



Goel Special Steel Engineering Pvt Ltd

A photograph of a globe showing the Earth, with the Indian subcontinent and parts of Africa and Europe visible. The globe is partially covered by several large, vibrant green leaves in the foreground, creating a natural and eco-friendly aesthetic.

**Machining Solutions - Vacuum Heat Treatment -
Gas Nitriding Surface Treatment - Profile Sawing and
Logistics Service Provider**

INTRODUCTION

Goel steel company has been serving the tool and die steel industry since 1973 and has 7 service centres and represents worlds best manufacturers in our country. We have been able to harness to our mutual benefit the developed technology of these manufacturers and able to improve our steel products and machining capabilities.

We at Goel steel are working to provide **Vacuum Heat Treatment facilities** using the highest state of the art technology with full support from our principals in Asia/Europe and India.

Modern vacuum furnaces are being made available for the heat treatment of tools.

To understand heat treatment thoroughly, the meaning of hardening has to be understood exactly. Quenching actually changes the structure of steel. Tool steel starts the heat treatment with austenitic structure but ends with martensitic or bainitic structure.

We wish and pray for your continued patronage to our Heat treatment unit-Sanjay Steel Syndicate.

VACUUM HEAT TREATMENT

- ENVIRONMENTAL FRIENDLY - NO POLLUTION WASTE
- Bright clean surface and no oxidation.
- Optimum minimum changes in dimensions.
- No carburisation or decarburisation.
- Save cost in post treatments.
- Repeatability of heat treatment cycles & results.
- Optimization of heat treatment cycle in accordance to require characteristics.
- Computerized documentation HT cycle.
- Closer allowance before heat treatment means saving in HT cost & final machining cost.



PROCESS CAPABILITIES

- Vacuum Furnace - IPSEN TURBO TREATER Make Size: 600x600x900 - Quenching Pressure @ 12 bar. Capacity: 800kg Load - Max temp: 1250 degrees.
- Vacuum furnace-ALD Dynatech Make Size: 900x900x1200 - Quenching pressure @ 12bar. Capacity: 1800kgs Load - Max temp: 1300 degrees.
- Controlled Atmosphere Tempering Furnace: 4 Nos.
- Max Size: 900x900x1200 - Capacity:1800 Kg Load - Max Temp: 750deg.
- Degreasing Cleaning Machine.
- Equotip - Portable Hardness Tester.
- Rockwell Hardness Tester.
- Brinell hardness Tester.
- Metallurgical Testing Laboratory.
- Gas Nitriding furnace-make-IPSEN-Size 1000x1000x1300.Load weight 1500kgs

PROCESS

- Stress Relieving
- Vacuum Hardening
- Vacuum Tempering
- Vacuum Annealing



HEAT TREATMENT

Heat Treatment is a very important Process in developing a Tool steel die. The mechanical properties (hardness, roughness, wear resistance etc) are achieved only after proper heat treatment is done after machining. Normal procedures adapted in making a tool steel die are as under:

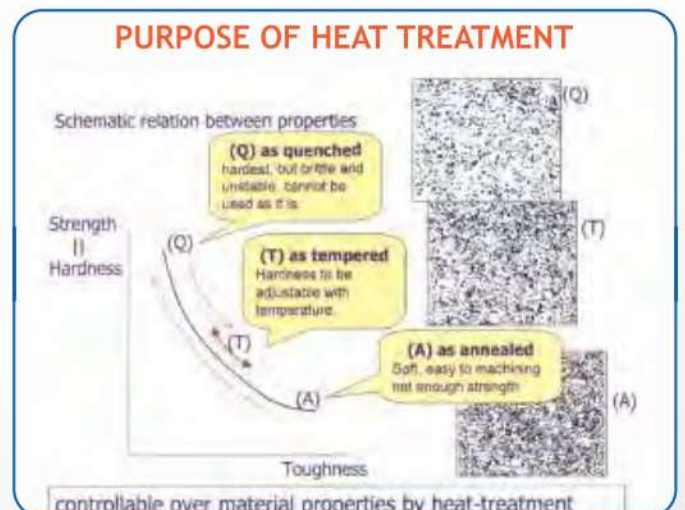
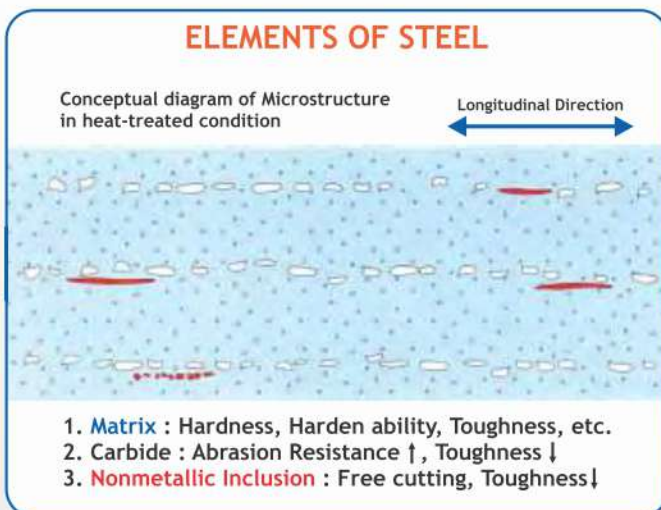
- Rough machining,
- Stress relieving,
- Machining with grinding tolerances,
- Heat treatment including tempering,
- Final machining and grinding,
- Production.

