

# **MSE-402**

## **Furnaces**

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A furnace is an equipment used to melt metals for casting or to heat materials to change their shape (e.g. rolling, forging) or properties (heat treatment). Since flue gases from the fuel come in direct contact with the materials, the type of fuel chosen is important. For example, some materials will not tolerate sulphur in the fuel. Solid fuels generate particulate matter, which will affect the materials placed inside the furnace.

### **Types of furnaces and classification:**

In metallurgical industries, the furnaces are used for applications like calcinations, reduction/smelting, drying, roasting, agglomeration, refining, melting, metal heating metal heat-treatment and for hot deformation etc. In these furnaces, various energy sources are used including solid fuel, gaseous fuels, liquid fuel, electrical energy and chemical energy present as carbon, sulphur, phosphorus, silicon and manganese.

Classification of Furnaces:

**1. Solid Fuel based Furnaces:** The solid fuels like coal, petro-coke, coke, and charcoal have application in metallurgical furnaces as energy source to fulfill thermal and chemical energy requirements.

**Examples of them are:**

**a. Coal based furnaces**

**b. Coke based furnaces:** Blast furnace, Cupola, Foundry pit furnace, Foundry pot furnace.

**c. Petro-coke using furnaces:** Petro-coke is a by-product of oil refineries as solid residue left after crude oil refining process.

**d. Charcoal using furnaces:** Charcoal is a renewable energy source obtained by carbonization of wood.

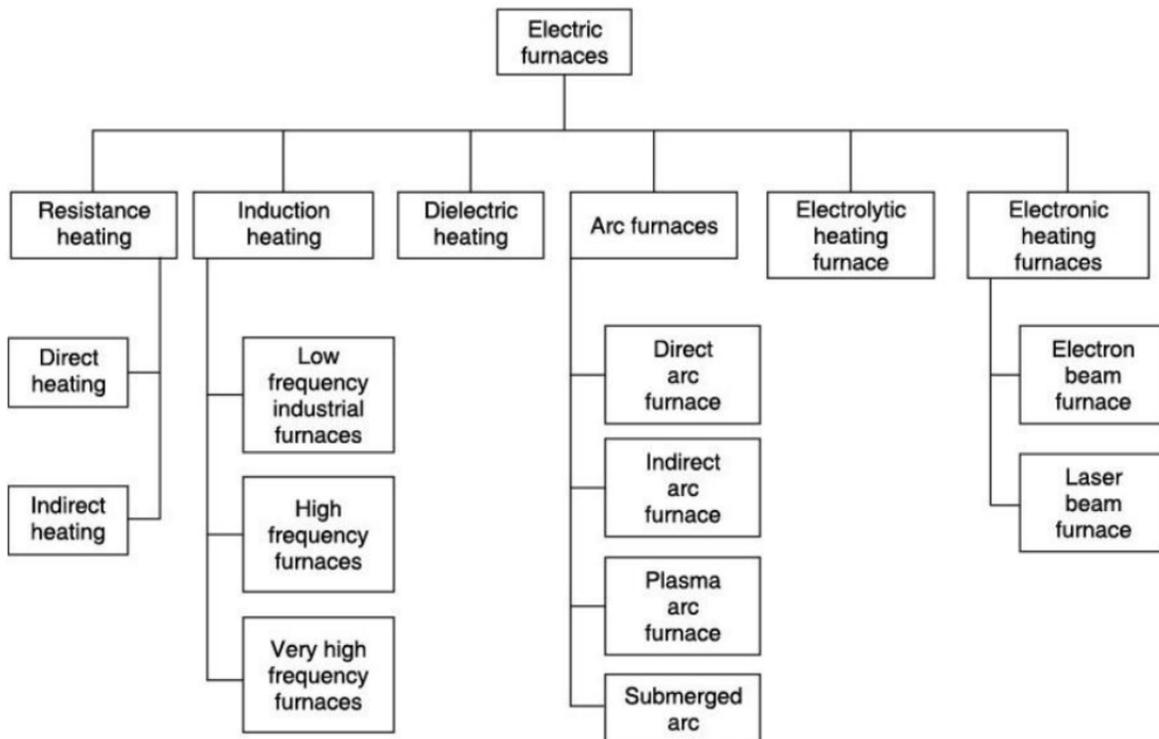
**2. Liquid Fuel based Furnaces:**

**a. Melting furnaces:** Crucible furnace, Skelner furnace, Open hearth furnace or Siemens-Martin furnace

**b. Heating furnaces:** Forging furnace, Batch type re-rolling mill furnace, Continuous pusher type re-rolling mill furnace, Walking hearth and walking beam furnaces

3. **Gaseous Fuel based Furnaces:** Coke oven heating, BF stoves, Soaking pit furnace

4. **Furnaces based on Electricity**



## Types of Electric Furnaces

### Industrial application of furnaces:

- ✚ Annealing purpose
- ✚ Glass industry
- ✚ Use in ceramic industry
- ✚ Use in molding

- ✚ Debinding purpose
- ✚ Use in brazing
- ✚ Use in calcination process
- ✚ Use in sintering process
- ✚ Thermal cycling
- ✚ Use in metallizing