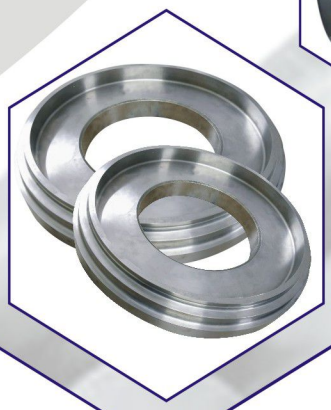
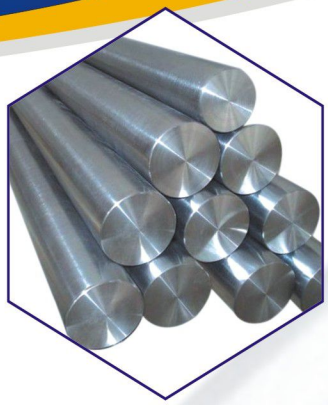
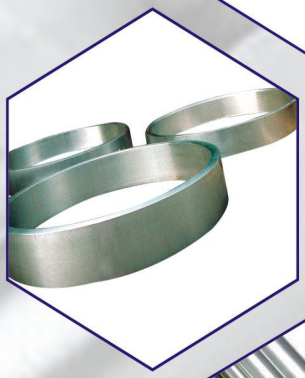
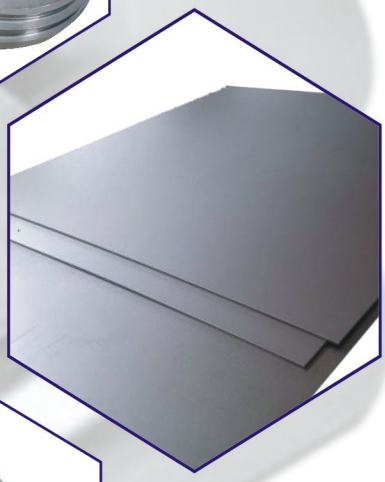
Titanium & Titanium Alloy Products









MIDHANI

MISHRA DHATU NIGAM LIMITED

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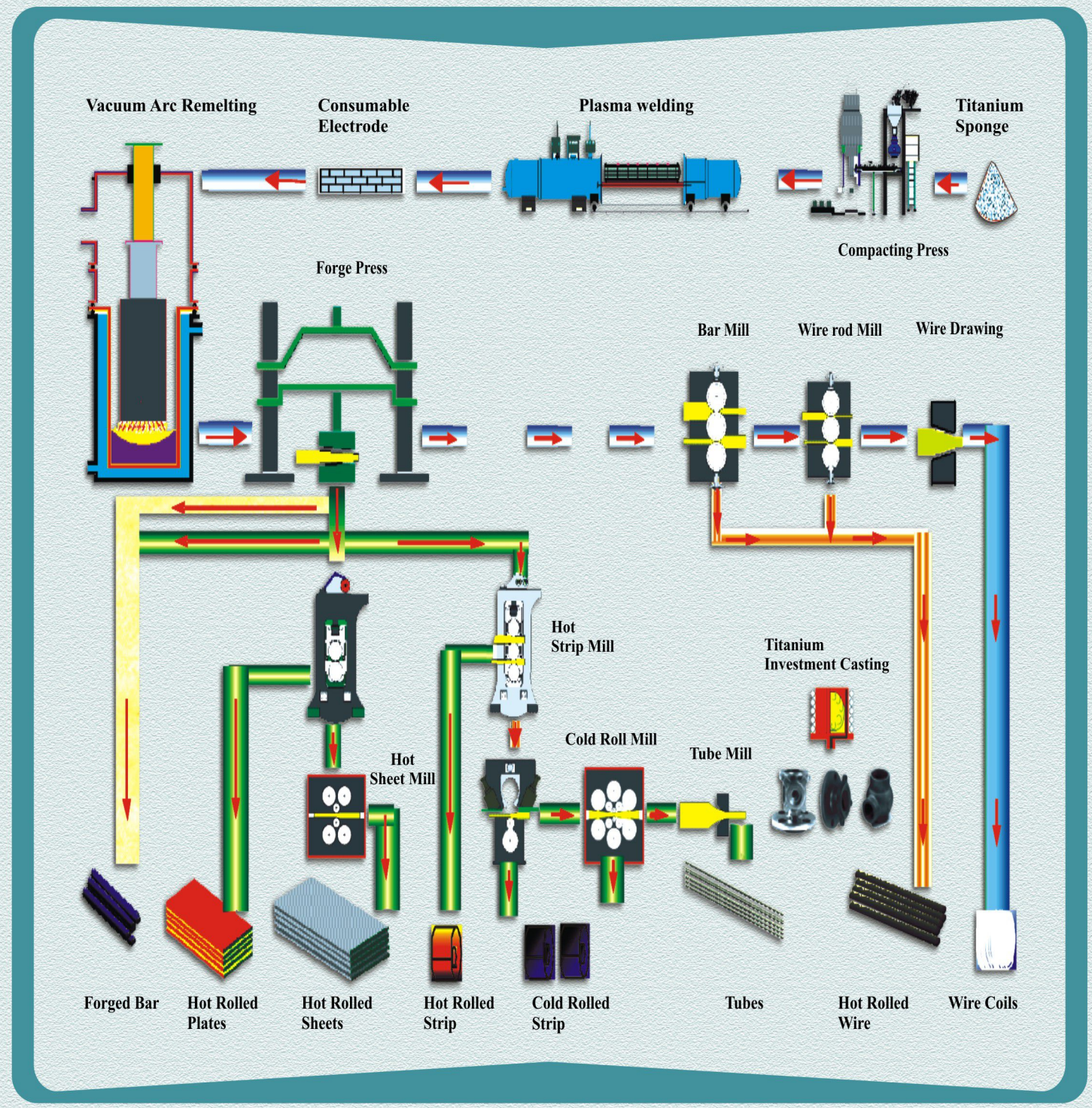
TITANIUM MANUFACTURING PROCESS IN MIDHANI



