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Ensuring reliable rail operations across India's longest rail-road bridge

/ TRAIN DETECTION SYSTEM

The Bogibeel Bridge is India's longest rail-road bridge that connects Assam and Arunachal Pradesh, carrying both rail and road traffic across the Brahmaputra River. Harsh environmental conditions and structural constraints made conventional signalling unworkable. The Frauscher Advanced Counter FAdC® axle counting system was selected for its proven reliability and low maintenance under these challenging conditions.

Background

Bogibeel Bridge is India's longest rail-cum-road bridge. This bridge is 4.94 km and the first fully welded steel bridge ensuring greater durability and reduced maintenance. It is strategically important as it connects Assam and Arunachal Pradesh over the Brahmaputra River, enhancing mobility and regional connectivity.

The bridge's construction necessitated a reliable railway signalling system to cover a 13 km block section, including the 4.94 km bridge span.

Partner	Technocom
Operator	Indian Railways - Northeast Frontier Railway
Country	India
Segment	Main Line
Application	Block Section
Project start	2018
Scope of project	8 counting heads, 4 track sections (Dual Detection)
Solution	FAdC®, RSR180

Challenges

Selecting the right signalling solution required careful consideration of operational and environmental challenges. The infrastructure demanded a system that could function reliably on a bridge, where conventional track circuits were not a feasible option.

The key challenges and factors detailed below had to be considered to identify the right solution for the project:

- Conventional track circuits are prone to shorting on metallic structures, making their implementation on the bridge impractical.
- DC track circuits required significant investments in glued joints, power arrangements, and precise rail maintenance of positive and negative rails.
- Standard SSDAC/BAPC systems cannot provide media redundancy. Typically, HASSDAC is used to address this limitation, but the cost exceeds that of our Dual Detection MSDAC system.
- The signalling system needed to support smooth transmission of reset and cooperation pulses for effective operation of the axle counter system.
- The solution had to withstand conditions such as high humidity, potential electromagnetic interference, and operational loads.
- A key consideration was to avoid active electronics equipment and earthing due to space constraints.

The system also incorporated Co-Operational Reset Functionality, where the Up line is reset by the Station Master at Dhamalgaon, while the Down line is reset by the Station Master at Tangani, following an inverse pattern, so each station controls resets in only one direction. By distributing responsibility, delays are minimised, and traffic flow is optimised, improving overall operational efficiency.

The Frauscher Diagnostic System FDS was further installed at Tangani, enabling real-time diagnostics and monitoring of axle counting performance, providing vital track section data at both locations, which enhances decision-making and reduces downtime

Additionally, with the patented Frauscher rail claw, the installation of the Wheel Sensor RSR180 was performed in a fast and efficient manner, without the need to drill into the rail, preserving its structural integrity and saving costs. This allows the sensor can be easily unplugged and reattached during maintenance activities, such as rail replacement.

Finally, no trackside electronics were needed to be installed, fulfilling a key consideration and requirement of the project.

Frauscher also provided hands-on training to employees of Indian Railways to monitor and manage the system efficiently with minimal support.

Solution

Considering these challenges and requirements, Frauscher's Train Detection System with the Frauscher Advanced Counter FAdC® was chosen as a cost-effective, reliable, and future-ready solution. Its advanced technology, flexibility, and proven performance in demanding railway environments ensured seamless integration while addressing all project requirements.

The Frauscher Advanced Counter FAdC®, which represents a SIL 4 axle counting solution was implemented together with the Wheel Sensor RSR180 at Tangani Station and Dhamalgaon Block Cabin, covering the Bogibeel Bridge block section. The system featured a Dual Detection configuration, for enhanced reliability and safety. Media redundancy was further achieved through the implementation of both OFC and Quad mediums, ensuring uninterrupted operation in case of a communication failure, something standard SSDAC/BPAC systems cannot provide. A distributed architecture with redundant power and communication was deployed, further increasing system reliability. The system provided track clearance pulses to interlocking via Q-series relay, ensuring seamless integration with railway signalling operations.

Benefits

The deployment of the Frauscher Advanced Counter FAdC® in the Bogibeel project proved to be a game-changer, delivering unparalleled reliability, efficiency, and safety. The key benefits included:



Exceptional reliability

The distributed architecture of the FAdC® enhanced operational safety and dependability, ensuring smooth and secure railway operations.



Seamless installation & track integrity

The Wheel Sensor RSR180 allowed effortless installation without drilling and facilitated easy detachment during maintenance, preserving track integrity.



Uninterrupted operation with media redundancy

By leveraging both Optical Fiber Cable (OFC) and Quad mediums, the Frauscher system ensured fail-safe performance, thereby minimising disruptions.



Minimal maintenance & enhanced efficiency

The absence of active outdoor electronics significantly reduced maintenance demands and eliminated the need for earthing and enhancing long-term efficiency.



Cost-effective alternative

Delivering the same level of redundancy and safety as HASSDAC, the FAdC® provided a more economical solution without compromising on performance.

The successful implementation of the axle counting solution at the Bogibeel Bridge block section demonstrates how Frauscher's innovative technology combined with a customised approach can address complex infrastructure challenges, ensuring seamless railway connectivity, safety, and operational efficiency.



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