Jewell Instruments

Monitoring Bridge Truss Distortion

- **Objectives:** Measure bridge's truss distortion
- **Solution:** Jewell C801 Tuff-Tilt Sensor
- **Benefits:** High-precision and exceptional repeatability
- **Results:** Avoided overstressing and buckling

Overview

As part of the overall bridge widening for the Huey P. Long bridge over the Mississippi River in New Orleans, two 528 ft long, 2700 ton trusses were built on shore, transported on barges and simultaneously lifted 130 ft and set in place. Jewell was contracted to provide sensors to measure truss distortions and assure overstressing or buckling of the truss does not occur during the transport, lift and setting operation.

Jewell C801 Tuff Tilt 420 sensors were deployed to monitor each truss in real-time.

Jewell Instruments C801 Tuff-Tilt sensor

Project

The Huey P. Long Bridge in Jefferson Parish, Louisiana, is a four-span steel truss bridge that carries a two-track railroad line over the Mississippi River with two lanes of US 90 on each side of the central tracks owned by the New Orleans Public Belt Railroad. A contract was awarded to the Joint Venture MTI to widen the existing Huey P. Long Bridge to carry three lanes of traffic with shoulder in each direction in addition to the existing two rail linesto skid the trusses laterally for the final setting on the piers.

The widening was completed by fabricating trusses on barges near the shore, and the prefabricated trusses under the bridge were lifted into place using 900-ton strand jacks. Two sides of the prefabricated bridge span were lifted 130 ft in 12 hours and set simultaneously to avoid any unbalance forces on the bridge

MTI built a four-barge system connected by three sectional barges. HNTB designed the stability frame/ floor beam assembly which was built on the barge platform to help support the trusses and keep them plumb throughout erection. The stability frame was also used to help support the twin trusses during transport to the bridge, during the lifting operation and provided a means to skid the trusses laterally for the final setting on the piers.

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Problem

The biggest concern for MTI and HNTB was out-of-plane distortion, primarily 'sweeping' of the truss. Since the truss would be lifted at the end points of the 528-ft long truss, any tilting of the truss could initiate buckling. Therefore, the two most important parameters to measure were tilt and out-of-plane deflection of the truss. Jewell worked with MTI and HNTB to develop an instrumentation layout that utilized Jewell C801 tilt meters and laser distance sensors.

The C801 tilt meters were located on the vertical stability frame members and measured tilt in both the longitudinal and transverse directions of the truss. Since the truss was fixed to the stability frame during transport and lifting, measurement of the vertical member of the stability frame was representative of the truss tilt. A total of eight (four on each truss/frame) biaxial tilt meters were used.

Laser distance sensors were used to measure truss out of plane distortion. The concept of using distance sensors to measure deflection was developed by Jewell for this project. A total of ten lasers were used (five on each truss) to measure out-of-plane truss distortion.

All sensors were hard wired to a data logger and transmitted to a laptop computer with multiple display panels under the bridge deck. Data was continuously transmitted and updated approxi¬mately every 5 seconds. Data was under constant review by HNTB Engineers and decisions made for controlling lift were based on real-time truss tilt/deflection measurements.

