

WheelSense

Intelligent Wheelset Management

Why existing approaches failed –
and what WheelSense does differently–

Why existing approaches have not established themselves – and how we do it differently

The **study of the wheel-rail interface** is as old as rail transport itself. For decades, efforts have been made to **maximize the lifespan of wheelsets** – whether through “the perfect” wheel profile, modified flange lubrication, additional sensors, or complex profile analyses. Yet all these approaches share one thing in common: **they have not achieved lasting success in the market.**

The reason lies not in a lack of technological progress, but in a **lack of practical applicability.** Most research results and solutions are too theoretical and cannot be seamlessly integrated into existing processes. Operators need systems that are tailored to their specific requirements – without adding complexity to daily operations.



We developed **WheelSense** together with our customers – with a clear focus on the practical challenges they face: making better decisions, planning ahead, and avoiding unnecessary downtime.

Major challenges in day-to-day operations: Minimizing downtime and avoiding material loss



Bogie overhauls or wheelset replacements are often planned too late



The **overhaul of bogies or the replacement of wheelsets** often needs to be planned more than a year in advance – not only because service partners require **long lead times**, but also to assess potential **synergies** with other major maintenance activities, such as vehicle overhauls.

To estimate a wheelset's remaining service life that far in advance, its specific wear must be realistically projected – taking **future reprofiling** into account. This kind of interpolation is complex, and **traditional fleet management systems** offer no support for it.

**The consequences are as unnecessary as they are costly:
Incorrect assessments, unexpectedly early
overhaul needs, and extended downtimes.**

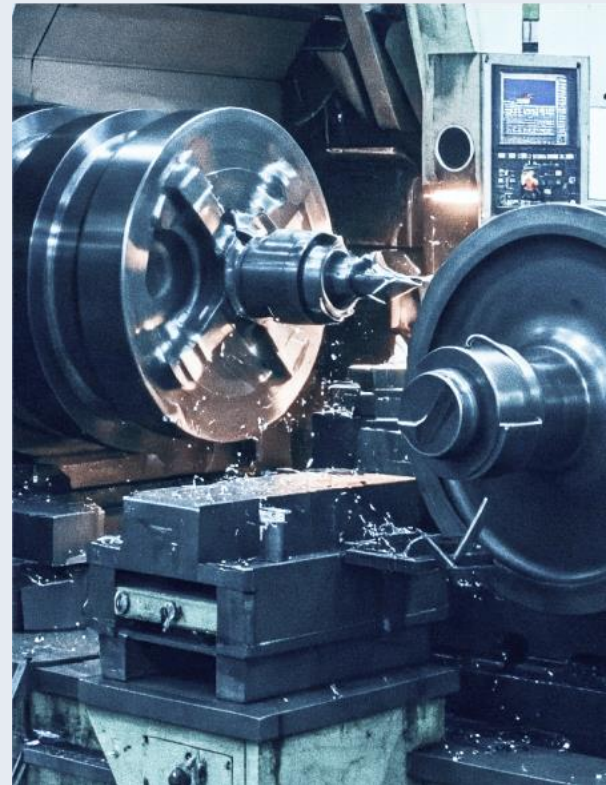
Major challenges in day-to-day operations: Minimizing downtime and avoiding material loss



Not all limits are equal – they need to match the vehicle characteristics

Flange thickness has a significant impact on a vehicle's running behavior – especially on sinusoidal movement and the development of hollow wear. A thicker flange can improve **the guiding effect of the wheel** – particularly in tight curves or on irregular tracks. At the same time, it restricts the radial steering of the wheelset, which can lead to higher lateral forces and **increased wear**.

Conversely, a **thinner flange allows for smoother sinusoidal movement** and lower lateral forces – but this comes at the cost of reduced guidance. Especially when thin flanges are used continuously, **hollow wear** becomes more likely, as the contact point shifts inward on the tread, disrupting uniform material wear.



The optimal limit depends heavily on the vehicle's operational profile. That's why limit values **shouldn't be defined fleet-wide**, but tailored **individually to each vehicle**.

This is exactly where **WheelSense** comes in: By analyzing historical wear data, the system helps evaluate – on a per-vehicle basis – how flange dimensions have influenced wear over time. This enables targeted insights from past behavior and informed recommendations for adjustment.

