

Overview & Definitions of Services Offered by Akron Steel Treating

Definitions of the broad range of metallurgical services offered by Akron Steel Treating:

1. **Aerospace Heat Treating:** Heat treating services done to a higher standard of control to assure higher part performance and to increase reliability.
See *Nadcap*.
2. **Annealing:** Heat treatment that makes metals (steel, aluminum, etc.) softer and more ductile. Facilitates part shaping, stamping, or machining operations. Removes unwanted stresses and strains. Makes parts more dimensionally stable.
3. **Atmosphere Heat Treating:** Heat treating done under a controlled, gaseous environment, usually devoid of oxygen. By controlling the gases surrounding the part at high temperatures, the part surface can be protected from oxidation and scale, or enhanced. See, *Neutral Hardening* and *Carburizing/ CarboNitriding*.
4. **Austempering:** Heat treatment for steels and cast irons (ductile iron) that makes parts ductile and tough. After heating to transformation or austenitizing temperature, parts are quenched in hot molten salts (450F to 750F).
5. **Ausquenching:** See, *Austempering* and *Martempering*.
6. **Blast Cleaning:** Using steel grit or shot to remove scale or oxide from the surface of metal parts. Facilitates post-heat treat grinding or finishing operations. (More aggressive cleaning than sand blasting.)
7. **Carburizing:** Steel parts are heated to 1600F-1750F in a carbon-containing atmosphere, and the carbon atoms are diffused into the surface of the steel making iron nitrides. See, *Case Hardening*.
8. **Case Hardening:** Carburized steel parts are heated to transformation temperature in a controlled carbon-rich atmosphere and quenched in oil (or water) to produce a part with a very hard shell or "case", but with usually with a ductile core.
9. **Carbonitriding:** Steel parts are heated to transformation temperature in a carbon and nitrogen-rich atmosphere to form a hard surface of iron carbides and iron nitrides (after quenching) for resisting sliding wear.
10. **Carbon Restoration:** A carburization process that is designed to bring the surface of a casting or forging back to its original carbon content and to restore the hardenability of the surface.
11. **Cryogenic, Deep Freezing:** Parts are cooled with liquid nitrogen in the freezer chamber's coils, usually to -100F to -300F; used to remove retained austenite in the steel structure, or to relieve stresses and make the part's metallurgical structure more homogenous and geometrically stable.
12. **Fixture Tempering:** Heat treating (usually tempering) done in jigs, under pressure to remove distortion or warpage in parts. Also known as flattening, straightening or flat tempering.
13. **Heat Treating:** The controlled application of heating and controlled cooling of a metal part to change its physical properties, to enhance part performance (hardening) or to allow further processing (annealing).
14. **Hardness Testing:** Quantifying the relative resistance of metal parts to penetration by a probe of a known size with a given force. Measured in Rockwell, Brinell, Knoop or Vickers scales. Hardness is directly related to tensile strength in most metals.



15. **IntensiQuench®:** Timed water quenching with highly agitated water (to eliminate film boiling around the part), then cooling in air, that creates a more refined and deeper hardened structure with low distortion.
16. **Martempering or Marquenching:** A heat treating process where parts are heated to the transformation temperature (> 1300F), then cooled in a molten salt or hot oil (350F – 450F). Used to reduce part distortion.
17. **Metal Treating:** See, *Hardening*. See also, *Annealing*.
18. **Metallographic testing:** Determining the microstructure of steel or other metallic parts to predict or to confirm the physical properties, e.g., tensile strength, ductility, hardness. Done on a polished, often etched with an acidic solution to reveal the structure in the sample under a microscope.
19. **Metallurgical Consulting (re heat treating):** Advice on selection and the treatment of steel alloys and other metals (aluminum, copper, bronze, brass, stainless steel), to enhance the metal's structure to optimize part performance in a given application, with low part distortion and to minimize part costs.
20. **Nadcap Certified (National Aerospace and Defense Contractor Accreditation Program):** A third-party certification program to meet the highest quality processing standards and documentation under AMS-6875,* AMS-2759, etc. Usually specified on aerospace parts. A step above an ISO 9001:2000 Certification.
21. **Normalizing:** A heat treat process to bring the microstructure into a condition that facilitates subsequent processes by making the part more homogenous in structure. Usually done on castings or forgings.
22. **Neutral Hardening:** Heat treating done in a virtually oxygen-free environment that neither adds nor removes carbon or other elements from the part surface. Endothermic atmosphere, nitrogen or argon gas blankets, molten salt or processing in vacuum can maintain neutrality with the part surface.
23. **Precision Gas Carburizing:** A gaseous carburizing process where the gas mixtures, time and temperatures are all controlled continuously throughout the process through oxygen probes with digital controlled feedback loops.
24. **Quenching:** The rapid, but controlled, cooling (in air, inert gas, oil, salt, or water) of hot metal parts to produce a desired change in the microstructure of the material. See, *Intensive Water Quenching (IntensiQuench®); Marquenching, Martempering, Austempering and Ausquenching*.
25. **Selective Hardening:** Heat treating processes that harden only one area of a part. Also, a physical barrier (copper plate or stop-off) is applied to prevent carburization and case hardening of an area of the part.
26. **Solution Treating:** A heat treating process that prepares the material for subsequent low temperature precipitation hardening by artificial aging. Allows "soft" parts to be finished to size before the aging process.
27. **Spheroidize Annealing:** A "softening" of steel by heating and then cooling very slowly to provide a metallurgical structure that looks like "spheres" or "balls." Allows the metal to be easily stamped or formed.
28. **Steel Hardening:** See, *Hardening*.
29. **Straightening:** A post-heat treat process to bring shafts, blades, or other parts into tolerance for flatness.
30. **Stress Relieving:** A heat treating process (usually below 1250F) to remove internal strains from welding, cold working or other mechanical processing to avoid part movement (or even cracking) during subsequent processing – e.g., hardening, machining, grinding or assembly.
31. **Tempering:** After the hardening process parts are usually very hard, but too brittle to use reliably. Tempering is a subsequent heating process to lower the hardness (into a specified range) and to increase ductility.
32. **Testing:** Metallurgical: See, *Metal Testing*.
33. **Thermal Processing:** See, *Heat Treating*.
34. **Vacuum Heat Treating:** Heat treating of parts inside a vessel that has had most of the ambient air removed before heat-up. Since there is no oxygen present, the parts do not oxidize and come out "bright."