



Nitroglide®



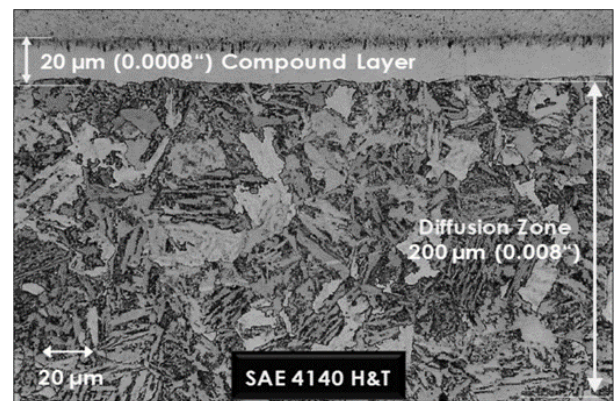
Ultimate Surface Performance HYDRAULIC & PNEUMATIC CYLINDERS & RODS

- Cliffco is the only Arizona supplier of Nitroglide® hydraulic components.

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.

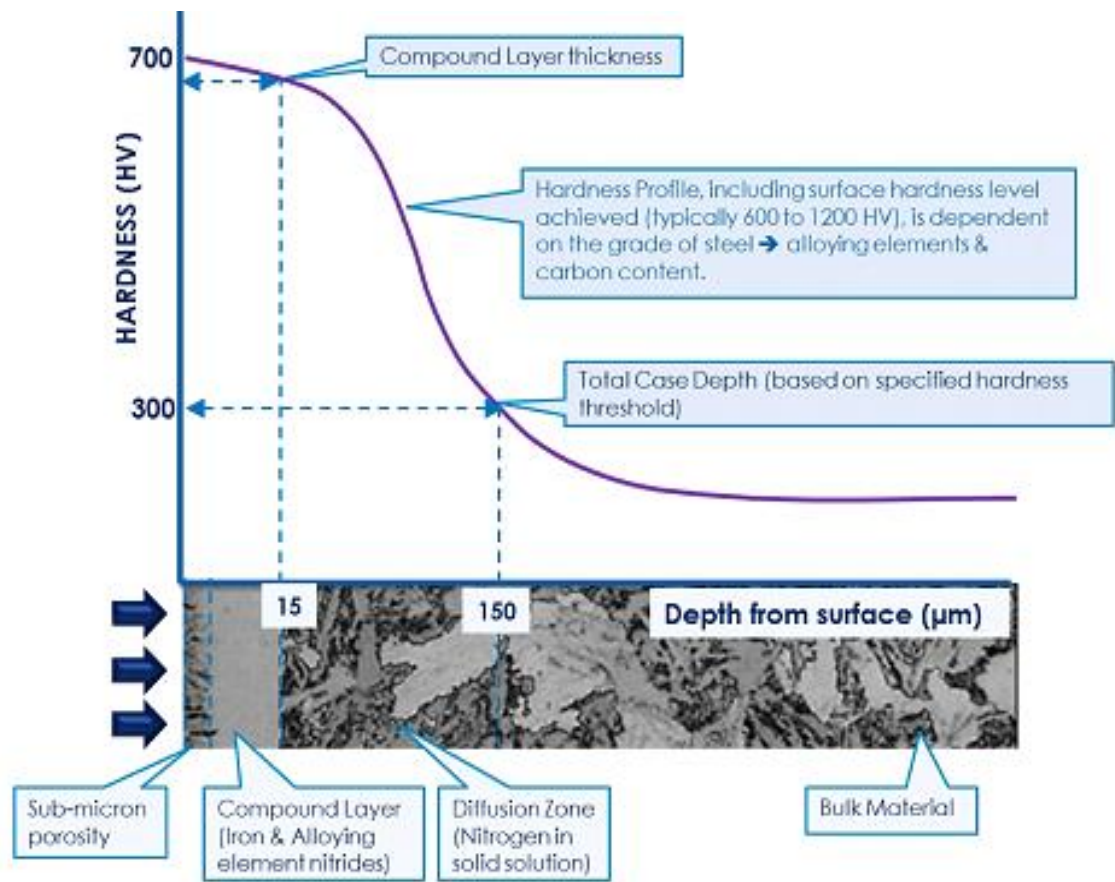


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LIQUID NITRIDING BENEFITS

- Hard (600-1 200 HV) surface layer provides excellent wear resistance.
- Good frictional properties.
Excellent scuffing / seizure protection (adhesive wear)
- Excellent corrosion protection
- Good surface fatigue resistance
- Decorative black surface

LIQUID NITRIDING: PROPERTIES



COMPOUND LAYER:

- Very high hardness
 - Abrasion wear resistance
 - Adhesive wear / Scuffing resistance
- Low-friction

OXIDE LAYER:

