MEASUREMENT & ANALYTICS | CASE STUDY

London’s landmark Tower Bridge

From steam to modern digitalization

Digital upgrade of ABB load monitoring system helps extend life of London’s landmark Tower Bridge. When it was first constructed, Tower Bridge was the largest and most sophisticated bascule bridge ever to be built. The bascules were operated by hydraulics, using steam and giant pumping engines and, despite the complicated procedure,the bascules only took a minute to raise to their maximum angle of 86 degrees.

Measurement made easy.

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Tower Bridge, London, UK

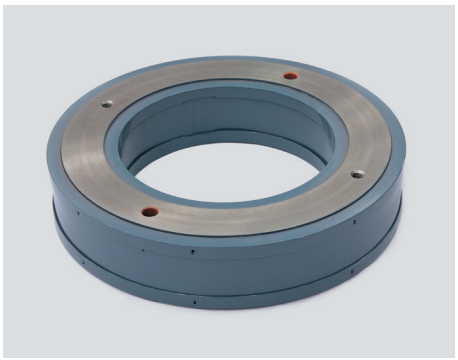
Today amazingly the bridges still operate by hydraulics – but oil and electricity have replaced the need for steam since 1976.

What has been achieved?
The ABB Pressductor® load cell system has been upgraded with digital electronics from ABB Measurement & Analytics. Millmate Controller 400R, Millmate Excitation Unit and Millmate Operator Unit 400. The load cells have been installed since 2002 with analogue electronics. Together, the load cells and new digital electronics serve to safely balance drawbridge loads, preventing damage to bearings and pivot mechanisms. Also, assuring safe crossings of the Bridge for thousands of Londoners every day.

We ask Mr David Wilson, Technical Officer at City of London Corporation, about the ABB load cell and digital electronics installation: “The new ABB electronics was installed in September 2016 and we are very satisfied with the ABB load cells and electronics. We certainly appreciate the accuracy and repeatability of the ABB load monitoring system”.

Background
London’s historic Tower Bridge across the Thames, opened in 1894, operates more smoothly these days thanks to an ABB load monitoring system. The Bridge’s central 200-foot roadway span opens draw-bridge style to allow the passage of shipping. Hydraulically powered gear mechanisms housed in the towers at each end raise and lower the two bridge decks, called bascules. The decks each weigh 1,200 tons, and are counterbalanced to minimize the force required and to allow raising and lowering them in about five minutes. The counterbalance weight consists of a ballast box filled with lead and iron.

Modern traffic weight loads and volumes over the Bridge were adversely affecting the main bearings on which the deck structures pivot.



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01 ABB annular load cell
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02 ABB electronics
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04 Tower Bridge, London, UK

The dead weight of the bascules and the live load of the traffic were not being carried fully on the resting blocks and locking pawls, but also on the shaft bearings. Because of misalignment and wear, the pawls didn't properly lock the ends of the bridge decks in the down position and they didn't correctly engage.

The challenge

As a result some bearings were taking on more load than others. Left unresolved, the bearings and pivot mechanisms would suffer further damage, leading to a major bridge shutdown for repairs. In addition uneven loading causes misalignment of the two bridge decks.

If the fully digital Millmate Controller 400R senses imbalanced weight from the Millmate Pressductor load cells, the hydraulic cylinders adjust the position of the resting blocks.

Balancing loads

To overcome the problem, the old stationary resting blocks for the decks were replaced with active blocks capable of movement. With this new system, the ABB Millmate Pressductor load cells housed in each of the new blocks continuously measure the load across the bridge decks. The load cells, capable of measuring up to 600 tons, relay load data for each deck to the control system.

The Millmate Controller 400R senses imbalanced weight from the load cells. The imbalance is monitored and can be adjusted by changing the position of the resting blocks. This action maintains equal loads across the deck bearings, which will help to both increase their life and the life of Tower Bridge overall structure.

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