

Steel-concrete railway bridge: strains and cracks during load tests



Nerve-Sensors: Case Study

The composite (steel-concrete) bridge in Dąbrowa Górnica was designed according to a new approach and put into the service in 2019. This is why verification of its structural performance under real operating conditions was of significant importance. The bridge was equipped with DFOS strain sensors, installed both on the concrete and steel surfaces. The measurements during load tests allowed for detailed analysis of the deformation state, including the detection of all microcracks.



Benefits of application

- Detection of **local events like cracks** on the concrete surface
- Simultaneous measurements of **strains in concrete and steel** part of the girder
- Observation of bridge performance during **load test** before opening
- Possibility of **calibration FE model** and **improvement of the a design approach**

Example results

Distributed fibre optic strain sensors were installed at the bottom and top flange of the steel girder, as well as at the side surface of the concrete. Such a sensing system setup allowed for detailed analysis of the interaction between these two materials and validation of a new design approach. Distributed measurements taken during load tests (locomotive load) prior to commissioning enabled the detection of all microcracks along the girder length. However, most of them were closed after removing the load, which was very important information for the engineer responsible for the long-term safety and durability of the bridge.

 **4 800** measurement points

 **48 m** of sensing path

 **3 x** strain sensor

 **short-term** (load tests)

 project **partner:**



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