

Strip Heating & Coating

INDUCTION
HEATING + MELTING



STRIP HEATING & COATING



- ❑ Oldest and most experienced induction company, since 1916
- ❑ First to develop and supply flat product applications equipment
- ❑ First to develop and supply ceramic coating pots
- ❑ Full time research and new product development
- ❑ Worldwide network of service and repair centers
- ❑ Technical support and training



Ajax TOCCO Magnethermic supplies systems that provide the most advanced state-of-the-art heating and melting equipment. These systems offer a wide variety of power and frequency to best fit our customers' applications. We are continually developing new ways to improve our induction heating and melting systems in order to satisfy worldwide requirements.

Ajax TOCCO induction technology is providing the answer to many modern strip-processing quality and production needs. ATM's expertise with galvanizing, galvannealing, strip preheating, heat treating and curing is at the forefront of applying clean, efficient, precise induction heating and melting technology for the metals industry.

Induction heating and melting is adaptable for most strip lines. Whether it's for coating, curing, preheating, or annealing; precision heating is versatile, compact and economical to operate.

Ajax TOCCO induction heating and melting should be considered for new installations and modernization of existing facilities. Induction has many advantages to offer such as comparatively low capital costs, energy savings, reduced floor space requirements, improved yield, and better quality.

Power Supplies

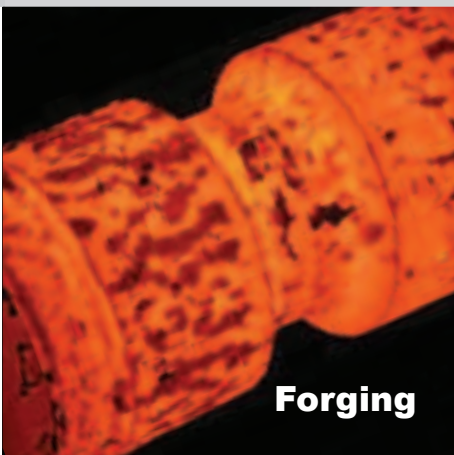
with Expanded Conductance Ranges to allow a wide range of loads without limitation.

Water Systems



Brazing





Forging



Heat Treat



Coating Pots



Bar & Tube



Coreless Furnaces



Service & Maintenance



Installation & Construction

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Introduction to Strip Heating

- Proven technology
- Short heating space
- Very high operating efficiency compared to other heating media
- Response and control are superior
- Excellent temperature uniformity
- Lower maintenance cost
- Reduce operating cost
- Increase yield
- Helps eliminate environmental concerns



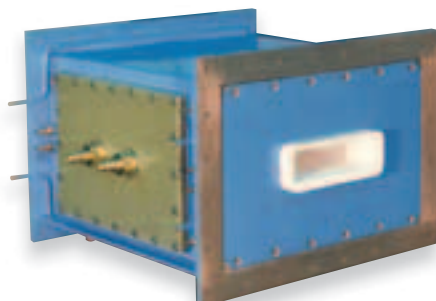
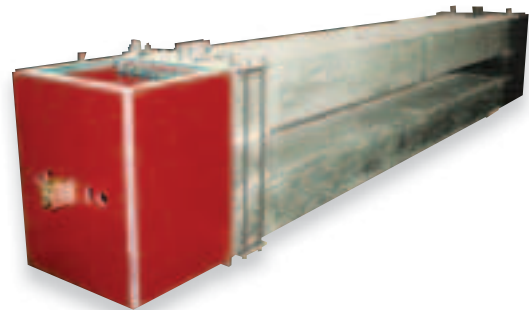
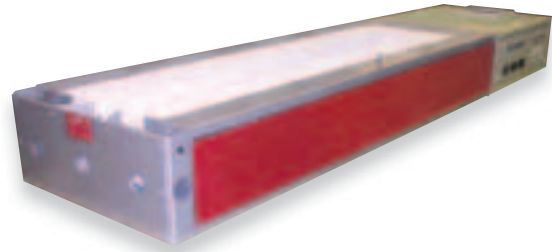
Advanced Heating

Ajax TOCCO offers solid state induction technology along with innovative inductor designs enabling mills to dramatically improve processes such as bar and slab rolling, and strip processing.

In-line induction heaters working in conjunction with continuous casting lines save thousand of energy dollars by utilizing casting generated heat and restoring only the additional energy required to reach optimum rolling temperature.

Continuous plate or slab heating, with strategically placed heating coils, accurately controls temperature cycles using only a fraction of the space of convention heating methods.

Induction Strip Galvannealing, developed by Ajax TOCCO, is easily integrated with new or existing equipment. Strip heater designs present many cost cutting opportunities for applications such as strip annealing, strip dryers, and taper heating for more uniform rolling.

