Monitoring solutions for large movable scaffolding systems

André Resende, Hugo Coelho, Pedro Pacheco

Bridge Engineering Research and Design (BERD), Porto, Portugal

João Costa, Carlos Moutinho, Filipe Magalhães

Faculdade de Engenharia da Universidade do Porto (FEUP), Porto, Portugal

Contact: andre.resende@berd.eu

Abstract

This paper aims to describe the SMART-OPS research project, present preliminary results of the experimental campaign and foresee the characteristics and advantages of the product under development. In the first stage, a commercial monitoring equipment was adopted. The paper will describe preliminary results obtained with this equipment to demonstrate in a full-scale MSS under normal operation the advantages and challenges of monitoring. In the second stage, a customized monitoring system is under development.

The monitoring system was implemented in a Movable Scaffolding System (MSS) used to build spans up to 70m of prestressed concrete deck. The monitoring scheme included 2 sonic anemometers, 29 strain gages and 3 triaxial accelerometers. The MSS built 12 spans near Bratislava between May 2019 and February 2020.

Keywords: Movable Scaffolding Systems (MSS); Large MSS (LMSS); Organic Prestressing System (OPS); Structural Monitoring; Operational Modal Analysis (OMA).

1 Introduction

The 2.9km Danube Bridge is a highway crossing over the Danube River, 10km from the centre of Bratislava, Slovakia. The structure is part of a major highway project, which is being undertaken to ease traffic on existing radials and roads in and around the Slovak capital. The crossing comprises a 900m-long main bridge and two access viaducts: the 12-span 784m-long west viaduct and the 18-span 1,250.5m-long east viaduct.

For simplicity, the superstructure of the approach viaducts was built in two phases (see Figure 1). The first comprised the central box girder, which was built as a full span continuous beam using MSS. Lateral wings were built by wing travellers during the second phase. Both viaduct decks have similar cross sections and were designed to be built by similar MSS, both equipped with Organic Prestressing System (OPS) [1].

The construction of prestressed concrete bridge decks with MSS, a three-dimensional steel lattice structure that supports the formwork used to construct one entire span of the bridge deck that additionally has the ability to self-launch between adjacent spans, is normally used for a 40-60 m span range [2]. Until the last few years, bridges with 70-90 m spans were normally constructed with precast solutions, metallic solutions or balanced cantilever method.

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