FRAUSCHER

Track more with less.

Case Study

Tracking Trains in Houston FAdC and RSR180

Requirements

Houston MetroRail, or METRO for short, is comprised of three light-rail lines totaling 22 miles. Two-car, low-floor trainsets are powered by overhead catenary and operated on a mix of rail types, including embedded, grooved, concrete, and ballasted track. Extreme heat, humidity, and storms that produce heavy rain and flooding are typical in Houston. The combination of severe weather and the variable track structure presented significant challenges to the reliability of wheel sensors at the core of METRO's signaling system. The previously installed equipment was unable to handle these conditions and malfunctions were commonplace, which led the operator to explore alternate solutions. The need for significant improvements in uptime, availability & safety became more apparent as Houston began preparations to host Super Bowl LI, which would take place in early 2017. The expected influx of approximately 700,000 visitors would greatly increase the burden on the already troubled METRO system.

Solutions

METRO invited several suppliers of axle counter solutions to participate in trial installations to demonstrate the uptime, availability and overall performance of their respective products. Frauscher engineers understood that the complicated track structure and environmental conditions required wheel sensors that are easy to install, immune to extreme heat, and waterproof with an IP68 rating to provide immunity to flooding. After a successful trial at the first location, Frauscher was asked to conduct a second trial in a different location. METRO verified through these trials that the Frauscher Wheel Sensor RSR180 is robust and not impacted by water or other environmental conditions. They installed 565 Wheel Sensors RSR180 along the rail line, and the axle counter Frauscher Advanced Counter FAdC in 103 locations throughout the network. The FAdC is vital, fail-safe, and CENELEC SIL4 safety rated.

Benefits

The Frauscher axle counting solution met all of Houston METRO's environmental, interface and reliability requirements. The operator appreciated the ease of installation and reduced maintenance costs, as well as a smooth transition from the existing problematic train detection system. Since installation, METRO has experienced a consistent and significant reduction in down time and maintenance costs, which will continue to add up over the lifecycle of the system. The additional smart functionalities that were implemented further increased the availability of the system.

Project details

A challenging operating environment

Weather is a major contributor to the complexity of METRO's operating environment. Factors include high heat, humidity, and supercell storms that produce sudden, heavy rainfall. These storms result in the sensors becoming submerged under water, especially in areas with embedded track sections. In addition, since the embedded track sections act as a drainage system for the city streets, the flowing water would carry trash and debris into these embedded sections. This debris would frequently trigger false occupations, increasing downtime and decreasing availability.

Replacement requirements

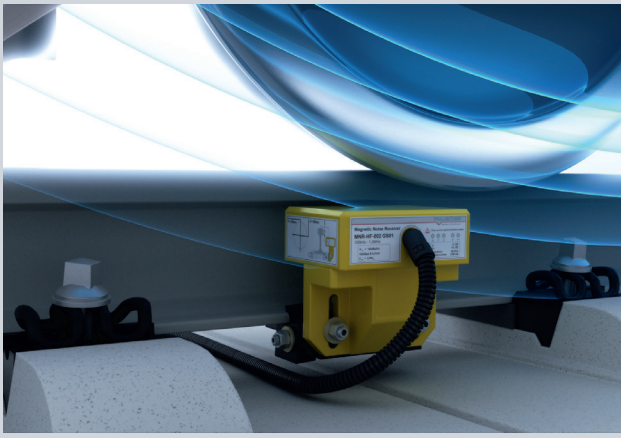
METRO required that the implementation of a replacement train detection system meet several criteria, including the ability to seamlessly integrate with the existing signaling system and to utilize as much of the existing I/O and wiring as possible. In addition, any new solution must interface with existing infrastructure such as trackside equipment cabinets and traffic control systems. Since many of the wheel sensors are installed in high traffic areas (rail, auto and pedestrian), the need to minimize service disruptions during installation and commissioning was vital. METRO also required that the new sensors be able to withstand significant electromagnetic disturbances. These criteria would be used to evaluate the trial results for all tested systems.

First on-site demonstrations

After thoroughly evaluating Houston's requirements, Frauscher offered a trial with twelve RSR180 wheel sensors connected to the Frauscher Advanced Counter FAdC. They were installed in six locations of embedded track downtown. Following the success of this trial, METRO requested a second trial installation at a vital interlocking of the Northline Transit Center, and this trial was also successful. During this second trial, intermittent electromagnetic interferences (EMI) occurred, which is not uncommon for this type of rail system. Frauscher was able to troubleshoot by using its Magnetic Noise Receiver MNR to analyze all METRO fleet vehicles. The MNR provided the information needed to choose a sensor with an operating frequency that would not be affected by the train-emitted interference, guaranteeing optimal performance.

In Houston, wheel sensors must work reliably under water

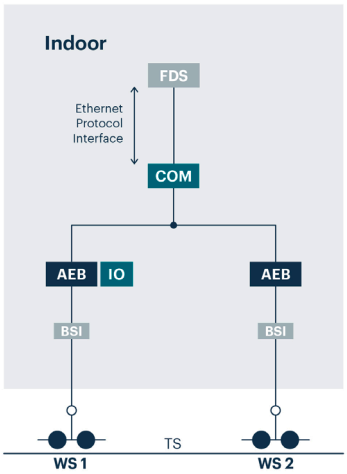
The Wheel Sensor RSR180 is highly robust against various influences



The Magnetic Noise Receiver MNR is a mobile measuring system

Smart functionalities for maximum availability

The trial results concluded that the Frauscher Advanced Counter FAdC met all of METRO's requirements regarding environmental influences, interfaces, reliability and seamless integration into the existing infrastructure. The flexible design of the FAdC enables efficient data transfer via relay interface to the traffic control system and interlocking. The existing cable system only required slight modifications, and the actual installation activities had minimal impact on operations. In addition, two optional intelligent functions, Supervisor Track Sections and Counting Head Control, were utilized to counter the effects of unexpected influences such as metallic debris.