Major challenges in day-to-day operations: Minimizing downtime and avoiding material loss



Maintenance planning often lacks a proactive view on material wear



In practice, reprofiling is often only performed when the wheel profile is about to exceed the permitted limits. What is frequently overlooked: if the reprofiling had been scheduled just one or two inspections earlier, the **amount of material removed could have been significantly lower**. These optimization potentials remain unused today because fleet managers lack reliable forecasts or historical analyses.

WheelSense provides transparency: By analyzing historical data and individual wear patterns, the system makes it possible to **identify the optimal time for reprofiling early** – and thus avoid unnecessary material loss.

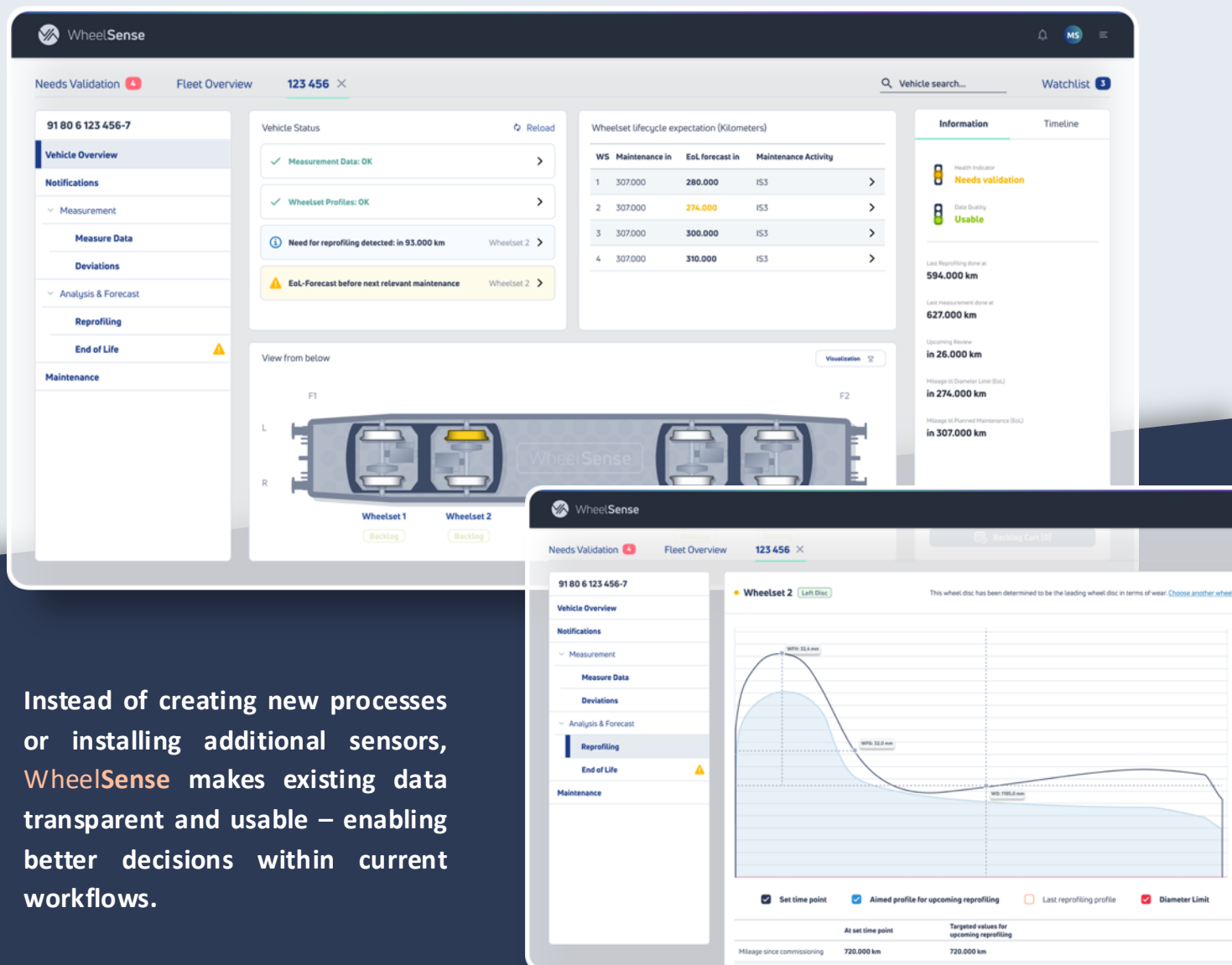
In the final phase of a wheelset's service life, special attention is required. If this point is not identified and planned in time, it often happens that the last reprofiling (URD treatment) reduces the wheel diameter below the minimum limit. In that case, the vehicle can no longer be operated and must undergo an unscheduled wheelset or bogie replacement.

