Forging 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 the 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 genera1on 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 innova1on 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

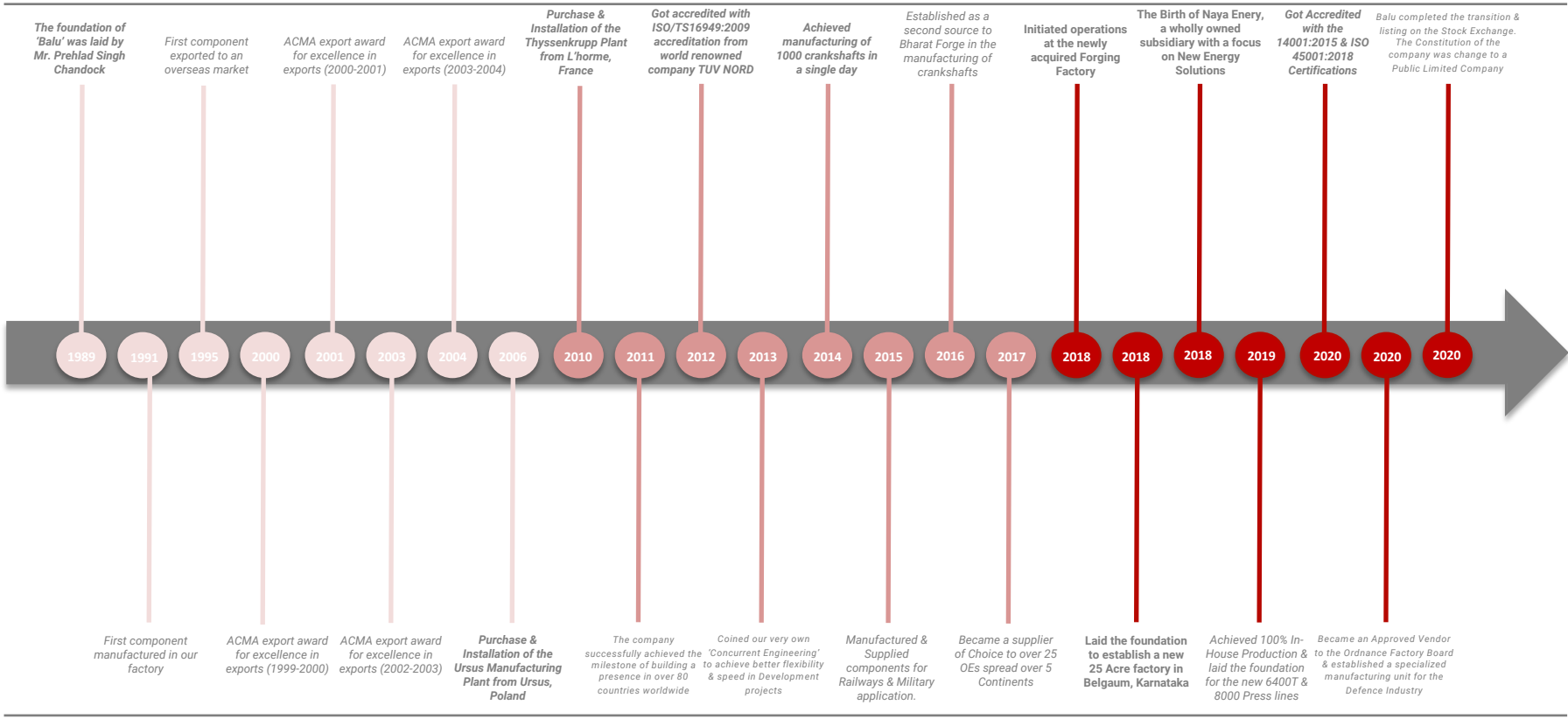
The youngest & newest recruit who joined the business in 2014 after completion of BSc in Business Management from Cass Business School, London & MSc in Strategic Marketing from Imperial College, London. He has had Previous experience in MNCs such as Reeves & Njoy E-cigs & a notable achievement at the 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

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.