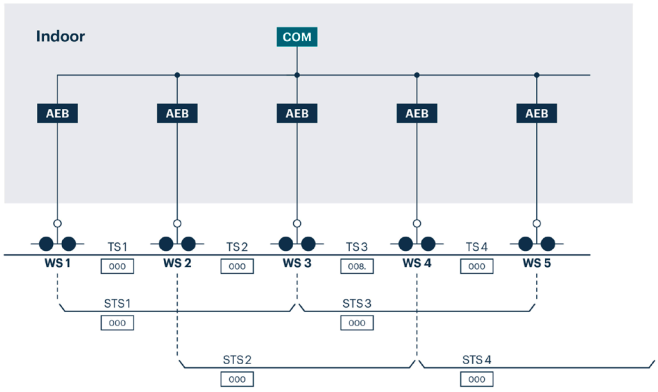


Frauscher Advanced Counter **FAdC**

Supervisor Track Section STS

The Supervisor Track Section STS function allows operations to continue should a disruption from an external source occur, without sacrificing safety or vitality. The STS function corrects these interferences by establishing supervisor track sections that monitor and synchronize the track sections within them, creating a virtual track section.

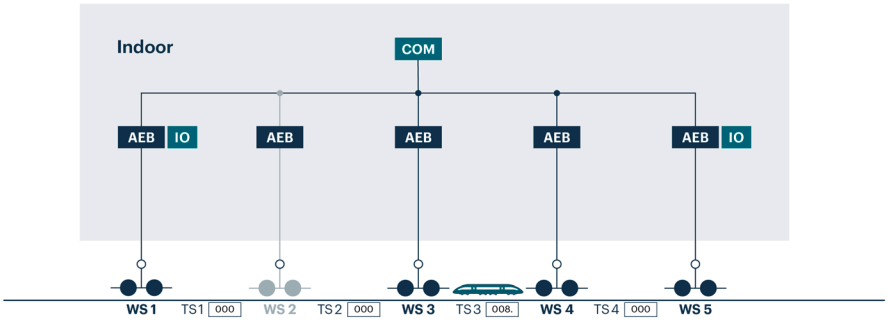
STS allows a faulty track section to be reset automatically if the corresponding STS is clear. Similarly, a faulty STS is automatically reset if the two corresponding track sections are clear. This increases the system's availability without additional cost, equipment, or negative effects on safety.



STS overlay the existing track sections

Counting Head Control CHC

The Counting Head Control CHC function helps prevent false activations due to unexpected disturbances such as road traffic or debris on the surface of tracks. If adjacent track sections are clear, the wheel sensor switches to stand-by mode. In this state, a configurable number of disturbances or false presence detections can be suppressed. As a result, uptime and availability is increased. Once an approaching vehicle enters either of the adjacent track sections, the stand-by mode is immediately deactivated, resulting in normal fail-safe train detection at a SIL4 safety level.



CHC Active counting heads at traversed sections

Frauscher Advanced Counter FAdC

Frauscher Wheel Sensor RSR180

Frauscher Diagnostic System FDS

Conclusion

By replacing the existing system and equipment with Frauscher wheel sensors and axle counters, all of METRO's requirements for increased uptime and availability were met. The design and flexibility of Frauscher's axle counting system allowed fast and efficient installation and commissioning, with minimal impact on operations. The robustness and resilience of Frauscher wheel sensors allows them to withstand the challenges caused by extreme environmental conditions and various track infrastructures.

These unique characteristics ensure high reliability of the outdoor equipment, and additional smart functionalities help to further maximize availability. The Frauscher Diagnostic System (FDS) and Remote Monitoring Display (RMD) are also utilized. They provide METRO with remote access to system operation and predicative maintenance information from all 103 equipment locations. This remote access capability allows METRO to troubleshoot the system from their operations center if required. Preventive and targeted maintenance can then be performed, often remotely.
Not only did the new system improve availability and uptime, but Frauscher's engineering team was able to provide comprehensive training to METRO personnel, allowing them to install the entire system in just four months with time to spare before Super Bowl week began. As a result, METRO successfully transported over 700,000 passengers through the city during this epic sporting event – a successful kick-off for Super Bowl LI, and for Houston's new signaling system.

Update

In 2020, the Frauscher system has been operational with a successful, proven track record for over three years. Independently, the operator has since been able to successfully and vitally integrate the Frauscher axle counter system with road traffic signals at intersections in the downtown area, which has greatly streamlined traffic flow. The versatility of our systems can provide a variety of add-on benefits, without additional equipment or expense.

Operator	MTA Houston	**Wheel Detection**	Wheel Sensor RSR180
Partner	MEC Mass Electric Corp.	**Diagnostics**	Frauscher Diagnostics System FDS Remote Monitoring Display RMD
Scope of Supply	2 trial installations, MNR measurements, installation, commissioning support, remote diagnostics	**Country**	USA
		Segment	Urban & Mass Transit
Scope of project	565 wheel sensors 103 equipment locations	**Application**	Train detection
Axle Counting	Frauscher Advanced Counter FAdC	**Project Period**	Trial: 2015 – 2016 Installation: 09/2016 – 01/2017