

Below is a heat-treating glossary with basic explanations for many commonly used terms for metal heat-treating and metal finishing processes. Please contact our Impact Metals team with any questions. 205.338.5131; Impactmetalsales@cmc.com.

Heat Treating

This is a general term used to describe the process of applying extreme temperatures to strengthen the metal. Heat treating can be broadly defined as the process of heating metal, holding for some period of time, and then cooling the metal at various rates to achieve the desired mechanical properties. A wide range of properties can be obtained from metal of the same chemical content using different heat treatments.

Annealing

The process of heating metal and allowing it to cool slowly in order to remove internal irregularities and toughen the metal. The purpose of annealing is to produce a soft, pliable material suitable for machining, drawing, or other cold-working processes. The annealing process involves heating the material until it is at a uniform temperature, then bringing the temperature down very slowly, and finally completing the cooling process in ambient air. Varying the speed of the initial cooling cycle results in different internal granular structures in the steel that are tailored to the intended subsequent processing.

Normalizing

This is a type of annealing done to ferrous alloys to make them less brittle; this process is performed to make the internal granular structure of the steel more uniform. It involves heating the steel to higher temperatures than annealing, and holding at that temperature until the material temperature is fully uniform and then cooling in air. This heat treatment process will often improve the impact resistance and ductility properties of the material with little or no decrease in strength.

Quench and Temper

A process that involves heating the metal and cooling it rapidly; this process is used to harden and strengthen steel. Strength and hardness can be increased by over 50% with the quench-and-temper process with no loss of ductility and impact toughness. It can also be used to create steels of very high hardness (400 Brinell hardness and above) that are used in abrasion resistant and armor plate applications. The typical process for quenching and tempering involves heating the steel until fully uniform, and then rapidly cooling in water or other quench agents. Then, the steel is typically tempered at a lower temperature to achieve the desired final properties.

Straightening

The ability to correctly shape the metal to the appropriate requirements for downstream processes; steel often has to be mechanically straightened after Q&T due to the distortion that takes place during the heat treating process. Rounds, structural shapes and flat bar products are straightened using hydraulic presses or mechanical straightening. If required, stress relieving may be performed after straightening.