The main steps involved in Heat treatment are Quenching and Tempering.



QUENCHING		
Heating	Deformation cracking	Preheating
	Hardness, Hot strength	Higher quenching temperature
	Toughness	Lower quenching temp
	Oxidation	Vacuum furnace
Cooling	Toughness	Rapid cooling
	Deformation cracking	Uniform quench, salt bath quench

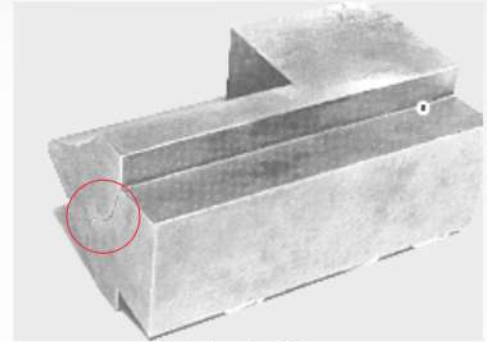
TEMPERING	
Hardness, Wear resistance	Low temp. Tempering, High temp. Tempering
Hot strength	High temp tempering
Toughness	Higher temp tempering
Cracking	Uniform mild cooling
Stabilization / residual stress	Multiple tempering



COMMON QUENCHING PROBLEMS

Problem	Possible Causes	Remedy
Distortion, Dimensional changes	Sharp comers, Notches, Thin fins Abrupt changes in section Improper marking	Well balanced design Chamfering Properly supported heating
Overheating Underheating	Failure to operate facilities Improper parts arrangement Inaccurate thermocouples	Appropriate arrangements Furnace control check
Decarburization	Improper furnace atmosphere	Controlled atmosphere Vacuum furnace Redesign removing amount
Improper cooling	Inappropriate quenching medium Failure to temper immediately	Less severe quench Careful operation about material temperature
Non-uniform microstructure	Inadequate spheroidized carbide Non-uniform carbide distribution	Spheroidizing annealing Normalize prior to quench

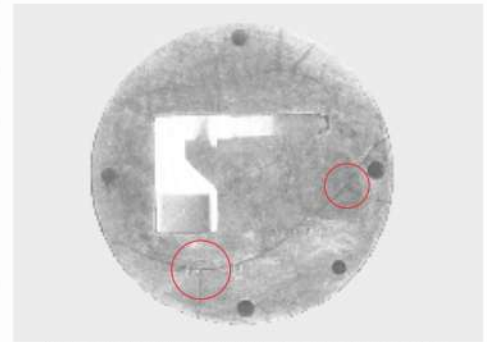
Heat Treatment Cracks



Sharp-edged transitions

COMMON PROBLEMS IN HARDENING

Problem	Possible Causes	Remedy
Quenching temp. too low	Failure to operate facilities Improper parts arrangement Inaccurate thermocouples	Use recommended temperature Appropriate arrangements Furnace control check
Quenching temp. too high	Failure to operate facilities Inaccurate thermocouples	Use recommended temperature Furnace control check
Inadequate cooling	Failure to begin cooling after extracting parts from furnace Inappropriate quenching medium Too much oxidation Improper quench bath temperature Improper agitation Improper interruption temp.	Improve facility layouts Employ more drastic quench Use of protecting coat, controlled atmosphere Oil 60 80 Water 80 Review procedures and facility Interrupt cooling at Ms+50
Tempering start temperature	Start tempering before material temperature reaches Ms.	Careful operation about material temperature
Decarburization	Improper furnace atmosphere	Controlled atmosphere Vacuum furnace Redesign removing amount



