aalberts surface technologies

QUENCH AND TEMPER

Benefits

- Increased strength
- Flexibility of hardness range
- Increased toughness
- Superior wear and abrasion resistance

Process

Quench and Temper process provides strength and toughness throughout the part being processed. It is a two-stage, heat-treat process that includes hardening and tempering processes.

Stage 1 - Hardening Process:
The hardening process involves heating up the material above the critical temperature (austenitizing temperature) in the range of 1500°F – 1625°F based on the material grade and rapidly cooling via quench media such as oil, water, polymer, forced air or inert gas. This process hardens the material through phase transformation which imparts strength to the metal. The hardening of the material is the function of the rate at which the material is cooled (quenched). The cooling rate can be varied using different quench media depending upon the material grade, desired hardness and microstructure.

Stage 2 - Tempering Process (metal softening):
Tempering is the post-hardening process utilized to soften the material to a desired hardness. After the hardening process, the material is at its hardest state but brittle and can be susceptible to cracking. To lower the brittleness, the process of tempering is employed. This process decreases brittleness and improves toughness and ductility of the material. The softening is achieved by reheating the material below the critical temperature for a predetermined soak time and then cooling it in the air. This process does not involve phase transformation but provides varying degrees of hardness depending upon the steel grade being processed and tempering temperatures being employed.

Materials

Quench and Temper process is best suited for low carbon steel, plain carbon steel, medium carbon steel, alloy steels, and cast iron. High Carbon, steels with high hardenability (DI), or parts with intricate shapes are not suitable for this process due to the risk of cracking or distortion.

Applications

Quench and Temper process is used in the applications where the tensile strength, fatigue resistance and impact strengths are of utmost importance. These are some of the applications and components where this process is predominantly used:

- Crankshafts
- Gears
- Pinions
- Knuckles
- Pitman Arms
- Transmission components
- Connecting rods
- Gas valve bodies
- Pistons
- Sockets