Althen Sensors

Smart Tram Monitoring at HTM: Althen Sensors & Controls Implements 3D Wheel+ System

3D Wheel+ integrating real-time weighing, 3D wheel profiling and vehicle identification into one seamless installation

Innovative real-time weighing and 3D wheel measurement enhance predictive maintenance at HTM.

Driving Railway Digitalisation with 3D Wheel+

Railways and public transport systems worldwide are increasingly embracing digitalisation and smart maintenance technologies. Predictive maintenance, real-time diagnostics and data-driven fleet management are no longer futuristic ambitions – they are essential strategies for efficient, safe and sustainable operations. Recognising this shift, HTM partnered with Althen Sensors & Controls to implement a state-of-the-art measurement solution: 3D Wheel+.

A Strategic Upgrade for HTM

HTM, the public transport operator in The Hague region, needed a smart, automated system to monitor tram conditions with minimal operational disruption. Althen responded with its 3D Wheel+ solution, integrating real-time weighing, 3D wheel profiling and vehicle identification into one seamless installation.

The project, technically led by Sylvio Puzzo, Senior

Project Engineer at Althen, was executed with precision, overcoming the complexities of an urban viaduct installation and strict operational timelines.

3D Wheel+: A Combined Smart Solution

At the heart of this project is the integration of:

- **Dynamic Weighing System (AWIM):** Measures axle loads, wheel loads, total tram weight and balance dynamically as trams pass at regular speeds
- **Automated 3D Wheel Measurement System:** Laser scanning technology captures precise wheel profiles, measuring critical parameters like flange height, flange thickness, tread wear and wheel diameter without stopping the vehicle
- **Vehicle Identification via RFiD:** Each tram is uniquely identified, ensuring accurate tracking and data linkage

Using advanced load cells integrated into the rails, the AWIM system dynamically records the load distribution without requiring vehicles to halt or slow down. Simultaneously, the laser-based 3D Wheel+ system captures ultra-high-resolution wheel profile data, enabling early detection of wheel defects such as flange wear, flat spots or ovalisation.

All systems are linked via smart data architecture to HTM's new Data Hub, enabling predictive maintenance strategies.

Installation in an Urban Environment

Installing 3D Wheel+ on an elevated viaduct near The Hague Central Station required detailed coordination. The location, selected for its open construction and minimal disruption to tram schedules, demanded precise sensor positioning, custom concrete mounting and night-time installation windows.

"Urban installations always bring unique challenges," explains Sylvio Puzzo. *"We engineered the 3D Wheel+ system to ensure durability, easy maintenance and perfect integration with HTM's infrastructure."*

Real-Time Data, Predictive Maintenance

3D Wheel+ continuously captures and transmits data to HTM's backend. Key benefits include:

- Immediate visibility of wheel and weight condition through an online dashboard
- Alerts triggered when measurements exceed safety thresholds

Dynamic Weighing System: measures axle loads, wheel loads, total tram weight and balance dynamically as trams pass at regular speeds

- Automated data feed into HTM's Data Hub and AURA Wheel system via REST APIs
- Seamless integration with existing asset management systems
- Reduction in unexpected maintenance interventions and associated costs

Protecting Infrastructure through Early Detection

Beyond individual tram maintenance, 3D Wheel+ also contributes to predictive track maintenance. By identifying trams with out-of-tolerance wheels early, HTM can anticipate potential areas of accelerated rail wear along the network. Over time, this data-driven insight helps prevent localised damage, reduces the need for costly track repairs and ensures smoother, safer operations across the system.

This empowers HTM to move from reactive to predictive maintenance, significantly improving fleet uptime and operational safety.

"HTM now benefits from a continuous stream of reliable, actionable data," says Olaf de Kok, Commercial Director at Althen. *"It allows for smarter maintenance planning and ensures the highest safety standards."*

Tailored for HTM

Though based on Althen's proven platforms, the 3D Wheel+ for HTM included:

- Custom weather protection for coastal conditions
- Specific calibration for multiple HTM tram models
- Customised software dashboards with configurable alert thresholds
- Integration with both HTM's Data Hub and Nem Solutions' AURA Wheel system

Benchmark for the Future

The successful delivery of 3D Wheel+ at The Hague Central Station sets a new standard for urban tram monitoring. Althen has proven that complex, real-time measurement solutions can be deployed efficiently, even in challenging environments.

The project highlights Althen's capability to deliver complete system integration, including mechanical installation, sensor calibration, IT connectivity and aftercare.

Automated 3D Wheel Measurement System: Laser scanning technology captures precise wheel profiles and wheel diameter without stopping the vehicle

Looking Ahead

Following the successful launch, HTM and Althen continue to collaborate on fine-tuning, monitoring and potential expansions of the 3D Wheel+ system to additional tram lines.

As urban mobility systems become increasingly complex, solutions like 3D Wheel+ will be critical. Smart measurement and predictive maintenance technologies are rapidly becoming standard practice across global public transport networks. Operators seeking to maximise vehicle availability, extend asset life and ensure safety are turning to integrated monitoring platforms as a strategic necessity.

HTM's proactive investment in smart diagnostics sets a shining example of how modern cities can future-proof their public transport fleets.

About Althen Sensors & Controls

Althen Sensors & Controls is a trusted partner for sensor, measurement and control solutions in railway, industrial and infrastructure sectors. With decades of experience and a commitment to customer-specific innovations, Althen delivers technologies that drive smarter, safer and more efficient operations.

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