



Machining Division

October 2020

Balu Forge

Company Overview

Balu has become a name symbolising quality & excellence in the field of crankshaft manufacturing since its inception in 1990. Our in-house capability & state of the art automotive engineering enables us to manufacture any type of crankshaft in a large range of applications namely Automotive, Agricultural, Marine & Industrial. We have developed a very extensive range of forged crankshafts for leading Original Equipment Manufacturers within India and the rest of the world & a strong aftermarket presence in over 80 countries. The ISO/TS16949:2009 accreditation of our units in 2012 by TUV Nord Cert GmbH added to our competitive edge making Balu one of the very few companies to have this accreditation in the field of manufacturing crankshafts.

Balu is now an avant-garde manufacturer of fully finished and semi-finished forged crankshafts and other Forged Components. Our incremental innovation & continuous strive to improve has awarded us by making us the only company to have the capability to manufacture components conforming to the New Emission Regulations & the New Energy Vehicles

The manufacturing of the components is done with the latest equipment, instruments, technologies and highly skilled workforce which provide exceptional control over the entire process of manufacturing & strict adherence to Six Sigma & 8D disciplines. Balu is the supplier of choice of major OEMs not only in India but around the world due to our technological advantage and the highest standards of quality in the industry. All the components are manufactured to exact O.E specifications and on CNC lines, to ensure precision at every stage.

Balu has continually strived to broaden our manufacturing base and with the acquisition of the state of the art machining lines from Poland in the year 2006 and as recently as 2011 from France, our capability has expanded to produce crankshafts up to 2.5 meters in length and installed capacity has increased to 30,000 fully finished crankshafts per month.

Company Overview

Balu had a humble beginning in the year 1990, in Belgaum, India. The initial set up was for manufacturing of crankshafts for single cylinder & two cylinder with a limited workforce. Within the last decade the company is supplying to OEM companies and the aftermarket presence has since expanded to over 80 countries. In 1990, Balu India was the first company in India to mass-produce Crankshafts suitable for Tractor, Trucks and Passenger car applications. Two decades later Balu has gained an excellent reputation in the world market.

Balu Forge

Vision, Mission & Culture

VISION & MISSION

- We will continuously strive to be a preferred supplier of components to OEM's in India and around the world.
- We aim to enhance and grow its reputation as one of the world's most respected manufacturing companies by exceeding customer expectations, providing an engaging and supportive work environment, and delivering financial success. We aim to always UNDERPROMISE & OVERDELIVER in all our ventures. While pursuing the above, we will ensure that we establish a robust management system so as to enhance customer's experience in dealing with us, satisfaction of all stakeholders and due consideration to the environment.

CULTURE

- **Respect:** We value each other, our guests, our business partners our stakeholders and our environment.
- **Honesty:** We are genuine and open in our communication and business practices.
- **Commitment to Quality:** We deliver services and products that exceed our guests' expectations.
- **Creativity:** We listen, encourage and support different approaches as we continually strive to improve
- **Growth:** We invest in personal and professional development
- **Teamwork:** We work together towards a shared goal

Balu Forge

Management



Jaspal Singh Chandock, Managing Director

A Mumbai based & 2nd generation entrepreneur with decades of experience & investments in a vast sphere of industries. The Foundation for Balu was laid by Mr. Jaspal Singh Chandock under the guidance of late Mr. Prehlad Singh Chandock & the company has risen to new heights with a consistent year on year growth. The manufacturing of engine components has always been core to the vision for Mr. Jaspal Singh & a presence in over 80 countries has led to the establishment of global brand strong in its values & integrity



Trimaan Singh Chandock, Executive Director

A young & dynamic leader with a MSc & a BSc in Management studied from H.R College, Mumbai. A 3rd generation entrepreneur who joined the company in 2009. A visionary with a keen interest in innovation in the field of manufacturing. The company has had incremental innovation in the core of its practices since the joining of Mr. Trimaan Chandock. The introduction of the same led to greater productivity, flexibility & speed in the manufacturing plants. The shift to the OEM business had been undertaken after the achievement of the TS16949 status under the leadership of Mr. Trimaan Chandock



