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Case Study | CA

Edmonton Metro Line: Increasing Reliability and Safety with FAdC and RSR180

Background

The Edmonton Metro Line was experiencing significant issues with its newly installed Communications Based Train Control (CBTC) signaling system, which was not performing to the operator's expectations. The grade crossing warning systems were not functioning properly, causing extended gate closures that impacted vehicular traffic. Trains were not running on schedule, were often delayed at stations, and would sometimes stop suddenly without explanation. While the Edmonton Metro engineers tried to fix these issues, the city was forced to run an incomplete schedule with reduced train speed and frequency. This resulted in a compromised transit system that negatively affected commuters and the city of Edmonton in general. Every effort to fix the system was made from the time of installation in 2016 until 2019, when the operator made the decision that a new system was needed.

Solution

Frauscher axle counters were brought into consideration to fix these issues and provide a system with considerably better performance. Frauscher collaborated with the integrator to redesign the system, with the goal of providing products better suited to the needs and operating environment of Edmonton Metro. Rather than continue using a complex moving block design that proved difficult to implement, the system was replaced with a simple, highly available fixed block system using Frauscher axle counters. Additional benefits of the reliable, CENELEC SIL 4 safety-rated axle counting system include being unaffected by severe winter conditions, and the ability to offer flexible installation options using Frauscher rail claws. These rail claws can accommodate standard ballast as well as the embedded track used in sections that run street cars, since this LRT line includes both types of track. After deploying the Frauscher system, performance (as measured by train throughput) is equivalent to the original expectations set for the previous moving block system.

Benefits

The Frauscher Advanced Counter FAdC provides a more reliable design composed of robust products, allowing the Edmonton Metro Line to resume full operations. Uptime is significantly improved, and previous issues with the grade crossing warning systems have been mitigated. Additional advantages to the operator include low maintenance requirements and costs, as well as the implementation of advanced smart functionalities that further increase system availability for this mixed track line. A benefit of particular importance to the operator was that trains were able to continue running during installation due to the ease of installation and integration as the existing system continued to run.

Project details

Rugged and robust components needed

When the integrator approached the City of Edmonton with a solution utilizing the Frauscher system, the simpler concept and more reliable equipment claims still generated hesitation. For reassurance as to the product's resilience, a Frauscher Wheel Sensor RSR180 was installed on the track in early winter 2019, fully exposed to the winter elements and temperatures as low as -40 °F (-40 °C). The sensor was left in place until summer, and when connected it was immediately 100% functional. The operator obtained confidence in the Frauscher equipment by experiencing firsthand its functionality, reliability, and robustness in all environmental conditions.

Designing a simpler, more reliable system

The original moving block CBTC system was designed without a secondary back-up system. After being tasked to address the resulting performance issues, Frauscher worked with the integrator to design a simple but highly reliable fixed block system. The Frauscher Advanced Counter FAdC was combined with an Ethernet interface and easily integrated with the vital controller, without the need for relays.

The outdoor equipment includes 65 Frauscher Wheel Sensors RSR180, attached to the rails using the Frauscher Rail Claw SK140 for the ballast installation, and the Frauscher Rail Claw SK420 for the embedded track. The wheel sensors detect trains at switches, crossovers and mainline grade crossings. The FAdC indoor equipment is housed in ten wayside cabinets located along the line.

A pandemic arrives

Installation of the system took place during the pandemic lockdown period. A complicating factor was that commissioning and testing would be conducted without Frauscher providing on-site support due to travel restrictions. For some systems this might have posed a major problem, but the simple design of the FAdC allowed Frauscher engineers to train the integrator's personnel to handle the installation with little intervention. Another advantage was that train service was not interrupted due to simplicity of installation.

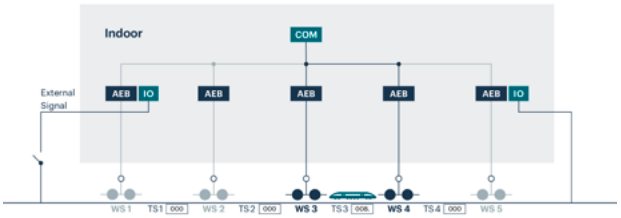
Although not physically present, Frauscher engineers were freely available to assist remotely, during and after the successful installation. The system was cut into operation in March of 2021, following weeks of extensive testing.

Smart functionalities to increase availability

Urban transit systems, especially LRT lines like Edmonton Metro that include street cars, have unique characteristics that can negatively affect the availability of the train detection system. A Frauscher axle counting system offers unique smart functionalities that can take these factors into account, maintaining maximum availability of the system without additional equipment or expense.

