Ultimate Surface Performance for Automotive Components

*HEF Group is the exclusive supplier of both Liquid Nitriding treatments and PVD/DLC coatings to the automotive industry.*

Through its jobbing facilities and licensees, HEF Group is the world’s largest supplier of wear, friction and corrosion reduction treatments and coatings to the automotive industry. Two-thirds of all passenger cars worldwide use HEF’s technologies in powertrain, drivetrain, braking systems and elsewhere.

**Liquid Nitriding (LN) / Salt Bath Nitriding (SBN) / Nitrocarburizing**

**Liquid Nitriding** is a thermo-chemical diffusion treatment that enriches the surface of steels and cast iron with Nitrogen.

The surface **Compound Layer** is composed of iron nitrides + special nitrides. The area below the compound layer is the **Diffusion zone**, where Nitrogen diffuses into the iron lattice to form a solid solution.

**HEF Group’s trademarked family of Liquid Nitriding processes:**

**ARCOR®**: ARCOR V, ARCOR C, ARCOR N, ARCOR DT, SURSULF®

**MELONITE®**: TF1, QP, QPQ, TENIFER® TUFFTRIDE

**Liquid Nitriding Benefits**

- Hard (600-1200 HV) surface layer provides very good wear resistance
- Good frictional properties
- Excellent scuffing / seizure protection (adhesive wear)
- Excellent corrosion protection
- Good surface fatigue resistance
- Decorative black surface
Liquid Nitriding Automotive Applications

Brake System Components

**Rotors**
- Significant corrosion reduction for increased rotor life
- No compromise of braking characteristics
- Prevents brake pedal or steering wheel shudder caused by an uneven buildup of rust on the rotor. Nitrided rotors create less brake dust than untreated rotors

**Brake Pistons**
- Significantly higher corrosion resistance than chrome plated pistons
- Excellent friction properties

**Brake Pad Backing Plates**
- Much higher corrosion resistance and durability than conventional treatments
- Good brake pad adhesion

Valve Train Components

**Engine Valves**
- Excellent fatigue, impact and stem anti-scuffing properties
- Superior corrosion resistance
- Lower coefficient of friction
- Cost effective
- Delivers superior performance compared to chrome plated and plasma nitrided valves

**Rocker Arm Shaft & Rocker Arms**
- Minimize adhesive wear
- Reduced friction
- Possibility to use rocker arm without bushing
Drivetrain / Differential Components

- **Clutch Plates:** Enhanced wear & fatigue resistance; superior clutch durability
- **Differential Pins:** Higher wear resistance; lower cost than nickel-plating; lower friction
- **Differential Casing:** Cast Iron component - improved wear resistance
- **Torque Converter:** Improved adhesion of friction material; improved wear and corrosion protection

PVD / Diamond-Like-Carbon (DLC) Coatings

While Liquid Nitriding is a surface modification technology, Physical Vapor Deposition (PVD) involves the deposition of very hard, thin (2-4 microns; 0.0001”- 0.0002”) films on the surface of components.

The PVD process, conducted under high vacuum conditions, involves the extraction of material, in atomic or ionic form, from a high-purity solid source, such as Titanium or Chromium. This extraction is done by bombarding the source material with high-energy inert gas ions. The extracted ions/atoms react with gases such as Nitrogen to form thin and very hard coatings such as Titanium and Chromium nitride. If a source material, such as a hydrocarbon gas is used, a very hard, ultra low-friction Diamond-Like-Carbon (DLC) coating can be deposited.

**PVD / DLC Coating Benefits**

- Very hard (1500-4500 HV): high resistance to wear, abrasion and erosion.
- Thin (2 to 5 microns) coatings
- Low friction coefficients (0.1-0.5)
- Low coating temperatures (150-250° C)
Power Cell Components

- Significant friction reduction
- Piston pin: higher load sustainability without seizure

Valve Train Components

- Improved wear resistance
- Convert sliding contact to rolling contact: significant friction reduction

Fuel System Components

- Improved sliding wear resistance
- Significant friction reduction

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