The result: significant downtime and additional costs. WheelSense helps identify these critical situations in advance – through systematic analysis of historical data and clear indicators of approaching end-of-life thresholds.

All these challenges share one thing in common:
Existing data is not being used effectively to support decision-making.

The Answer: Putting **WheelSense** into Action

WheelSense was designed to address the very gap where current systems lack the necessary transparency and depth: the **intelligent use of existing measurement and maintenance data.**



Instead of creating new processes or installing additional sensors, **WheelSense** makes existing data transparent and usable – enabling better decisions within current workflows.

WheelSense provides:

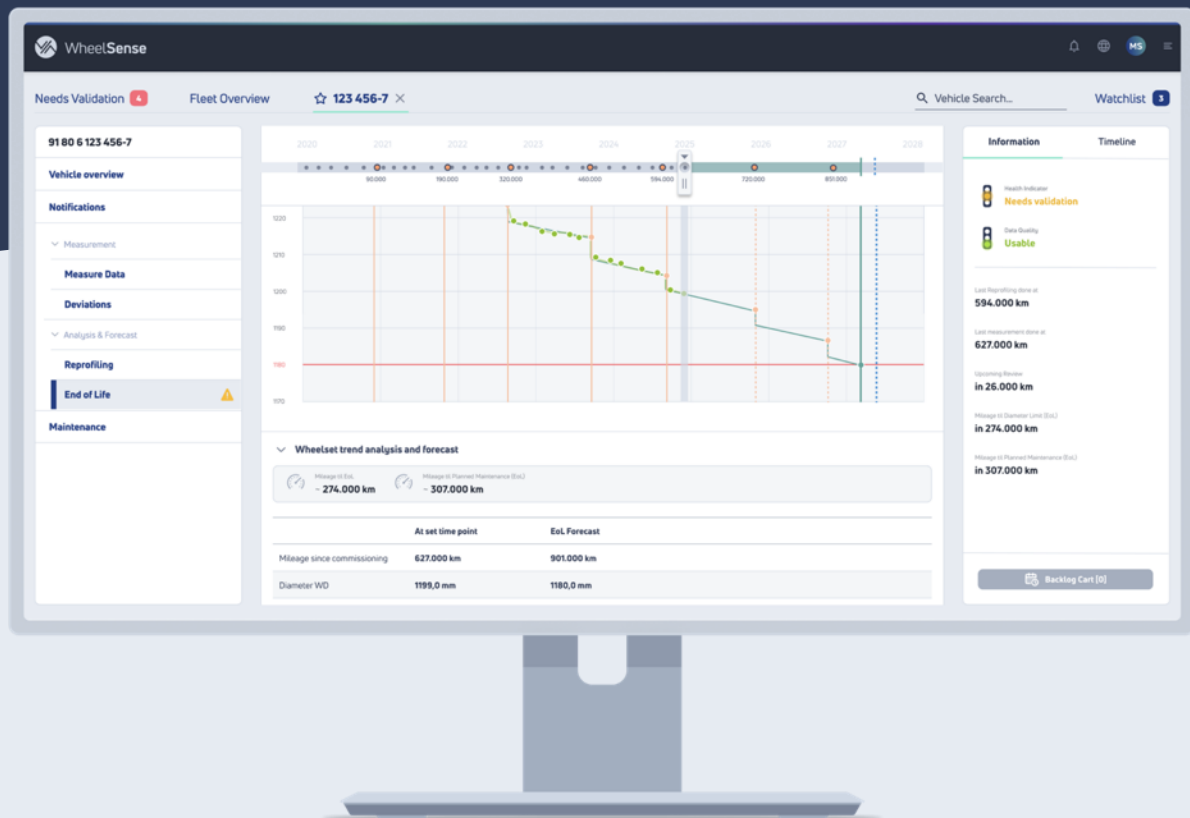
Clear insights into the **wear history** of every wheelset

Early identification of the **final reprofiling** before end-of-life

Forecasts for the ideal **reprofiling time**

Vehicle-specific recommendations based on real wear history

Seamless integration into existing systems and delivery of relevant information



By processing and presenting this information in a targeted way, **WheelSense** supports fleet managers, maintenance planners, and workshops in planning more precisely, avoiding material loss, and reducing downtime – without costly sensors, new materials, or complex operational changes.

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