CASE STUDY 2025

PREDICTIVE TYRE MAINTENANCE AND ANALYTICS

Presented By.

Quytech PVT. Ltd

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Company Overview

A top-tier logistics provider recognised as one of India’s foremost companies in transportation and supply chain management, with over 20 years of experience in delivering high-performance trucking solutions across the nation. Specialising in pan-India supply chain movement, the company manages a powerful fleet network with over 1500+ trucks operating seamlessly across urban, rural, and industrial corridors.
With a deep-rooted presence in the industry, the company has built a reputation for reliability, efficiency, and scale. Its commitment to operational transparency and customer satisfaction makes it a trusted logistics partner for some of India's top enterprises.

Key Strengths Driving Our Success

Reliability Through Experience

The company has established itself as a dependable logistics partner, ensuring consistent and timely delivery across complex transportation networks.

Operational Excellence

Unmatched efficiency and scalability in supply chain movement—serving urban, rural, and industrial sectors with precision.

Customer Transparency

A strong focus on transparency and client satisfaction positions the company as a trusted partner.

Problem Statement

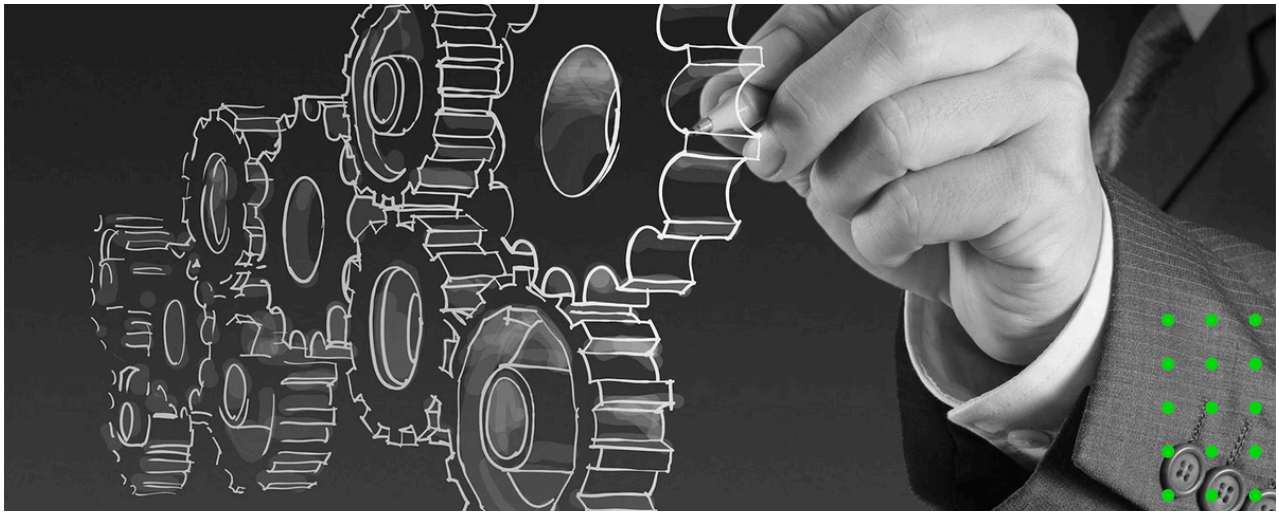
The logistics industry is increasingly burdened by rising costs and safety risks stemming from inefficient tyre maintenance practices. Tyres are frequently overused, misaligned, or remoulded too late, resulting in unexpected failures, roadside breakdowns, and operational delays. Currently, tyre tracking is fragmented across challan logs, manual fitment registers, and inspection reports, offering no real-time visibility or actionable insights. This reactive approach not only compromises fleet safety but also inflates maintenance and fuel costs. The lack of centralized data prevents logistics companies from predicting wear patterns, scheduling timely remoulding, or optimizing tyre lifecycles.

Project Objective

Leverage machine learning models to accurately predict tyre failures, remoulding requirements, and replacement timelines, enabling proactive maintenance.

