SARVAJANIK COLLEGE OF ENGG. & TECH. SURAT

REPORT ON INDUSTRIAL VISIT AT ELECTROTHERM,AHEMADABAD

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CLASS: ELECTRICAL M.E-2

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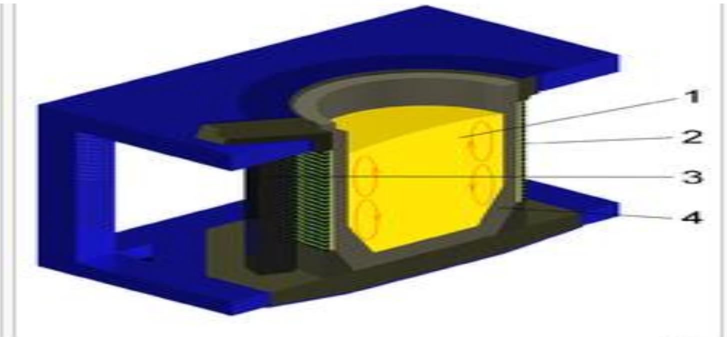
ELECTROTHERM

Electrotherm makes 14 MW induction melting furnace,the cost of production is less. Efficiency of 10 to 25 ton capacity has been increased, the reduction of energy consumption is to the ton of 25-50 units/tons. IGBT power supply is developed and supplied having constant power factor of 0.98 and power sharing features.

An induction furnace is an electrical furnace in which the heat is applied by induction heating of metal. The advantage of the induction furnace is a clean, energy-efficient and well-controllable melting process compared to most other means of metal melting. Since no arc or combustion is used, the temperature of the material is no higher than required to melt it; this can prevent loss of valuable alloying elements.

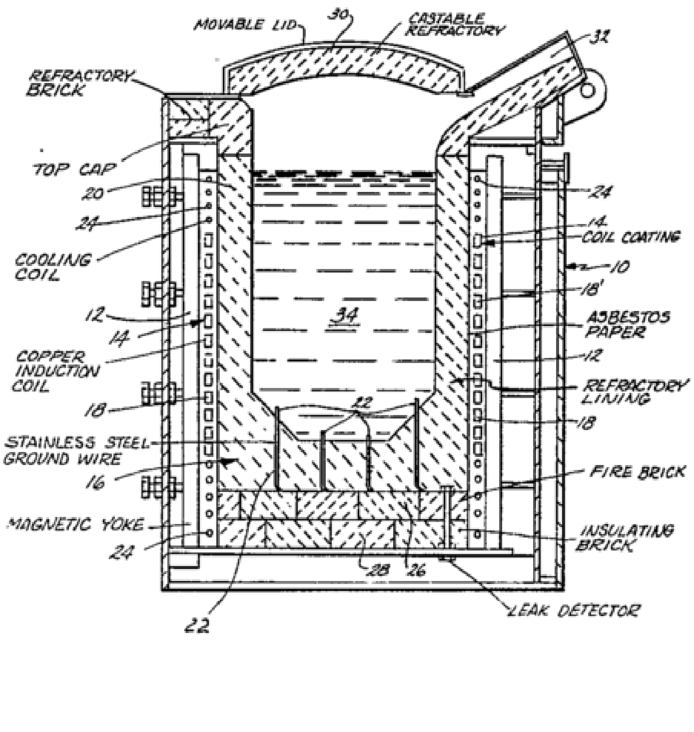
In the coreless type, metal is placed in a crucible surrounded by a water-cooled alternating current solenoid coil. A channel-type induction furnace has a loop of molten metal, which forms a single-turn secondary winding through an iron core.

