GOPAL & FOMRA NITRIDING

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Non pollutive sulfur accelerated nitriding and nitrocarburising process.

NITRIDING *process solves problems of wear, scuff seizure, fatigue and corrosion of ferrous meterials like steels and cast irons.*

NITRIDING *process helps you to bring down warranty claims and customer satisfaction.*

NITRIDING *also greatly reduces costs because of short treatment times.* ***NITRIDING*** *is applied to fully finished and ground components as it is distortion free. It can hence be advantageously utilised to replace cyaniding, carbonitriding, gas nitriding and carburising.*

MATERIALS TREATED BY US

CARBON STEELS ■ ALLOY STEELS ■ HIGH SPEED STEELS
STAINLESS STEELS ■ CAST IRONS INCLUDING SG IRONS

THE PROCESS

- *Temperature of operation 560° + 10°C*
- *There are three separate salts needed for operation of* ***NITRIDING***

1. *Base salt NC4 used for making up new baths and also to maintain the working bath at a constant level by means of periodic additions.*
2. *Regenerator salt NC2 used to regenerate the bath and maintain & constant nitriding potential.*
3. *Potassium sulphide (K2S) added regularly in very small quantities to maintain the non pollutive nature of the bath and improve the metallurgical properties of parts treated in it.*

PROPERTIES OF **NITRIDING** TREATED PARTS

- *Increase in* ***NITRIDING*** *Hardness the compound zone and the less is its thickness.*

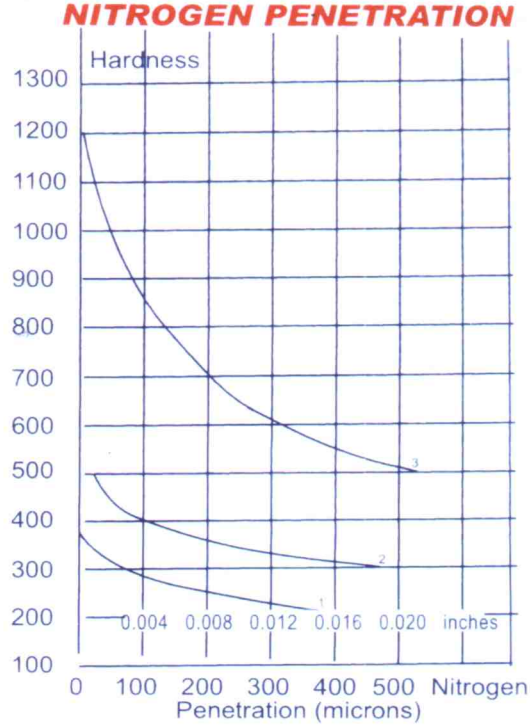
The higher the carbon and alloy contents of the surfaces treated the higher is the hardness of the surface layer.

Chart 1

Material Treated	Surface Hardness	
	before treatment	after treatment
SAE 1038 (En 8)	180 HV1	320 HV1
SAE 4140 (En 19)	370 HV1	560 HV1
AISI 304	230 HV1	650 HV1
S. G. Iron	350 HV 0.1	650 HV 0.1

Figure 1

NITROGEN PENETRATION



Relation between hardness & depth of nitrogen penetration of steels treated at 570'C for 2 hours.

1. EN8 (SAE 1038) 2. EN19 (SAE 4140)
3. H 11 Die Steel

METALLOGRAPHY OF NITRIDING LAYERS

NITRIDING *process produces a combination of a very hard compound zone of epsilon and the diffusion zone. The higher the carbon and alloy content of the substrate, the more compact is the compound zone and the less is its thickness. The sulfur produces a unique porous surface layer.*

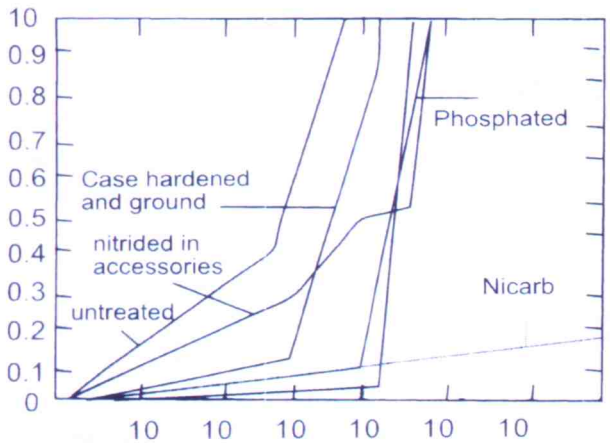
DECREASE IN FRICTIONAL POWER LOSS

NITRIDING *reduces coefficient of friction of treated surfaces. This results in reduced frictional power loss under identical conditions and contributes to increased fuel economy.*