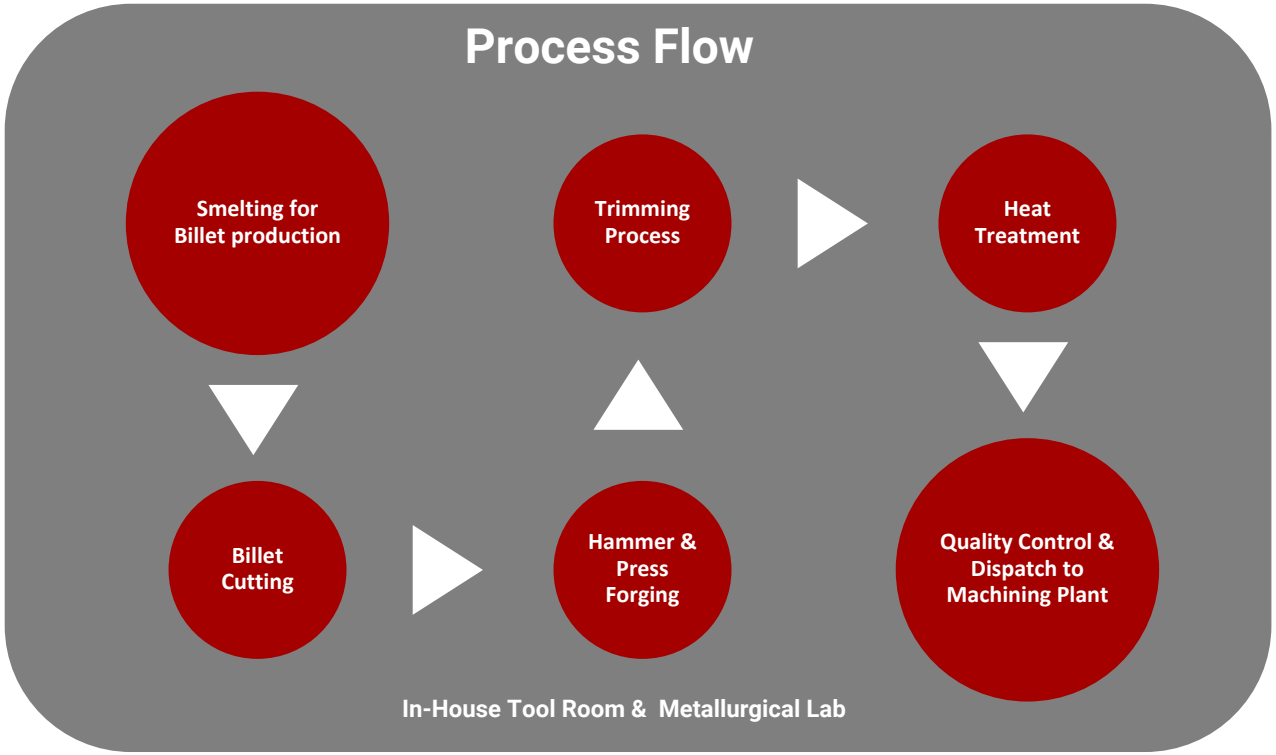
There is a continuous focus in the below areas:

- *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.

Forging Division

Infrastructure Overview



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Forging Division

Land & Building of our Forging Unit

Forging Plant

Land Area: 10 Acres

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

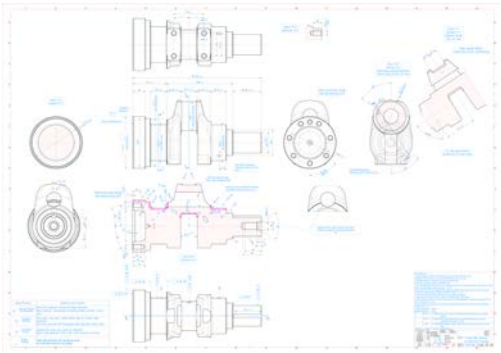
Location: Mumbai, India

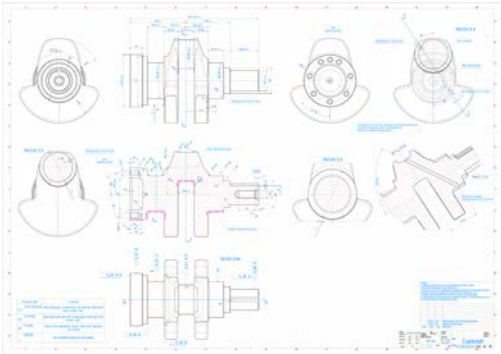
Land & Building

Overview of the Plant Infrastructure spread over 1 Unit

Forging 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

Forging Division

In-House Die Making Facilities

In-House Die Making Facilities

Our Forging units are completely integrated with our own In-House Die Making. This offers greater flexibility & shortens our lead time for New Part Development.