Jaikaran Singh Chandock, Director

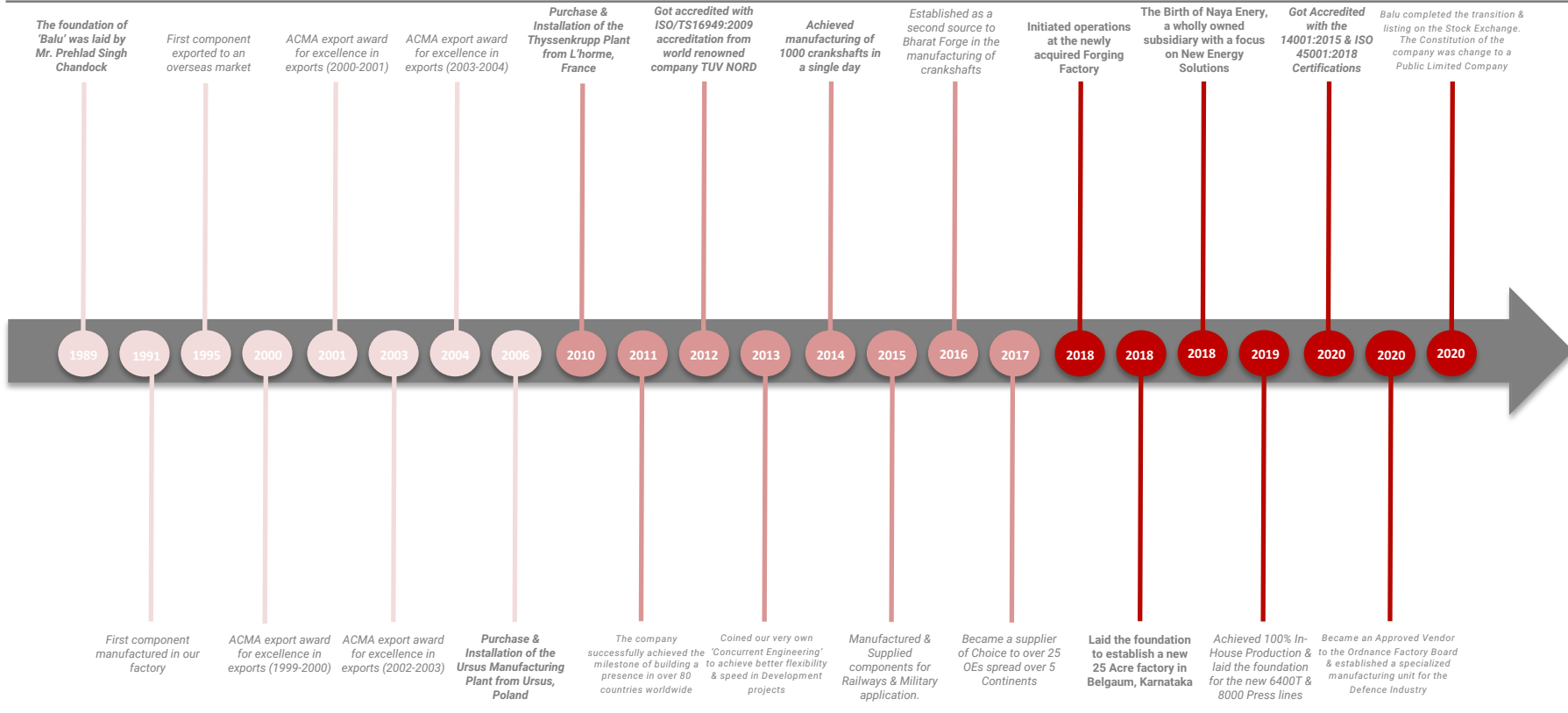
The youngest & newest recruit who joined the business in 2014 after completion of BSc in Business Management from Cass Business School, London & MSc in Strategic Marketing from Imperial College, London. He has had Previous experience in MNCs such as Reeves & Njoy E-cigs & a notable achievement at the college level was that he was crowned the winner of an Entrepreneurship challenge amongst 50,000 participants. As entrepreneurship runs in the family, the recent addition has led to application of new technology in the company & further diversification into manufacturing of different engine parts from the diesel engine family. The recent setup of the R&D facility under his vision has set a base & laid the path of the company for the future

Key Management Personnel

The Strong Lineage of the company spreads over three generations & the growth story has been consistent since its inception in 1989. The company has consistently built a formidable reputation & strong global presence. The company's reputation now resonates with precision & quality engineering delivering success for all its stakeholders spread over 80 Countries

Balu Forge

Company History & Key Milestones



Company History & Key Milestones

It has been a long journey & over three generations of the Balu Family have worked to build a truly global enterprise. But we have only just started & endeavor to become one of the largest Precision Engineering & Metal Forming Company in the world. We have also adapted to the changing times & enhanced our product portfolio to meet both the needs of both the Conventional ICE Applications & the New Energy Vehicles.

Balu Forge

Accolades



Accolades

We have won numerous export & supplier awards over three decades of manufacturing excellence

Balu Forge

Certifications



Certifications

IATF 16949:2016 | ISO 9001:2015 | ISO 14001:2015 | ISO 45001:2018

Balu Forge

Core Competence

- Fully Integrated Plant providing full supply capability to its Geographically dispersed customers from concept to product design, engineering, manufacturing, testing & validations.
- Can service requirements of all dependent & allied sectors like railways, defense, oil & gas, aviation, renewable energy.
- Highly skilled workforce with the technologically advanced plant.
- In-house capability to manufacture a product from 2 Kgs to 500 Kgs & upto 3 Meters long.
- Supply base comprising of over 15 OEMs both in India & overseas.
- Aftermarket customer & distributor base in over 80 countries.
- Developing Aluminum Forgings for New Energy & Electric Vehicle sector.

Core Competence

We have a Fully Integrated Forging & Machining Unit with a large product portfolio offering to our customers ranging from 1 Kg to 500 Kgs. The Forging Unit comprises of Both Closed Die Forging Hammers & Presses.

This offering is spread over a large number of applications & Industries namely Automotive, Off Road & On Road Vehicles, High Performance Applications, Industrial, Heavy Duty, Oil & Gas, Marine, Defence, Railways, etc.

We have one of the largest capacities to manufacture Crankshafts & other Forged Components in the world. Our existing units can presently machine 360,000 units of crankshaft per year & this will shortly be upgraded to reach 720,000 units per year by the second half of 2021. Our Forging unit has the capacity to produce 5000 Tons per month & another 5000 Tons per month will be added from the second half of 2021

Balu Forge

Industries Served & Applications



Industrial Vehicles



Oil & Gas



Earthmoving Machinery



Automotive



Wind Energy



Railway Applications



Defense



Agriculture

Industries Served & Applications

Agriculture: Tractors, Harvesters | Heavy Duty: Trucks, Buses, Trailers | Automotive | Generators: Industrial, Standby, Home backup, Portable | Oil & Gas: Pumps & Compressors | Refrigeration: Compressor | Industrial | Off Road & On Road: Motorcycles, Carts, Jet Skis | High Performance: Racing Series | Locomotive | Marine | Aerospace

Balu Forge

Research & Development

Development of New Materials

A number of new material chemistries have been worked on during the many R&D Projects to assess the material compositions & applications of newer metals. The New Energy Era has led to a number of opportunities & rise to newer applications of conventional metals with innovative manufacturing processes.