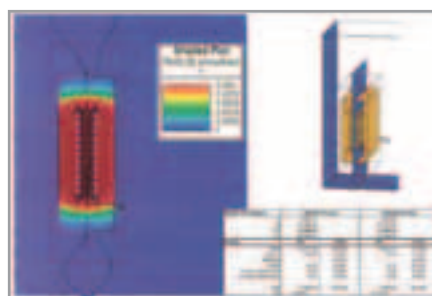
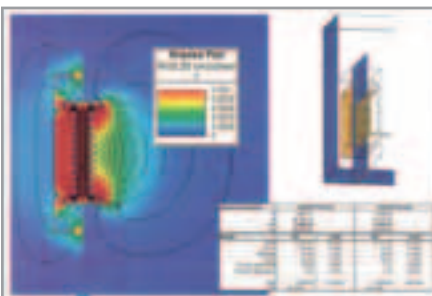
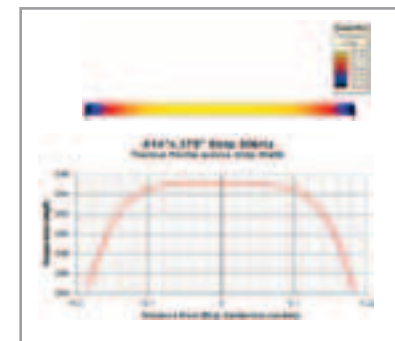
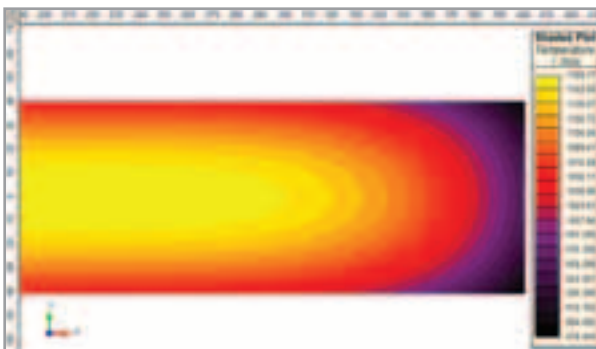
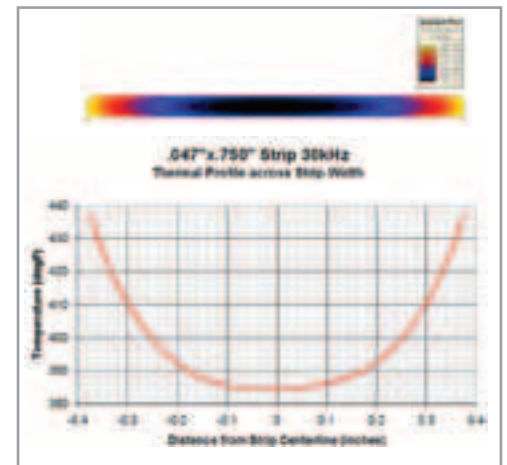
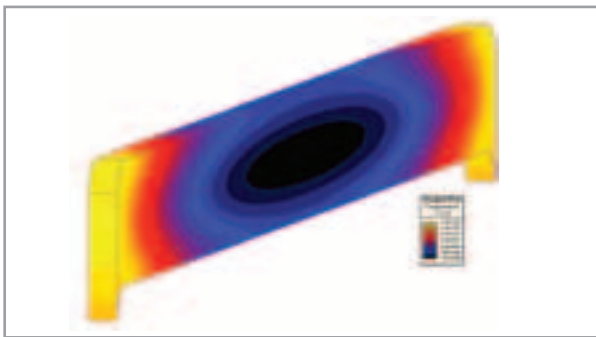
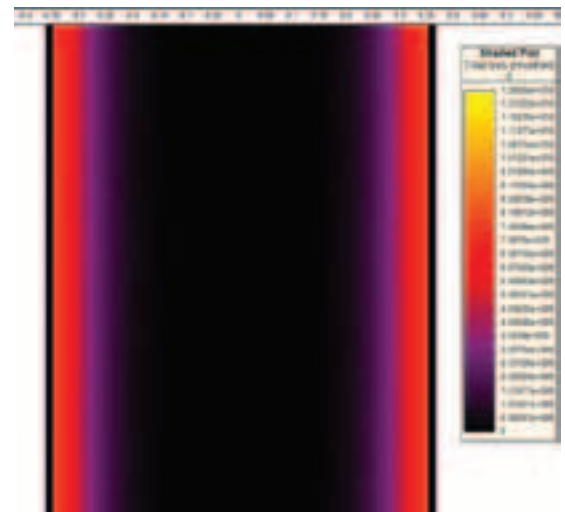


Ajax TOCCO systems provide the most advanced state of the art heating equipment. These systems offer the shortest heating lengths and the most efficient system in the industry. We continue to develop new ways to improve the system to satisfy our customers' needs.