All Die Blocks are sourced from reputed manufacturers with no compromise on quality & offers greater Die life for our production. We have a fully equipped Die-Shop which comprises three 4-axis Vertical Machining Centers along with other supporting machines.

Forging Division

Raw Material Selection & Storage

Raw Material Selection & Storage

We have a Comprehensive & Dedicated Raw Material Selection & Storage. All the Raw Material for our components are only sourced from Recognized & Approved Steel Mills.

All components are supplied with the Material Test Certificate & every material is Tested in our Laboratory to ensure it is conforming to the Standard Material Chemical Composition. We offer components in a wide variety of Raw Materials & also have the flexibility to source & use material as per customer requirement. Some of the common materials we use are Alloy Steel, Micro Alloy, Stainless Steel & Carbon Steel.

Forging Division

Heat Treatment

Heat Treatment

We utilise box type Furnaces in the Forging Unit for Hardening of the Components. The unit is capable of loading up to 6000 Tons per month & the capacity is further expandable depending upon the demand.
There is a dedicated facility with multiple furnaces & Hardening, Tempering & Normalizing Operations are done under one roof. We generally maintain a Hardness range of 250-350 BHN (Varies as per Customer & Part Specification) & BHN is the generic unit we use internally for measuring the Hardness in the Forging Process.

Forging Division

Billet Cutting

Billet Cutting

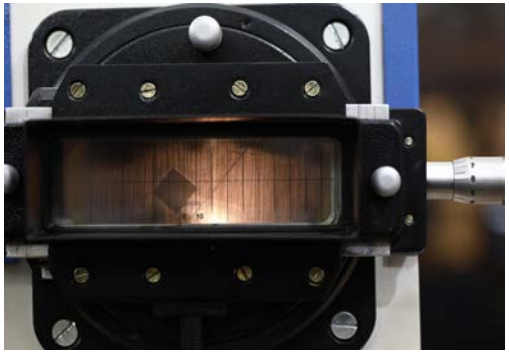
We have numerous fully automated bi-metallic Band Saws enabling it to meet forging capacity with minimum-cutting losses. The Cutting Shop has capacity to utilise 10,000 tons per month on two standard shifts with plenty of spare capacity to meet any demand at hand..

Machining Division

Metallurgical Lab

Metallurgical Microscope

Case Depth



Metallurgical Lab

Metallurgical Lab

All Components are Tested for Hardness post the Forging Process & prior to the Machining. We have an In-House Heat Treatment Facility in the Forging Unit & Offer Hardening & Tempering services on all components forged in our facility. We generally maintain a Hardness range of 250-350 BHN (Varies as per Customer & Part Specification)

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.

Forging Division

Hammer & Press Forging

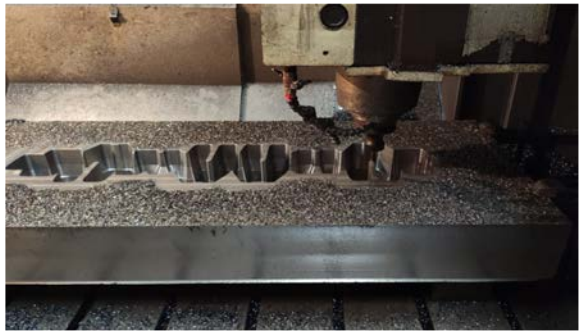
Hammer & Press Forging

We have a comprehensively & fully Integrated Forging Hammer & Press unit. This offers the flexibility of both type & volume of production. Each of the Hammer & Press units are fully equipped with the most energy efficient induction Heaters, reduce rollers, trimming & padding presses, Heat treatment & Controlled Cooling, Twist & Bend Checking equipment.

The Hammer & Press units are regularly modernized to keep with the production needs & keeping the plant energy efficient. We boast of one of the largest Forging Equipment comprising our 16T Forging Hammer line. This is further complemented by a range of 2 Ton, 3 Ton Hammer lines followed by a 2000T Hot Forging Press Line. We are in the process of commissioning our 6300T & 8000T press line which will be complete in 2021 & 2022 respectively.