ABOUT MIDHANI

Mishra Dhatu Nigam Limited (MIDHANI), was set up in 1973 at Hyderabad. It is listed at BSE/NSE (Code BSE:541195/ NSE: MIDHANI) WITH 26% Shares in Public.

MIDHANI is an ISO 9001:2016 & AS 9100D Certified company with modern metallurgical facilities and technical competence. MIDHANI is the only producer of Titanium alloys in India.

MIDHANI specializes in manufacturing a wide range of superalloys, titanium, special purpose steels and other special metals and alloys meeting stringent international standards for application in Aerospace, Defence, Nuclear, Space, Chemical and various other high technology industries. At present, MIDHANI is capable of manufacturing more than 500 grades of special alloys like Titanium alloys, Superalloys and Special steels for various applications.

MIDHANI PRODUCTS

SUPERALLOYS

- Nickel-base
- Cobalt-base
- Iron-base

TITANIUM & TI ALLOYS

- Commercially pure Titanium
- Titanium Alloys

SPECIAL PURPOSE STEELS

- Maraging Steels
- Armament Steels
- Nuclear Grade Steels
- Special Stainless Steels

COMMERCIAL GRADES

- Superalloys for Oil & Gas Sector
- Tool & Die Steel for Auto Sector
- Helical Springs & Spring Rounds
- Alloy Steel for Mining Sector

SPECIAL PRODUCTS

- Titanium and Superalloy Investment Castings
- Speciality Fasteners
- Weld consumables
- Armour Products

TITANIUM AND ITS ALLOYS

- Commercially pure Titanium
- Titanium Alloys

Titanium by virtue of its excellent corrosion resistance and high strength-to-weight ratio finds application in the aerospace, chemical, petrochemical, marine, paper pulp, textile, food and dairy industries. Titanium alloy is also used for bio-medical implants.

KEY WESTERN ALLOYS BY MIDHANI

MIDHANI Grade	Alloy Type	Conformity to International Specification	Typical Application
Titan 12	CP	ASTM B348/B 265 Grade 1	Airframes, Aircraft engine parts, gas compressor, chemical desalination, marine components, heat exchanger plates , Jigs , fixtures and basket for electroplating
Titan 15	CP	ASTM B348/B 265 Grade 2	
Titan 31A	Alpha+Beta	AMS 4928, AMS 4967E, BS 2TA 12, MIL-T-9047, BS 2 TA11, BS 2 TA 12, ASTM B348/B 265 Grade 5	Rocket motor, structural forging and fasteners, pressure vessels, Gas and chemical pumps, cryogenic parts, marine and ordnance components, steam turbine blades
Titan 32	Alpha+Beta	MIL-T-9047, ASTM B348 / B 265 Grade 9	Tubes for aerospace
Titan 22A	Near Alpha	LA 114, TA8DV, AMS 4972E	Compressor blade feed stock
Titan 26A	Near Alpha	LA 202, IMI 685	Blades and other Aero engine components
Titan 44A	Beta	Titanium Beta 21S	Structural Applications of Aircraft