Overheated during hardening, different cross-sections

PROPERTIES OF ALLOYING ELEMENTS AFTER HT

Alloying element	Mechanical properties							High temperature stability	Cooling rate	Carbide formation	Resistance to wear	Forgeability	Machinability	Scaling	Nitridability	Resistance to corrosion
	Hardness	Strength	Yield point	Elongation	Reduction of area	Impact value	Elasticity									
Silicon	↑	↑	↑↑↑	↓	□	↓	↑↑↑↑	↑	↓	↓	↓↓↓	↓	↓	↓	↓	-
Manganese at perlitic steels	↑	↑	↑	□	□	□	↑	□	↓	□	↓↓	↓	↓	□	□	-
Manganese at austenitic steels	↓↓↓	↑	↓	↑↑↑	□	-	-	-	↓↓	-	-	↓↓↓	↓↓↓	↓↓	-	-
Chromium	↑↑	↑↑	↑↑	↓	↓	↓	↑	↑	↓↓↓	↑↑	↑	↓	-	↓↓↓	↑↑	↑↑↑
Nickel at perlitic steels	↑	↑	↑	□	□	□	-	↑	↓↓	-	↓↓	↓	↓	↓	-	-
Nickel at austenitic Cr -Ni steels	↓↓	↑	↓	↑↑↑	↑↑	↑↑↑	-	↑↑↑	↓↓	-	-	↓↓↓	↓↓↓	↓↓	-	↑↑
Aluminium	-	-	-	-	↓	↓	-	-	-	-	-	↓↓	-	↓↓	↑↑↑	-
Tungsten	↑	↑	↑	↓	↓	□	-	↑↑↑	↓↓	↑↑↑	↑↑↑	↓↓	↓	↓↓	↑	-
Vanadium	↑	↑	↑	□	□	↑	↑	↑↑	↓↓	↑↑↑↑	↑↑	↑	-	↓	↑	↑
Cobalt	↑	↑	↑	↓	↓	↓	-	↑↑	↑↑	-	↑↑↑	↓	□	↓	-	-
Molybdenum	↑	↑	↑	↓	↓	↑	-	↑↑	↓↓	↑↑↑	↑↑	↓	□	↑↑	↑↑	-
Copper	↑	↑	↑↑	□	□	□	-	↑	-	-	-	↓↓↓	□	□	-	↑
Sulphur	-	-	-	↓	↓	↓	-	-	-	-	-	↓↓↓	↑↑↑	-	-	↓
Phosphorus	↑	↑	↑	↓	↓	↓↓↓	-	-	-	-	-	↓	↑↑	-	-	-
Carbon	↑↑↑	↑↑↑	↑↑↑	↓	□	↓	↓	↓				↓				□
↑ Increase	↓ Reduction		□ ca. constant		-not characteristic or unknown				Several arrows = more intensive effect							

SURFACE TREATMENT - NITRIDING

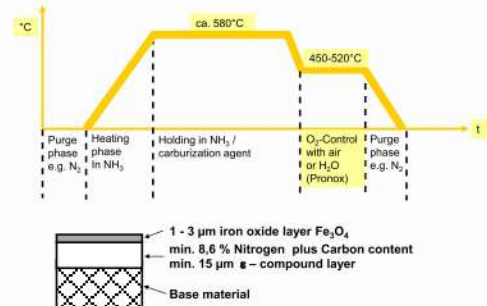
PROCESS AND EQUIPMENT

- Combines excellent wear and lubricating properties with high load carrying capacity and corrosion resistance.
- Low temperature process with very little distortion.
- Multiple processes in one cycle.
- Process uses NH₃ + a Carbon evolving gas, instead of only NH₃ as in conventional gas nitriding.
- Designed for IPSEN Patented Nitempering process.



Post NITEMPER Properties

- Wear resistance and self lubrication.
- Increase in fatigue strength - a characteristic of the diffusion zone, so it remains even in absence of compound layer.
- High corrosion resistance - because of stable Fe-C-N layer.
- Nitemper® - a patented Ipsen process using 50% NH₃ + 50% Endogas



Nitemper® INitriding vs. Salt Bath Nitriding

NITEMPERINITRIDING

- Cycle time can be as long as required.
- Automation is simple.
- No disposal issues - gas emission control is easier.
- Safer operation.
- Batch Furnace so charge loading/unloading is very easy and can be put in SQF line.

SALT BATH NITRIDING

- Cycle time should be short - cleaning problems.
- Automation is difficult.
- Salt disposal is a big issue and may be banned in future.
- Salt exposes operators to health hazards.