- Generate real-time alerts for critical conditions such as low Non-Skid Depth (NSD), alignment issues, and missed inspection schedules.
- Establish an end-to-end system to track the complete lifecycle of each tyre across all vehicles, optimising remould intervals and overall usage.
- Perform in-depth analysis of claim ratios, recurring maintenance issues, and cost metrics at the tyre, vehicle, and driver level to support data-driven decisions.
- Forecast future tyre consumption to streamline inventory management and support efficient procurement planning.
- Centralize tyre health monitoring by integrating data from challan logs, fitment records, and inspection reports into a unified platform.
- Provide visual analytics and graphs detailing tyre purchase history, usage trends, and associated performance indicators.
- Enhance overall fleet safety, minimize tyre burst incidents, reduce operational downtime, and lower total tyre maintenance costs.

Technical Highlights



Data Preprocessing

Cleaned, standardised, and extracted key features from logs and remarks.

Feature Engineering

Created indicators like tyre age, remould history, and NLP-based risk flags.

Modelling and Validation

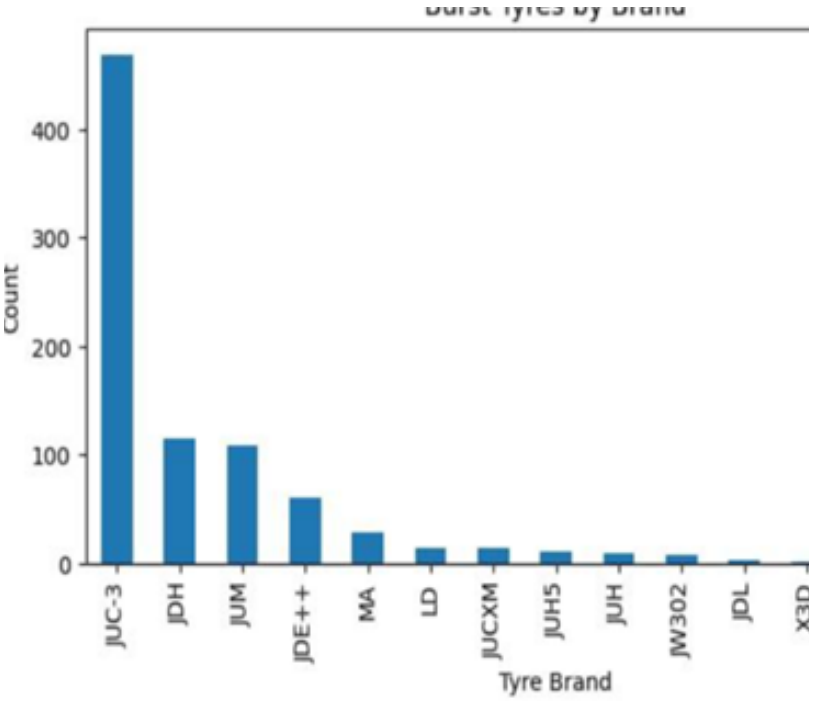
Used regression, classification, and survival models to forecast failures and actions, hence, applied time-based splits, handled class imbalance, and measured with MAE/F1-Score.

Deployment

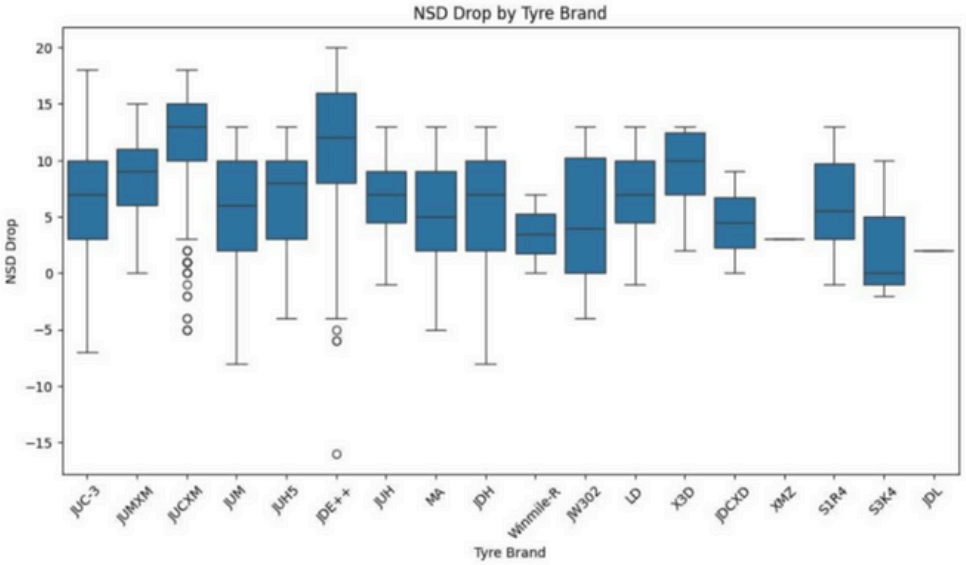
Deployed as a REST API with SHAP/LIME for explainability and integration.