A number of key areas of R&D are as follow:

- Fatigue Analysis of Steels (Stainless steel alloys, Aluminium, Titanium, etc)
- Durability & Analysis of Failure (Root Cause Analysis, etc)
- New Raw Material Selection & Process Development
- Selection of Raw Material
- Modelling and simulation of Heat Treatment Processes

Product Engineering & New Product Development

Advanced & Additive Manufacturing

We use a number of additive manufacturing methodologies for rapid prototyping & New Product Development. This ensures flexibility & Speed in the New Product Development process & ensures a rapid development of New Prototypes The Use of 3D Scanning also adds efficiency & speeds up the entire design & development Process. The In-House Infrastructure for 3D Scanning can measure up to 5 Million Points in 2 Seconds & 7-20pm Accuracy.

The Additive Manufacturing Centre also formulates a good foundation for our company's foray in the Aerospace Industry with a large product portfolio that now is possible by the Additive Manufacturing Methodology. 3D printing also is a key area as part of our In-House Tool Room Strategy as key components from the Manufacturing Process can now be produced In-House in the 3D Printing Center

State of the Art Machining

The Machining Facilities are well supported with State-of-the-Art Infrastructure namely:

- Comprehensive In-House Tool Room
- Metallurgical Labs
- Design & Process Facilities
- Inspection & Tests Facilities

The R&D complements the above excellence by further enhancing the existing capability of our company. The Three Key Pillars that are now possible in the R&D Center:

New Product & Process Development

Development of New Material Chemistries for the New Energy Era | Gear Manufacturing | Assembly Services & Testing

Technology Enhancement

Ultrasonic Machining | High Speed Grinding | 4-Axis & 5-Axis Machining | Rapid Prototyping

Analysis

Tool Wear Analysis | Fracture Analysis | Grain Deformation | Force & Temp | Durability & Fatigue | Cost Saving

Forging the Future

All our facilities are being powered by Renewable Energy Sources as part of our strategy to drastically reduce our carbon footprint.

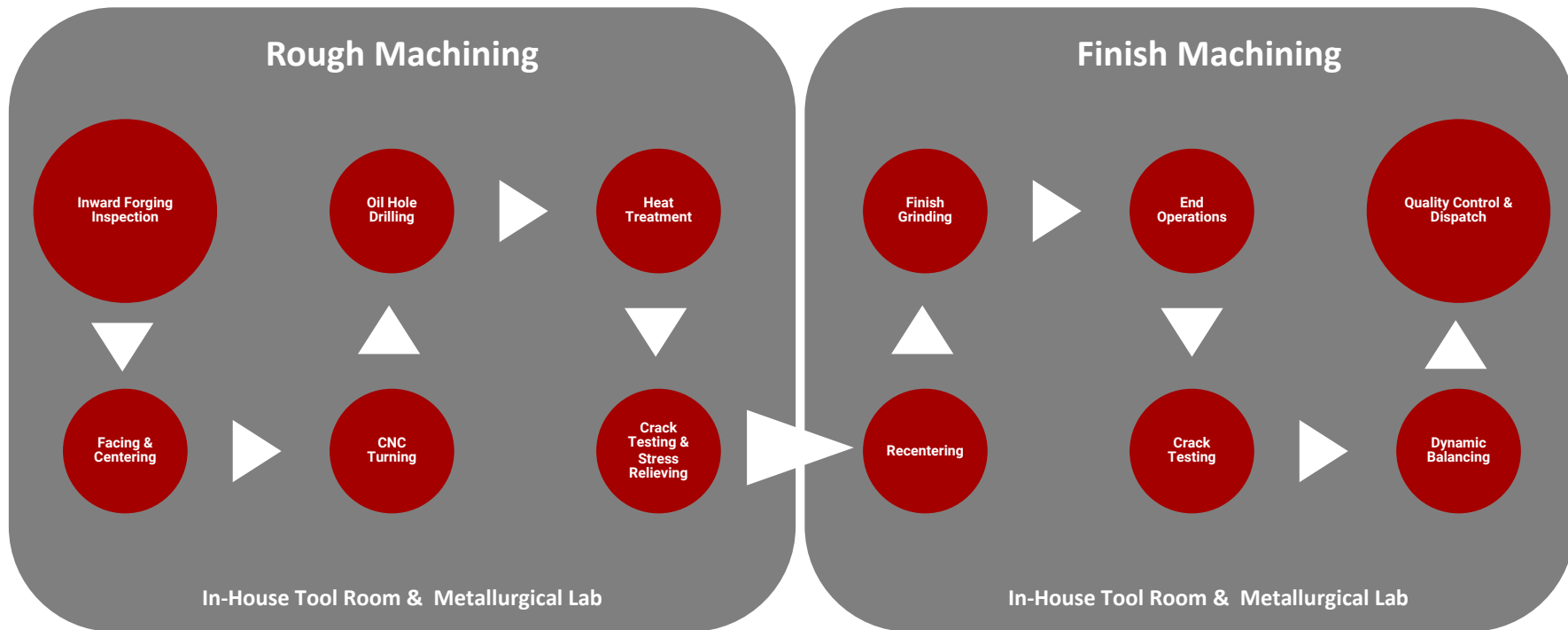
There is a continuous focus in the below areas:

- Design and Development of new products and processes.
- Modelling and Simulation of Metal Forming processes.
- Deformation studies and associated metallurgical analysis of Alloys.
- Process improvements/ Cost optimization in Metal Forming Process.
- Product life assessment through Fatigue & Fracture studies.