Feature of Nitriding Method

		Salt Bath	Gas	Plasma	Solid
Method	Temp.	560°C-	about 450°C-	about 400°C-	about 400°C-
	Nitrogen	Salt bath	NH ₃ gas	N ₂ gas	NH ₃ gas
	Carbon	NaCN, NaCNO	CO, CO ₂ gas		CaCN ₂ powder
	Sulfur	Na ₂ S ₂ O ₃	H ₂ S gas	H ₂ S gas
	Environment	C	B	A	B
Structure	Freedom	C	A	A	A
	Uniformity	B	A	C	A
Difficult nitriding material for use (SUS304, etc)		Less possible than others	Possible (Soft nitriding, sulphur nitriding)	Possible	Possible

Structure and Effect of Nitriding Method

	Nitriding	Soft nitriding	Sulphonitriding
Sulfur layer (Adhesion resistance ↑↑) (Anti melt-down ↑↑)	-	-	○
Oxygen layer (Adhesion resistance ↑) (Anti melt-down ↑)	-	○	○
Nitrogen layer (Adhesion resistance ↑↑) (Anti melt-down ↑)	○	○	○
 Nitrating structure			

MACHINING CENTRE

INTRODUCTION

M/s. SANJAY STEEL SYNDICATE (SSS) is an associate concern of M/s. GOEL STEEL COMPANY and is our first step in providing value addition services to our esteemed customers. SSS is an independent arm which is being developed to meet ever increasing demand on quality, price, service and time.



DETAILS OF MACHINING FACILITIES

1. HEAVY DUTY PLANO MILLING MACHINE

Make : SAGAR

Capacity : 2400 x 1200x 1500 mm

Max. Load: 8 Tons

Additional Feature : 60 Deg Swiveling with Side Milling Head

2. VERTICAL MILLING MACHINE

Make : BATLIBOI

Accuracy : +0.05 mm

Capacity : 900 x 315 x 385 mm

Accessory : Make

Horizontal /Vertical

Rotary Table : Vertex

Super Open Vise

Universal Dividing Head

Precision Right Angle Plate

3. HEAVY DUTY LATHE

Make : NAGMATHI

Capacity : 350 Dia x 2400 mm Long Over Bed

900 Dia x 350mm Long Over Gap Bed only

face plate holding

Accuracy : +0.05 mm

4. UNIVERSAL CYLINDRICAL GRINDER

Make : SARDA

Accuracy : 0.01 mm (10 Micron)

Capacity : 200 Dia x 450 mm Long

5. SURFACE GRINDER

Make : AVRO

Accuracy : 0.01 mm (10 Micron)

Capacity : 600 x 300 x 280mm

Accessory : Make

2 Way Angle Vise: Vertex

Permanent Magnetic Chuck

6. RADIAL DRILLING MACHINE

Make : SIDDAPURA

Capacity : 36 mm

Table Size : 1020 x 650 mm

Base Plate Size : 1625 x 850 x 190 mm

7. VERTICAL MILLING MACHINE

Make : ELGAMILL 1 Butler

Accuracy : +0.05 mm

Capacity : 2100 x 950 x 950 mm

Accessory : Make

Horizontal / Vertical

Rotary Table : Vertex / DRO attached

Super Open Vise

Universal Dividing Head

Precision Right Angle Plate

8. SURFACE GRINDER

Make: LUMSDEN (Model 92 LE)

Capacity : 48 inches

Accessory : Rotary table 1 segment type

9. SURFACING AND BORING LATHE

Make : Dean Smith 8: Grace, UK

Capacity : 500 mm Swing

10. VERTICAL TURRET LATHE

Make : SANCO, Russia

Accuracy : +/- 0.005 mm

Capacity : 1500 Dia x 1000 mm

11. VERTICAL MACHINING CENTRE

Make : Hartford, Taiwan

Travel (X,Y,Z) : 800x510x630 mm

Working surface : 900 x 470 mm

Max Load : 500 Kgs

12. VERTICAL MACHINING CENTRE

Make : Hartford, Taiwan

Travel (X,Y,Z) : 1600x820x660 (820 Op) mm

Working surface : 1750 X 820 mm

Max Load : 2200 Kgs



JOB / PROFILE SAWING

We at 'Sanjay Steel' also undertake job cutting as per drawing or profile. Our current maximum capacity is to cut 2250x1650mm rectangular section or 1650mm diameter. Our maximum handling capacity is 30tons of weight.

Our workshop has enough space to continuously maintain your stock and process and dispatch as per your needs.

- High speed bandsaw Cutting machines - 9 nos.
- Maximum capacity - 2250 x 1650 mm
- Handling capacity - 30 tons
- Storing space - 24000 sq. ft.



