

STRENGTHENING INDIAN DEFENCE



JSHL DEFENCE

AN INITIATIVE BY: JINDAL STAINLESS (HISAR) LIMITED

ABOUT JINDAL STAINLESS

- Founded by Shri O.P. Jindal (1930-2005), Jindal Stainless ranks amongst the top global stainless steel conglomerates
- A part of USD 15 billion O.P. Jindal Group, Jindal Stainless manufactures superior quality steel and a wide range of products for defence purposes
- 'State-of-the-Art' R&D facility for continuous innovation along with modern manufacturing technologies
- Doing value driven business worldwide with established distribution network
- Melting capacity of 1.8 MTPA
- Strong presence in the manufacturing category of specialty steel for Indian Defence segment
- Accredited with internationally recognised Quality Management Systems
- Success factors: Customization as per customer needs and cross market expertise

JSHL's Accreditation

NABL Accreditation Certificate for Environmental Laboratory, Jajpur

Empanelled Environmental Consultant Certificate of Env. Lab

QMS (ISO 9001:2008)

EMS ISO 14001:2004

OHSAS 18001:2007

JSHL Subsidiaries

Jindal Stainless Steelway Limited (JSSL)

JSL Architecture Limited

JSL Lifestyle Limited



JINDAL STAINLESS MANUFACTURING CAPACITY

| Process | Hisar Plant Capacity (Per Annum) | Odisha Plant Capacity (Per Annum) |
|--------------------------------|----------------------------------|-----------------------------------|
| Melting in UHP Furnace | 800,000 MT | 1,000,000 MT |
| Hot Rolling (Steckel Mill) | 800,000 MT | - |
| Hot Rolling (Strip Mill) | 350,000 MT | 1,600,000 MT |
| Cold Rolling (20 high Z-Mills) | 300,000 MT | 400,000 MT |
| Plate | 80,000 MT | 100,000 MT |
| SPD | 30,000 MT | - |

PRODUCT SPECIFICATIONS

| HNS Product Specifications | Range |
|----------------------------|---|
| Plates / Sheets | Width: up to 1650 mm, Thickness: up to 100 mm |
| Rolled and Forged Bars | Dia: 20 - 350 mm , Length: up to 6000 mm |
| Ring Forgings | Up to 3500 mm OD |

DOMAIN EXPERTISE

- Jindal Stainless' expertise spans over a wide range of products in defence segment:
 - 15CDV6, Super Duplex Stainless Steel UNS S32750 and UNS S32760
 - High Nitrogen Steel (HNS) for armouring applications: Sheets, Plates, Forged / Rolled Rings
 - Precipitation Hardened Stainless Steel i.e. 17-4 PH, 17-7 PH and 15-5 PH
 - Maraging Steel like MDN 250 for Aerospace applications: Sheets, Plates, Forged / Rolled Rings
 - Special steel like JD-1 for better ballistic protection in bulletproof jackets, helmets and bulletproof vehicles like MVP, LSV, LAMV etc.
 - Heat resistant alloys (EN 1.4841 & EN 1.4835) and corrosion resistant alloys (UNS S31727 & EN 1.4829)
 - Caters to the stringent requirement of Nuclear Segment including the prestigious ITER project

SECTORS SERVED

| | | |
|-----------------------|-------------------------|---------------------------------------|
| Oil & Gas | Petrochemical & Process | Railways & Metros |
| Nuclear Energy | Chemicals | Household Applications |
| Offshore Oil Drilling | Automobiles | Architecture, Building & Construction |
| Paper & Pulp | Aerospace & Defence | Lifestyle |

PRODUCT FORMS

Slabs | Blooms | Plates | Sheets | Coils | Forged Rings | Discs | Shafts | Cold Rolled and Hot Rolled Products | Forged and Rolled Bars / Rods



15CDV6

- A key material in aerospace and defence segment
- JSHL is a manufacturer and supplier of high quality 15CDV6 material to Indian Defence segment
- A high yield and high tensile strength material that enables it to sustain high temperature
- **Applications:** Pressure Vessels, Canisters of Missiles, Rocket Motor Casings, Suspension components, Wishbones, Track and Push Rods
- **Available Products:** Slabs, Sheets, Plates, Coils, Forged Rings, Forged and Rolled Bars in various dimensions

Super Duplex Stainless Steel: UNS S32750/32760

- Characterized by very high strength, good weldability and high corrosion resistance even in extreme environmental conditions; suitable for marine environment
- Super Duplex Stainless Steel (UNS S32750) exhibits PREN value higher than 40
- **Applications:** Submarine rocket launchers, heat exchangers, vessels, oil and gas industry equipment and other naval components
- **Available Products:** Plates, Sheets, Coils, Forged Rings, Rolled and Forged Bars across a range of dimensions

17-4 PH STEEL

- One of the most widely used precipitation hardening grades
- Characterized by high corrosion resistance, hardness, toughness and strength
- Similar grade in our product range: 17-7 PH and 15-5 PH
- **Applications:** Aerospace and Defence, nuclear reactors, gas turbines and other similar applications

