An Overview of

Production Engineering Division

Pimpri, Pune
- A captive division of Tata Motors since 1965
- The Largest Tool Room in India
  - ~1 eq. die mfg per day
  - Spread in 30,000 m2 area
- PE brings in its knowledge of vehicle level fitments and engineering in its tool making which is an added benefit to its customers to reduce project risks and manage timelines
- Commercial Operations since 2000 – 01 since then have done tooling works for O.E.M. and Tier 1 companies in India and Europe
- PE’s product portfolio comprises of Stamping Dies (Press Tools), Sheet-Metal Fixtures, Inspection Fixtures and Gauges, Foundry Tooling and Thermoforming Moulds
Tata Motors' Plant Locations in India

A. Pantnagar
B. Sanand
C. Pune
D. Dharwad
E. Jamshedpur
F. Lucknow

Tata Motors Plant in Pimpri, Pune @ 20 km from Pune airport and 20 km from Pune City center

Pune, International Airport
Profile

Product Portfolio

- Stamping Dies: 70%
- Sheet Metal Fixtures: 10%
- Jigs & Fixtures: 8%
- Foundry Tooling: 6%
- Inspection Fixtures & Gauges: 4%
- Moulds for Roof Liners etc: 2%
- Inspections Fixtures & Gauges: 4%

Product Portfolio: 100%
Products and Services offered

• Engineering Services
  • Tool Design
  • Sheet Metal Part Feasibility
  • Weld shop Process Engineering
  • Weld shop Feasibility

• Stamping Dies (Press tools)
  • Skin Panels
  • Inner Panels
  • HSLA / HSS Reinforcements
  • Aluminium Panels
  • Longitudinal / Side Members of Trucks

• Sheet Metal Fixtures
  • BIW Welding
  • Frame / Chassis Welding
  • Piercing Fixture
  • Inspection Fixtures

• Foundry Toolings and Thermoforming Moulds
Engineering Services - Tool Design

- Data management through Team centre PLM. 3D visualization in Complete tool design in 3D using Catia V5 and PRO-E
- “.jt” files format and large standards library

- Stamping Dies
- BIW welding fixtures
- BIW / Panel Piercing fixtures
- Frame Welding Fixtures
- Aluminium / Grey Iron Foundry tooling
Engineering Services - Sheet Metal Part feasibility

Method Plan in 3D

Simulation for all subsequent Forming Operations

- Virtual Try-out with PAMSTAMP and One Step Simulation modules like FTI
- DFM review by Macro-feasibility: Experienced engineers provide valuable feedbacks prior to simulation by visually reviewing panel CAD data.
- One Step Simulation: Use of FTI one step simulations to minimize Pam-stamp trials
Engineering Services - Weld Shop Feasibility

- Weld gun simulation and collision checking using Delmia
- Studying from ergonomic perspective to enable ease of handling welding and safety

Ergonomics

- Ease of Handling
- Ease of Welding
- Fatigue reduction
- Equipment safety and safe work practices
Stamping Dies

Stamping dies for manual loading press, tandem press lines with robots, transfer lines or coil fed high speed blanking lines.

Following are the types of panels and materials normally handled

- Skin Panels
- Inner Panels
- HSLA HSS Reinforcements
- Aluminium Panels
Stamping Dies: Skin Panels

- **Body Side Outer** for Tata Xenon Thailand
- **Load Body Outers** for Tata Xenon Thailand
- **Door Outers** for Tata Xenon Thailand
- **Door Outers** for Tata Aria Cross-Over

- **Roof Panels** for Tata World Truck
- **Skin Panels** for Tata World Truck
- **Door Outers** for Tata World Truck
Stamping Dies: Skin Panels

- **Roof** for Tata Aria Cross-over
- **Tailgate** for Tata Safari Storme SUV
- **Tailgate** for Tata Aria Cross-over
- **Fuel Tank Outers** for Indian OEM's Motorcycle
Stamping Dies: Skin Panels for Customers Outside Tata

