

“Eco Friendly Vehicle System Engineering Designs for Greener Vehicles”



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Tata group's vision for a greener, cleaner, more sustainable and equitable future for the planet.



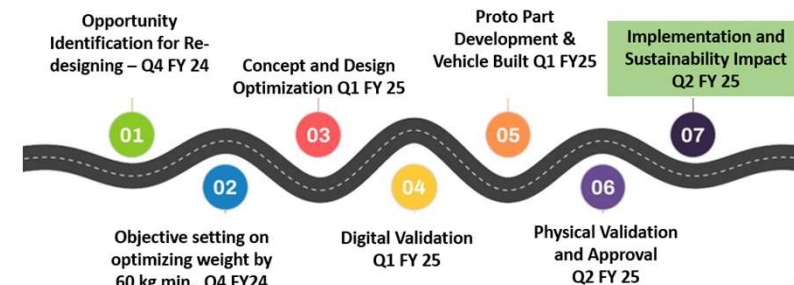
Re-engineered Products to Maximize Carbon Footprint reduction across vehicle systems `by optimization of Material Process and Weight for TATA LPT 812 Truck

- Carbon foot print reduction of 4,320 tonnes CO₂ annually
- Annual 910 tonnes virgin material reduction
- Reduced waste, energy usage

Sets a benchmark for sustainable green engineering practices



Project Milestones



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Tangible Benefits

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Environment Benefits

Energy Savings



~15,400 GJ annually
(≈ 4,300 MWh), equal to powering
~3,000 households/year.

Water Savings



~112,700 m³ annually, equal
to ~45 Olympic-size
swimming pools

CO2 Savings



~4,320 tonnes CO₂
annually, equal to
planting ~72,000 trees.

Tox Savings



Toxic gas reduction during Tyre
manufacturing



Economic Benefits

Cost Optimization of Material and Process of Major Chassis aggregates 12-15%

Fuel Efficiency Improvement by 3-4 % by rolling friction optimization

ROI 5 / 6 months for Tooling & Development cost

Intangible Benefits



Society Benefits - Reduction in Co2 emission, VOC, SO2, H2S— during manufacturing processing Enhancing Quality of human life

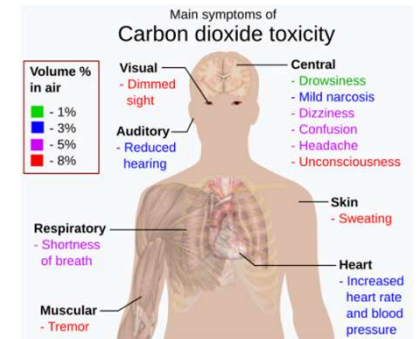


Skill Enhancement — Advanced Vehicle Design, Digital Validation and Vehicle Testing tools were utilized during our innovation which upskilled the team and enhanced capability



Attitude Shift — Challenging Status Quo and risk management benefited designer's perspective led to innovations and IP generation

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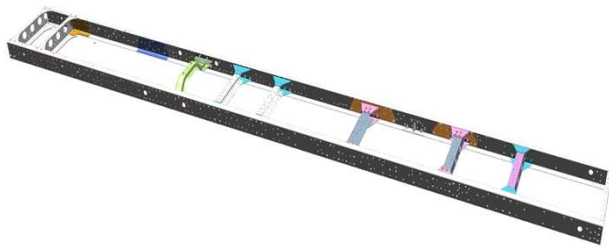
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Project Status- Implemented

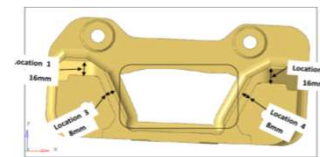
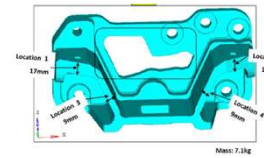
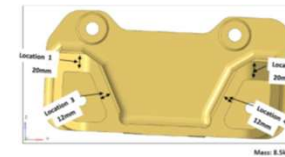
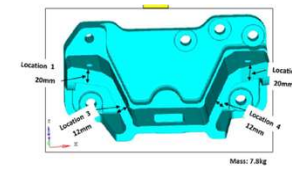
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Chassis & Suspension component with Design Optimization & Weight reduction 12-15%