KEY RUSSIAN ALLOYS BY MIDHANI

MIDHANI Grade	Alloy Type	Conformity to International Specification	Typical Application
BT 3-1	Alpha+Beta	OCT1-90173-75	Sleeves, casings, flanges, brackets, fasteners, shank, compressor blades
BT 5-1	Alpha	OCT1-90266-78	Engine cooling rings, fasteners, tank linings, rings, tail cones
BT 9	Alpha+Beta	OCT1-90006-77	VI, VII, VIII stage rotor blades, wing nose boxes
OT4-1	Near Alpha	OCT1-90218-76	Exhaust shrouds, brackets, tail cones, turbine nozzle covers
BT 20	Alpha+Beta	GOST 23755-79	Structural Applications of Aircraft

FORMS OF SUPPLY

(All dimensions are in mm)

Bar	Forged	Dia	75 - 300
	Hot Rolled	Dia	10 - 75
Wire	Cold	Dia	0.1 and above
Sheet / Plate	Hot Rolled	Thickness (min)	4.0 and above
		Width (max)	1000
		Length	1500 - 2000
	Cold Rolled	Thickness (min)	0.5
		Width (max)	1000
		Length	2000 - 2500
Strip	Cold Rolled	Thickness (min)	0.1
		Width (max)	250
Rings	Rolled	OD	3540
		Wall Thickness (Min.)	40
		Height (Max/Min)	620/50

QUALITY ASSURANCE

MIDHANI is an ISO 9001:2015 and AS 9100D, certified NABL Accreditation as per IS-17025 for Chemical Testing Laboratory.

MIDHANI's quality systems are approved by more stringent standards of Director General of Aeronautical Quality Assurance, Director General of Civil Aviation, Director General of Quality Assurance, Department of Space, Department of Atomic Energy. "Source Approval" has been accorded by Boeing Aircraft Company, USA for titanium and Titanium alloys of MIDHANI for their C-17 transport and MD series of jet aircraft.

Apart from close control over chemistry and maintaining processing conditions, the intermediate as well as final products are subjected to various destructive and non-destructive tests to establish their suitability for high temperature, corrosion, vibration or stress conditions.

The central laboratory in MIDHANI, fully equipped with chemical, metallurgical, mechanical, non-destructive, magnetic and physical testing ensuring excellent quality of finished products.

TESTING & MATERIAL EVALUATION

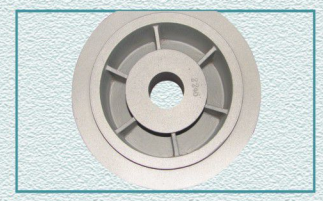
A comprehensive range of testing and evaluation services covering chemical analysis, mechanical, non-destructive and magnetic testing are rendered by MIDHANI.

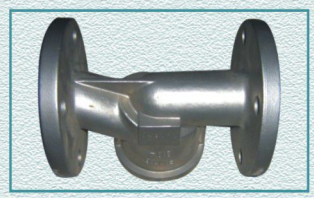
These include X-Ray, Atomic Absorption, Optical Emission & Ultra-voilet visible Spectrometry and gas analysis Flux analyser. Tensile, Creep & Fatigue testing, Fracture toughness evaluation, Ultrasonic, Eddy Current, Magnetic, Particle inspection, Dye-Penetrant, Radiography Hysteresis graph, Core Loss testing, Scanning electron microsclope with EDAX etc are also carried out. Sophisticated services dedicated to testing and evaluation of aeronautical materials and components are also offered by MIDHANI. Mechanical testing services include Tensile & Compressive Testing at ambient, elevated and cryogenic temperatures, low cycle fatigue.

OTHER TITANIUM PRODUCTS

Investment Casting Facility

Vacuum investment casting facility enables MIDHANI to supply near-net-shape castings of Nickel, Iron & Cobalt base Superalloys and Titanium & Titanium alloys.





Titanium & Titanium alloys

Length	(mm)	: 350 max
Diameter	(mm)	: 300 max.
Weight	(kg)	: 50 max.

Fasteners Facilities

Hexagonal bolts, Hexagonal socket, Head cap screws, Cheese Head screws, Countersunk screws, Locking washers, and Plates, Wire locking screws and Nuts, Studs, Specialised and Custom made fasteners, Lock nuts, Locking plates and Split bushes.

Biomedical Implants & Devices

- Knee Hinge Joint
- Hip Prosthesis
- Compression Hip Screw
- Implants

- Screws
- Clamps and Plates
- Intra medullary

  Nails & Rush Nails

MIDHANI also manufactures custom made implants biomedical products to suit the specific requirements e.g. Hinge Knee Joint, Acetabular Cup with attached IliacWing, Lumbar Puncture Needle Device.

MIDHANI conforms to ASTM, BS, ISO, IS, AMS, MIL, AFNOR, DIN & other standards for materials as well as biomedical products.