Counting Head Control CHC

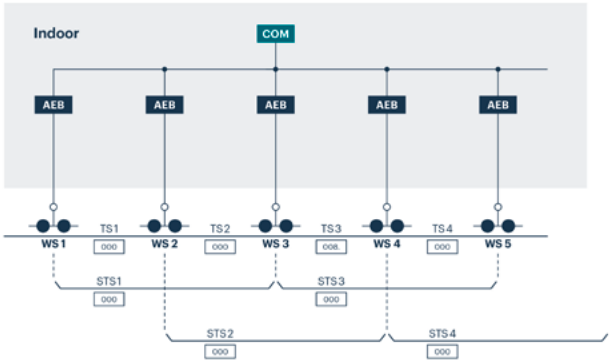
The Counting Head Control CHC function helps prevent false activations from disturbances that may happen in urban and mass transit lines, such as road traffic or debris landing on the tracks. The CHC function prevents interference with the system due to unexpected damping that could potentially occur in these circumstances. If adjacent track sections are clear, the wheel sensor switches to standby mode, and in this state a configurable number of false presence detections can be suppressed. As a result, no faults or occupied indications are generated from short-term damping caused by metallic debris or a steel-toe boot. Once an approaching vehicle enters either of the adjacent track sections, the stand-by mode is immediately deactivated, resuming fail-safe train detection at a SIL 4 safety level.



CHC Active counting heads at traversed sections

Supervisor Track Section STS

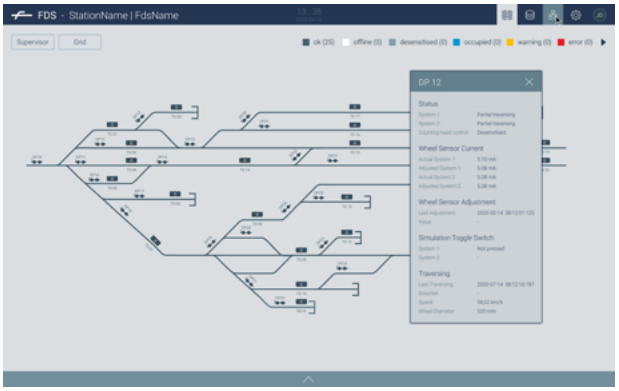
The Supervisor Track Section STS function allows operations to continue should a disruption from an external source occur, without sacrificing safety or vitality. The STS function corrects these interferences by establishing supervisor track sections that monitor and synchronize the track sections within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

Smart maintenance system to save time and reduce costs

The Frauscher Diagnostic System FDS was also implemented on the Metro Line. The status of the entire axle counting system can be displayed in real time via remote connection, allowing the operator to assess overall system health. If issues are detected, maintenance crews can be dispatched with specific information in hand regarding the nature and location of the problem. Network access to the FDS also provides personnel with the tools needed to conduct focused preventive maintenance activities, such as pinpointing specific fault areas that can be addressed before causing a negative impact on operations. The information provided by the FDS allows the operator to focus maintenance work on areas of need, leading to a reduction in overall maintenance costs, worker time on track, and emergency maintenance.



Frauscher Diagnosic System FDS

Frauscher Advanced Counter FAdC

Frauscher Wheel Sensor RSR180

Conclusion

By replacing its existing, troubled system with a Frauscher axle counting system, Edmonton Metro has experienced the high availability, low maintenance costs, flexibility and level of safety that are necessary for a busy transit line. The robust Frauscher system has been proven to function reliably in all conditions, providing the city of Edmonton with an efficient transit system they can depend on. Despite the move from a moving block to a fixed block signaling system, the planned headway met the expectations set for the original system. In addition, the system is future proof in the event of increased ridership and additional trains.

The Frauscher Diagnostic System FDS provides Edmonton LRT with remote access to system operation and predictive maintenance information from each of the ten trackside cabinets along the line. Troubleshooting can be completed from the operations center, with the possibility to perform required maintenance remotely. The STS and CHC functions are invaluable additions for a transit line, preventing possible downtime from external influences on the tracks that can negatively impact other train detection systems.

The limitations of pandemic restrictions prevented Frauscher engineers from providing on-site assistance during installation and commissioning, but these operations were completed successfully due to a simpler design, remote assistance, and training of integrator personnel. Post commissioning help from Frauscher will continue to be available to the operator as needed.

Key Facts

Operator	Edmonton Metro Line	**Diagnostics**	Frauscher Diagnostic System FDS
Partner	Alstom	**Country**	Canada
Scope of project	65 wheel sensors 10 equipment locations	**Segment**	Urban & Mass Transit
Axle Counter	Frauscher Advanced Counter FAdC	**Application**	Train detection
Wheel Sensor	Wheel Sensor RSR180	**Project start**	Trial: 2019 – 2020 Project: 2020 – 2021