

## NORMALIZING

### Benefits

- Improved machinability of steel components
- Reduction of residual stresses
- Microstructural homogenization
- More uniform response to subsequent processing
- Moderate control over strength/hardness

### Process

Normalizing is when steel is austenitized (heated above a critical temperature), held for a specified time, and then cooled in air. Processing temperatures typically range from 1500°F - 1750°F. Normalizing utilizes a faster cooling rate than annealing. The faster cooling rate produces a fine pearlitic structure and a higher hardness and strength than annealing produces. The final microstructure and properties are dependent on cooling rate and material grade.

Normalizing can be done in a controlled atmosphere, to help limit variable surface conditions like scale and decarburization, or in open air.

### Materials

Normalizing is done on low-to-high carbon steels, alloy steels, and cast irons. Depending on the structure and processing of the material in the as-received condition, a normalizing process can either increase or decrease hardness and strength.

### Applications

Normalizing is an effective processing technique associated with the following manufacturing methods:

- Cold Forming
- Forging/Hot Forming
- Casting
- Machining

Normalizing is a cost-effective method to provide the benefits listed above, while retaining some hardness/strength.