A key focus is Aluminium as part of the light metals that have seen a surge in demand in the New Energy Vehicles.

Machining Division

Infrastructure Overview



Infrastructure Overview

We have Two Dedicated units in our Machining Facilities namely the Rough Machining & Finish Machining Units. There correspond to 10 Precision Machining lines & 2 Prototype Manufacturing Lines enabling us to have a Total Output of 1000 crankshafts per day which will shortly be upgraded to 2000 crankshafts per day. The Dedicated Prototype lines enables us to Develop New Parts & Components with flexibility & shorter lead times. We have added a large array of components in our portfolio through a spectrum of Industries further expanding our footprint & expanding our product range.

Machining Division

Land & Building of our Machining Units

Machining Units

Land Area: 25 Acres

Full Fledged Built up Land approximately 500,000 Square Feet with Machinery

Location: Belgaum, India

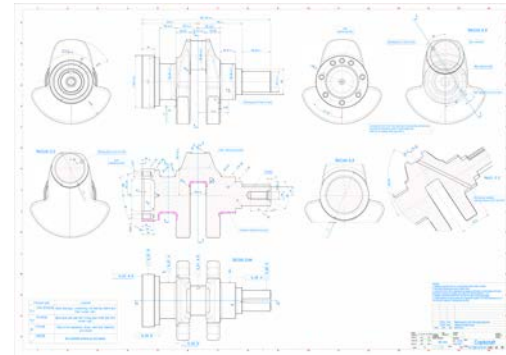
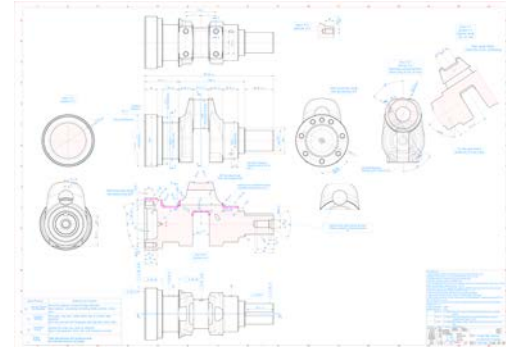


Land & Building

Overview of the Plant Infrastructure spread over 3 Units

Machining Division

Design Facilities



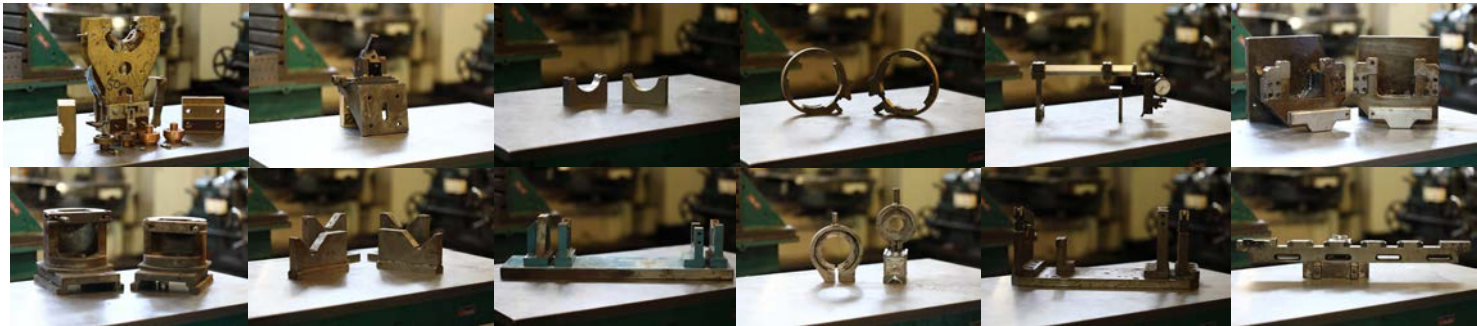
Design Facilities

We have a dedicated team of very skilled designers with a capability of both 2D & 3D Modelling. We use all the latest 2D & 3D Design Softwares with Simulation Modelling to enable the product design is done as per the customer specifications.

We also offer solutions to our patrons for New Product Design & Development & our comprehensive Design Team & Infrastructure enables us to offer end to end Design Solutions

Machining Division

Machining



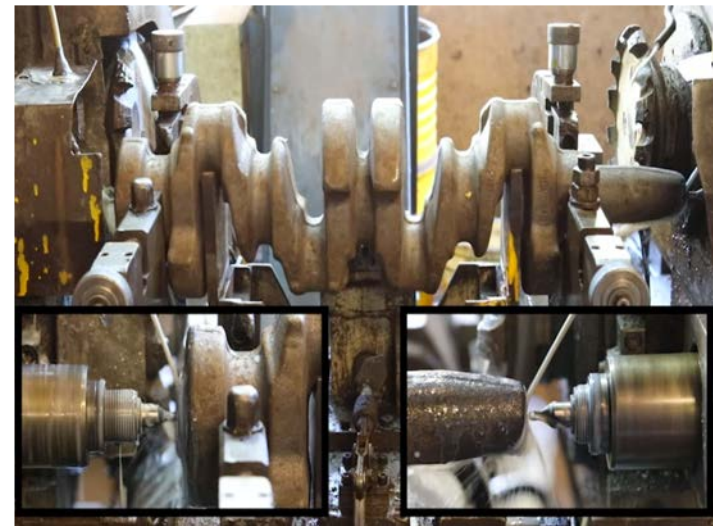
In-House Tool Room

All the required Tooling are produced in our comprehensive In-House Tool Room. The same is key to manufacturing flexibility & adding speed to Production. We have a fully integrated Tool Room & all Jigs, Fixtures, Coils, Forging Dies & related tooling etc are produced In-house. This enables shorter lead times & also enables us to have minimal breakdowns in our production lines on account of Tooling.

