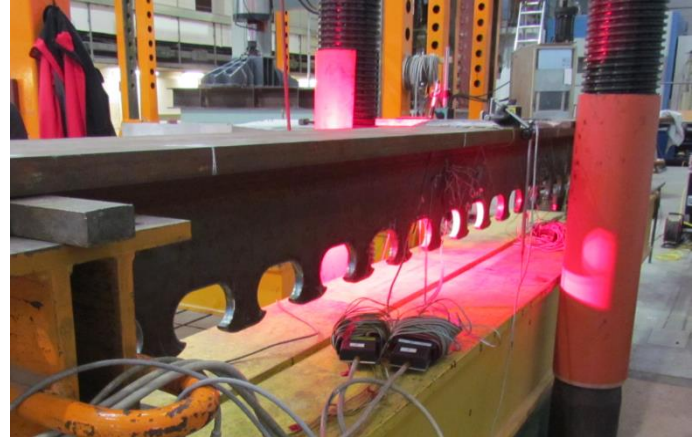


Steel girders during mechanical load tests: elastic and plastic strains



Nerve-Sensors: Case Study

A number of steel girders designed for bridge applications were investigated in laboratory conditions during mechanical tests. The research includes MCL girders as well as I- and H-beams. The challenge in this project was to measure extremely high strains, exceeding significantly the range of elastic behaviour. Thanks to DFOS strain sensors it was possible to analyze yielding process up to 20 000 $\mu\epsilon$ in tension and 10 000 $\mu\epsilon$ in compression.

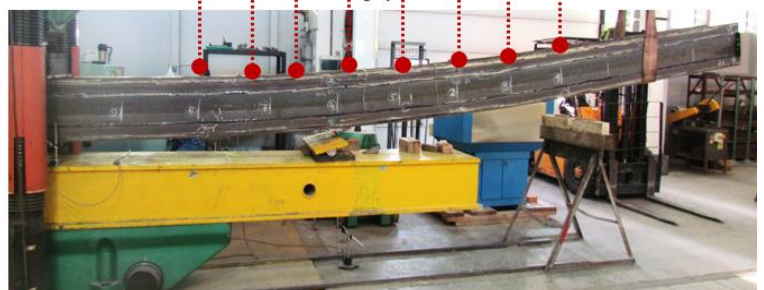
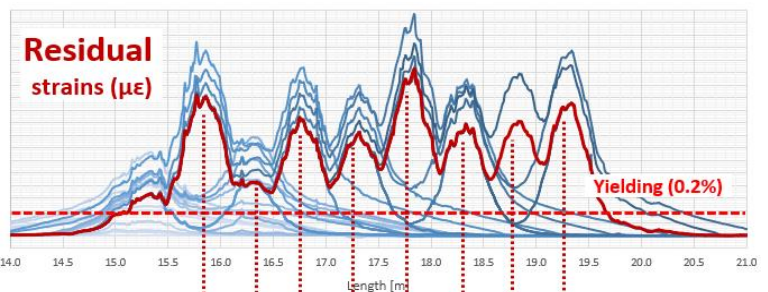


Benefits of application

- Strain measurements **during elastic and plastic behaviour** of steel (20 000 $\mu\epsilon$)
- Knowledge about **residual strains, both in compression and tension zones**
- Thousands of measurement points **over freely shape traces**
- Unique data for **scientific analysis, FEM calibration and PhD thesis**

Example results

One of the research goals was to monitor the yielding process of steel girders, both in their compression and tension zones. The network of DFOS strain sensors installed within the structural elements allowed to obtain comprehensive picture of strains for different load schemes and force values. The figure below shows the example result of strain distributions for selected girder. The red line corresponds to residual strains, which remained after tests were completed.



28 800 measurement points



288 m of sensing path



26 x strain sensor



short-term (load tests)



project **partner:**



Wroclaw University
of Science and Technology