An induction furnace consists of a nonconductive crucible holding the charge of metal to be melted, surrounded by a coil of copper wire. A powerful alternating current flows through the wire. The coil creates a rapidly reversing magnetic field that penetrates the metal. The magnetic field induces eddy currents, circular electric currents, inside the metal, by electromagnetic induction. The eddy currents, flowing through the electrical resistance of the bulk metal, heat it by Joule heating. In ferromagnetic materials like iron,the material may also be heated by magnetic hysteresis, the reversal of the molecular magnetic dipoles in the metal. Once melted, the eddy currents cause vigorous stirring of the melt, assuring good mixing. An advantage of induction heating is that the heat is generated within the furnace's charge itself rather than applied by a burning fuel or other external heat source.



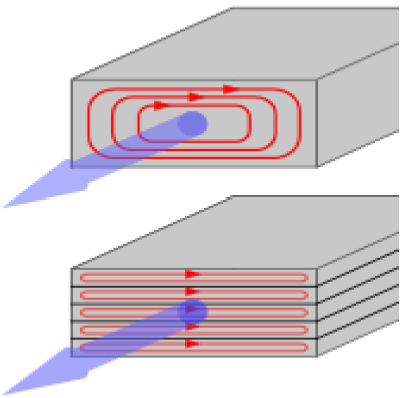
1 - Melt
2 - water-cooled coil
3 - yokes
4 - crucible

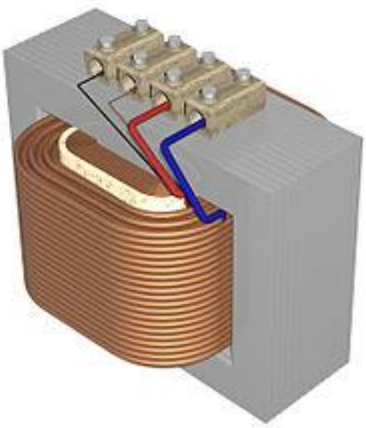
Operating frequencies range from utility frequency (50 or 60 Hz) to 400 kHz or higher, usually depending on the material being melted, the capacity (volume) of the furnace and the melting speed required.



Electrotherm has started manufacturing of transformers with high and lower ratings as a contribution in a ramp-up in distribution infrastructure including the replacement market. Electrotherm conscious effort to maintain quality and keep up with the growing demand by enhancing production capacity.

A transformer is an electrical device that transfers electrical energy between two or more circuits through electromagnetic induction. Transformers for use at power or audio frequencies typically have cores made of high permeability silicon steel. The steel has a permeability many times that of free space and the core thus serves to greatly reduce the magnetizing current and confine the flux to a path which closely couples the windings. Transformer uses the core by stacking layers of thin steel lamination. Each lamination is insulated from its neighbours by a thin non-conducting layer of insulation. The universal transformer equation indicates a minimum cross-sectional area for the core to avoid saturation. The effect of laminations is to confine eddy currents to highly elliptical paths that enclose little flux, and so reduce their magnitude. Thinner laminations reduce losses,





The conducting material used for the windings depends upon the application, but in all cases the individual turns must be electrically insulated from each other to ensure that the current travels throughout every turn. For small power and signal transformers, in which currents are low and the potential difference between adjacent turns is small, the coils are often wound from enamelled magnet wire such as Formvar wire. Larger power transformers operating at high voltages may be wound with copper rectangular strip conductors insulated by oil-impregnated paper.

Construction of oil-filled transformers requires that the insulation covering the windings be thoroughly dried of residual moisture before the oil is introduced. Drying is carried out at the factory, and may also be required as a field service. Drying may be done by circulating hot air around the core, or by vapor-phase drying (VPD) where an evaporated solvent transfers heat by condensation on the coil and core.

For small transformers, resistance heating by injection of current into the windings is used. The heating can be controlled very well, and it is energy efficient. The method is called low-frequency heating (LFH) since the current used is at a much lower frequency than that of the power grid, which is normally 50 or 60 Hz. A lower frequency reduces the effect of inductance, so the voltage required can be reduced. The LFH drying method is also used for service of older transformers.

Larger transformers are provided with high-voltage insulated bushings made of polymers or porcelain. A large bushing can be a complex structure since it must provide careful control of the electric field gradient without letting the transformer leak oil.