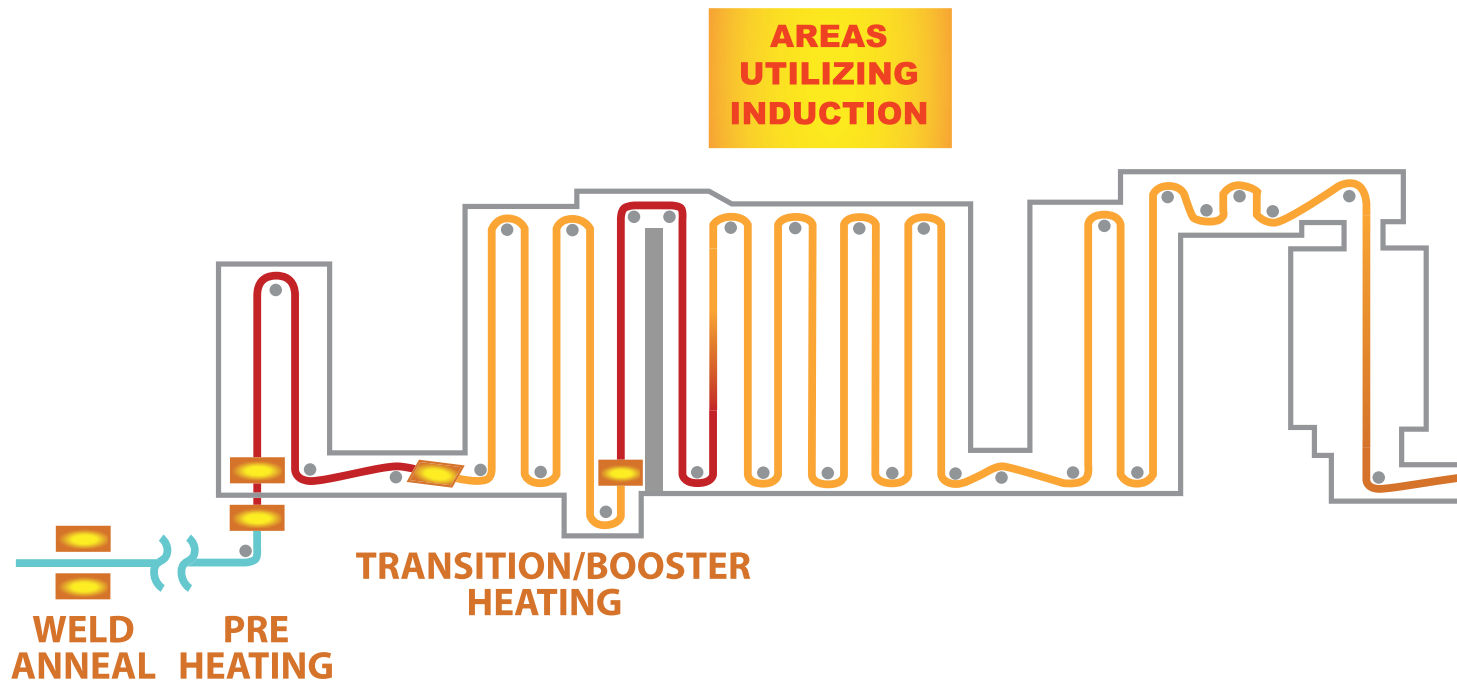
Magnetic Field Mapping

Ajax TOCCO Magnethermic's field mapping capabilities provide important technical information in the development and application of induction heating systems.

- Determines the patterns where energy is actually being generated.
- Saves time and money in development, instead of using a trial and error method.
- Determines if and where stray heating may occur.
- Most importantly, defines areas where magnetic fields are present and identifies field strengths. This can be used to establish safe working areas for personnel.



Overview: Induction Heating & Melting for Flat Products



Preheating

- Weld anneal
- Prior to a furnace (hot dip coating lines, annealing, electro-galvanizing)
- Prior to pickling tanks
- Ultra rapid anneal of silicon steels

Transition / Booster Heating

- Preheating section of furnaces for initial heat or to boost production
- Transition areas of furnaces to boost production and substrate / alloy changes
- Prior to snout leading into coating pots for special heating cycles

Coating Pot

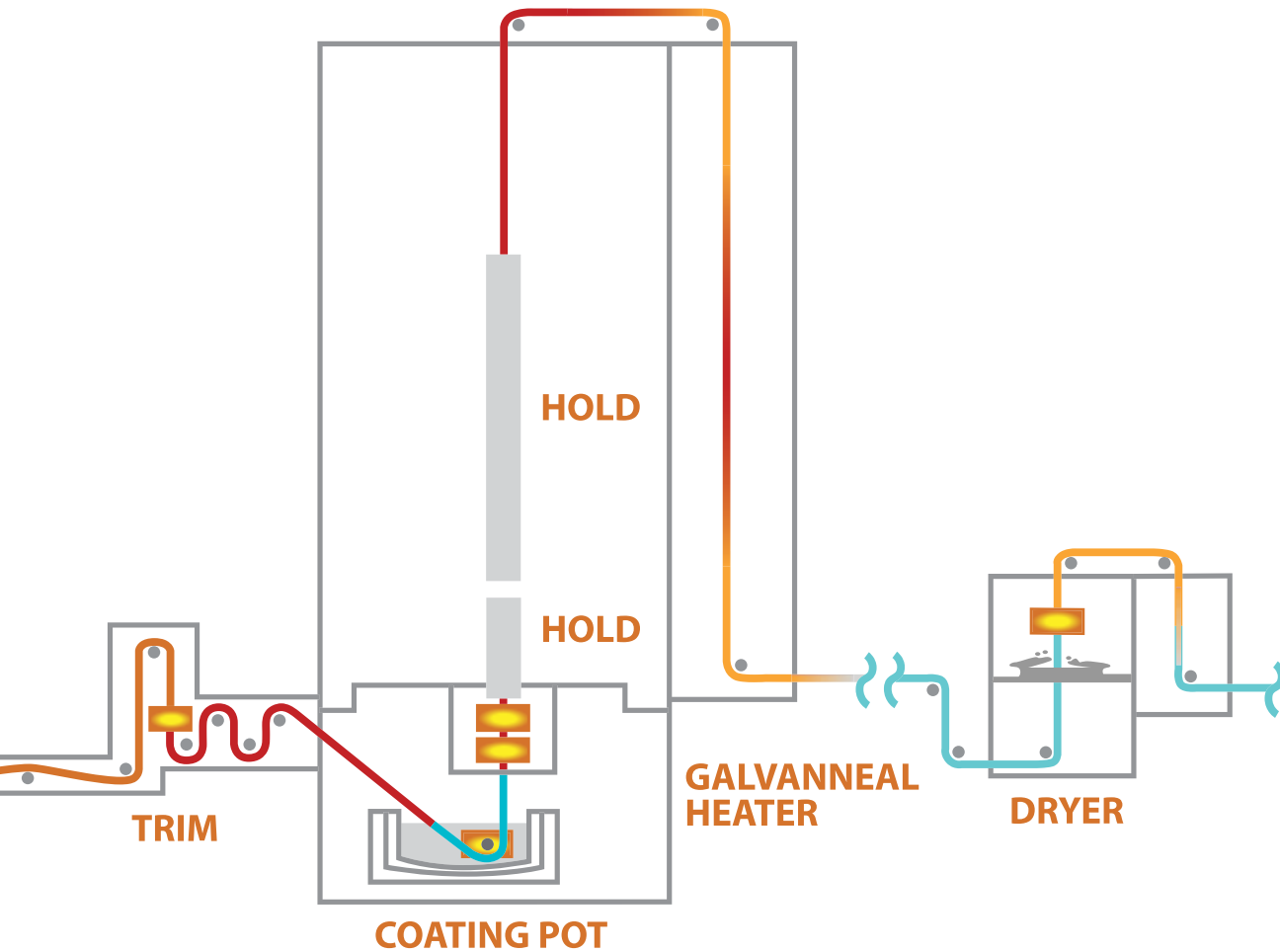
- Melts metal alloys for continuous coating
- Maintains molten alloy temperatures

