

# HEAT TREATMENT

## MCE063

### COURSE DESCRIPTION

This course conveys a general appreciation of the metallurgical/technological background to industrial heat treatment processing. It examines the various processes, how they are carried out and controlled, what they seek to achieve in structures and properties, and the problems that can be encountered. It is assumed that course participants have had no prior formal scientific/metallurgical training.

Whilst conceived with the heat treatment shop supervisor in mind, the course has proved equally suitable for those who supply equipment, materials and fuels to the industry.

### COURSE GOAL

To enhance the participants' knowledge, skills and abilities necessary to understand basic metallurgical principles of heat treatment, the fundamentals of furnace design & operation and concludes with an explanation of testing & quality control procedures.

### COURSE OBJECTIVES

By the end of this course, participant will be able to:

- Understand why heat treat.
- Understand strengthening mechanisms.
- Understand heat treatment terminology.
- Understand heating, soaking, cooling, quenching.
- Understand furnaces & furnace issues.

### WHO SHOULD ATTEND

Anyone requiring an overall understanding of the principles & practicalities of heat treatment, including purchasers & vendors of heat treatment services, design engineers & quality control technician.

### COURSE DURATION

5 Working Days

### COURSE OUTLINES

1. Why Heat Treat?
  - Modifying mechanical properties.
  - Improve cosmetic appearance.

- Crystallography of metals.
- Influence of grain size.
- Effects of alloying elements.

## **2. Strengthening Mechanisms**

- What is strength?
- Lattice strain.
- Crack propagation.
- Solid solutions.
- Martensitic transformations.
- Precipitates & grain boundaries.
- Phase diagrams.
- Continuous cooling transformation (CCT) diagrams.

## **3. Heat Treatment Terminology**

- Homogenization.
- Solution treatment.
- Normalizing.
- Annealing.
- Precipitation treatment.
- Tempering.
- Aging.
- Stress relieving.

## **4. Heating, Soaking, Cooling, Quenching**

- How hot is hot enough.
- How long is long enough.
- How quickly is quick enough.

## **5. Furnaces & Furnace Issues**

- Batch furnaces.
- Continuous furnaces.
- Choice of fuel – gas, electricity, fuel oil.
- Burner types.
- Atmosphere control.
- Furnace linings.
- Furnace control & monitoring.

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