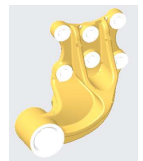
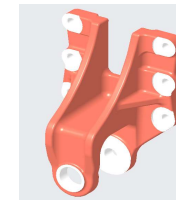
Frame Weight and Material Optimization



Mounting brackets design Optimization



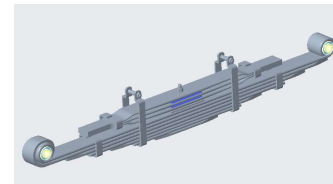
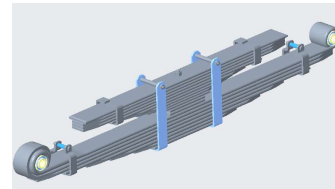
Suspension brackets design Optimization



Twin to Single Tyre Concept



Rear Spring – Redesign reduced leaf



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Environmental Best Practices Deployment Potential

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Product Launched

Environment Best Practices
Innovations Implemented
on
TATA LPT 812



Horizontal Deployment on Light .Medium, Buses planned



Industry Adaptation

Environment Best
Practices can be
adopted across industry

APPLICATIONS



Fruits &
Vegetables



Market Load



FMCG



White Goods



Containers &
Reefers



Parcel Courier &
E Commerce



Industrial Goods



Food Grains



LPG Cylinders



Beverages &
Mineral Water

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Achievement National Benchmark

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Challenging Status Quo



Current light Commercial Vehicle

- 7.5T above Vehicles with 6 tyre (2 Front + 4 Rear).
- Increases both the Kerb weight and overall cost.

Eco friendly Vehicle – LPT 812

- Design concept was proposed to develop **new 245/90R16** tyre with new wheel rim to meet required twin wheel performance.
- Re-engineered Product with Ride and handling comfort with Improved suspension to Increase Payload and Higher Fuel Efficiency



Major Highlight :

- Enhanced torque, improved power, and low-end torque.(125 PS, 350 N.m)
- 1 Ton Higher payload (First in class)
- Single Tyre in Rear.





Major Highlight :

- Better Fuel Economy(~4-5%) even after increasing 1 Ton higher payload.
- Value to money.





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Challenges during Implementation

Technical Challenges

A. Frame & Mounting Brackets

Engineering Challenges resolved during Design and Weight optimization without reduction in Performance, Durability, Reliability, Manufacturability.

Manufacturing Challenges at different supply locations analyzed and overcome with product cost optimization. Process and Cost optimization at different Retention: Similar performance and reliability (fatigue life) achieved.

B. Introduction of design optimized single tyre

Technical challenges related to Vehicle stability & dynamics, Ride & handling performance overcome in new single tyre concept without compromising customer requirements for heavy duty trucks

Administrative Challenges

With stringent project timelines team has delivered new product LPT 812 with optimum project cost.

Maintenance Challenges

Challenge of Fuel economy and Total cost of ownership were addressed through new design and weight optimization

Top 10 Best Practices Adopted

- 1. Collaboration:** Integrated design, CAE, and Materials teams for innovative concepts.
- 2. CAE Driven Optimization:** Used Finite Element Analysis to reduce weight without compromising performance & safety.
- 3. Material and Process Selection :** Ensured cost optimized Material and Manufacturability during design process.
- 4. Prototyping :** Faster Proto Built through Rapid Prototyping methods during product development
- 5. Enhanced Tyre design methodology:** Developed a new tyre specification with performance and durability validation.
- 6. Robust Design verification and validation:** Adopted knowledge of DFMEA & Product validation for higher reliability
- 7. Process Standardization:** Streamlined manufacturing processes for consistent quality.
- 8. Cost & Feasibility Analysis:** Evaluated cost-benefit of design changes before implementation.
- 9. Sustainability Focus:** Minimized material usage and energy consumption, reducing CO₂ footprint.
- 10. Learnings and Knowledge Sharing :** Learnings captured during project and will be deployed in future products.

Major Learnings From Project

This project challenged the status-quo and has led to Environment Best Practices for Automotive Industry

Eco -Design Approach:

Lightweighting requires integrating design, materials, and manufacturing considerations.