Galvanneal Heater

- Heating zinc coated strip to create a zinc iron layer by diffusion

Dry / Cure

- Post treatment coatings
- Paint applications



Special Applications

Heat to Coat

- Heating from ambient to pot temperature in an atmosphere

Edge Heating

- Eliminate bright or non-alloyed edges on galvanneal products
- Prevent cracking and improve quality on plate or slab
- Extend roll wear

Tin Reflow

- Reflow tin that has been applied to steel

Transverse Flux

- Heating thin non-magnetic materials
- Applications requiring rapid heating
- Applications with limited heating space
- Cladding (bonding of dissimilar metals)



Standard Applications

Preheating

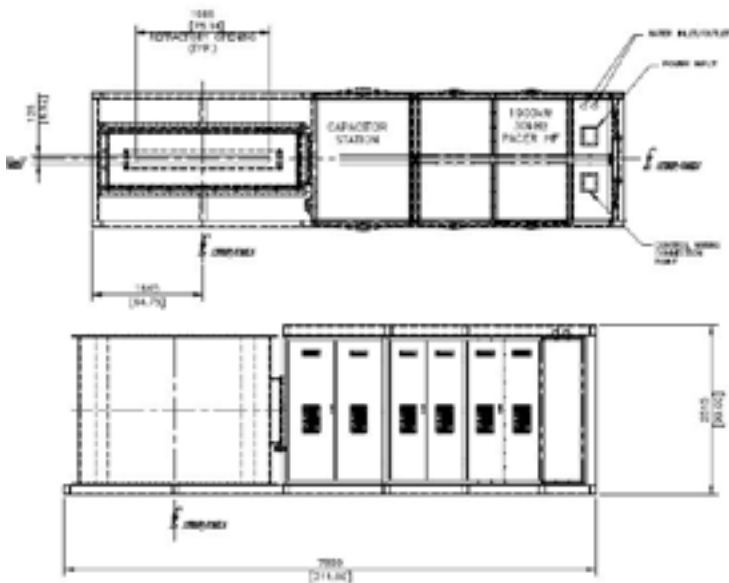
Ideal application for many strip processing lines

The most requested application is for increased production. An increase of 30% is typical and can be achieved in a very short heating length prior to a furnace. Several thousand kilowatts can be installed in a single heating coil.

Heating prior to pickling has many advantages. Operating costs can be substantially reduced due to several factors, such as:

- Lower acid concentration and less usage
- Lower vapor content in the atmosphere
- Lower acid concentration in the waste
- Lower water treatment costs

Ultra rapid anneal is an application of preheating prior to a silicon steel decarburizing furnace. Heating to 770°C (1420°F) is typical and results in superior silicon steel electrical properties.



Transition/Booster Heating

Increased production, or booster, is the main purpose of this application. To achieve this, induction heating coils are located in strategic areas of the furnace per customer requirements.

Heating coils located between the preheat and soak sections of the furnace offer several advantages. Furnace adjustments for heavier gauges and/or transitions between annealing cycles are easily accommodated by induction heating.

Heating coils can be located prior to the snout of the coating pot. Specific heating cycles require cooling the strip below the coating pot temperature. These induction coils are used to reheat the strip so that it enters the coating pot at a specifically controlled temperature.