We have also introduced 3D Printers in our Tool Room to further add flexibility & speed up our Tooling Process. We presently have one of the shortest Tooling Lead Times in the Marketplace credited to the said infrastructure.

Machining Division

Machining



Facing & Turning

The First Process in the Machining of a Crankshaft is the Facing & Centering Process. This acts as a base & reference for all future processes & is very critical. The Facing & Centering is the process to reduce the initial imbalance of the crankshaft thus assisting in the final balancing accuracy of the crankshaft.

We also have an additional layer in our Machining Flow where Re-entering is done prior to Grinding & post Rough Machining. This ensures that the initial reference is maintained & there is no deviation found on the parts.

Machining Division

Machining



Rough Machining Line

Machining Division

Machining



CNC Milling & Turning

The CNC Rough Machining is done in our State of the Art Rough Machining Unit. There are a large number of flexible Machining Centres enabling Turning & Milling of Smaller as well as Larger Components. The CNC Rough Machining is done in our State of the Art Rough Machining Unit. There are a large number of flexible Machining Centres enabling Turning & Milling of Smaller as well as Larger Components.

Machining Division

Machining



Heller Pin Milling

We are one of the only companies in India to have 10 Heller Milling & Turning Centres installed in our units enabling us to achieve the volume capacity of 1000 pcs per day presently.

This is a mark or signature of a high quality product which has over the years become the norm of every well-known component manufacturer. This infrastructure gives us the competitive edge over our peers & also ensures that the highest standards of quality is maintained.

Machining Division

Machining



Drilling

All Drilling Operations are carried out in our 4 Axis & 5 Axis CNC machines. This enables higher accuracy enabling us to achieve the standards of quality desired by our patrons & partners globally with closer Tolerances, shorter lead times & higher efficiency. The Oil Holes are produced in our 5 Axis & SPMs (Special Purpose Machines). This enables higher accuracy enabling us to achieve the standards of quality desired by our patrons & partners globally. We have Dedicated Oil Hole Drilling Machines capable of machining up to 1500 crankshaft in a single day.

All Components are machined in our CNC Machining Lines which ensures the accuracy & consistency in the production to enable us to supply precision parts with the closest tolerances, highest quality & maximum efficiency. We internally adhere to a strong policy of regular upgradation & modernisation of the technology used in our manufacturing units to ensure we always stay ahead of the curve & deliver highest standard of quality.

Machining Division

Machining



Induction Hardening, Crack Testing & Stress Relieving

We have an In-house Heat Treatment facility that adds flexibility in our production Flow. All Components are tested for the Surface Hardness post the Heat Treatment process to ensure it is conforming to the requirement of the customer. We offer various Heat Treatment methods to our customers namely Induction Hardening, Fillet Hardening & Nitriding. All Induction Coils for Heat Treatment are also manufactured in our In-house Tool Room. This shortens our lead time for production & also speeds the Development Time for new parts. In addition to the same, we also have our fully equipped In-House Metallurgical Lab for measuring Case Depth/Material Flow & Hardness We generally maintain a Hardness range of 55-62 HRC (Varies as per Customer & Part Specification) & HRC is the generic unit we use internally for measuring the Hardness.

The Heat Treatment process is followed by the Crack Testing, Demagnetization & Stress Relieving process. The parts are subject to crack testing twice in the production process namely post Heat Treatment & Post Grinding. There is a practice & policy of 100% Crack testing on all components manufactured by our company. Stress Relieving is the final process prior to shipping the parts to our Finish Machining Unit. It is a very critical process to ensure that the parts do not stay brittle post Heat Treatment & prior to the Grinding Process.

Machining Division

Machining



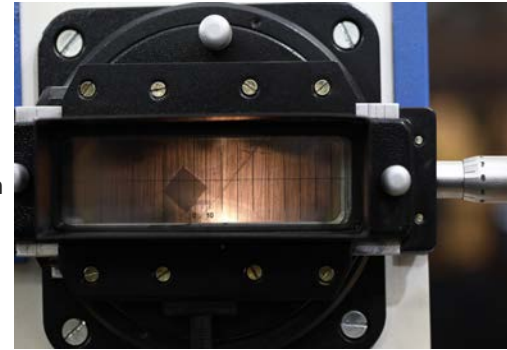
Finish Machining Line

Machining Division

Metallurgical Lab



Metallurgical
Microscope



Case Depth up to 4.5mm



Induction Heaters



Metallurgical
Lab

Metallurgical Lab

We have a fully equipped In-House Metallurgical Laboratory for measuring Case Depth/Material Flow & Hardness (In HRC). We generally maintain a Hardness range of 55-62 HRC (Varies as per Customer & Part Specification) & Case Depth of up to 4.5 mm.

Our Metallurgical Laboratory is fully equipped with Hardness Testers & Metallurgical Microscopes. We have a key emphasis on the Laboratory & the same is regularly upgraded with latest instruments & equipment. We supply cut pieces with every batch to our customers. This ensures the Hardness is consistent & is conforming to the Customer requirement. Metallurgical testing includes microhardness testing and microscopic and macroscopic examinations to evaluate surface and internal features, defects and material characteristics. Samples for all metallurgical testing are prepared at our laboratory. All inward Raw material is tested & also per lot one unit is cut to check the pattern of the hardness & material flow.