- For European OEM’s Hatchback car for India
  Roof

- For Leading Japanese OEM’s MUV for India
  Rear Door Outers

- For Leading Farm Tractor Company
  Grill, Hood Top

- For an American OEM’s MUV for India
  Bumper Parts
Stamping Dies: Inner Panels

HSLA Body Pillar

Dash

Front Floor

Rear Floor

UNDERBODY AND BODY PILLARS

For American OEM in Indian Market
Stamping Dies: Inner Panels

Underbody Parts
For Japanese OEM in Indian Market
Range Rover Evoque

- Firewall Upr LHD
- Firewall Upr RHD
- Tunnel Mem LH RH
- Lower Cold Zone
- Main Floor
Stamping Dies: HSLA / HSS Panels, Reinforcements

HSS Parts for Tata Vista Hatch Back

Material DP590

Typical IFHS / HSLA material panels handled
Aluminum panels
Jaguar X150 Coupe
Stamping Dies: Longitudinal / Side Members of Trucks

- Since its inception PE has been in dealing with manufacturing and repair of tools required for producing Longitudinal / Side Members of Trucks.

- All toolings required for in-house requirements of Tata Motors, Pune trucks are managed by PE.

- 3 Axis CNC Gantry Machine that is specialised for Long Member die machining / Co-ordinate Drilling Boring

- Salient features of toolings are
  - More than 100 variants are handled
  - Modular design where-in various lengths of long members can be manufactured through same set of Mother shoes by change over / shifting various inserts outside press.
  - All Forming / Stripper pads operated by Air cushions.
  - Special Threaded Punches in Slippner steel that are easily replaceable in press.
General Flowchart (Sheet Metal Dies)

1. Receipt of RFQ & Data
2. Tentative Tooling Process
3. Costing & Preparation of Quote
4. Finance Approval & Submitting Quote
5. Technical & Commercial Discussion (as per customer methodology)
6. Submitting revised quote as per technical discussion

Simulation & MP Plan

- Tool Design
- CAD / CAM

Detailed Project Plan

- Kick Off Meeting with customer
- Negotiation & Order Placement

Planning & Production Control

- Raw Material Procurement

- Fabrication

- BOP Procurement

- Premachining of small parts

Assembly

- 3D

Correct Loops between concerned agencies

- Spotting / Suiting

Spotting / Suiting

- Final Tryout & Tool Buyoff by Customer

- Packaging

- Forwarding

- Commissioning

- Commercial Closure

Pre Assembly

- Castings
- 2D Machining

- Final Tryout & Tool Buyoff by Customer

- QA Approval

Commissioning

- Commercial Closure

Fabrication

- Castings

Packaging

- Forwarding

Finance Approval

- Submitting Quote

- Technical Discussion

Negotiation & Order Placement
Sheet Metal Fixtures

• PE has a highly skilled team that has at its credit the experience of handling almost all vehicle projects.

• Emphasis on Fixtures that are safe, ergonomic.

• Use of modular bases and units and high quality standard items.

Following are the types of Fixtures handled

• BIW Welding
• Frame / Chassis Welding
• Piercing Fixture
• Inspection Fixtures
Sheet Metal Fixtures: BIW welding

Main Line Welding Fixture for Tata Ace Small Truck

Main Line Welding Fixture for Tata Xenon, in Thailand Plant

Sub-assembly Welding Fixture

Sub-assembly Welding Fixture for Tata Xenon, Thailand
Sheet Metal Fixtures: Frame welding

- Experienced team to design and manufacture welding fixtures for “C in C” or Hydroforming type chassis / frames.
- Frames of many Tata vehicles known for their reliable performance in rugged Indian road conditions tooled in PE.