Galvanneal

Many existing galvanneal lines benefit from Ajax TOCCO heating systems. Ajax TOCCO supplied the very first induction heating system for galvanneal in 1986. Heating for galvanneal has been successfully used in more than 50 lines worldwide.

Galvanneal heating coils are very compact and utilize a unique design allowing them to move off the line to accommodate production schedules.

Galvanneal, using induction, produces an iron zinc alloy coating better than any gas fired furnace. Its precise temperature control and instantaneous response to strip speed assures uniform heating throughout the heating zone.

Advantages:

- Improves quality and yield due to its instant on-off capability, plus its ability to control temperature.
- Adaptable to computer control and provides instantaneous response to changing line speeds and conditions.
- Metallurgically, induction provides superior uniformity of zinc iron alloy, better paint adhesion, and excellent welding characteristics.



Dry / Cure

Drying of various coatings is improved using induction heating. Final peak metal temperature and uniformity are essential in this application. Maintenance cost are greatly reduced compared to other heating methods. Curing paint requires precise heating control which is easily obtained using induction.

A view of a 1200 kW strip drying application. This equipment is being used for a wide variety of coating applications. The equipment can be designed for horizontal or vertical installations.



Coating Pots for Strip Processing

Ajax TOCCO Mangnethermic provides static and mobile induction coating pots for the continuous coating of steel strip. Each pot is equipped with the industry leading Ajax TE **Jet-Flow**® Inductor.

Coating Pot

Large high powered channel induction furnaces, ceramic lined induction coating and pre-melt pots are the industry standard in the production of coated steel strip and tubing.

Channel & Coreless Coating Pots

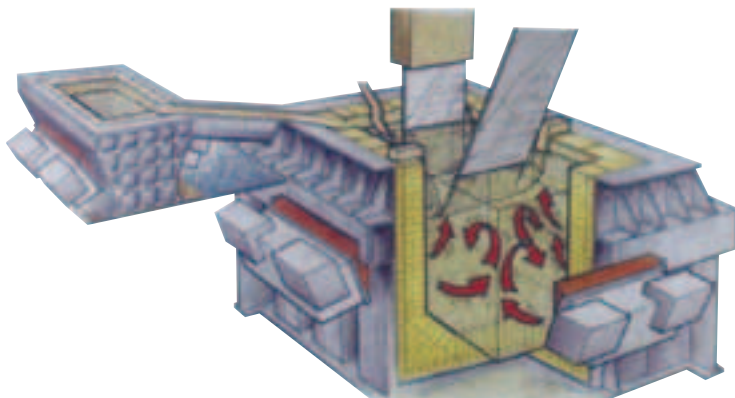
Main coating pot is a welded steel casing, equipped with reinforced walls and base. Ajax TOCCO leads the industry with over 400 installations world-wide.

Premelt Pots

- Channel or coreless for melting alloys prior to the coating pot.

Layouts

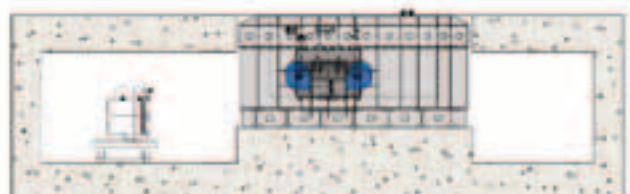
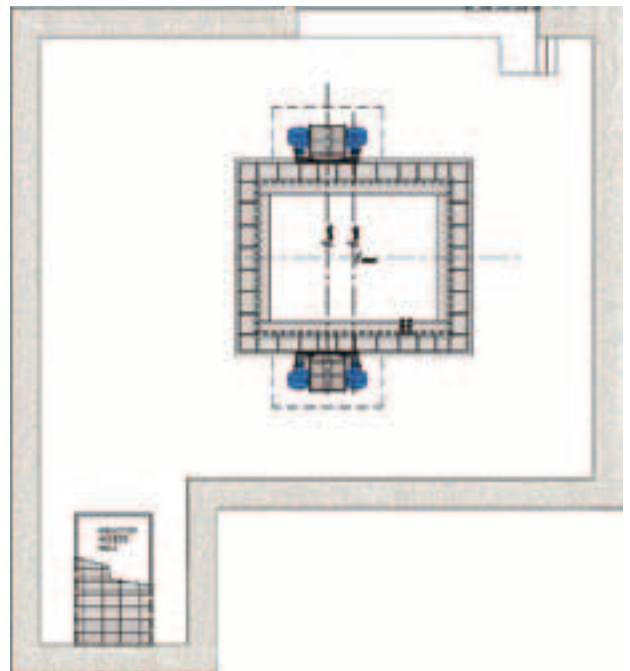
- Can be designed for: Zn, ZnAL, ZnMg, Al, AISi Duty.
- Existing pot designs and references ranging from 80 to 400 tonne capacities.
- New designs for the customer's exact requirements and space.
- Can be designed to replace existing ceramic and iron pots.



Jet-Flow® inductor on coating pot

Static Pots

- Fixed production.
- No requirement to change alloy or coating.
- Reinforced base to mount directly onto customer foundations.
- Designed to accommodate customer's exact requirements and productions.



Pot Movement

Mobile Pots

- Multiple productions requiring quick change alloy coating.
- Incorporated into any layout or configuration.
- In-line, perpendicular, L-shape, even single pot shared between two parallel CGL projects.

