Villari

wireless sensor technology that continuously monitors structural integrity using passive magnetic flux leakage to identify structural deformation or crack growth; a non-invasive inspection that eliminates the need for frequent manual check-ups

the challenge

The transport and logistics industry depends heavily on steel-based infrastructure—like cranes, bridges, and other heavy lifting equipment—to support massive operations. This reliance on steel structures brings an inherent challenge: fatigue cracks and other structural damages develop over time due to constant use, environmental stressors, and heavy repeated loading. These undetected cracks pose serious risks, as they can result in sudden equipment failures, costly downtime, or fatal accidents. Historically, ensuring safety and structural integrity has required frequent manual inspections, which can be time-consuming, labor-intensive, and often require workers to access hazardous or confined spaces. This raises both the likelihood of injury, overall costs and operational downtime, making the inspection process a critical safety and efficiency issue for the industry.

the innovation

Villari developed a pioneering solution consisting of wireless sensor technology that continuously monitors structural integrity using passive magnetic flux leakage. The system involves installing wireless sensors on critical points of steel structures to detect minute magnetic field changes caused by emerging cracks or stress points. These sensors use the Earth's magnetic field to identify variations in the steel's magnetic field due to structural

deformation or crack growth, without requiring complex infrastructure or constant recalibration. This data is then transmitted wirelessly to a central platform for real-time analysis and reporting, enabling a non-invasive, continuous inspection that eliminates the need for frequent manual check-ups. Villari's innovative technology shifts from reactive to proactive safety measures, allowing operators to stay informed of potential issues before they become severe.

how it was implemented

Villari's implementation process is highly scalable, requires no surface preparation, and is designed for minimal disruption to operations. Installation begins by identifying critical stress points on steel structures where cracks or weaknesses are most likely to develop. If asset owners lack the internal expertise for this assessment, Villari partners with engineering services firms specializing in structural analysis. These experts evaluate the structure and recommend optimal sensor placement to ensure comprehensive coverage of high-risk areas.

Once these critical points are identified, Villari's sensors can be installed within minutes. They transmit data wirelessly via LoRa (Long Range) technology to a secure platform, where Villari's algorithms analyse it to monitor crack growth potential. This data is continuously updated in an online environment accessible from anywhere with an internet connection. Through this system, operators can remotely and continuously monitor asset conditions, reducing the need for frequent manual inspections and enabling a proactive maintenance strategy. Additionally, the accumulation of historical data facilitates a data-driven maintenance approach, offering valuable insights into structural health trends over time.

This implementation model has been highly effective for major clients, including Eurogate, Port of Antwerp, ProRail and Hutchison Ports and has become a trusted solution for safety and asset management in demanding operational environments.

result

The implementation of Villari's continuous monitoring technology has yielded substantial benefits, particularly for critical and high-value assets like cranes and bridges. By enabling continuous monitoring, Villari's sensor system provides improved safety and significantly reduces the need for labour-intensive manual inspections, particularly in dangerous locations. This approach has led to enhanced safety for both the assets and maintenance personnel. Continuous monitoring reduces the risk of unplanned downtime due to early detection of structural weaknesses, leading to timely, planned repairs. Additionally, the end-of-lifetime for each asset could now be precisely assessed – and increased – through the valuable data acquired.

conclusion

Villari's sensor technology marks a significant advancement in industrial safety and asset management. By moving from frequent manual inspections to continuous, automated monitoring, the solution improves operational safety, reduces costs, and extends the lifetime of critical steel assets. The deployment of Villari's technology not only lowers risks for workers by minimizing the need for physical inspections in hazardous zones but also helps transport and logistics companies optimize maintenance schedules and prevent expensive, unexpected failures and downtime. As industries continue to prioritize safety and efficiency, Villari's model could become a standard for infrastructure health monitoring, setting a new benchmark in proactive safety and operational resilience for transport, logistics, and beyond. Villari aims to be the global leader in advanced steel structural integrity monitoring, revolutionizing the way industries realize asset lifetime extension. Guided by integrity, expertise, and accountability, offering disruptive solutions clients can trust.

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