ideal for drying and curing operations since it allows solvents and vapors to escape. This heating method therefore provides:

- Better adherence.
- Better surface appearance.
- Good reproducibility, which is important when drying colored paints.
- Highly flexible operation via the selection of treatment temperatures.
- And lastly, a more compact treatment system that may be operated discontinuously, without presence of thermic inertia.
- Better adherence to the substance applied to the metal.
- Higher quality surface appearance.
- Excellent reproducibility which is important when drying colored materials.
- Highly flexible operation by means of easy selection of processing temperatures.
- Compact and instant heat on/off capability controls thermal pollution in the working environment.

INDUCTION HEATING EQUIPMENT FOR HEAT TREATMENT

Induction heating allows for both surface and core treatment of metals using a wide range of induction heating equipment possibilities. The best known use for induction heating equipment is for the heat treatment of metals.

There are few heat treating techniques that allow for a wide range of processes such as selected or continuous surface hardening, through hardening, tempering, annealing, normalizing and structure refinement.

The selectivity and speed of induction heating equipment combined with effective power transfer allows for more conservative use of energy in the heat treating process. In addition to the considerable advantage of reduced energy and associated costs in using induction heating equipment the following is realized:

- The use of relatively inexpensive steels.
- The small degree of part distortion after heat treatment.
- High production rate capability in cell or inline configuration.
- Easily integrated into existing production manufacturing line.
- Highly repeatability for assurance of quality control.
- Minimal to no surface oxidation.
- Lower work in process requirements when compared to furnace heat treating.
- Use on Accelerated Austenitizing™ process.

High speed induction heating equipment processing 1200 parts/hour using the Accelerated Austenitizing™ process.

INDUCTION HEATING EQUIPMENT FOR BONDING

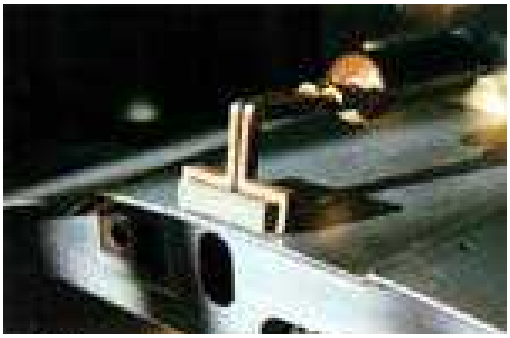
Bonding has become more widespread as a preferred method of assembly especially in the automotive industry. The method involves accelerating the polymerization of the adhesive by heating the metal parts to be bonded by induction heating equipment. The temperatures required are generally low in the 150 to 300°C. This process is now extensively used to manufacture automotive body parts such as doors, hoods and rear deck lids. Metal to polyester bonds can also be treated by induction heating equipment.

There are essentially two techniques presently being used in industry for applying this technology:

1. Heating of the entire perimeter to be bonded which in this case involves an inductor which has the same contour as the part being bonded.
2. Heating of specific segments or spot heating in which case the polymerization zones are heated using small flat magnetic circuit inductors.

With respect to spot bonding, the advantages of this process are as follows:

- The part bonded is not marked therefore there are no after painting defects and polishing is not required.
- Less power consumption with induction heating equipment.
- No corrosion problems associated with welding points.
- Adhesive may be combined with sealing strip.



Polymerization of glue on a car door (IGBT transistors generator of 25 kW - 10 kHz).

INDUCTION HEATING EQUIPMENT FOR SEMI-SOLID FORMING

Semi-solid forming consists of injecting a metal under high pressure which has been heated until it attains a semi-solid/semi-liquid state. Operating in this temperature range, the method, when correctly applied, makes full use of the thixotropic properties of the metal and improves the quality of the finished part. Induction heating is the ideal method for this application in respect to its rapidity, repeatability and homogeneity of temperature obtained thanks to individual re-heating. CELES our strategic partner has designed and manufactured an ingot transfer system right up to the injection chamber (patented process). This process is suitable for use with all thyrotrophic alloys and in particular with magnesium which may be treated without the need for special safety measures.

- Elimination of porosity in molded parts that is turbulence is eliminated.
- Adaptable to all types of injection molding machines.
- Transfer of ingots in a horizontal position. without distortion and material wastage.
- Energy savings, since it is sufficient to heat instead of melting.
- Rapid heating.
- Net shape forming.