Bogies

Ajax TOCCO provides bogie assemblies for mobilization of coating pot. Bogies allow the furnace to be moved from the coating position to the ambush position.

Two bogie assemblies are mounted on each side of the furnace base. Each assembly consists of a pair of flanged wheels mounted in roller bearings and supported on a rigid frame.

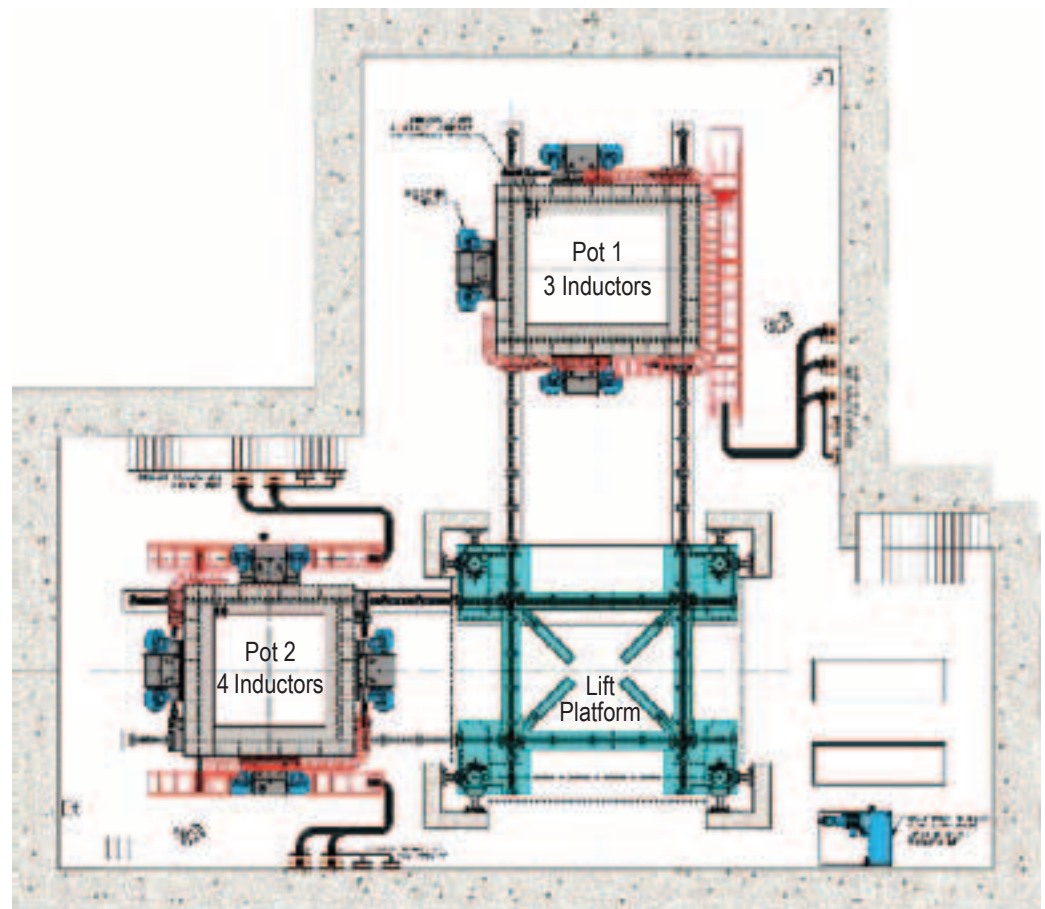
Each bogie is attached to the furnace base by means of a fixed pin passing through a bearing carried on the bogie. This provides fully articulated movement and equal load sharing between the wheels.

1st Floor Level

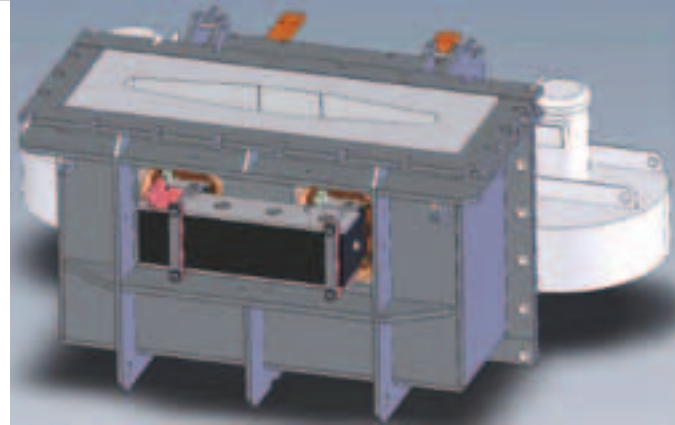
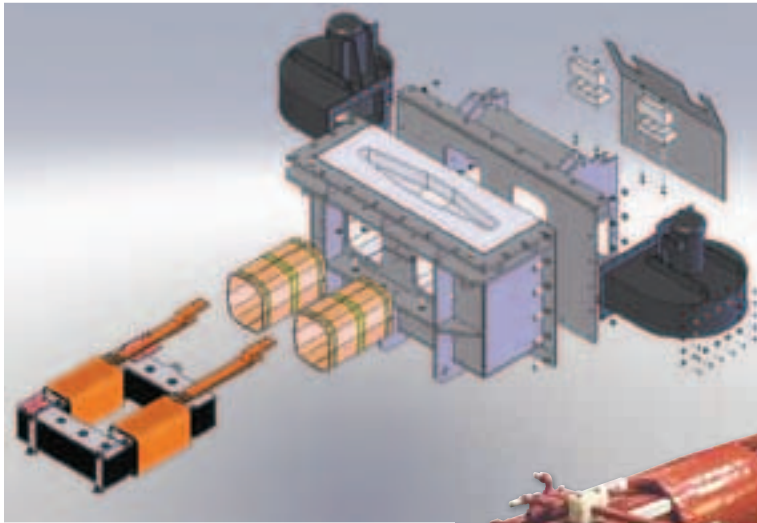
Pot