Eco Friendly Material & Process selection:

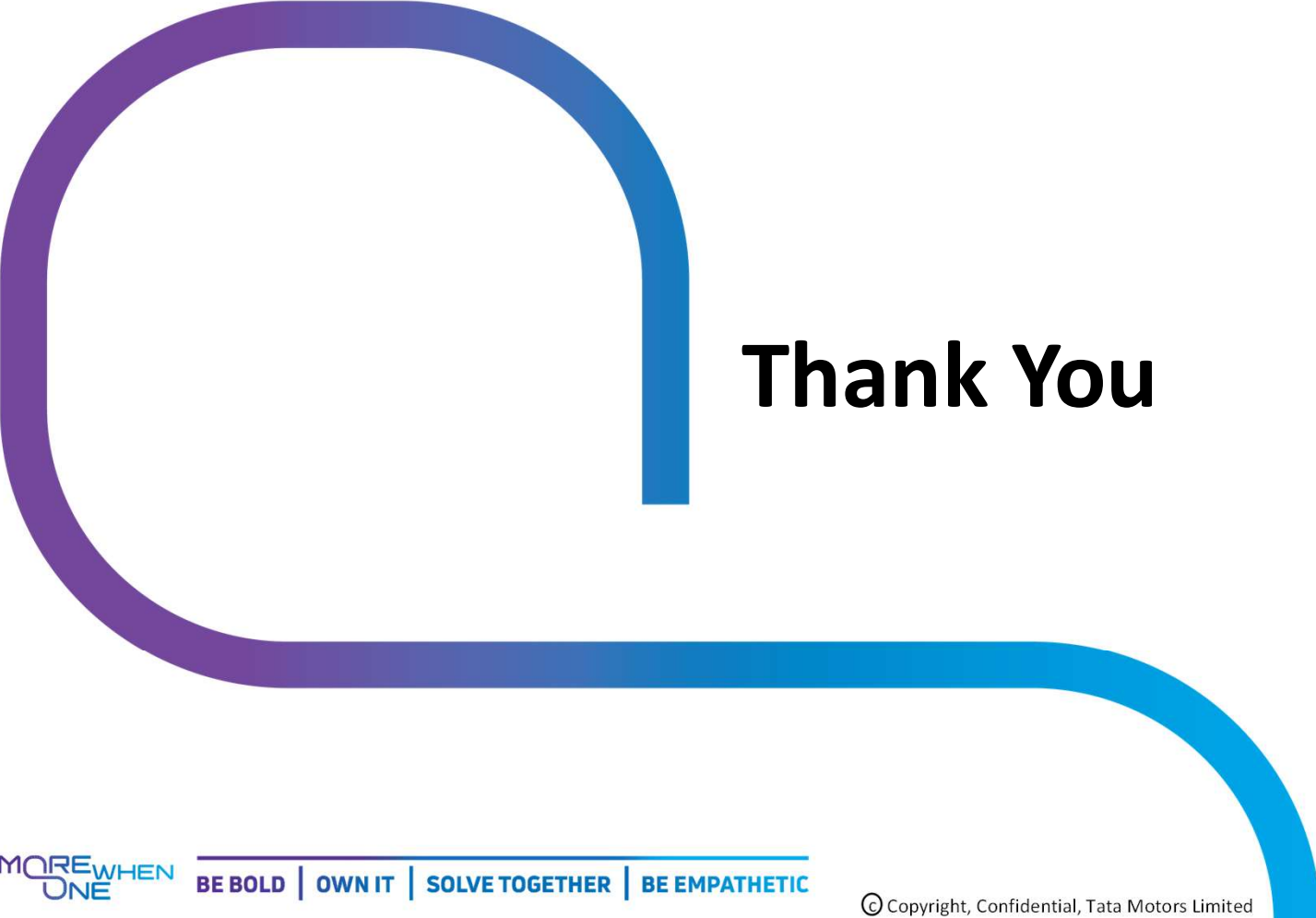
Selection of Materials and Process is key to success in early stage of the project.

Data-Driven Decisions:

FEA simulations and prototype testing are critical for optimizing performance and safety.

Sustainability Integration: Environmental benefits (CO₂, energy, water reduction) achieved alongside performance gains.

Cross-Functional Coordination: Effective collaboration between Design, Materials, CAE and Production teams accelerates implementation.



Thank You