



MU263: Heat Treatment





Training Description:

Heat Treating is defined as heating and cooling a solid metal or alloy in such a way as to obtain desired conditions or properties. This course provides valuable insights into the effects of thermal treatments for softening steel (annealing) as well as hardening treatments such as quenching and tempering, austempering, and various surface (cases) hardening methods.

Heat treatments for plain carbon, low alloy, stainless, cast irons, and tool steels are described and related to the fundamental changes in microstructure and properties that occur during such processing. There is also emphasis on heat treating process control with regard to furnace atmospheres, temperature, quenching techniques, and selection of proper furnace equipment for different types of heat treating operations.

During this intensive training course, participants will learn the heat treatment processes and related technology; the guidelines for the heat treatment of steel; the carbon and alloy steels, tool steels, ultrahigh-strength steels and stainless steels; heat treating iron castings and P/M steels; heat treating of gray iron and ductile iron; heat treating malleable irons; and the P/M tool steels, P/M stainless steel and P/M steel parts.

Training Objectives:

By the end of the training, participants will be able to:

- ✓ Apply and gain an in-depth knowledge on heat treatment
- ✓ Discuss heat treatment processes and related technology
- ✓ Review the guidelines for the heat treatment of steel covering the normalizing process, annealing of steel, surface hardening treatments, steel quenching technology, other quenchants processes and tempering processes/technology
- ✓ Determine carbon and alloy steels, tool steels, ultrahigh-strength steels and stainless steels
- ✓ Carryout heat treating iron castings and P/M steels as well as heat treating of gray iron and ductile iron
- ✓ Illustrate heat treating malleable irons, P/M tool steels, P/M stainless steel and P/M steel parts

Training Designed for:

This course is intended for design and manufacturing engineers, plant managers, supervisors, metallurgists and technicians, quality control inspectors, sales and marketing personnel.

Training Program:

DAY ONE:

- ❖ PRE-TEST
- ❖ Introduction
- ❖ **Heat Treating Processes & Related Technology**
 - Heat Treating Processes
 - Causes of Distortion & Cracking During Quenching
 - Stress Relief Heat Treating of Steel
 - Furnace of Atmospheres





- Cold & Cryogenic Treatment of Steel
- Representative Applications of Heat Treating Operations
- How a Commercial Heat Treater Uses SPC & the Computer
- Practical Applications of the Computer in Heat Treating
- ❖ **Guideline for the Heat Treatment of Steel**
 - Introduction
 - The Normalizing Process
 - Annealing of Steel

DAY TWO:

- ❖ **Guideline for the Heat Treatment of Steel (cont'd)**
 - Surface Hardening Treatments (Induction Hardening, Flame Hardening, Gas Carburizing, Pack Carburizing, Liquid Carburizing & Cyaniding, Vacuum Carburizing, Plasma (Ion) Carburizing, Carbonitriding, Gas Nitriding, Liquid Nitriding, Plasma (Ion) Nitriding, Gaseous & Plasma Nitrocarburizing, Fluidized Bed Hardening, Electron Beam Hardening)
 - Steel Quenching Technology (Introduction, Air Quenching Process, Water Quenching Process, Oil Quenching Process, Polymer Quenchants, Molten Salt Quenching Process, Brine Quenching Process, Caustic Quenching Process)
 - Other Quenchants/Processes (Introduction, Vacuum Quenching, Self-Quenching Processes, Fluidized Bed Quenching, Ultrasonic Quenching, HIP Quenching, Spray Quenching Process, Fog Quenching Process, Cold Die Quenching, Quenching in an Electric or Magnetic Field, Quenching Flame & Induction Hardened Parts)
 - Tempering Processes/Technology (Conventional Processes, Martempering of Steel, Austempering of Steel)

DAY THREE:

- ❖ **Carbon & Alloy Steels Introduction**
 - Carbon Steels (Introduction, Nonresulfurized, Resulfurized Carbon Steels, Rephosphorized & Resulfurized Carbon Steels, High Manganese Carbon Steels)
- ❖ **Alloy Steels**
- ❖ **Tool Steels**
 - Introduction
 - Water-Hardening Tool Steels
 - Shock-Resisting Tool Steel
 - Oil-Hardening Cold Work Tool Steels
 - Medium-Alloy, Air-Hardening Cold Work Tool Steels (A Series)
 - High-Carbon, High-Chromium Cold Work Tool Steels (D Series)
 - Low-Alloy Special-Purpose Tool Steels (L Series)
 - Mold Steels (P Series)
 - Hot Work Tool Steels (H Series)
 - Tungsten High-Speed Tool Steels (T Series)
 - Molybdenum High-Speed Tool Steels (M Series)
- ❖ **Ultrahigh-Strength Steels**





DAY FOUR:

- ❖ **Stainless Steels**
 - Introduction
 - Austenitic Stainless Steels
 - Ferritic Stainless Steels
 - Martensitic Stainless Steels
 - Cast Stainless Steels
 - Cast PH Stainless Steels
- ❖ **Heat Treating Iron Castings & P/M Steels**
- ❖ **Heat Treating Cast Irons**
- ❖ **Heat Treating of Gray Iron**
- ❖ **Heat Treating Ductile Iron**

DAY FIVE:

- ❖ **Heat Treating Malleable Irons**
- ❖ **Heat Treating P/M Tool Steels**
- ❖ **Heat Treating P/M Stainless Steel**
- ❖ **Heat Treating of P/M Steel Parts**
- ❖ **Course Conclusion**
- ❖ **POST-TEST and EVALUATION**

Training Requirement:

“Hand’s on practical sessions, equipment and software will be applied during the course if required and as per the client’s request”.

Please note that the above topics can be amended as per client’s learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:-

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Software & General Discussions
- Pre and Post Test

Training Certificate(s):

Internationally recognized certificate(s) will be issued to each participant who completed the course.

Training Fees:

As per the course location - This rate includes participant’s manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.





Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Timings:

Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:30	Recess (Prayer Break & Lunch)
13:30 - 15:00	Last Session

For training registrations or in-house enquiries, please contact:

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Training & Career Development Department