

A futuristic train station with a high-speed train. The train is sleek and aerodynamic, with a blue and white color scheme. It is surrounded by glowing blue digital lines and patterns, suggesting advanced technology. The station has a modern, industrial design with large glass windows and digital displays. In the background, a control room with multiple monitors and people working is visible. The overall atmosphere is high-tech and innovative.

Atos

How Talgo and Atos reinvented train maintenance

From fixed schedules to trains that flag their own faults.

Founded in 1942, Talgo has spent more than eighty years building its reputation by doing things differently, with high-speed trains designed around comfort, safety and speed. But as its fleets grew and expanded across the world, one part of the operation struggled to keep pace: the way those trains were maintained.

The challenge: maintenance built around the calendar, not the train

Traditional train maintenance follows a fixed schedule. Inspections take place at set intervals, whether a system needs attention or not. That cuts both ways: time goes into checking components that are perfectly fine, while faults that develop between inspections can go unnoticed until they cause a delay.

For Talgo, a manufacturer maintaining high-speed trains across dozens of countries, that approach was becoming both costly and limiting. Routine inspections took engineers away from more valuable work and every new fleet meant more trains to inspect and maintain.

So, Talgo wanted to turn that logic around: let the actual condition of each train, rather than the calendar, determine when maintenance was due.

A five-year partnership, not a project

To reach that goal, Talgo needed a partner to help them process telemetry from moving trains in real time, analyse a vast stream of signals and turn that data into insights engineers could act on within a second. In 2020, Talgo turned to Atos to design and build the solution. A single team brought together deep rail expertise with data and AI engineering, in a collaboration that has been running for five years now.



THE SOLUTION

a fleet that reports its own health

The result is TSMART, a platform that monitors the fleet in real time. Across around 100 trains worldwide, it streams and analyses more than 30,000 signals per second from each train, processing roughly 5 GB of data per train every day. Within about one second, those signals are turned into a clear visualisation on an engineer's screen, giving teams a real-time view of the fleet's condition.

On top of that live monitoring, TSMART turns data into foresight:

- Predictive models, delivered through an MLOps architecture, flag components before they fail.
- An engineer cockpit traces alarms and signals back to their source, including live values.
- The platform can scale to new train series without having to be rebuilt each time.

Atos designed and built the system and continues to operate it end to end, with the data platform running on Google Cloud.



Developing TSMART changed the conventional paradigm from systematic preventive maintenance to a dynamic model based on predictive, condition-based maintenance using AI.”

José Antonio Marcos

Head of Intelligent Maintenance Systems Engineering and New Projects, Talgo

THE IMPACT

Measurable, and running around the clock

The results speak for themselves:



15%

better fleet
reliability



10%

better
maintainability



5%

better
availability

20h

of inspection time
saved per train, per year

The impact goes beyond the numbers. Because faults are detected before a train reaches the maintenance base, breakdowns decrease, fewer reactive repairs are needed and maintenance intervals can safely be extended.

Atos operates the platform 24/7 from global operations centres, ensuring continuous monitoring and support. That combination of predictive technology and ongoing operational support has turned a one-off project into a lasting change in how the fleet is maintained.

Five years in, Talgo is extending TSMART to new train series and can even offer the platform to others as a service. The lesson for other rail organisations is clear: predictive maintenance only delivers when the monitoring, the models and the people behind them work as one.



**It has been a very
successful project that
helped us meet all these
challenges.”**

José Antonio Marcos

Head of Intelligent Maintenance Systems
Engineering and New Projects, Talgo



For rail organisations with growing fleets, the challenge is clear: how do you prevent an ageing maintenance model from holding you back? The answer is not simply AI. Predictive maintenance only delivers when monitoring, models and the people operating them work together.

**Curious what predictive, data-driven
maintenance could mean for your fleet?**

Let's talk →

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