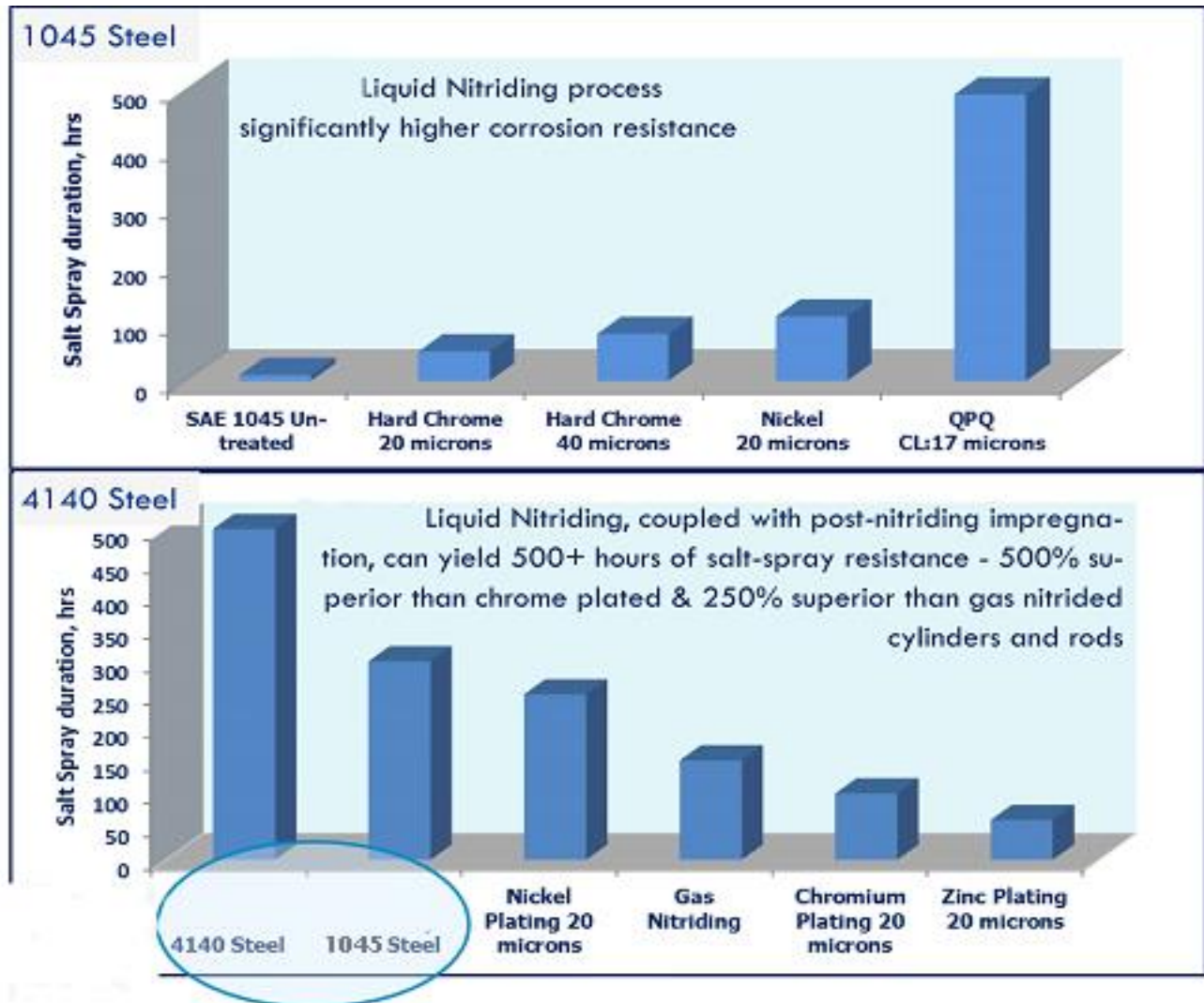
- Corrosion Resistance
- Impregnate micro-porosity
 - Low-friction, running-in Layer
- Black finish

DIFFUSION ZONE:

- Fatigue Strength
- High Compressive Strength
- Hardness higher than bulk

NITROGLIDE® LIQUID NITRIDING vs. CHROME PLATING

CORROSION RESISTANCE



NOTE: Salt Spray tests are suitable only for comparative and relative evaluation of corrosion resistance. The salt spray hours achieved are a function of several factors including: steel grade; geometry of the part being tested; and surface treatment/coating.

NITROGLIDE® LIQUID NITRIDING vs. PRE-NITRIDED (GAS) CYLINDERS & RODS

NITROGLIDE® LIQUID NITRIDING BENEFITS

- Superior corrosion resistance
- Lower friction coefficient: reduced wear
- Superior bend and impact resistance
- Finished tubes, rods and plungers can be liquid nitrided without issues of distortion etc.