Solution

Predictive Tyre Health Monitoring: It leverages AI-driven models to forecast tyre wear, track the reduction in tread depth (NSD), and identify potential failure risks before they occur. By analyzing real-time usage data and wear patterns, the system classifies each tyre into actionable states, such as Healthy, Requires Remoulding, or Needs Replacement, enabling timely and informed maintenance decisions. This proactive approach significantly reduces the likelihood of tyre bursts and unexpected breakdowns, ensuring safer operations and minimising fleet downtime



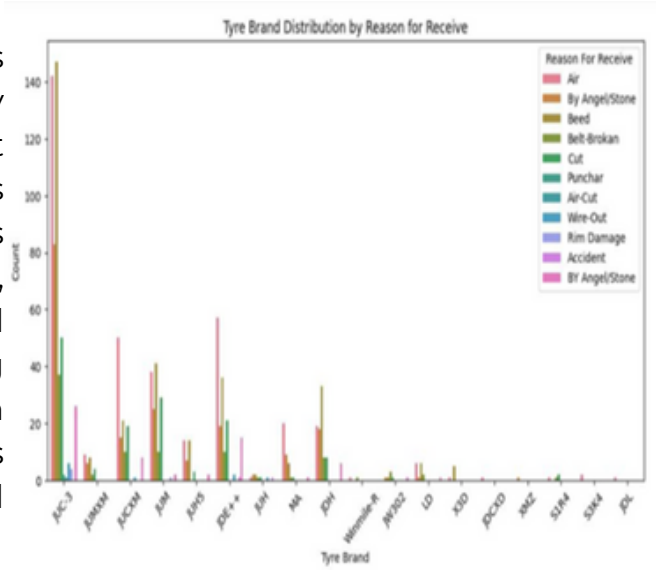
Real-Time Alerts and Notifications: It provide fleet managers with instant, data-driven warnings when tyre conditions fall below safety standards—such as when NSD (Non-Skid Depth) drops below critical thresholds like 7mm. The system also issues timely alerts for key issues including wheel misalignment, overdue tyre inspections, and identification of high-risk tyres within the fleet. These notifications are not static but are intelligently generated based on real-world usage patterns and wear rates obtained from trip and route data, allowing managers to take immediate action to prevent failures and ensure vehicle safety.



Solution

End-to-End Tyre Lifecycle Tracking: It provides comprehensive visibility into the entire lifespan of each tyre, beginning from procurement through fitment, daily operational usage, remoulding cycles, and ultimately scrapping. The system meticulously logs vital data such as remould history, total kilometers driven, vehicle assignments, and inspection records. By maintaining this detailed trail, the platform ensures that no tyre is overused or retained beyond its safe operational limit, thereby enhancing fleet safety, reducing risk, and optimizing tyre utilization.

Tyre Performance & Claim Analytics: It enables a data-driven evaluation of tyre reliability by analyzing claim ratios across different manufacturers, models, and tyre types. It helps identify recurring defect patterns such as frequent bursts, sidewall wear, or exposed wires, allowing fleet operators to make more informed decisions during procurement. By uncovering durability trends and failure causes, the system supports better vendor selection, reduces maintenance costs, and ensures higher overall tyre performance and fleet safety.

