



Ion Nitriding

A Distortion-Free Case Hardening Process

Ion nitriding of components extends wearing ability and produces compressive stresses which reduce fatigue failures. Ion nitriding case hardens from .001" to .025" at low temperatures of 850° to 1050°F. The process also surface hardens up to RC 72.

Ion nitriding's low temperature processing and controlled heating and cooling rates provide:

- Shorter processing time
- Minimum distortion
- Excellent dimensional stability

Typical components that are ion nitrided include:

- Gears
- Machine tooling
- Dies
- Punches
- Bearings
- Molds
- Engine components
- Power transmission components
- Shafts
- Plastic extrusion screws



METAL TREATING INSTITUTE



1969 Clearview Road, Souderton, PA 18964
215 721-1502 • FAX 215 723-6460 • 800 347-3236
www.solaratm.com • info@solaratm.com

Ion Nitriding

The Process

Ion nitriding is the result of a reaction caused by a high voltage glow discharge between the metal work being processed (the cathode) and the vacuum chamber wall (the anode). Aspects of the glow discharge are a function of operating parameters such as applied voltage, vacuum level and gas mixture.

Voltage from a controlled D.C. power supply energizes the work and the electrically isolated hearth of the vacuum furnace. The resultant plasma glow discharge is caused by the ionization of hydrogen and nitrogen gas which is bled into the furnace at a controlled rate. Gas ions bombard the work being processed raising the work temperature to the 850° to 1050°F range. The photons released by this reaction create the blue-violet glow surrounding the work pieces.

Positively charged hydrogen ions accelerate to the work at great velocity and act as a reducing and cleansing agent, removing oxides and small quantities of impurities from the surface. Nitrogen ions react with the base metal or other alloys present forming very hard nitrides and ultimately the desired nitrided case. Processing time can vary between one hour and fifty hours depending on the type of alloy and the case depth requirement.

The Advantages

Ion nitriding is a reliable, repeatable, economical and environmentally acceptable process. It is a surface treatment for low and medium alloy metals, tool steels, as well as heat resistant and heat treatable high alloy stainless steels. A variety of industries including auto, textile, plastics, machine tool, aerospace and aircraft benefit from using ion nitrided components.

Ion nitrided surfaces are made up of the outer compound zone, a thin and compact white layer, and/or the inner diffusion zone. To an extent, the structure, thickness, hardness and homogeneity of the compound and diffusion zones can be controlled independently of each other. This allows optimum metallurgical properties to be produced.

This process operates at temperatures as low as 850°F, thus, materials sensitive to retempering can now be treated. Most materials can take advantage of the process with shorter processing times than some other treatments resulting in quicker turnaround. Heating and cooling rates can be controlled, leading to good structural stability and minimum distortion. Dimensional stability is excellent. Most components can be used straight from the vacuum furnace without blasting, grinding, straightening, or pickling.

The Ability

Solar Atmospheres Inc. has been a leader in offering the ion nitriding process to companies in the eastern United States. To meet your ion nitriding requirements, we have four furnace units to accept work sizes as follows:

- Two 12" diameter x 24" high units with 300 lb. capacity
- Two 30" diameter x 54" high units with 5,000 lb. capacity

Solar's furnaces are equipped with the best technology in instrumentation capable of repeatability and controlled operations. Unlike traditional premixed gas bottles, mass flow controllers allow unlimited variability in gas mixtures with multiple gases. Actual part temperatures can be monitored by a patent pending thermo-couple arrangement in conjunction with the patented feed through/ furnace thermocouple work support. The programmable logic controllers, gas mass flow controllers and temperature recorders permit excellent control of parameters.

Near 100 percent uptime is assured by regimented maintenance procedures and a technically qualified staff. Furnace designs and proper repairs are carried out by Solar engineers. We service a variety of heat treating and brazing needs and offer:

- Quick turnaround
- Pickup and delivery of most orders
- Personalized customer service

We have the equipment, the expertise and the experience to produce the results you require.