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Case Study | CA

City of Calgary Grade Crossing Upgrade Increasing Availability with RSR180 and FAdC

Background

The City of Calgary in Alberta, Canada was investigating its options to change/upgrade the existing signaling system at grade crossings in the downtown area. Typical winter conditions negatively affected operation of the crossings, mainly due to snow, slush, and road salt. These factors caused the crossing track circuits to experience shunt issues, significantly reducing reliability. An alternative method of signaling was needed to work in tandem with the existing system to increase reliability.

Solution

Frauscher and the city began discussions to determine how an axle counting system could alleviate these frequent shunt issues, especially during Calgary's harsh winters. Frauscher wheel sensors are not affected by the conditions mentioned above, or by extreme temperatures, flooding or the magnetic track brakes that are utilized in Calgary. These factors indicated to Calgary that the proposed new system would provide the desired increase in reliability. A trial installation was proposed to give the city confidence in the axle counting system, and to ensure it would perform as promised. RSR180 wheel sensors and the Frauscher Advanced Counter FAdC were added to the crossing's island section to work in parallel with the existing track circuits. During the eleven month trial period, the axle counter ran in shadow mode with the legacy system to gauge performance and compatibility. The FAdC performed without interruption or false occupancy occurrences, working in tandem with the existing equipment. No interference issues occurred between the systems, allowing the city to implement a successful hybrid crossing design using the axle counter and track circuit combination.

Benefits

Frauscher's robust RSR180 wheel sensors delivered the high level of reliability sought by the City of Calgary. Shunt issues at the island were eliminated, with system uptime maintained even in harsh precipitation and severe temperatures. The FAdC provides further advantages such as quicker installation, and cost savings due to reduced maintenance requirements.

Project Details

Components to withstand winter conditions

One of Calgary's main requirements for the grade crossing system enhancement was that its components could withstand the harsh Canadian winters. The 25th Street crossing was targeted to test the Frauscher system. This is a double track crossing adjacent to Erlton Station, where trains enter the crossing shortly before arriving at the station on one track, and immediately after departure from the station on the opposite track. Due to the crossing's proximity to Erlton, reliability is particularly important.

Proof of concept trial installation implemented during the pandemic

When the trial location was agreed upon the pandemic was already well under way. Frauscher was able to supply the required equipment to complete the installation, but due to travel restrictions Frauscher engineers were unable to train Calgary staff in person or be present for the installation. Detailed instructions were provided to Calgary personnel via several video training sessions, resulting in a successful installation. Frauscher engineers were available throughout the process from shadow mode to in service, and to assist remotely for testing during cut over.

Successful trial leads to permanent installation of the FAdC

Features of the FAdC for Train Detection tested during the trial include:

- Ease of installation and maintenance
- Integration into the current infrastructure
- Performance in comparison to existing technology
- Reliability and availability in adverse track and weather conditions
- Capability to handle various wheel sizes
- Ability to detect maintenance vehicles

After eleven months without errors or faults, the trial was deemed successful, and the next step was to cut over the Frauscher system into service, completed in May of 2022.

Simple design protects island section

The 25th Avenue crossing was equipped with two wheel sensors on the entry and exit points of the island for track A (WS3 and WS4 in Figure 1) creating track section 25AXT, and on track B (WS1 and WS2) creating track section 25BXT. As mentioned earlier, inbound trains on Track A enter the crossing prior to arriving at the station, while trains traveling outbound from the station on Track B enter the crossing right after station departure. The crossing's closs proximity to the station increases the need for a system that can be depended on to maintain availability at all times.

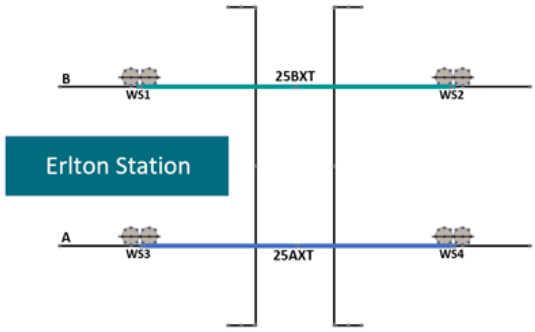

Figure 1 shows equipment layout for 25th Avenue crossing

Frauscher's IP68 rated wheel sensors (water and dust proof) are connected to a trackside connection box and to the indoor equipment via star quad signaling cable. The indoor equipment includes an overvoltage protection board (BSI) to protect from interference voltages induced into the signaling cable. The Advanced Evaluation Boards (AEB) communicate via an internal CAN bus. The COM board, also connected to the CAN bus, provides a vital Ethernet protocol interface to the crossing controller to pass on vital and fail-safe clear/occupied status information. Although the function wasn't utilized at this single crossing application, the FAdC is capable of connecting to adjacent crossings to share wheel sensor and track section data. An additional advantage to the the FAdC is that it eliminates the need for relays and can provide occupancy and direction of travel information via a vital Ethernet protocol. By doing so, wiring and future maintenance requirements are reduced.