Forging Division

Trimming Press



Trimming Press

The Forging Units are fully equipped with Trimming & Padding Presses. We have a range of Trimming Presses namely 100T, 300T, 500T & 1500T capacity Trimming Presses. This further enables us to have a fully integrated Forging Unit.

Machining Division

Quality Control





Quality Control

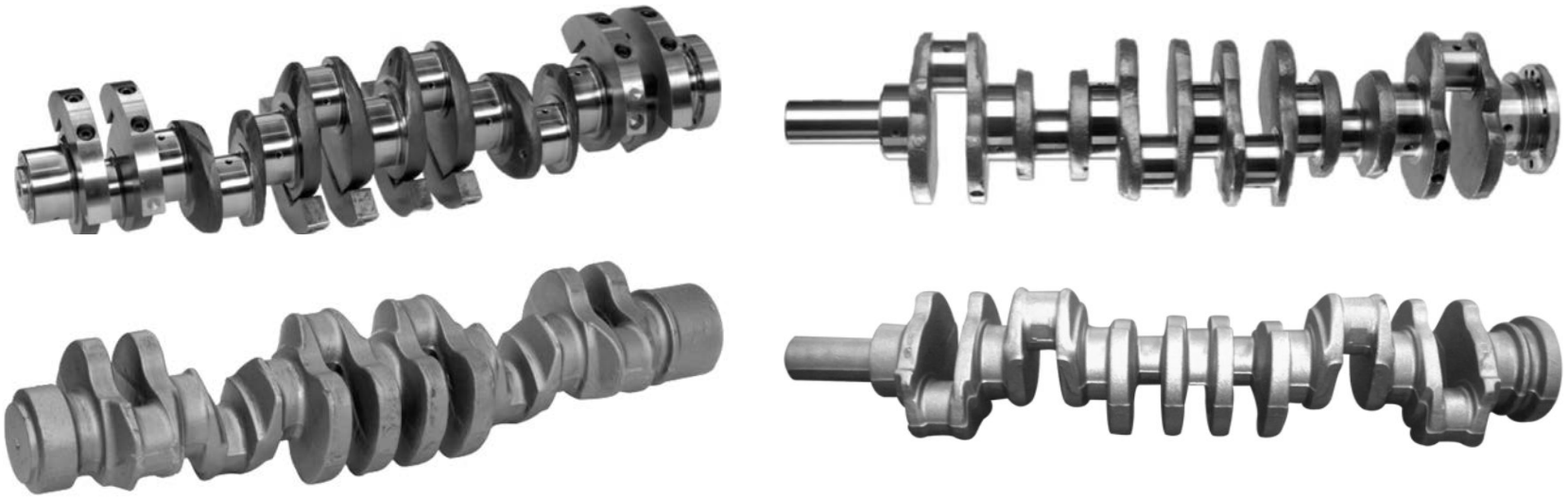
We have inculcated a culture of 'Quality First' throughout the organisation to ensure we can deliver to our promise & the part quality expected by our patrons & partners globally.

A crucial part of any Forging Process is the In-Process 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.

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

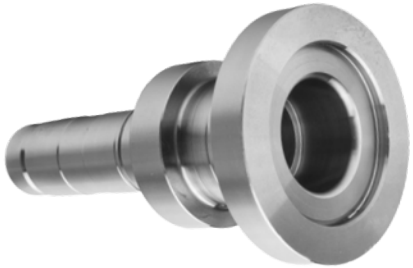
Track Shoe, Track Link, Track Roller, Carries Roller, Sprocket, Track Chain, Idler

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

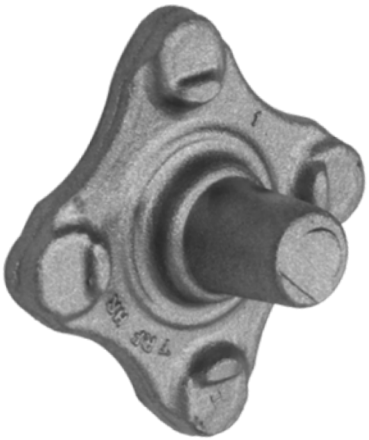
Rotor, Track, Body & Piston Brakes

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

BALU FORGE

TOGETHER WE WILL WIN