Supply and heating facility for a die-casting machine (MC generator of 25 kW - 20 kHz).

INDUCTION HEATING EQUIPMENT FOR BRAZING

Induction heating is widely used for brazing applications. The reason for its popularity is heat can be applied to the surface and the filler material very precisely. By having the capability of applying heat to a precise area the overall processing time is reduced significantly form what is experienced with a furnace or direct flame heating. Oxidation along with structural or chemical changes in the treated parts is reduced to a minimum. Substantial savings in energy costs are realized for medium and high production rates.

Power requirements are generally low, e.g.: from 10 to 100 kW. Our portable transistorized power supplies are ideal for many brazing applications. Various types of inductors can be used such as, external, internal, multi-turn, pancake, hairpin, proximity inductors, etc.

Brazing of short circuit ring on rotor cage (thyristors inverter of 100 kW - 4 to 8 kHz).

INDUCTION HEATING EQUIPMENT FOR PRE-FORMING HEATING APPLICATIONS

Core heating of metal makes it considerably easier to shape. Induction heating equipment is particularly well suited for heating half finished metal products such as billets, slugs, bars, tubes, etc, before rolling, stamping, forging, drawing, extrusion or other shaping operations.

Pre-forming heating of gas bottle bottom (thyristors inverter of 100 kW - 10 kHz).

INDUCTION HEATING EQUIPMENT FOR WELDING

One of the main induction heating application for welding is for producing tubes and other closed profiles made of steel, aluminum or copper. Some advantages of the induction heating equipment used for this process are high production rates, quality, regularity of the weld, welding strips without first picking, and lower power consumption.

Continuous welding of spiral fins on steel tube (high frequency generator 300 kW/400 kHz).

ATMOSPHERE & VACUUM FURNACE

Induction heating equipment is often used for high-temperature vacuum or heating under an atmosphere for such processes as infiltration and treatment of composites. These materials must be subjected to long heating cycles lasting several days at high temperatures, up to 2,200°C, at various gas and vacuum pressures. Multizone heating is often used with MF power exceeding 1000 kW.

Graphitization furnace inductor. Supply 900 kW - 1 kHz.

HEAT SEALING

Today, induction technology provides and elegant means of sealing aluminum covers on jars of food products. This packaging method assures tamper protection, safety, hygiene and product preservation. Inductive heating of the aluminum film increases the temperature of the sealing product applied to the side of the cover in contact with the jar. This heating is combined with pressure applied to the cover for 0.5 to 1.5s. This process is applied to all shapes of containers and for a wide range of materials, including: glass, cardboard, and plastics (PE, PP, PVC…).

In all cases there is no contact between the inductor and the cover. In addition to this advantage, there are several reasons why this new method is increasingly used:

- The heat is generated in the cover itself as near to sealing surface as possible. The process is thus simplified and the problems associated with the overheating of resistor type sealing heads are avoided.
- The method can be used for circular, oval, square, rectangular or other shapes
- The medium frequency generator is made using solid state components and has no parts subject to wear.

We supply several types of systems:

- One-step sealing.
- Continuous sealing before encapsulation.
- Static sealing before encapsulation.

Simultaneous heating of eight covers in 1 second using a 25kW/50kHz power supply with indexing conveyor.

DRAWING OF FIBER OPTICS

Drawing furnaces are used to heat pre-formed quartz with a maximum diameter of 80 mm to a temperature of 2,200° C followed by a continuous drawing process to produce fiber optics at speeds of up to and exceeding approximately 4,000ft/min. Indirect induction heating is applied using a graphite susceptor which enables precise control of furnace temperature.

In order to protect the fiber and also prevent the graphite crucible igniting, a neutral gas atmosphere such as Argon is maintained in the chamber. Thermal inertia is reduced to a minimum. The power consumed by the transistorized power supply lies generally between 25 & 50 kW at a nominal operating frequency of approximately 15 kHz.

Multi-cell optical fiber drawing furnace supplied by five generators 12 kW /30kHz.