Mother Company

Goel Steel Company

INTRODUCTION

Goel Steel Company an ISO 9001 :2008 certified company, was established in the year 1973 with sole aim of serving tool room with quality tool steel at reasonable price, we are glad to have achieved a fair degree of success with numerous satisfied customer. We are happy to state that we have retained most of our customer and also expanded the list in the last 43 years.

FACILITIES OFFERED

- ISO 9001 : 2008 Certified
- **India's Largest Infrastructures for tool and special steels**
- Engineering services
- **Steel/Saw, Machining / Tool room / Gas Nitriding/Vacuum heat treatment**
- Single window for total tool steel solutions
- 7 service centres
- Technical support for steel and Engineering services from the world's best manufacturers
- Technical collaboration from Japan for Heat treatment
- NADCA and NADCAP compliant Vacuum heat treatment facilities
- Largest vacuum heat treatment facility in South India, maximum load weight 1.8tons
- Gas Nitriding surface treatment for your dies and components
- Machining/tool room/VMC's to handle upto 2.5tons weight
- Only company in India to have steel/tool room and vacuum and surface heat treatment services under one roof.

Competence in Tool Steel



Our Partners for Tool Steels
Authorised Stockist :



GRAPHITE INDIA LIMITED
(Powmex Steel Division)

 **Hitachi Metals, Ltd.**

 **KIND & CO**
EDELSTAHLWERK

 Schmiedewerke Gröditz
GmbH · seit 1779 · Edelstahl

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ravne



DEUTSCHE EDELSTAHLWERKE
Providing special steel solutions



SERVICES OFFERED & NETWORK



PRODUCTS

- Hot forming tool steels
- Cold forming tool steels
- Die steels
- Plastic mould steels
- RSH steels
- Nickle based alloys
- special materials

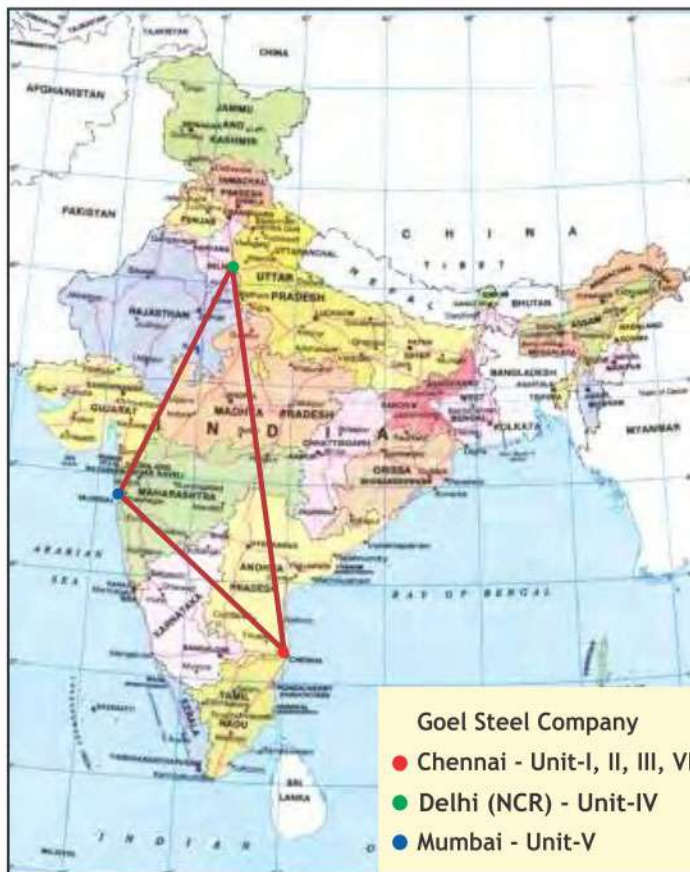
INDUSTRIES

- Die casting
- Drop forging
- Extrusion
- Glass production
- Pipe production
- Plastics technology
- Power generation
- Special applications



SERVICES

- Steel
- Stocking
- Sawing
- Machining
- Vacuum heat treatment
- Gas Nitriding



Goel Special Steel Engineering Pvt Ltd

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TIN No.: 33400060739 / 01.01.2007

CST No.: 69756 / 10.08.98

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CST No.: 82907 / 01.04.2005

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TIN No.: 33120060990 / 01.01.2007
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Raigad, Navi Mumbai-410 208.
Ph: 27401359
Excise Regn.: AAGFG0504 MXD 003
Division: ANDHERI
Range: IV
TIN No.: 27950592047V / 23.02.2007
CST No.: 27950592047C / 23.02.2007



GOEL STEEL COMPANY

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