

Monitoring, analysis and durability assessment of a concrete cable-stayed bridge

Jan BILISZCZUK

Professor

Wrocław University of Science and Technology

Wrocław, Poland
jan.biliszczuk@pwr.edu.pl

Full Professor at the Wrocław University of Science and Technology. Designer of many outstanding footbridges and cable-stayed bridges.

Paweł HAWRYSZKÓW

PhD

Wrocław University of Science and Technology

Wrocław, Poland
pawel.hawryszakow@pwr.edu.pl

Assistant Professor at the Wrocław University of Science and Technology. Researcher focused on bridges' dynamic. Specialist in installation of stay cable systems.

Marco TEICHGRAEBER

MSc

Wrocław University of Science and Technology

Wrocław, Poland
marco.teichgraeber@pwr.edu.pl

PhD candidate at the Wrocław University of Science and Technology, working on durability assessment of stay cables based on data from Structural Health Monitoring systems.

Contact: marco.teichgraeber@pwr.edu.pl

1 Abstract

Over the last 20 years big bridges in Poland have been built and equipped in Structural Health Monitoring systems (SHM). One of those objects is the Rędziński Bridge in Wrocław. It is a cable-stayed concrete bridge built along the motorway A8 in 2011. Since this time the SHM has been collecting data from 222 installed sensors. The bridge is outstanding because of its unusual structure: two separate concert box girders are suspended to a single pylon. The connection is made of 160 stay cables – so this is also the most sensitive part of the structure.

The first part of the paper concerns the SHM application. In the next part the measured data from the period 2011-2017 are presented, containing comparisons between forces in cables and temperature changes in the whole structure. The third part will include SHM based calculations and simulations with a complex FEM model, to check the measured data and to estimate future measurements. The last part contains the durability assessment calculation for the cable stays.

Keywords: bridges, stay cables, durability, maintenance, monitoring, SHM

2 Introduction

The Rędziński Bridge was built in 2011 and it is the main bridge along the Wrocław ring-road motorway [1]. The structure is a concrete cable-stayed bridge with spans 49.00 m + 256.00 m + 256.00 m + 49.00 m. The H-shaped pylon is 122.00 m high (Fig 1).

The characteristic feature of the bridge are two separate box girder concrete decks under each road suspended to one pylon with 160 stay cables [2] (Fig. 2). Because of its size and outstanding structure the Rędziński Bridge was equipped with 222 sensors of Structural Health Monitoring (SHM) system (Fig. 3).



Figure 1. Aerial view of the Rędziński Bridge,
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