Railway bridge safety enhancement through advanced tilt monitoring system

Country

India

Industry

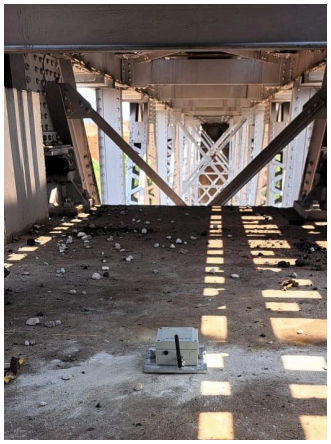
Infrastructure
Transport

Aplication Areas

Geotechnical
Structural

Context

In 2017, flash floods completely washed away a plate girder railway bridge located near Rayagada (Odisha), India. Another bridge located upstream of the collapsed one suffered serious damage to its columns and began to shake significantly. Despite extensive repairs to control pier movements, the bridge continued to show excessive movement. As a result, Indian Railways issued a caution order, reducing train speeds from the previously permitted 100 kmph to 40 kmph. A new bridge was proposed to divert traffic. Given that the construction of the new bridge is expected to take approximately one year, and considering the impracticality of halting train operations for such an extended period, a remote monitoring solution was proposed.



Solution

Shodh Structural Solutions led the project and implemented a near real-time tilt monitoring system with active alert management. This system contributes to ensuring the safe operation of trains on the bridge with damaged piers throughout the interim period until the new bridge is completed.

Since the pier movement involved low-frequency rocking, Shodh first conducted a preliminary investigation to establish baseline tilt measurements over a 48-hour period. This helped capture the general trend and tilt patterns caused by train movements. Based on these insights, two Worldsensing tiltmeters, along with an edge gateway powered by solar panels, were installed to continuously monitor pier movements.

> With continuous remote monitoring data we can detect issues early, respond faster, and make confident, data-backed decisions, turning reactive maintenance into proactive infrastructure management.

Dr Prashant Motwani
Director
Shodh Structural Solutions Pvt Ltd

Benefits

By comparing near real-time data from the tilt sensors with the preliminary baseline measurements, any deviations or changes in tilt patterns over time can be accurately detected. This allows for timely alerts to be issued to the authorities if the tilts exceed predefined thresholds or exhibit an increasing trend, enabling prompt intervention and enhancing operational safety.

Advantages

Shodh Structural Solutions prioritizes the safety of infrastructure and its users by employing advanced technologies. By leveraging continuous data, they shifted bridge maintenance from a reactive, uncertain process to a science-driven approach focused on safety and reliability.

Traditionally, maintenance and repairs have relied heavily on periodic inspections or reactive interventions, often leaving safety to chance. With near real-time monitoring, informed decisions can now be made based on actual field data, directly from the convenience of the office, allowing for proactive maintenance and timely response.