CASE STUDY

STRUCTURAL HEALTH MONITORING (SHM)

NEW YORK STATE OF OPPORTUNITY. Department of Transportation

ISSUED – OCTOBER 2017

Solutions to complement steel bridge inspections for the New York State Department of Transportation

THE PROBLEM

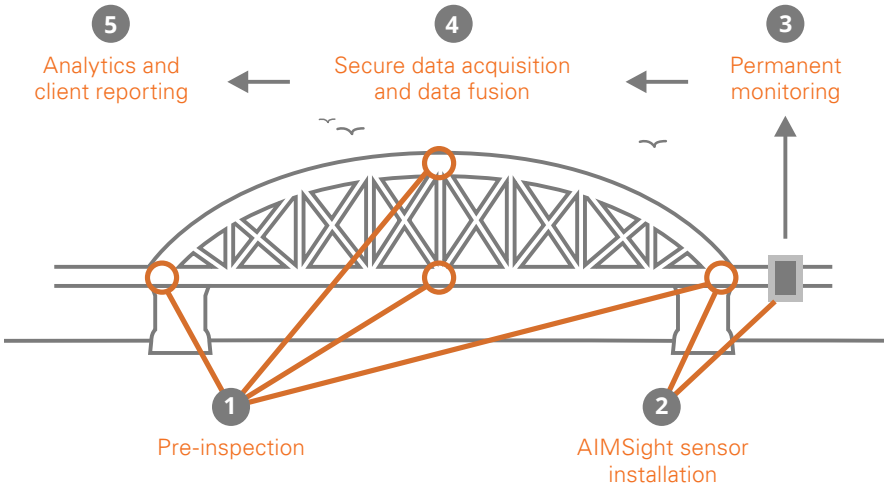
According to the FHWA, there are a total of 18,000 fracture critical bridges throughout the U.S. There are critical components on these bridges, which require immediate action as soon as a crack initiation starts. Failure of these bridges due to structural defects threatens asset owners with potentially serious financial and operational consequences. Standard NDT inspection methods in structural engineering are unable to provide continuous information on new and evolving defects. The true condition of a bridge remains uncertain between inspections.

THE SGS SOLUTION

To continually improve its bridge inspection program, the New York State Department of Transportation (NYSDOT) allowed SGS to pilot test a new NDT/SHM monitoring system, called AIMSight. In early 2017, SGS installed two AIMSight systems on an eight span steel bridge and a steel truss bridge. This solution provided permanent, real-time, sensor-based structural health monitoring and NDT. To date, the retrofitted cracks have not grown and with this information, NYSDOT can focus efforts elsewhere.

SGS 5-STEP PROCESS FOR 24/7 CONDITION MONITORING

As seen below, SGS provides a simple five-step process, which combines inspection and monitoring data. This 5-step process allows bridge owners to better manage their critical assets.



SGS

WHAT ARE THE BENEFITS OF THE SGS SOLUTION?

Since installation in early 2017, the systems have been consistently monitoring crack growth to the SGS SHM network, while sending reports to NYSDOT. The one-stop platform covers all structural health monitoring requirements, irrespective of the data/ sensor source.

The SGS AIMSight system was developed to support safe extension of the bridge's life, allowing NYSDOT to effectively plan maintenance events. NYSDOT can access the monitoring data on a real-time basis through a dashboard and regularly receive reports, which indicate crack initiation and growth as it occurs.

The reports are compliant with NDT standards (ISO 15548 – NDT equipment for eddy current testing) and professional practices, which reduces the need for costly expert human intervention while maintaining the same confidence as standard SGS NDT reports.

SGS COMPARED TO OTHER SENSORS TECHNOLOGIES

The SGS AIMSight system is superior to electrochemical based sensors in terms of accuracy. The Eddy Current based technology is accurate even below 20mils, as proven at Purdue University. Unlike chemical sensors, it requires no monthly replenishing of corrosive chemicals. With no site visits the maintenance costs are dramatically reduced. Unlike acoustic sensors, Eddy Current sensors are not sensitive to background noise typically found in steel structures. The SGS AIMSight system correlates other sensor parameters to provide owners with a quantifiable cause and effect (strain or temperature vs. crack size). In the NYSDOT pilot test, temperature, displacement, accelerometer, and video camera were incorporated for quantifiable cause and effect.

OTHER SGS SHM SYSTEM BENEFITS

- Fast ROI
- Crack sizing
- Easy installation
- Self-testing system
- Very Low Maintenance
- Automated data analysis
- Works on heavily rust areas and in webs
- Real-time alarms from crack growth as well as crack sizing
- Reduces traffic disruptions or access equipment from traditional inspections

THIRD PARTY TESTED AND VERIFIED

The SGS AIMSight system has been lab tested and third-party verified at Purdue University. This lab testing consisted of 10 critical fatigue tests using different types of bridge components. Additionally, the system also has been installed for long term monitoring of three bridges. See technical report supplied, IIW Commission XIII, WG 5 "Eddy Current Crack Monitoring System for Structural Health Monitoring (SHM) Applications".

RETURN ON INVESTMENT

Inspecting repairs and retrofits can be extremely costly with lane closures, access equipment, engineers, and report generation. By using SGS's monitoring technologies a bridge owner can expect ROI typically after two or three inspection deferral. SGS's monitoring systems are portable and reusable, making ROI even higher.

ABOUT SGS

SGS is the world's leading inspection, verification, testing, and certification company. SGS is recognized as the global benchmark for quality and integrity. With more than 95,000 employees, SGS operates a network of over 2,400 offices and laboratories around the world. We provide competitive advantage, drive sustainability and deliver trust. At SGS we continue to innovate our services and solutions so we can help our clients move their business forward.

VISIT: WWW.SGS.COM/INNOVATIVENDT

NYSDOT SYSTEM	LITTLE FALLS	FORRESTPORT
Brigde server	✓	✓
Temperature sensors	2	✗
Crack gauges	4	4
LVDT displacement sensor	✓	✓
Accelerometer	✓	✓
Video camera	✓	✓
Solar power supply	✓	✓

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Little Falls installation

Forestport installation