INCREASE IN WEAR RESISTANCE

Resistance to adhesive and abrasive wear is increased enormously by NITRIDING process. The wear resistance is better than other treatment processes like phosphating, gas nitriding case hardening etc. as given in Fig. 2

Figure 2



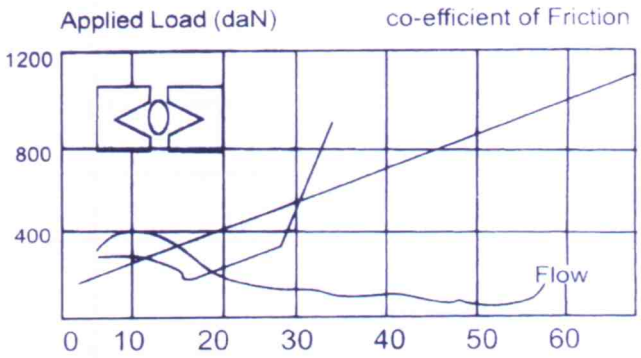
NUMBER OF REVOLUTIONS, log scale

Amaler tests with 20 kg load on 0.15% C steel test pieces subjected to various treatments using SAE 30 oil as lubricant.

INCREASE IN SCUFFING AND SEIZURE RESISTANCE

The sulfur compounds present in the surface layers inhibit 'metal to metal' welding and facilitates 'running-in'. Hence it completely eliminates problems of scuff and seizure (Fig. 3)

Figure 3



Favile experiment in oil. Times in seconds

Load

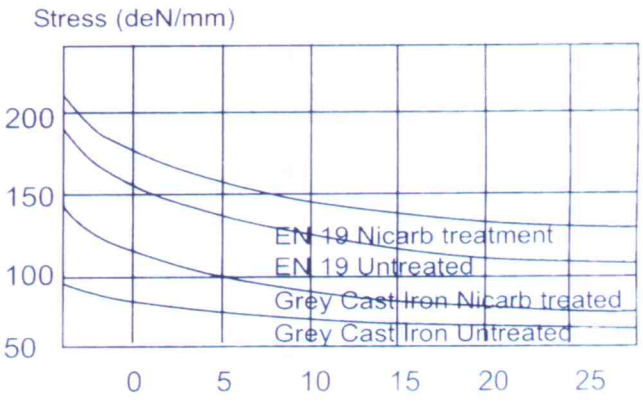
EN 8 Untreated

EN 8 Nicarb treated

INCREASE IN FATIGUE RESISTANCE

*NITRIDING gives rise to residual compressive stresses on the **NITRIDING** which increases the fatigue strength of treated components. (Fig. 4)*

Figure 4



DIMENSIONAL CHANGE

NITRIDING *treatment gives rise to a uniform growth of components, this being independent of the shape and position in the bath during treatment, but differing in magnitude depending on the composition of the material* (Chart-2)

Chart 2

Type of Steel (or) Iron	Average increase in diameter in microns (Treatment time 90 min)
EN 8 (SAE 1038)	6 - 8
EN 19 (SAE 4140)	6 - 8
GREYCAST IRON & S. G. IRON	10 - 12
H 11	2 - 4

PREREQUISITES FOR COMPONENTS TO BE TREATED BY US

The component to be treated by us should have been earlier stress relieved or tempered at a minimum temperature of 580C for 3 hours minimum.

TYPICAL COMPONENTS TREATED BY US

- *Crankshafts*
- *Camshafts*
- *Cylinder liners*
- *Valves and Valve guides*
- *Timing gears & spockets*
- *Rocker Arm Shafts*
- *Bearing cages*
- *Deffence Components*
- *Flanges*
- *Bushes*
- *Shafts & spindles*
- *Slides & guides*
- *Cylinder blocks*
- *Front fork tubes*
- *All ferrous materials & its alloys.*
- *Railways components*
- *Plastic machinery screws & barrels*
- *Hydraulic components*
- *Mining machinery components*
- *Aluminum extrusion dies*
- *Metal working tools*
- *High speed steel eating tools*