Frame Welding Process For Tata Safari Storme SUV Frame

Stage-5
- Asm.sturt mtg.bkt
- Lwr w/b cr.mbr
- Lwr w/b cr.mbr rr

Stage-4
- Fule tank mtg.cluster
- Damper mtg.Bkt.
- Rear ARM mtg.bkt.
- Rear tow ball mtg.bkt

Stage-3
- Station (Trunion)
- Full-Welding

Stage2
- Rear Suspn Bkt.
- Frt.ARB Bkt
- Frt.Bump Stop Bkt.
- Gear box extn tube

Stage1
- Ladder
  - LM-LH
  - LM-RH
  - Cr.mbrs

Trunion Fixture Having Balanced Rotation
For Tata Safari Storme SUV Frame

Frame Welding Fixture
for Japanese OEM’s MUV for India
Sheet Metal Fixtures: Piercing

- The concept of location and clamping can be innovatively used in Piercing tools
- Hydro-pneumatic systems can handle selectivity in pierced holes enabling multiple-variant management.

Pneumatic Fixture for Assembly Body Side
for Tata Indica
Sheet Metal Fixtures: Inspection Fixtures

Panel Inspection fixture
Panel Carrier Side wall RH for Tata Magic Iris
Public Carrier

Assembly Checking fixture
Assembly Underbody for Tata Ultra LCV

Assembly Checking fixture
Assembly Long Member LH for Tata Safari Storme SUV
Execution of Turn key TATA Projects in Stamping / BIW Tooling
Execution of Turn key TATA Projects in Stamping / BIW Tooling
Foundry Tooling: Aluminium Foundry

Aluminium Foundry Tools:
- Gear box Housing in HPDC
- Cylinder Head in LPDC
- Cylinder Head in GDC
Foundry Tooling: Grey Iron

Sand Casting Tooling, Patterns and Core Boxes

- Hot Box Core Box for Water Jacket Core
- Final Core Setting Fixture
- Metal Pattern for Cast Iron Cylinder Head
Hot Forming Moulds

- Thermorforming Moulds made of Aluminium with provision either for electric or oil heating

Headliner Mould Model
Technology
Resources
Facilities
Design Facilities and Capabilities

- World class infrastructure with over 100 high end workstations
- Over 100 CATIA V5 licenses for CAD and CAM supported by Pro – E and AutoCAD licenses
- Virtual Try-out facility with PAMSTAMP and one step simulation modules like FTI
- Virtual weld shop feasibility with DELMIA
- Diversified and well experienced workforce having expertise in Tool Design and Manufacturing with average experience of 16+ years.
- Data management through Team center PLM
Complete 3D Design
Virtual Try-out Facility

Virtual Try-Out Analysis for Drawing, Forming, Flanging and Spring Back using PAMSTAMP & One Step Simulation Module
Digital Prototyping Lab

• Good immersive projection room

• Encourages DMU study, so that all stakeholders can simultaneously look at the larger picture.

• Large scale projection (16 ft wide) allows real size viewing.

• Division of focus group of participants and gallery for backup group done.

• 24x7 server for remote loading of meeting documents, and complete PLM access

• Stereovision for studying complex assemblies and vehicle aesthetics
Tool Making Facilities
Thermocole Pattern Making

Well equipped thermocole (polystyrene) pattern shop with 3D visualization & Measuring tools.

In-house capacity backed with equivalent capacity through well developed vendor base.
• Well equipped machine shop with latest state-of-the-art technology.

• Machines ranging from 2D machining to modern 5 axis technology.

• Well equipped Stamping tool tryout press facility augmented highly skilled and experienced tool-making team.
NC path generation using TEBIS and CATIA V5
<table>
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<tr>
<th>TYPE</th>
<th>PRODUCER</th>
<th>TABLE SIZE</th>
<th>X mm</th>
<th>Y mm</th>
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<td>3 Axis CNC Plano miller</td>
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<td>6250</td>
<td>3700</td>
<td>800</td>
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<td>4000</td>
<td>2000</td>
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<td>2150</td>
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<td>3 Axis copy milling</td>
<td>TATA DIGIMILL</td>
<td>4500</td>
<td>2500</td>
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<td>5 Axis CNC machining</td>
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<td>2500</td>
<td>1400</td>
<td>1500</td>
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<td>5 Axis high speed</td>
<td>DROOP &amp; REIN</td>
<td>A ± 180°, C - ± 180°</td>
<td>6500</td>
<td>2550</td>
<td>1260</td>
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<td>JOBS</td>
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<td>3000</td>
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## Manufacturing: Gauge Room Machines

