CASE STUDY

Chulitna River Bridge

About Chulitna River Bridge

Industry: Civil
Location: Trapper Creek, Alaska

The Chulitna River Bridge, located in Anchorage, Alaska, was originally built in 1970 and was widened in 1993. This five-girder, five-span bridge crosses one of the longest straight sections of the Chulitna River and has become a popular route for heavy, overload vehicles (over 410,000lbs), as it is the most direct route connecting Anchorage, to Fairbanks and Prudhoe Bay.

The Challenge

Due to the area's propensity to seasonal temperature swings of 70°C, frequent flooding, and regular heavy vehicle loads, it is imperative that the Chulitna River Bridge has an accurate and reliable structural health monitoring system (SHMS).

The Solution

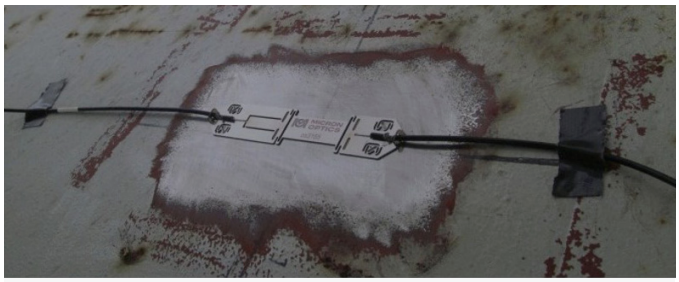
Luna Innovations, in conjunction with Chandler Monitoring Systems, Inc., worked to determine and monitor the structural integrity of the Chulitna River Bridge through the integration of a fiber optic, FBG-based sensing system which will help assess the long-term impact of temperature and load stresses.

Luna's solution divided the bridge into three monitoring zones based on the number of sensors in each zone. Luna's os3155 rugged fiber optic strain gages were installed long exterior steel plate girders to measure strain for loads that can run as high as 410,000lbs. This type of installation allows for a fast, simple, and repeatable process. Luna displacement gages were mounted on the rocker bearings to monitor movement away from the supports, as the bridge expands and contracts in response to the large temperature swings of up to 70°C. Cameras were also installed in multiple locations under the bridge, providing a means for visual inspection of the rock bearings and an added measure of security.

The control panel containing Luna's sensing instrumentation is located more than 1.5 miles from the bridge in a more controlled environment allowing for easier access. A fiber optic trunk line that was already in place is used to connect instrumentation with sensors installed on the bridge.

The Results

Working with the Alaska Department of Transportation and the University of Alaska (UAF), Chandler Monitoring Services collected data to study the effects of temperature and load on the bridge. Results are being used to identify changes in load distribution for the girders and trusses. Final working thresholds are being established for automated notification if changes occur in structural response or established thresholds are exceeded. Data collected will also be used to develop a protocol to apply an SHM program to bridge monitoring on other bridges in Alaska.



Luna's os3155 rugged fiber optic strain gages are installed along exterior steel pate girders to measure strains for loads that can run as high as 410,000 lbs.

Displacement gages are mounted on the rocker bearings to monitor movement away from the supports as the bridge expands and contracts in response to changes of up to 70°C

INSTRUMENTS USED

Micron Optics sm130-500 Interrogator, Micron Optics sm041-416 Interrogator; (40) Micron Optics os3155 Strain Gage Sensors, (24) Micron Optics os3110 Strain Gage Sensors, (11) Micron Optics os4350 Temperature Sensors, (5) Micron Optics os7100 Accelerometers, (4) FBG Tiltmeters, and (5) Kaisen Displacement Gages.

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