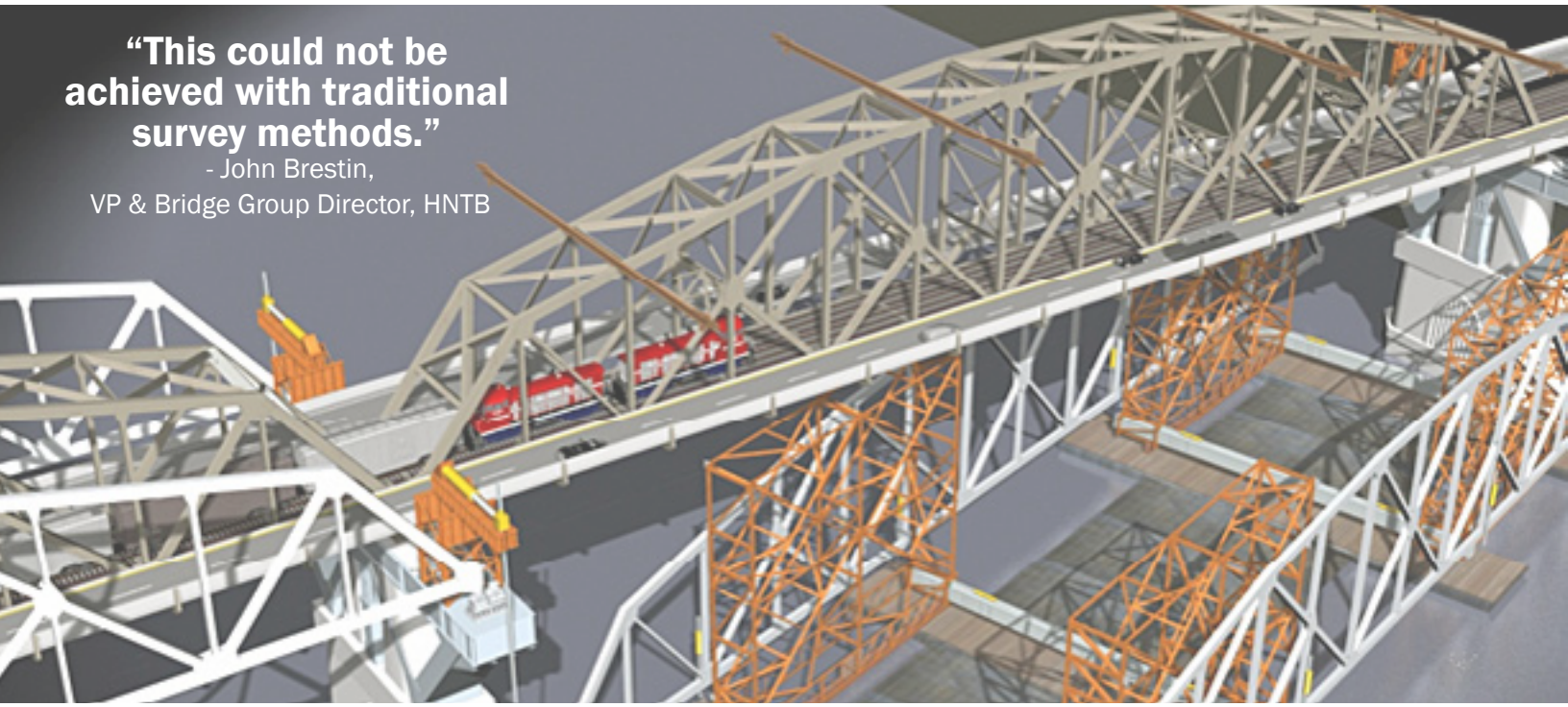

Photo courtesy of HNTB

Results

"The monitoring system was vital to the lift operation. We were able to use it in real time and know exactly what was happening with the lift. It allowed us to adjust the attitude of the truss 'on the fly' without slowing down the operation. This could not be achieved with traditional survey methods. Once we confirmed that the monitoring system was giving us results that agreed with survey and visual inspection if gave us the confidence to know how the truss was behaving at any given time. The system also allowed us to monitor the truss while it was sliding laterally into position over the bearings, which was as critical if not more critical to monitor that the lift itself" – John Brestin, Vice President and Bridge Group Director, HNTB

About Jewell Instruments

Jewell Instruments is a world leader in the design, manufacture, and distribution of high-precision products. Our expertise includes acceleration and tilt sensors, electronic compasses, avionics components, solenoids, and panel meters. The extensive application knowledge we have obtained through decades of experience allows us to provide custom solutions for a diverse group of industries. In fact, customers from all over the globe contact us for solutions to aerospace, medical, industrial, and telecommunications applications, to name a few.

To find out more, visit our website!

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