MARAGING STEEL

- An age hardenable Iron-Nickel alloy; mostly used in aircraft
- Possesses combination of ultra-high strength and toughness
- Easily machinable even before un-aged condition & has excellent transverse properties and resistance to crack propagation
- **Applications:** Rocket motor casings, light aircraft landing gear, power shafts and low temperature tooling

ENGINEERING SOLUTIONS

- JSHL has a modern automatic and semi-automatic welding facility:
 - Helps in developing welding solutions with the best welding process
 - Process parameters suitable for various types of steel and other materials
- TIG / Spot Welding / Brazing / Laser Welding / MMAW and SMAW / Projection Welding / Seam Welding
- CNC Controlled Laser Cutting Machine (for making designs and patterns), CNC Press Brakes, and CNC Turret Punching / Embossing
- Modernized Power Press (100-250 MT), Hydraulic Press (250-500 MT), Puff Machine (used for Sandwich Panels), Sand and Shot Blasting facility
- Profiling Machines, Spinning Machines (for cylindrical parts), Polishing Machines and a wide range of testing facilities



DEFENCE SECTOR

Defence Research Development Organization

Application : Rocket Launchers

Grade : Super Duplex Stainless Steel UNS S32750

Products : Plates and Forged Rings

Special Requirement:
High Corrosive Resistance

Defence Research Development Organization

Application : Missile Canisters

Grade : 15CDV6

Products : Large and Heavy Plate

Special Requirement:
Very low gas content specially Hydrogen < 3 ppm
and Oxygen < 40 ppm

Defence Research Development Organization

Application : Missile Canisters

Grade : 15CDV6

Product : Plates

Special Requirement:
Very low gas content specially Hydrogen <3 ppm and
Oxygen < 40 ppm

Defence Research Development Organization

Application : Ballistic / Blast Protection

Grade : High Nitrogen Steel

Product : Plates

Special Requirement:
Low inclusion level, good ballistic properties,
and high strength

