SIMHEAT®

Heat Treatments

What is the best design for an inductor? What frequency should I apply? What is the impact on part metallurgy? Master the simulation of your heat treatment processes with SIMHEAT®!

After some theoretical refreshers, you will study how to implement simulated induction heating with a static billet or one that moves through the inductor. You will be able to analyze the influence of the inductor's design, of the presence of concentrators and test the impact of the various generator parameters. Then you will go on to look at heating for heat treatment placing the emphasis on metallurgical aspects, predicting the area that is thermally affected and the use of static or mobile inductors. In this way, you will understand the thermal and electromagnetic phenomena for optimizing heating conditions.

LEVEL

Beginner

PREREQUISITES

There is no prior requirement for this course.

GOALS

- **Discovering the interface**
- **Data set up of a heat treatment simulation of a forged, cold formed or cast part**
- **Launching a single computation and/or a computation sequence**
- **Analyzing simulation results**
- **Defining the process conditions in order to obtain the best mechanical properties**
- **Be able to predict the microstructure changes during heating or cooling**
- **Creating your own TTT diagram using SIMHEAT®**
- **Observing the influence of the diffusion of carbon on the changes in surface hardness**
- **Determining the ideal treatment conditions in order to reduce cycle times**
- **Customizing your working environment**

TRAINING	DURATION	PRICE EXCL. TAX	PARTICIPANTS
In-company	2 days	€2800 per training	1 to 3 people

DAY 1 > 8.30 a.m. to 12.00 p.m. & 2.00 p.m. to 5.30 p.m.

Introduction	• Presentation of Transvalor • Course goals
General	• Fe-Fe3C diagram • Review of TTT and TRC diagrams
Modeling quenching	• Approximating the TRC diagram using the TTT diagram • Exercise: generating TTT and TRC diagrams with SIMHEAT® • Multi-physical coupled model • Exercise: model quenching in different baths (Houghton oils, polymer solutions) • Exercise: quenching via sprays
Result analysis	• Displaying results, the main scalars and vectors • Graphs, animations, VTFx exports • Multi-window analysis • Management of animations and exporting results

DAY 2 > 8.30 a.m. to 12.00 p.m & 2.00 p.m. to 5.30 p.m.

Austenitizing	• Generation of material composed of perlite and ferrite • Definition of the heating cycle • Report analysis: phase transformation, austenite content, optimizing the heating cycle
Carburizing	• Generating anisotropic meshing • Defining the carbon content • TTT diagram according to the carbon content • Result analysis: carbon content, phase transformation, hardness
Tempering	• Model used to determine hardness • Exercise: modeling of tempering after quenching • Result analysis: residual stresses, hardness, etc.
Optimization	• Basic optimization principle • Determining exchange coefficient thanks to reverse engineering
Working environment customization	• Creating specific models and specific data sets (materials, heat exchanges, etc.)
Conclusion	• Questions and course assessment