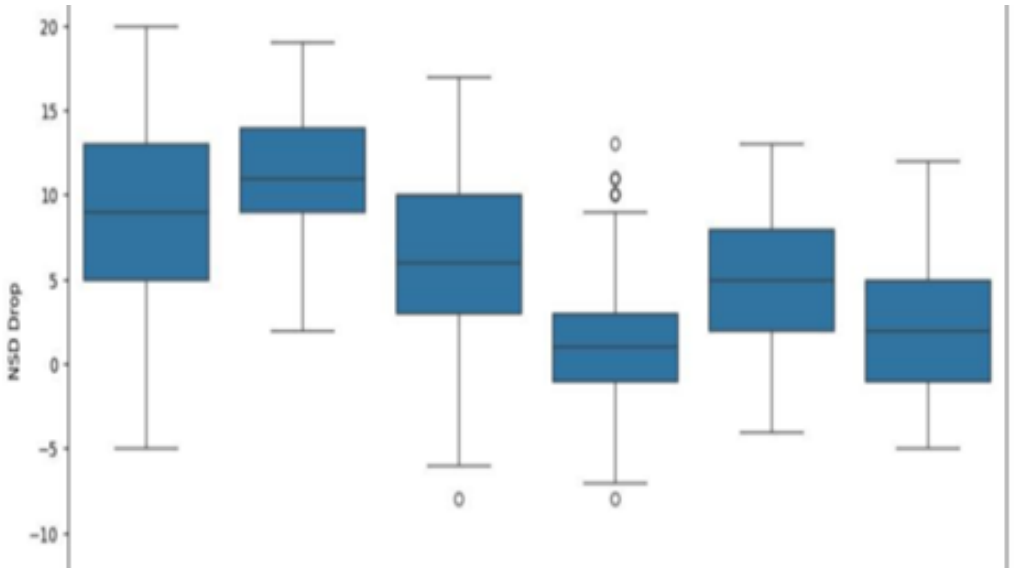


Trip-Based Usage Logging: It integrates seamlessly with challan logs or trip registers to record every loaded and unloaded journey, including the total kilometers traveled. By analyzing the impact of each trip on NSD reduction and overall tyre wear, the system provides a granular view of tyre performance in real-world conditions. This data-driven approach enables predictive maintenance planning based on actual tyre usage rather than relying on static or time-based schedules, resulting in more efficient upkeep, reduced downtime, and extended tyre life.

The Centralized Tyre Master Database: unifies all tyre-related information by consolidating data from diverse sources such as challans, inspection records, trip logs, and fitment entries. This centralized platform offers seamless access to each tyre's complete history, current status, and performance analytics, enabling informed decision-making across fleet operations. Designed with integration in mind, the system can be easily connected to existing ERP or fleet management solutions, ensuring continuity, accuracy, and efficiency in tyre data management.

Solution

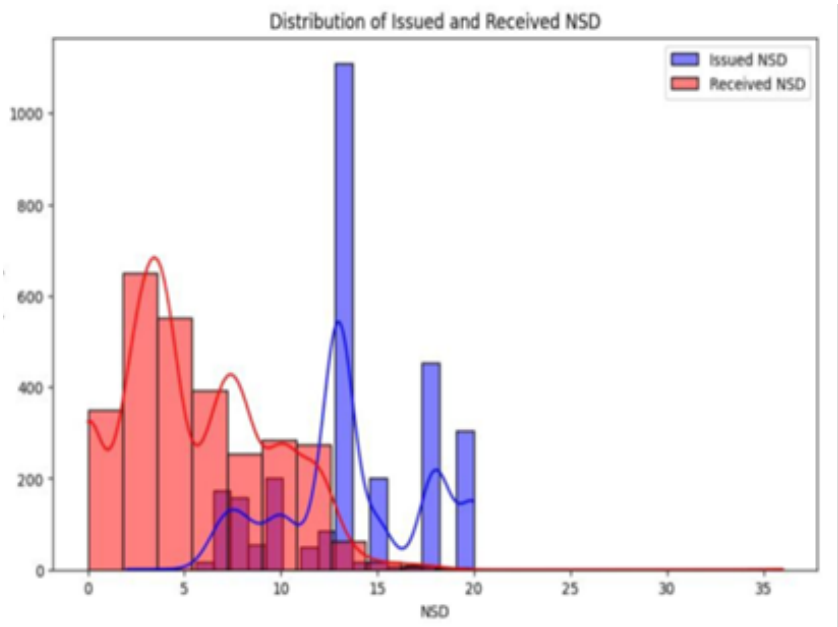
Dashboards and Reporting: provide an interactive visual interface that consolidates critical tyre-related insights in one place. The system displays key metrics such as tyre health distribution across the fleet, alert summaries, cost per kilometre segmented by vehicle or driver, and trends in claim frequency and remoulding cycles. These insights help fleet managers monitor performance, identify inefficiencies, and make data-backed decisions. Additionally, the platform generates exportable reports on a daily, weekly, or monthly basis, supporting operational reviews, compliance audits, and long-term planning.