Defence Research Development Organization

Application : Rocket Launchers

Grade : Super Duplex Stainless Steel UNS S32750

Product : Forged Rings

Special Requirement:
High Corrosive Resistance and UT with 1.2 mm FBH

Defence Research Development Organization

Application : Missile Pressurized Vessels

Grade : 316

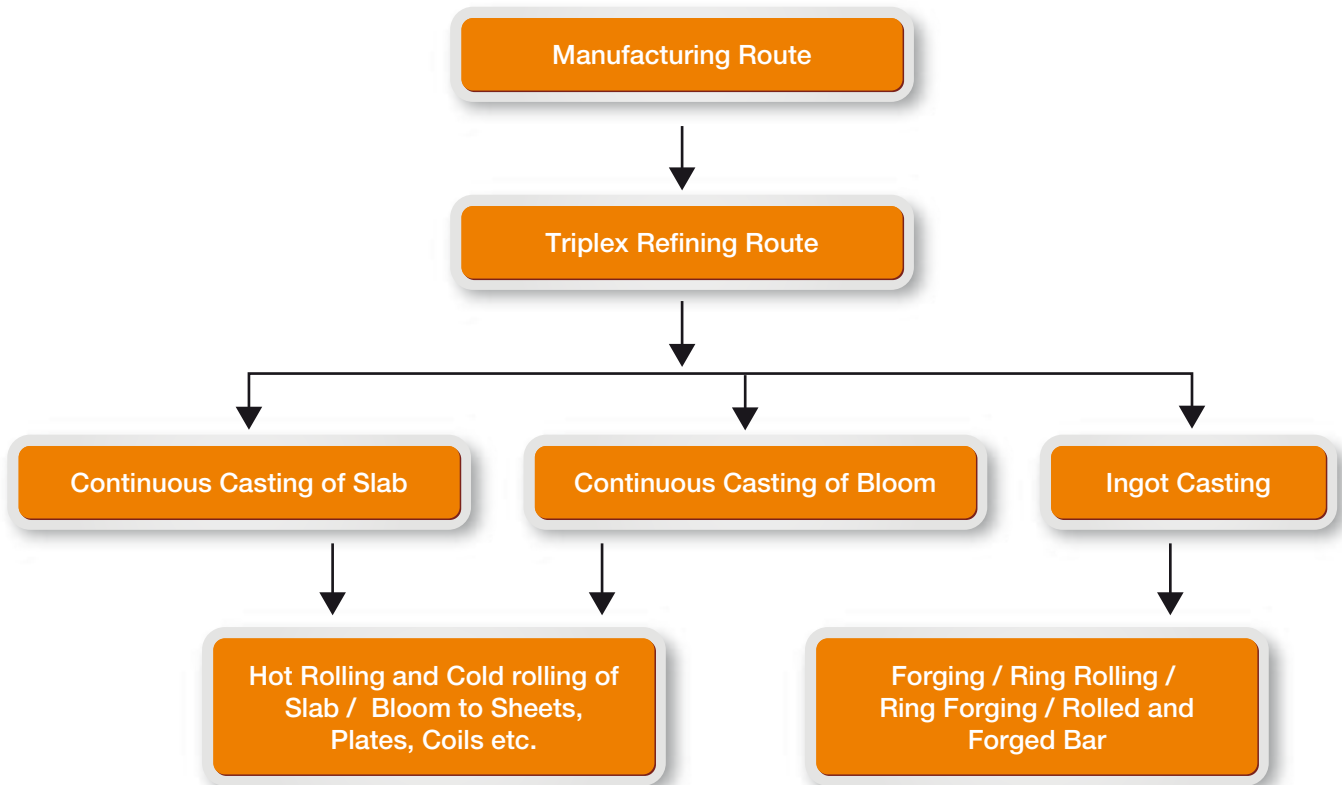
Product : Sheets

Special Requirement:
High Corrosive Resistance and Densification Test

HNS: A FUTURISTIC MATERIAL FOR ARMoured APPLICATIONS

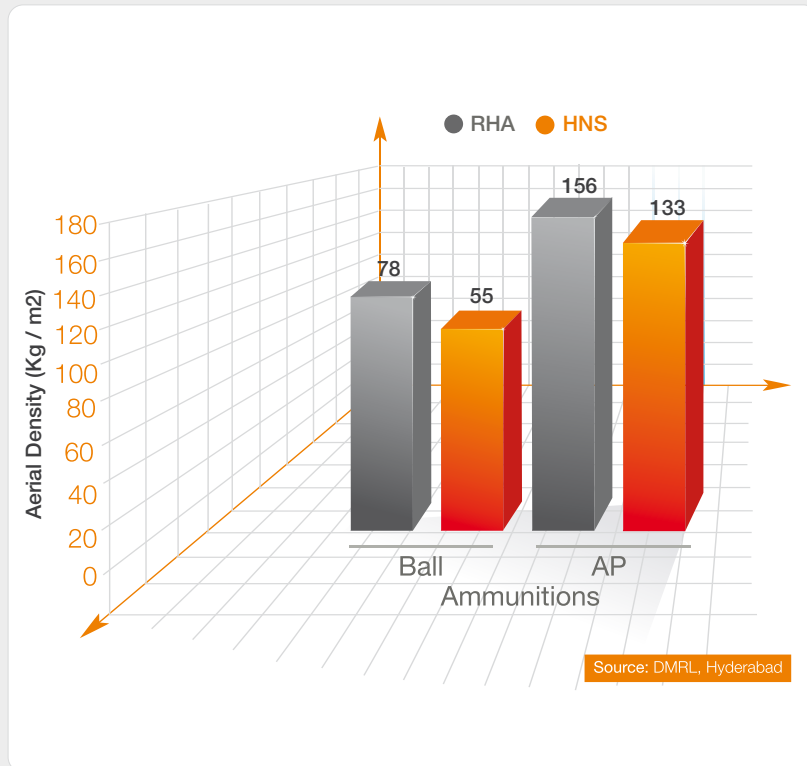
- After working incessantly for 10 years, Jindal Stainless along with Defence Metallurgical Research Laboratory (DMRL), has developed High Nitrogen Steel for "Armour Application"
- Jindal Stainless has optimized its manufacturing process for industry scale production
- Characterized with excellent combination of very high strength and toughness (in annealed condition also) coupled with high elongation for ease of manufacturing, high yield strength, and wear sustainability for long life cycle
- HNS has higher impact value compared to the currently used RHA material for armouring and retains non-magnetic properties even after heavy cold working
- It offers significant advantages over currently used RHA steel for armouring including mechanical properties, ballistic mass efficiencies and cost effectiveness
- Potential Applications: Combat platforms for Infantry Combat Vehicles, Light VIP Vehicles, LSV, LAMV, FICV, MPV, Armour Fighting Vehicles, Army Bridges, Helicopters, Protective shelters for Police Force, structural material for vehicles, structure-cum-armour for tanks
- DMRL has identified ocean engineering, aerospace, automobiles, medical implants and naval applications as potential sectors

MANUFACTURING ROUTE



- Tests conducted at DMRL have established superior performance of HNS over RHA
 - Against Soft projectile: Mass efficiency better by 30-35% as compared to spade steel
 - Against AP small projectiles: Ballistic efficiency better by 5-10%
- Against Long Rod Anti-Tank projectile, HNS shows similar performance in comparison to Spade steel
- Mine Protection Vehicle (MPV) and Mine Trawl using HNS are under development

BALLISTIC PERFORMANCE: HNS Vs RHA



ADVANTAGES

A. Soft Projectiles:
Mass Efficiency
better by 30-35%

B. Armour Piercing
Small Projectile:
Ballistic Efficiency
better by 5-10%

WHY JINDAL STAINLESS

- Integrated manufacturer and established supplier of customized and special defence materials
- A culture that is 'innovative by instinct'
- Adopting emerging technologies and building capabilities in pursuit of more efficient and cost-effective strategic materials for defence
- Diversified product forms like Slabs, Blooms, Ingots, Plates, Sheets, Coils, Rolled and Forged Bars, Precision Strips, Forged Rings with a range of Stainless Steel grades and different surface finishes
- Wide range of fabrication facility and high quality engineering works
- Well developed distribution network and efficient supply chain management

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Shaping a Stainless World