SKULL HEATING & MELTING OF GLASS

Glass, some oxides and salts all share the characteristic that they are electrical and heat insulators at ambient temperature and become conductive at high temperature. They may therefore be re-heated and melted using the induction method. This method of heating is attracting increased attention due to its intrinsic qualities:

- Exceptional energy efficiency.
- Control simplicity.
- Good thermal homogeneity in the pot (absence of hot spots and presence of a cold dome).
- No wearing parts.

Direct coil fusion of glass in a skull crucible (M.O.S. transistors generator of 100 kW - 200 kHz).

POWER SUPPLIES

Power Supply—High Frequency Vacuum Tube

Designed for a parallel oscillating circuit with a very wide power 7 frequency operating range. This is a flexible power supply and is available in two configurations, high frequency triode and a periodic. The standard range for these generators are 12-400 kW/ 8-450 kHz.

HF a periodic generator of 50 kW - 100 to 200 kHz.

Power Supply—Medium Frequency IGBT Parallel Tuned

This unit is designed for heating applications in the frequency range of 10 to 60 kHz. Basic circuit design is for a current source parallel tuned load. Power rating can exceed 1 megawatt.

M.O.S. transistor generator of 25 kW - 400 kHz

Power Supply—Parallel Tuned Thyristor

This unit is a controlled current source power supply with a parallel tuned circuit designed to provide a wide range of power levels from 50 to 400 kW. Frequency ranges from150 to 10,000 Hz.

Thyristor inverter of 900 kW - 1,000 Hz

Power Supply High Frequency Parallel Tuned

This Units is designed for heating application in the frequency range of 100 to 400 kHz. Basic circuit design is for a current source parallel tuned load. Power ratings are 50 to over 1 megawatt.

HF power supply 200 kW/400 kHz

Power Supply—Series Tuned IGBT

This unit is a voltage source series tuned IGBT transistor power supply and is designed for high voltage for high impedance loads. Frequency range is from 6 to 60 kHz.

Serial IGBT transistor generator of 50 kW - 30 kHz

Power Supply—Transistors High Frequency

The MOS transistor inverter is a high frequency 100 to 400 kHz converter. It acts as a current generator to a parallel resonance circuit. Power ratings at 2,3,6 and 12 kW. All control functions are located on the front panel.

Bench top 12 kW/400 kHz power supply

Variable Frequency Transistor Power Supply

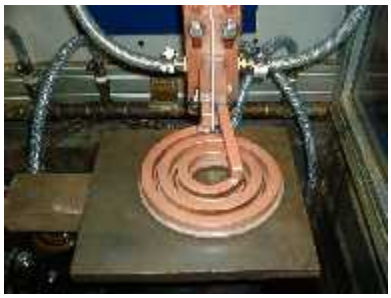
Our transistor inverter is a 10 to 400 kHz high-frequency power supply. It acts as a current source supplying a parallel resonant circuit. The following
is included:

- Front mounted circuit breaker
- Diode rectifier stage
- Low pass input filter
- Transistor high frequency section
- Ripple smoothing choke
- Full bridge output circuit
- High frequency output transformer
- Water cooled power section
- Electronic controls
- Internal timer
- Local or remote control
- Control interface on the front side of the cabinet
- Emergency stop button

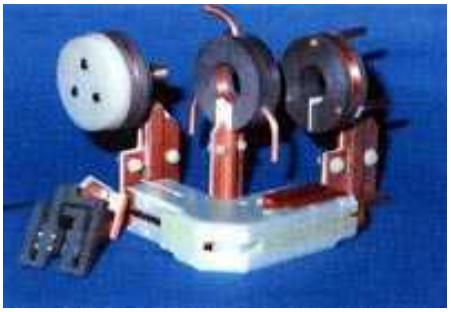
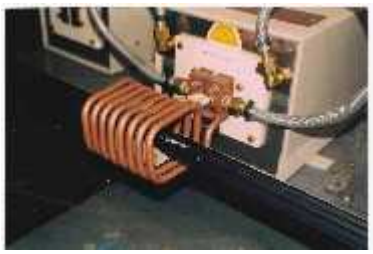
25 and 50 kW/10 to 400 kHz

INDUCTION TOOLING

- New Tooling Design
- Complete Manufacturing
- Inspection & Repair Services
- Full Testing Available



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SPARE PARTS

- SCR's
- Transistors
- Diodes
- Capacitors
- Transformers
- CELES Parts

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