

Heat Treating Steel

By:
Louie Mysse
Brandon Okerlund





Heat Treatment Processes

- **Tempering**
- **Annealing**
- **Stress Relieving**
- **Normalizing**
- **Quenching**

Tempering

- **Reheating a Hardened Material**
 - **Increases Ductility and Toughness**
- **Three Components**
 - **Temperature**
 - **Time**
 - **Cooling Rate**



Annealing

- Heating and holding a suitable temperature followed by an appropriate cooling rate.
 - Quenching has to occur
 - Produces desirable changes in the material properties or microstructure





Stress-Relief

- **Relieves stresses that remain locked in a structure as a consequence of a manufacturing sequence**
 - **Welding**
 - **Cutting with a torch**
 - **Machining**

Normalizing

- **Both Thermal and Microstructure point of view**
 - **Thermal**
 - **Heating then cooled in still or slightly agitated air**



Quenching

- **Rapid cooling of steel from an elevated temperature**
 - **Typical Quenching techniques**
 - **Water**
 - **Oil**
 - **Air**





How To Heat Treat In Shop

- **What is the hardness required?**
 - Refer to Heat Treater's Guide
- **How Deep do You Need the Treatment?**
 - Case
 - Through
- **What type of Heat Treatment is required?**
 - Tempering, Annealing, Stress-Relief, Normalizing, Quenching

How To Heat Treat In Shop



- **Turn On Furnace**
- **Set To Appropriate Temperature**
 - Determine from references
- **Place Metal In Furnace When Up to Temperature**
 - Leave for determined time
- **Remove and Immediately Quench**
 - Quench in appropriate fluid
 - Oil, Water, Air
- **Re-Set Furnace Temperature (Tempering)**
- **Place Metal Back in Furnace (Tempering)**
 - Leave for determined time
- **Remove and Cool at Designated Rate (Tempering)**

Sample Annealing Video





Ordering Heat Treating Processes

- **Establish the type of steel that will be used**
- **Determine the desired properties**
 - **Hardness**
 - **Case/Through**
- **Choose the proper quenching technique**

References

- Metals Handbook Desk Edition, Second Edition.
 - JR Davis, Davis and Associates, 1998, ASM International
- Steel Aluminum Stock List and Reference Book,
 - Jorgensen Steel, Earle M. Jorgensen Co., 1998. (Section S.)