

Keeping trains, track and infrastructure in tip-top condition

Maintenance is key to ensuring that European railways remain safe, reliable, and efficient.

This involves keeping close watch on key assets throughout the rail system:



trains



track



associated infrastructure

THE CHALLENGE



Maintaining and renewing the continent's rail infrastructure costs over €25 billion annually, and can cause long disruptions. Demands rise steeply as rail networks expand.

Rail faces a growing maintenance challenge.

HOW DO WE TACKLE THIS?

With innovative technologies and data analytics. EU-Rail demonstrations developed and tested an array of new maintenance solutions using:

- **Data-driven technologies**
- **Intelligent Asset Management (IAM)** and digitalisation

Prototype	How it works	Key findings
On-Track Autonomous Multipurpose Mobile Manipulator (OTA3M)	Road-rail excavator enhanced with trajectory scaling algorithms; fast-reacting Inertial Measurement Units; autonomous running modes and safety systems	Significantly improved efficiency, safety, control accuracy. Task operation 20% faster; positive Economic Net Present Value €90 million over 20 years
Occupational Back-support Exoskeleton (oBSE)	Fitted with sensors and IoT capabilities, helps workers lift and carry	Musculoskeletal loading reduced by up to 50% ; improved worker productivity and safety
Unmanned Ground Vehicle and End Effector	Autonomous vehicle equipped with command and control system; and a Robotic device that screws and unscrews rail fasteners	Better obstacle detection accuracy and maintenance cycle times; reduced ergonomic risks; produces up to 302.5 sleepers per hour
Who benefits		
	Infrastructure managers	 Railway operators

INTELLIGENT ASSET MANAGEMENT SOLUTIONS

Key findings	
Italian Urban Metro System IAMS	In urban areas IAMS can successfully: detect anomalies, increase data availability, reduce passenger disruptions
Digital Twin for Railway Asset Management	Scalable, easy to maintain. Can be integrated into existing information systems.
Anomaly Detection for Rail Fastener Systems	New Lindometer successful in adverse weather at 70 km/hour. Detects anomalous points precisely
Automated data collection and intervention	Algorithm now offered as an additional feature in TIRIS asset management system for predictive maintenance
SMART maintenance on rail freight corridor	Considering track anomalies, root causes, greatly improves maintenance planning and execution efficiency
IAM On-Track Machine Decision-Support Tool	Demo achieved TRL 6-7; could reach TRL 8, if used in existing systems
IAM Life Cycle Engineering tool	Enables comparison of maintenance strategies; guides choices respecting budgets
Operational Asset Management	Improves data acquisition, analytics, rail network maintenance decision-making
Integrated Maintenance Decision Support Platform	Provides decision-makers with diverse scenarios; Satisfactorily reproduces manual planning
IAMS integration demonstrator “Gotham City” with a Human Machine Interface	Live monitoring: interactive map of whole line, dashboard for KPI monitoring; Historical data visualisation of the map assets, access to all relevant information



THE BENEFITS OF DATA-DRIVEN TECHNOLOGIES AND INTELLIGENT ASSET MANAGEMENT

- More frequent, higher quality, relevant data on the conditions of key rail assets
- Optimised decision-making on maintenance needs and urgency

Better asset management = railways that are more efficient, attractive and cost-effective

WANT TO LEARN MORE?

Solutions developed by Shift2Rail, Europe's Rail's predecessor programme

rail-research.europa.eu

