NITRIDE SERVICES

The main objectives of nitriding are to increase surface hardness of the material, as well as its wear resistance, fatigue life, and corrosion resistance, which are achieved by the presence of the nitrided layer.

No quenching is typically done after nitriding. Nitriding is a better case-hardening process than carburizing or cyaniding, because in this method, nitrogen is diffused to the steel surface instead of carbon. Nitriding can be done at lower temperatures than carburizing. Common nitriding steel grades are generally medium carbon alloy steel types that have strong nitride-forming elements such as aluminum chromium, vanadium and molybdenum.

As the nitrogen reaches only a certain depth, the interior of the part retains its original properties and, therefore, is relatively softer. We can achieve a final surface hardness of up to 76 HRC (90 HRA) through the nitriding process.

The hardness layer (case depth) generally has a thickness of 200–300 μm (0.0002m) but can be up to 2 mm in some applications. We can control it by changing factors such as the duration of exposure, nitriding temperature, gas flow, etc.

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The nitriding process creates a compound layer – a white layer as the outer layer with a diffusion zone underneath. The diffusion zone consists of the absorbed nitrogen as well as the hard nitride precipitates.

Nitriding is carried out at temperatures below the austenitisation temperature of steel. The austenite formation begins at 727 °C (1340 °F) for plain carbon steel but varies for alloy steels based on composition.

Thus, nitriding is typically carried out at a process temperature between 500 and 550 °C (930 – 1022 °F) and up to maximum temperatures of 620 °C (1150 °F).

The nitriding process can take anywhere from 4 to 100 hours. Beyond 100 hours, the layer thickness increases at a very slow rate, making the process unfeasible.

BELOW IS A LIST OF COMMON PARTS TO BENEFIT BY THE NITRIDE PROCESS:

- Crankshafts
- Camshafts
- Cutlery
- Fuel Injectors
- Shafts SS
- Gears
- Drive Shafts
- Pins
- Plastic and Rubber Molding
- Pressure Vessels and Components
- Aluminum Injection Dies
- Forging Forming Dies
- Piston Rings
- Valve Seats
- Valve Stems
- Bushings
- Bearings
- Firearms

PROCESSING BENEFITS INCLUDE:

- **Enhanced Surface Finish:** Nitriding produces a greater surface finish quality.
- **High Endurance Limit:** The endurance limit is notably high, especially under bending stresses and at elevated temperatures.
- **Superior Hardness:** Nitriding forms a hard surface layer with high hardness levels, particularly effective at elevated temperatures.
- **Improved Wear Resistance:** Nitriding enhances resistance to wear, friction, and surface fatigue, making it ideal for abrasive or erosive environments.
- **Boosted Fatigue Strength:** Nitriding reduces surface microcracks, resulting in improved resistance to cyclic loading and fatigue failure.
- **Retained Core Properties:** The process primarily affects surface properties, preserving the core's original strength, toughness, and ductility.
- **Enhanced Corrosion Resistance:** Nitriding improves corrosion resistance, especially against surface pitting and corrosion.
- **Minimal Dimensional Changes:** Nitriding is a low-temperature process, ensuring minimal dimensional changes or distortion, suitable for precision components.
- **Cost-Effective:** Nitriding is cost-effective, with shorter processing times and lower energy consumption.
- **Crack Prevention:** Nitriding prevents the formation of cracks, a significant advantage.
- **Clean and Carbon-Free:** Nitriding is a clean, carbon-free process.
- **Time Efficiency:** The process requires less time.
- **Controlled Case Depth and Surface Hardness:** Nitriding allows control over case depth and surface hardness.
- **Controlled Compound Layer:** It provides control over the formation of the compound layer.
- **No Distortion:** Nitriding results in minimal or no distortion.