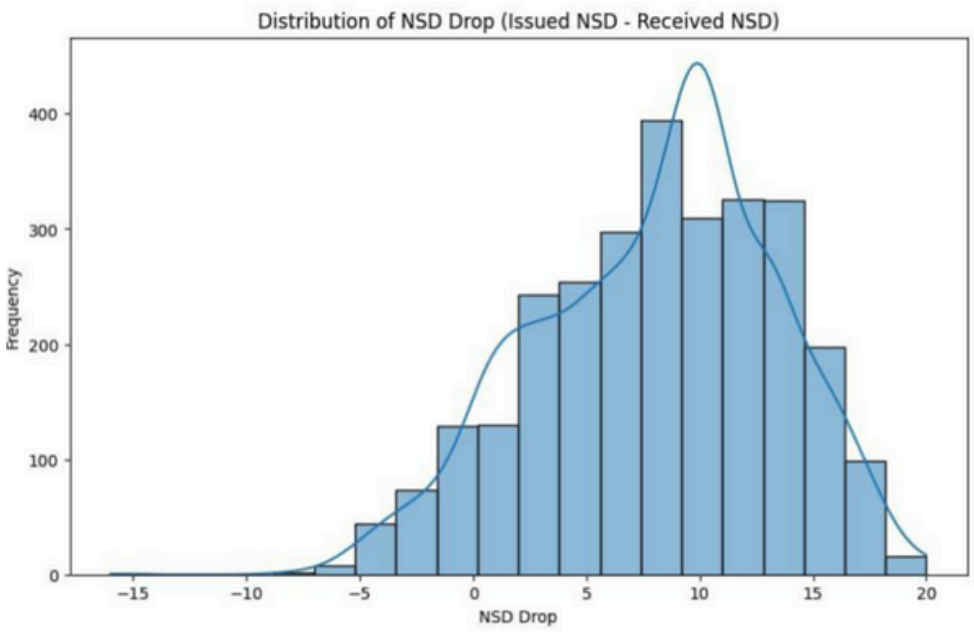
Tyre Purchase Analytics & Visual Insights offer a comprehensive view of tyre pricing and performance trends over time, across multiple brands. By visualizing historical price fluctuations and comparing them against real-world performance data, the system helps identify the most cost-effective and reliable tyre options. These insights empower procurement teams to make informed, data-driven purchasing decisions, ensuring better value for money and improved fleet efficiency.

Solution Continue

Inventory & Stock Monitoring: provides real-time visibility into tyre stock levels across various categories, including New, Under Remoulding, Claimed, and Scrapped. By leveraging AI-predicted wear patterns and usage trends, the system supports precise procurement forecasting, ensuring that tyres are available when needed without overstocking. This optimization not only reduces inventory-related costs and wastage but also streamlines the tyre supply chain, contributing to more efficient and cost-effective fleet operations.



Fitment & Inspection Record Management ensures comprehensive documentation of every tyre's lifecycle event, including fitment, removal, remoulding, and periodic condition assessments. It records the current status of each tyre—whether new, remoulded, or scrapped—along with precise NSD measurements captured during inspections. These inspection logs are directly linked to AI-based maintenance recommendations, allowing fleet managers to take timely, informed actions that align with the actual condition and performance of each tyre.



Results and Impact

Impact Area	Results
Reduced Tyre	Significant drop in on-road tyre bursts and emergency replacements
Improved Fleet Uptime	Minimized unplanned downtime, improving vehicle availability.
Optimized Tyre Usage	Extended tyre life and reduced wastage through proper remould timing.
Data-Driven Procurement	Better supplier selection and smarter negotiation using performance data.
Inventory Efficiency	Avoided overstocking and underutilization with AI-based forecasts.
Enhanced Executive Training	Identified gaps in brochure presentation to improve training.
Higher Operational Transparency	Real-time visibility and simplified audits with centralized dashboards.

Conclusion

The implementation of an AI-powered Tyre Monitoring Performance Analytics system brought measurable improvements across the client's logistics operations. By shifting from reactive to predictive tyre management, the solution significantly reduced breakdowns, optimised tyre lifespan, and streamlined inventory and procurement processes. Simultaneously, the video analytics tool enhanced the quality of customer interactions by providing actionable insights into executive engagement. Overall, the solution not only improved safety and efficiency but also empowered data-driven decision-making, setting a new standard for operational excellence in logistics fleet management.

Future Plan

Client plan to add real-time sensor data to monitor tyre health live and build a mobile app for technicians to log inspections easily. Therefore, also connect driver behavior to tyre wear and set up smart reminders for maintenance.

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Thank You