NITROGLIDE® LIQUID NITRIDING vs. CHROME PLATING

SEAL WEAR IN HYDRAULIC CYLINDERS

TEST CONDITIONS



Surface Treatment	● Hard Chrome ● Liquid Nitriding
Motion	Alternative rectilinear
Travel	70 mm
Linear Speed	0.1 m/s
Contact Pressure	2 MPa
No. of cycles	4000
Hydraulic Fluid	Viscosity @ 40 ⁰ C: 18 cST Density @ 15 ⁰ C: 0.83 g/cm ³ Surface tension @ 20 ⁰ C: 27.0 mN/m

Liquid Nitriding Process reduced elastomer seal wear

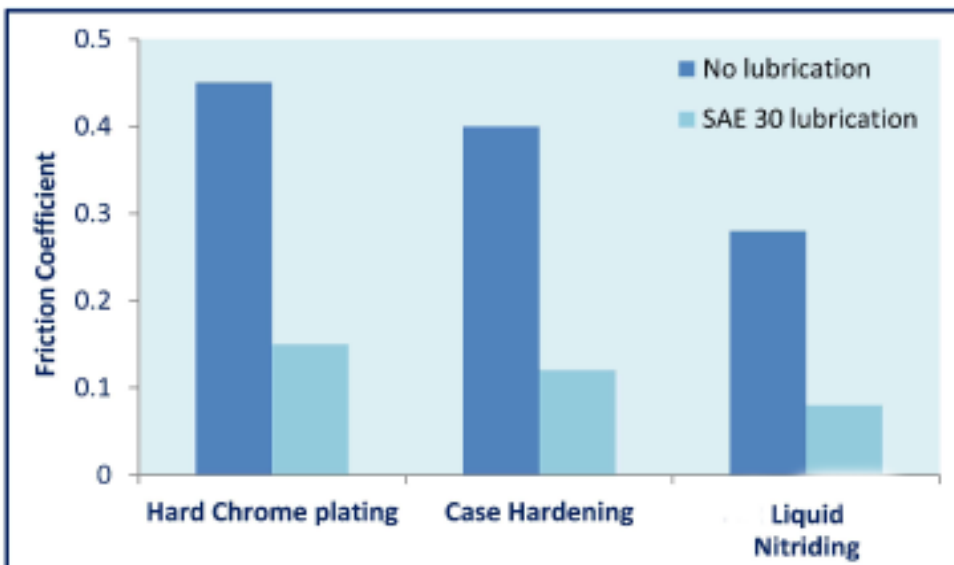
Friction Couple

PTFE / Hard Chromium
PTFE / Liquid Nitriding
Fluorinated elastomer / Hard Chromium
Fluorinated elastomer / Liquid Nitriding

Wear on polymer part

10 mm
10 mm
80 mm
50 mm

FRICITION COEFFICIENT



**Nitroglide®
Liquid Nitriding Process
lower friction coefficient**

NITROGLIDE® LIQUID NITRIDING vs. CHROME PLATING

Why Nitroglide® Liquid Nitriding is superior to Chrome Plating for Hydraulic and Pneumatic Cylinder applications:

- Vastly superior (6-7 times higher) corrosion resistance than chrome plating. (see attached standardized test). Liquid Nitriding is also superior to pre-nitrided (gas or plasma) tubes and rods, in terms of corrosion resistance.

Better frictional properties, therefore reduced seal wear compared to chrome plating.

- Much lower risk of cracking, peeling, or flaking because it is not a coating, but an integral part of the surface as opposed to chrome plating that goes on top of the cylinder's surface.

Improves the fatigue resistance of the base material—whereas chrome plating has no beneficial impact.

- Finished tubes, rods and plungers can be Liquid nitrided without issues of distortion etc.

Chrome Liquid Nitride



500 hours
Salt Spray



NITROGLIDE® LIQUID NITRIDING vs. CHROME PLATING

PISTON RODS					
Surface Treatment (+++ Best)	Wear resistance		Corrosion resistance	Ductility under flexion	Friction properties
	Abrasive	Adhesive			
Liquid Nitriding	++	+++	+++	+++	+++
Induction Hardening	++	0	0	-	0
Case hardening	++	0	0	-	0
Electroless Ni plating	+	++	++	+	+++
Cr plating	+	++	+	+	++
Gas nitriding	++	++	++	+	++
Zn plating	0	0	+++	+++	+

Nitroglide® treated cylinder and piston rods have significant advantages and application versatility compared to other surface treatment options.



BENEFITS OF NITROGLIDE®

- Minimizes adhesive wear
- Reduced friction
- Significant corrosion reduction
- Treated rods can withstand deflection without surface cracking

NITROGLIDE® HYDRAULIC CYLINDERS & RODS

APPLICATION AREAS

- Waste Disposal trucks
- Dump trucks
- Automotive & industrial lifting equipment
- Heavy-duty construction equipment
- Compaction equipment
- Fluid handling equipment



NITROGLIDE® GAS SPRINGS & PNEUMATIC CYLINDERS / RODS

APPLICATION AREAS

- Gas Springs
- Piston Rods for Pneumatic Cylinders
- Clamping devices
- Shock Absorbers

