






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 a type of annealing in which steel is austenitized (heated above a critical temperature), held for a specified time, and then cooled in air.

Processing temperatures typically range from 1500-1750°F. the rate of cooling from this temperature range in air defines a normalized micro-structure.

Variable cooling rates create different final normalized structures and properties. For example, a normalizing process, which uses forced cooling rather than still air, would produce a fine pearlitic structure, and therefore higher hardness and strength. The final structure and properties are highly dependent on both rate of cooling 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 steel pre-normalizing, a normalizing process can either increase or decrease hardness/strength.

Applications

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

-  Large parts
-  Cold Forming
-  Forging/Hot Forming
-  Casting
-  Machining
-  Quench and temper operations (and other heat treatments)

With respect to other annealing processes, normalizing is a cost-effective method to provide the benefits listed above, while retaining some hardness/strength.