Seamless Tubes

Outer diameter	:	27 - 90 mm
Wall thickness	:	3 - 10 mm
Max. Length	:	12000 mm

UNIQUE MANUFACTURING FACILITIES

MIDHANI is equipped with highly integrated and flexible manufacturing facilities to produce a wide variety of special metals and alloys in various mill forms such as forged bars/ flats, Rings; near net shapes hot rolled bars/ sheets, cold rolled sheets, strips, foils, wires, castings, tubes and fasteners.

Titanium Melting

MIDHANI has Vacuum Arc Remelting furnace for the production of Titanium ingots upto 6.5 T. For electrode preparation, a 3000 T capacity Compacting press and a Plasma arc welding unit are available. A high vacuum furnace is used for annealing.

Ingot

MIDHANI produces ingots of size 1.4T to 6T in weight and in diameters varying from 550mm to 860mm depending on the alloy grade. Primary ingot will be remelted multiple times based on the criticality of the application.

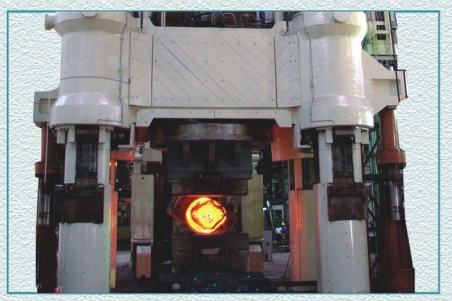
Forging

6000 T Forge Press:

6000 T Hydraulic Forge press with 20T manipulator, 4 Column push down type with 7000T upsetting force and 4500 X 1800 mm clearance.

1500 T Forge Press:

MIDHANI has a 1500 T capacity CNC hydraulic press operating with two rail bound manipulators for forging ingots to various shapes with close tolerances.



Ring Rolling Mill

Mill Type	:	Radial Axial Ring Rolling Mill
OD	:	320 - 3540mm
Height	:	50 - 635mm
Weight (max)	:	3500Kg

Hot Rolling

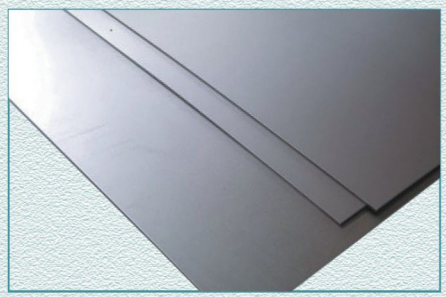
2-hi, 2-stand and 3-hi strip mills, 3-hi, 3 stand bar mill and 7 stand wire rod mill make up the hot rolling facilities.

Wide Plate Mill

4-Hi Mill stack, Hot/Cold Plate leveller, Hot Dividing shear, Roller Pressure quench, Walking Hearth Furnace, Roller Hearth Furnace, Tempering Furnace

Size Range

- Thickness : 4mm
- Width : 1000 - 3000 mm
- Length : 5000 - 15000 mm



TITANIUM AND TITANIUM ALLOYS

Titanium and alloys are mainly used for because of their higher strength to weight ratio and corrosion resistance.

Titanium has four outstanding characteristics:

- Corrosion resistance, especially in oxidising conditions
- Erosion resistance
- Strength to weight ratio
- Elevated temperature performance

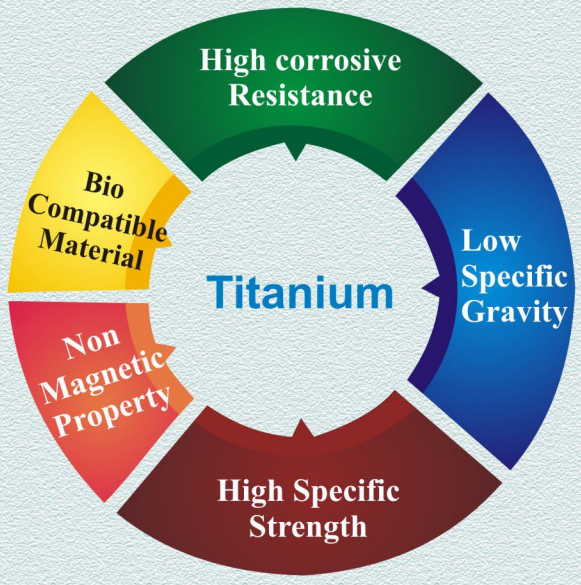
Titanium, which has excellent physical properties and is friendly to the environment, meets contemporary needs of the world.

Titanium alloys are being supplied in various forms like Ingots, Forgings, Rings, Plates, Wires, Castings, Fasteners and Bio medical Implants.

APPLICATIONS

- Aerospace
- Chemical Processing
- Oil & Gas Processing and extraction
- Electro chemical industry
- Medical Bio-implants
- Marine Industry
- Automotive Industry
- Desalination Plants

CHARACTERISTICS



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HYDERABAD, INDIA