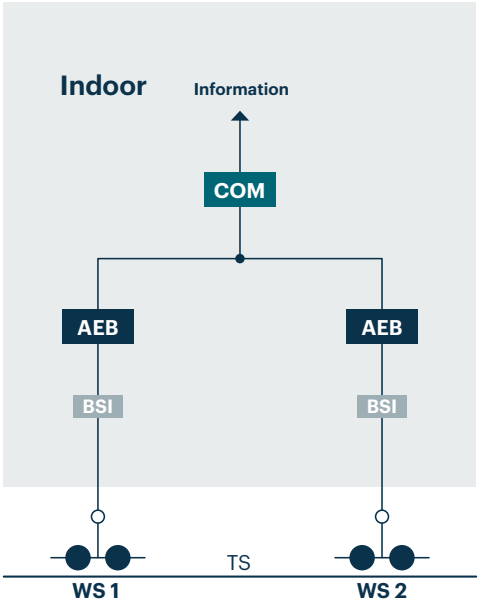

Figure 2 The Frauscher Advanced Counter FAdC

Frauscher Diagnostic System FDS

The Frauscher Diagnostic System FDS performs comprehensive diagnostics and monitoring of the FAdC. Depicted in Figure 3, diagnostic data is provided in real time via a Graphical User Interface (GUI) across an Ethernet network, and logged events from the past are also recorded. Although not utilized at this single crossing application, the FDS is capable of providing this information across multiple crossing locations.

The FDS provides the following advantages:

- Preventive maintenance of the FAdC
- Fast and efficient troubleshooting with errors in plain text
- Easy identification of issues requiring track maintenance
- Status overview of the diagnosed system (GUI), including COM-FSE board, AEB board, and connected wheel sensor via the AEB
- XML interface to a higher ranking diagnostic system

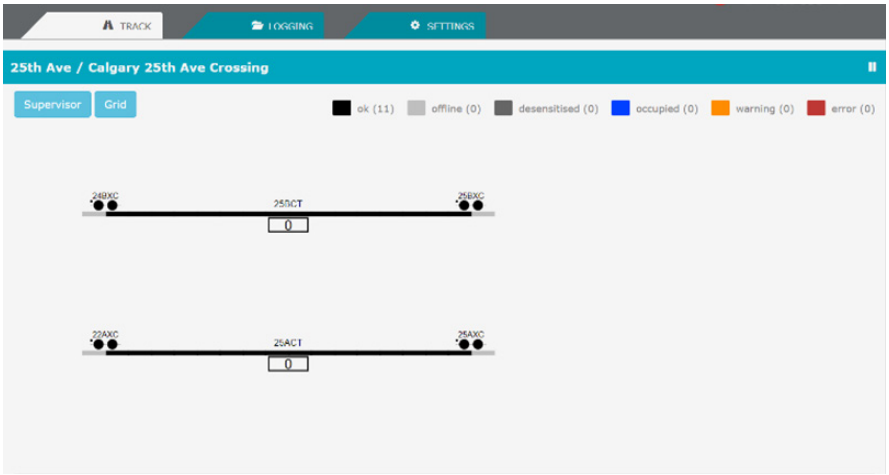

Figure 3 The Graphical User Interface (GUI) of the FDS

Conclusion

The goal of the initial trial project at the 25th Avenue grade crossing was to demonstrate improved availability and reliability, especially in adverse track and weather conditions, by merging Frauscher's axle counting system with the existing technology. Other key factors evaluated include ease of installation and integration into Calgary Transit's current infrastructure, reduced maintenance requirements, handling of various train wheel sizes and the ability to detect maintenance vehicles.

The trial was conducted from March 2021 through February 2022, allowing operation and evaluation during all four seasons. At that time, Calgary Transit deemed the trial a success, and together with Frauscher engineers the system was configured for commissioning. The Frauscher FAdC became operational in May 2022.

Equipment

Frauscher Wheel Sensor RSR180

Frauscher FAdC for Train Detection

Operator	The City of Calgary	**Country**	Canada
Scope of Supply	Delivery of pre-mounted wheel sensors Trial system	**Segment**	Urban & Mass Transit
Scope of project	Four wheel sensors Two island track sections	**Application**	Grade Crossing Warning System
Axle Counting	FAdC	**Project start**	2021
Wheel Detection	RSR180	**Project completion**	2022