Machining Division

Machining



CNC Grinding Line

We have 32 Grinders In-House in our Finish Machining Unit. The Grinders are CNC controlled & comprises of state of the art CBN grinders as well. The Grinding Unit on a 3-Shift Cycle can produce over 2000 units in a single day. These grinders were imported from our acquisitions of the Massey Ferguson plant in Ursus, Poland & Thyssenkrupp plant in Lyon, France. Our CNC Grinding unit is unmatched & unparalleled with the latest & regularly upgraded grinders allowing machining up to 2.5 meters. We are shortly commissioning three new CBN Wheel Grinders in our production lines which will further increase our output.

Machining Division

Machining

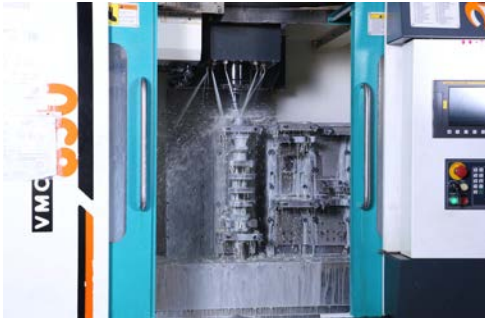


Cold Rolling (Serration/Spline Manufacturing)

We have multiple Special Purpose Machines (SPMs) which enable us to have higher outputs on specific production lines. This enables us to offer quicker ramp ups to our partners during sudden increase in volume demanded. These machines are specifically tooled for only one type of component & we install SPM machines on long terms contracts with our partners. A very special CNC special purpose machine is utilized for the purpose of producing the Serration/Splines on parts which may have a requirement for the same The process is called "deep rolling".

Machining Division

Machining



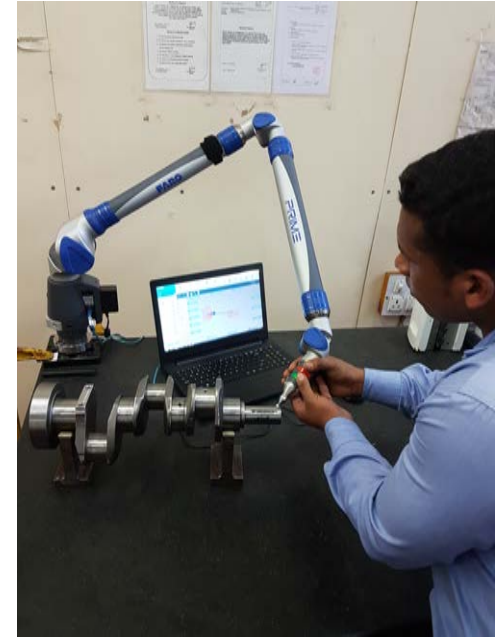
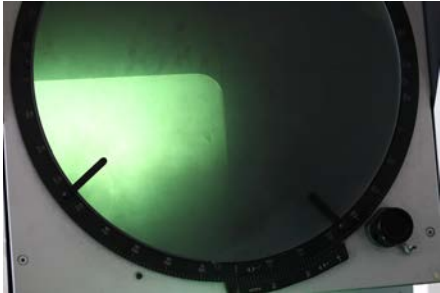
Post Grinding

We have a Dedicated Post Grinding Machining line capable of machining up to 2000 crankshaft in a single day. The line comprises of a number of CNC Horizontal Machining Centres (HMCs) & Vertical Machining Centres (VMCs).

We internally adhere to a strong policy of regular upgradation & modernisation of the technology used in our manufacturing units to ensure we always stay ahead of the curve & deliver highest standard of quality

Machining Division

Quality Control



Quality Control

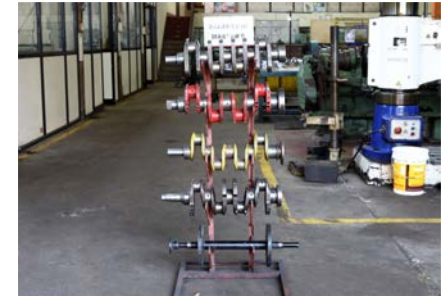
We have inculcated a culture of 'Quality First' throughout the organisation to ensure we can deliver to our promise & the part quality expected by our patrons & partners globally.

A crucial part of any Machining Process is the In-Process/In-Line Inspection methodology that adds an additional & crucial layer to the Quality Control Flow. This enables us to eliminate defects if any early in the production process & increase the efficiency of the whole operation. This also ensures a stringent Quality Control flow enabling us to achieve our 0% Rejection claim & promise policy.

Our Team ensures that every part is precisely checked & we maintain traceability for a period of 10 years for every part that is dispatched from our facility.

Machining Division

Machining



Dynamic Balancing

All Components are Dynamically Balanced & we have the capability to balance the crankshafts within 5 gms. We generally maintain the balancing limits as per the Customer Specification or OE requirement.

It is a very critical process in the machining & the sum of these processes optimises the running behaviour of the crankshaft in the engine and ensures that natural vibrations are as low as possible.