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<td>Universal milling and Boring</td>
<td>DECKEL</td>
<td>780 x 375</td>
<td>500</td>
<td>380</td>
<td>300</td>
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<td>Universal Precision Milling &amp; Boring</td>
<td>MAHO</td>
<td>1250 x 740</td>
<td>1100</td>
<td>600</td>
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<td>Milling &amp; Boring</td>
<td>BOKO</td>
<td>1600 x 800</td>
<td>1780</td>
<td>712</td>
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<td>Thread Grinding</td>
<td>STANKOIM</td>
<td>200 Dia x 500</td>
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<td>Universal Cylindrical Grinder</td>
<td>STUDER</td>
<td>400 Dia x 1000</td>
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<td>Universal CNC &amp; Boring</td>
<td>BOKO</td>
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# Manufacturing: General Purpose Machines

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<tr>
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<tr>
<td>CNC gas cutting machine</td>
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<td>Profile gas cutting machine</td>
<td>INDIAN MAKE</td>
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<td>Surface grinding machine</td>
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<td>Cylindrical grinding machine</td>
<td>HMT</td>
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<td>Int cylindrical grinding machine</td>
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<td>125 x 175</td>
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<tr>
<td>Int cylindrical grinding machine</td>
<td>WMW</td>
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Good Mix of experienced and young trained toolmaker in Tool assembly
## Tryout Presses

<table>
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<tr>
<th>Machine Description</th>
<th>Producer</th>
<th>Press Capacity</th>
<th>Slide Size</th>
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<tr>
<td>Single action hydro-mechanical</td>
<td>Schuler</td>
<td>2000T</td>
<td>4600 x 2500</td>
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<tr>
<td>Double action mechanical</td>
<td>Schuler</td>
<td>1400T</td>
<td>4000 x 2400</td>
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<tr>
<td>Single action mechanical</td>
<td>Isgec</td>
<td>1200T</td>
<td>3500 x 2500</td>
</tr>
<tr>
<td>Single action hydraulic</td>
<td>Isgec</td>
<td>1000T</td>
<td>3500 x 2500</td>
</tr>
<tr>
<td>Spotting press - Hydraulic</td>
<td>Muller</td>
<td>50T</td>
<td>4000 x 2100</td>
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<tr>
<td>4 point double sided</td>
<td>Erfurt</td>
<td>800T</td>
<td>4000 x 2500</td>
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<tr>
<td>Single action mechanical</td>
<td>Clearing</td>
<td>800T</td>
<td>2743 x 1524</td>
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<tr>
<td>Double action hydraulic</td>
<td>Clearing</td>
<td>1100T</td>
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<td>Double action mechanical</td>
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<tr>
<td>C F R M Press</td>
<td>Ameteep</td>
<td>150T</td>
<td>100 x 750</td>
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<tr>
<td>Die spotting press</td>
<td>Isgec</td>
<td>100T</td>
<td>4500 x 2500</td>
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Inspection facility includes Zeiss, CMM

2 Column Multi Purpose -5 Axis measurements with UMESS, KUM,KAM & HOLOS software along with general inspection tools.
Inspection facility includes Metronar Portable CMM

- High Accuracy 3-D Portable CMM offered by Metronar with three- Solo, Duo and Solo Twin PCMM systems.

- The system enables on site inspection of assembly welding fixtures / inspection of car body subassemblies on Blue buck (Part Coordination Fixture) or e-cube.
Other Facilities
## Laser Cutting

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<td>Prima, Italy</td>
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White Light Scanning

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<th>Type</th>
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<th>4MP CCD Camera’s</th>
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<td>White Light Scanning Machine ATOS III</td>
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Many Thanks