Bogies

Lift Platform



JET-FLOW[®] Inductors



As the world leader in channel furnace technology, Ajax TOCCO continues to refine the design of the famous Jet-Flow inductor.

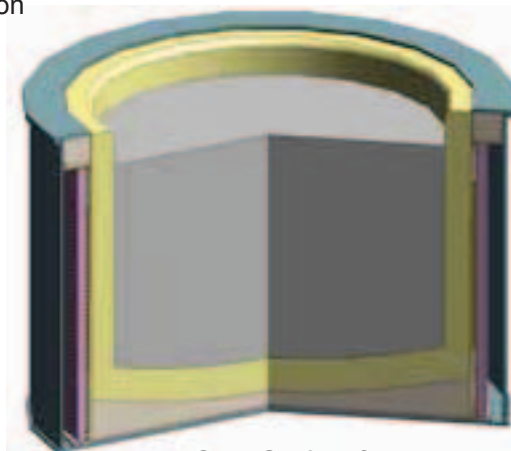
Ajax TOCCO has not only broken the 8000 kW barrier, but can also point to the successful start up of the largest channel furnaces in the world.

Ajax TOCCO air-cooled model TE Jet-Flow electric inductors are available up to 500 kW. Each inductor is air cooled by integral blowers. The inductor is supplied as a complete unit and complete interchangeability between inductors is assured.



Each Jet-Flow inductor comprises the following:

- (1) Inductor case of welded heavy steel construction flanged to match and mount to the furnace shell and fitted with suspension brackets.
- (1) Furnace transformer assembly.
- (2) Cooling air blowers each with integral driving motors.
- (2) Split copper air duct-bushing.
- Higher power, water-cooled inductors are available.



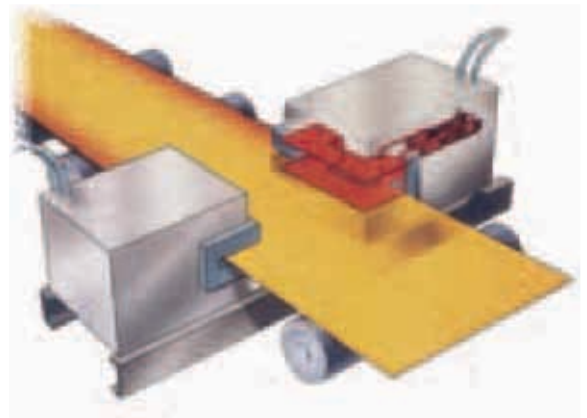
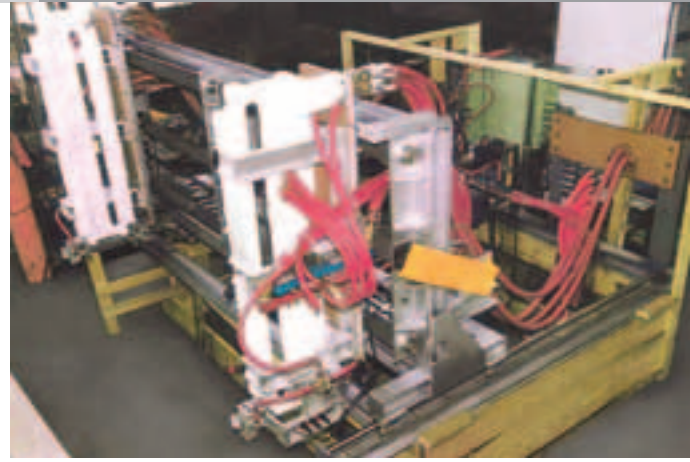
Cross Section of a
Coreless Pot

Special Applications

Edge Heating

A specially designed edge heating coil has been developed for galvanneal products. The air knives, that wipe the zinc off the strip as it exits the coating pot, may leave a heavier zinc coating on the edge. The result of this heavier zinc layer is a bright, shiny, or non-alloyed area at the edge of the strip. If the specifications of the end-user requires the edge to be alloyed the same as the body, induction edge heating is the answer. This system can heat a specific distance into the edge as determined by the customer.