Machining Division

Machining



Super Finishing

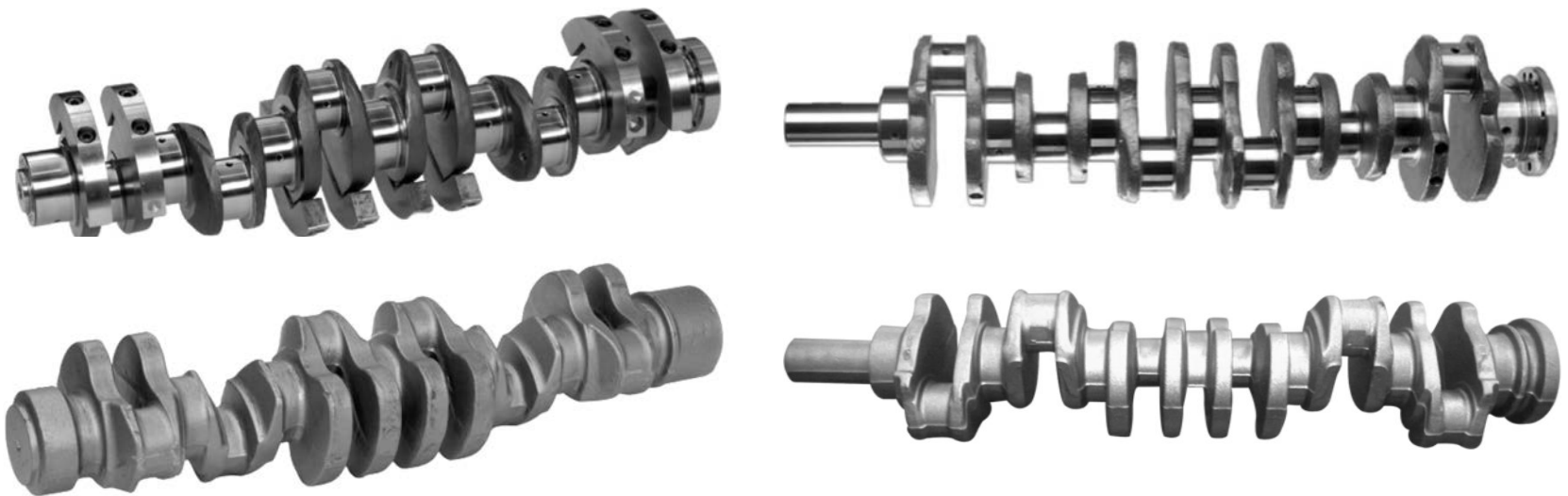
One of the most crucial processes in the production is the auto lapping/superfinishing/polishing process. We have a dedicated line for the polishing process complete with state of the art Nagel CNC auto lapping machines.

All components are super finished in these machines enabling us to achieve a surface finish of up to 0.10 RA which is the standard requirement for most of our OEM partners & patrons globally.

We are shortly introducing Micro Finishing as well as Nano Finishing Machines keep in line with latest Innovation & Technologies.

Product Mix

Components



Key & Core Component: Crankshafts

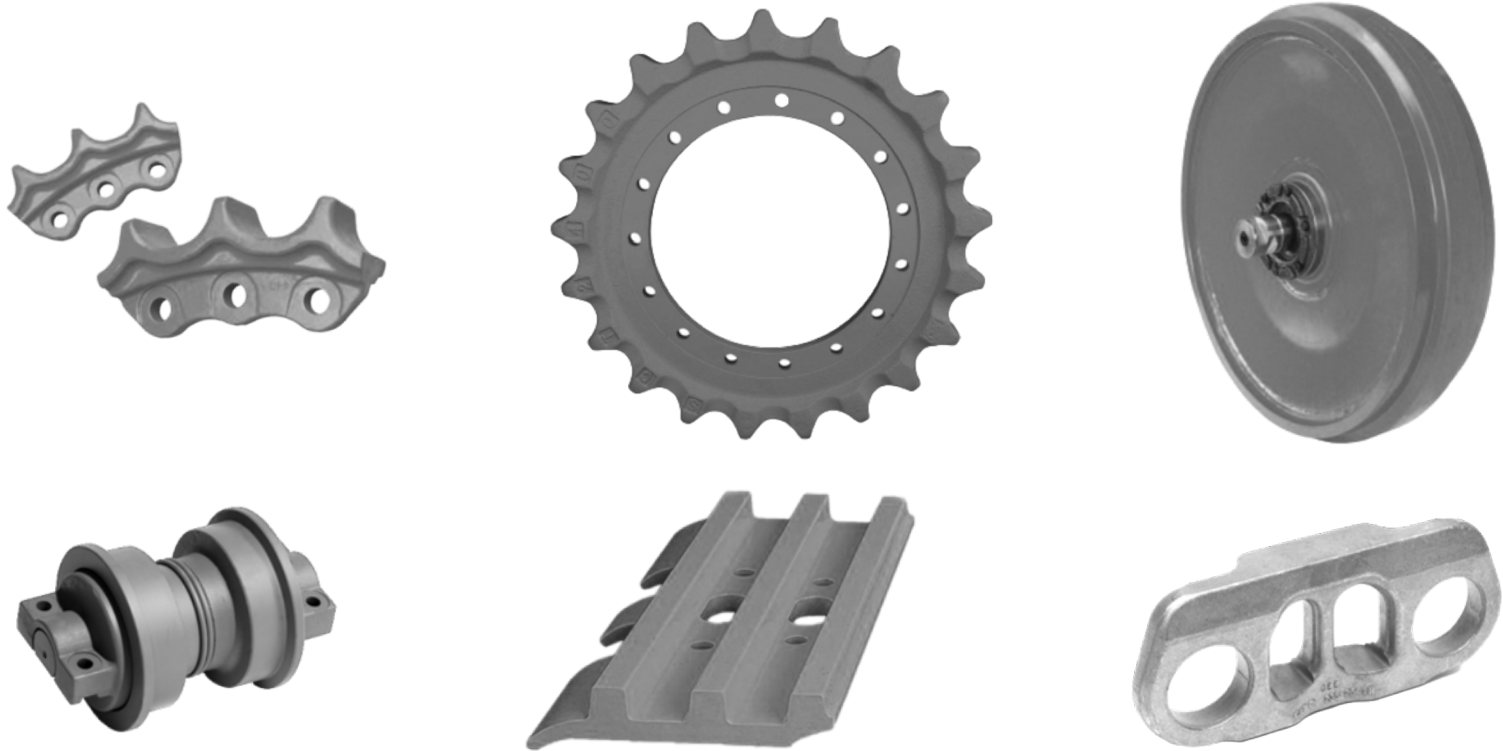
Other Engine Applications: Camshafts, Connecting Rods, Rocker Arms

