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Track more with less.

Case Study | CN

Chengdu Tram Line 2

Project Introduction

Chengdu Tram Line 2 (hereinafter referred to as Line 2) is located on IT Avenue in Chengdu City, the capital of Sichuan Province. It is the first tram line to be completed and operated in Chengdu. As of September 2021, Line 2 has a total of 47 stations, divided into two parts: the main line and the branch line – the main line runs from Pixianxi Station to Chengduxi Station, and the branch line runs from Xinyelu Station to Renhe Station. The overall line is Y-shaped, with a total length of 39,3 km.

It is the first line in China to be equipped with the new generation of Frauscher Advanced Counter FAdC. In this project, through cooperation with the integrator, CASCO, Frauscher's communication boards were integrated into the signalling system through the software interface of FAdC, which supports the communication protocol FSFB/2, thereby completing the installation and commissioning of the axle counting equipment on the whole line.

Since the completion of the project in 2018, Line 2 has been successfully operating under FAdC.

Project Details

The FAdC supports both relay hardware interface and Ethernet-based software interface. The functional modularity and flexible scalability of the software interface allows the FAdC to have a variety of configurations. This makes the operation of small central facilities as feasible as the implementation of complex systems.
At the same time, although the scale of modern projects is getting larger, FAdC's advanced communication technology reduces the space occupation, energy consumption and overall maintenance costs.
In addition to our self-developed Frauscher Safe Ethernet FSE protocol, FAdC also supports the customised interface. After connecting to the efficient electronic interlocking system via the FAdC communication interface, the axle counters in the decentralised arrangement on the trackside can be connected to the Internet via Ethernet, meaning all information about functions and diagnostics becomes available to the higher-level application. The FAdC customised software interface is used especially for this project.

Frauscher Advanced Counter FAdC

The design of the software interface enables the Frauscher Advanced Counter FAdC to be seamlessly integrated into higher-level systems, offering a high degree of flexibility in design.

Line 2 applies the integrator specified protocol – FSFB/2, the second-generation protocol of Alstom's secure communication protocol FSFB (Fail-Safe Field Bus), which has been widely used in European rail systems.

The FSFB protocol is aimed at open transmission systems and mainly implements safety-related data communication in the system.

The Frauscher Communication Board COM-FSFB in this project has obtained SIL 4 certification in 2015, meaning that in this specific communication application between FAdC and interlocking system, the FSFB/2 protocol is suitable for strict safety applications that comply with the Standard EN50159. Before this project, COM-FSFB has been successfully applied to projects in Denmark, Greece, and other countries.

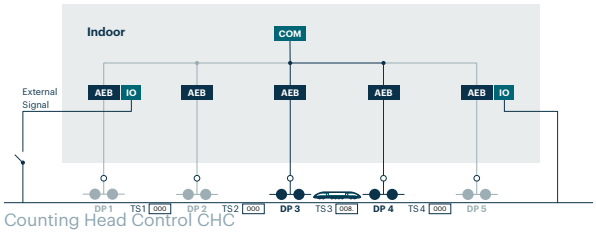
The technical conditions of inductive sensing ensure reliability and accuracy to a large extent. Therefore, in addition to the possibility to install redundant structures, Frauscher has developed two other functions: Counting Head Control CHC and Supervisor Track Section STS. The advantages of both functions are reflected in this project. Line 2 passes through a densely populated area of the city, and has a partially independent right of way, as shown in the figure. Such track arrangement has the following two characteristics in signal transmission:

- The track is located in a public road area, and metal products (such as cans, cigarette boxes, etc.) scattered on the track may affect the wheel sensors.
- At the level crossing area, the accuracy of the train position plays an important role in the shunting work.

Track on the road

In this case, the CHC and STS functions especially developed by Frauscher for axle counting products play a key role.

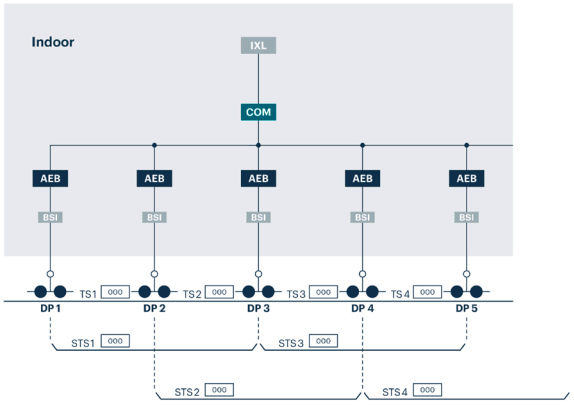
The CHC function suppresses fault messages triggered by unavoidable effects. If the adjacent track sections under the monitor are clear, the monitoring counting head will be in standby mode.



Counting Head Control CHC

Normally, the accidental induction can be suppressed, and the number of suppressions can be customised. Therefore, short-term effects caused by debris will not generate interference or occupancy messages, and maintenance personnel do not need to reset the count. When the real vehicle is approaching, the corresponding counting head will exit the standby mode, counting the axles and outputting information reliably.

STS is an automatic error correction function. This function aggregates two adjacent clear sections into one management section. When an external influence causes a fault, as long as the corresponding management section is clear, the disturbed track section can be automatically reset without manual intervention, thereby ensuring fluent operation. It significantly improves system availability without compromising security and requires no additional equipment and costs.



Supervisor Track Section STS

The high availability of CHC and STS functions is also reflected in the following aspects:

- The CHC and STS functions can be disabled for maintenance purposes
- The number of axles suppressed by the CHC function will be highlighted in the diagnostic data
- Resets performed via the STS function will be highlighted in the diagnostic data
- Each track section can be configured with 4 corresponding monitored sections through the STS function

The combination of the two functions provides increased reliability and availability of sensor information that is not easily affected by road vehicles, debris, etc., which guarantees the safe operation of the Frauscher Advanced Counter FAdC in this project.

Conclusion

The combination of FAdC and customised safety protocols, CHC that can suppress external interference, and STS that automatically corrects section information errors, allows projects to quickly develop from planning, engineering and configuration to diagnosis, maintenance and adaptation. The entire configuration process is supported by innovative software tools.

As the first project in China to benefit from Frauscher Advanced Counter FAdC and special functional configuration, the successful operation of Chengdu Tram Line 2 fully proves the super applicability of FAdC in the Chinese market.

Key Facts

Operator	CHENGDU RAIL TRANSIT	**City**	Chengdu
Application	Track vacancy detection	**Segment**	Tram
Axle counting system	FAdC	**Operate date**	26 December 2018
Interface	FSFB/2 protocol		