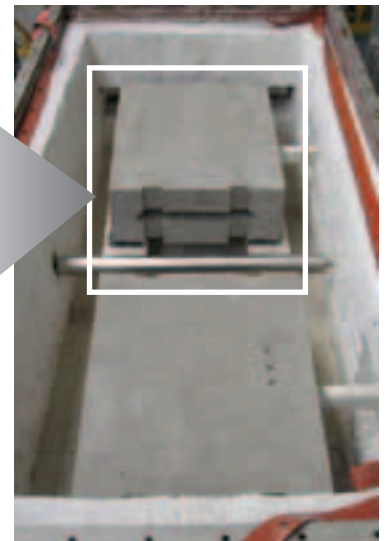
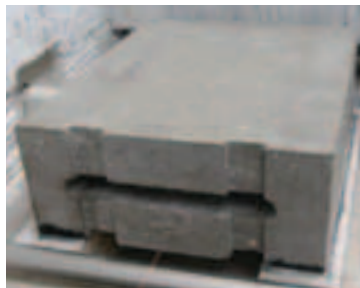
Cold edges during the rolling process affect quality, roll wear, and energy loss. Induction strip edge heating conserves energy by using energy only when and where required. It increases material yield and reduces wear-and-tear on rolls due to the even temperature over the whole width of the strip. Ajax TOCCO induction strip edge heaters are adjustable to different strip widths and are easily installed.



Heat to Coat

Heat to coat offers all the advantages of induction strip heating. Heating coils are located within an atmosphere-controlled chamber to heat strip to coating pot temperatures. Heating within a short space, operation at very high efficiencies, precise final temperatures, and excellent temperature uniformity are just some of the major reasons this process provides quality strip for the producer.

Converting to induction is easy because it requires only a fraction of the total space of a gas furnace.



Special Applications

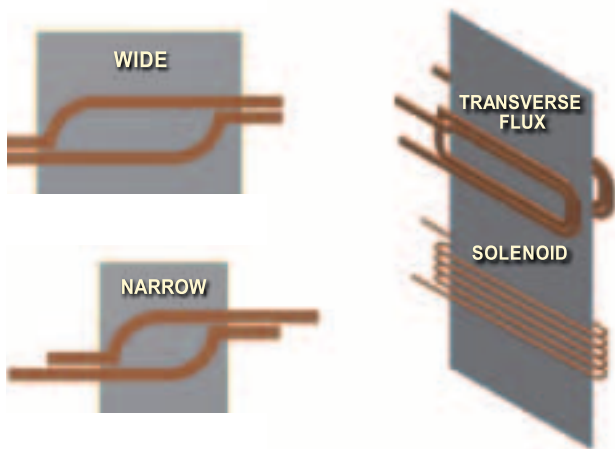
Transverse Flux

Ajax TOCCO Transverse Flux heating lends itself to a wide variety of strip heating applications. Transverse Flux is used for heating non-magnetic stainless steels, heating carbon steels above curie, or heating other non-ferrous strip such as aluminum. The results offer energy savings (as much as 1/3), low capital costs, less floor space, improved yield, quality, speed and flexibility.

Ajax TOCCO's Transverse Flux induction heating is changing the way producers want to heat strip. Specially designed transverse flux inductors enable the user to heat a wide variety of strip sizes with the same inductor and make adjustments to the system without shutting down the line.

Advantages:

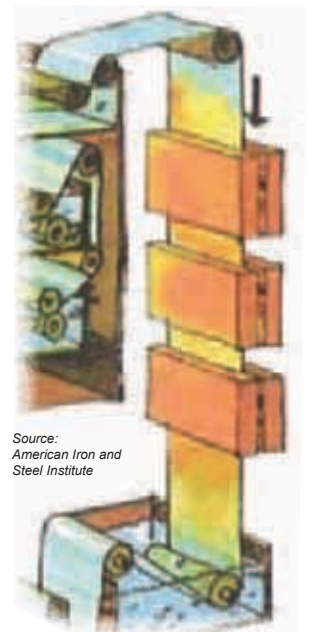
- New technology to heat thin metal strip.
- High electrical efficiency and low operating cost.
- Heating very fast strip speeds.
- Patented adjustable inductor design.



Tin Reflow

Tin coated steel strips are primarily used to make beverage, aerosol, industrial, and decorative type cans and containers. The tin is typically electro-plated onto the steel strip. After the tin is applied, it is heated to melt and reflow the tin. The process suppresses any porosity of the coating and produces a thin iron-tin alloy layer at the interface.

Ajax TOCCO supplied the very first system in 1942 and has completed more than 50 installations since that date. The original units used large vacuum tubes to generate the frequencies needed for thin gauges. Today, the availability of solid state devices makes these systems state-of-the-art. Whether new or upgrading an existing installation, Ajax TOCCO has the equipment, experience and technology our customers require.



Source:
American Iron and
Steel Institute



Power Supplies / Controls

Ajax TOCCO Magnethermic offers a wide variety of solid state power supplies with many features. Features such as single logic control board, built in diagnostics, infinite power control, widest load matching window in the industry, and convenient and simple customer interface are standard on all power supplies.

Power Supplies available:

- Power from 1 kW to 12,000 kW.
- Frequencies from 40 Hz to 450,000 Hz.
- Solid state inverter devices including SCR, IGBT, or MOSFET.



2700 kW / 50,000 Hz Pacer® HF



1200 kW / 30,000 Hz Pacer® HF



200 kW / 10,000 Hz Integral Pacer® T



CFC Panel
Channel Furnace Control



I/O Interface Panel



HMI - PLC Control Panel



PCU - Power Control Units



750 kW / 30,000 Hz Pacer® HF



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Germany (Hemer)	49-2372-55980
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