Supply Capability

Raw Forged, Semi Finished, Fully Finished or Assembled

Product Mix

Components



Under Carriage

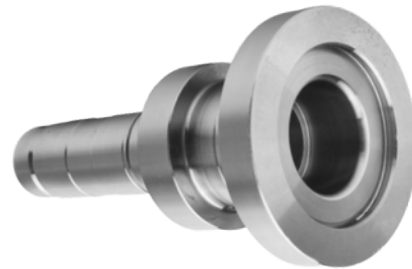
Track Shoe, Track Link, Track Roller, Carries Roller, Sprocket, Track Chain, Idler

Supply Capability

Raw Forged, Semi Finished, Fully Finished or Assembled

Product Mix

Components



Transmission & Clutches

Drive Shafts, Input & Output Shafts, Main Shafts, Yokes

Supply Capability

Raw Forged, Semi Finished, Fully Finished or Assembled

Product Mix

Components



Chassis

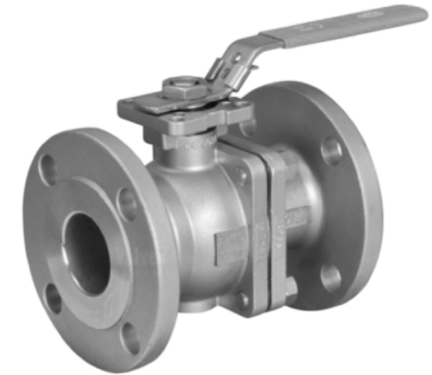
Front Axle Beams, Steering Knuckles, Control Arm, Fork, Steering

Supply Capability

Raw Forged, Semi Finished, Fully Finished or Assembled

Product Mix

Components



Oil, Gas & Flow Control

Stainless Steel Flanges, Valve Components, Stub Ends, Forged Hydraulic Fittings

Supply Capability

Raw Forged, Semi Finished, Fully Finished or Assembled

Product Mix

Components



Hydraulic Motors

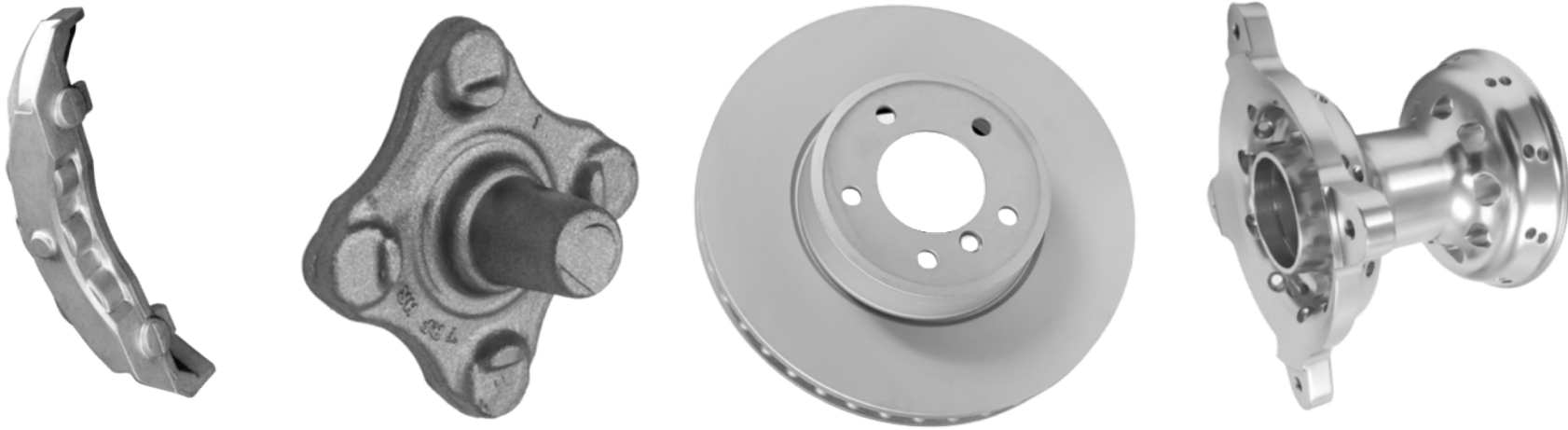
Rotor, Track, Body & Piston Brakes

Supply Capability

Raw Forged, Semi Finished, Fully Finished or Assembled

Product Mix

Components



Brake Parts

Hub, Brake Flange, Disc, Caliper

Supply Capability

Raw Forged, Semi Finished, Fully Finished or Assembled

Product Mix

Components



Hooks

Sorting, Snap, Shank, Ramshorn Lifting Hooks

Supply Capability

Raw Forged, Semi Finished, Fully Finished or Assembled

Product Mix

Components



Towing Accessories

Swan Necks, Flange Balls, Tow Bar

Supply Capability

Raw Forged, Semi Finished, Fully Finished or Assembled

Product Mix

Components



Turbine Blades

Supply Capability

Raw Forged, Semi Finished, Fully Finished or Assembled



TOGETHER WE WILL WIN

