Reference Details:

Owner Croatian General Highway Department, Zagreb, Croatia

DSI Unit DSI Group Headquarter Operations, Munich, Germany
DSI Scope Supply and installation of a cable vibration damper system

Cable vibration dampers secure one of the largest stay cable bridges in Europe

Dr. Franjo Tudjmann Bridge, Dubrovnik, Croatia

In May 2002, one of the most outstanding stay cable bridges in Europe was opened to traffic. The Dr. Franjo Tudjmann Bridge near Dubrovnik in Croatia, which has an overall length of 481.4 m, is suspended from the 143 m high pylon by 19 pairs of DYNA Bond ® Stay Cables, types DB-P27 and DB-P61.

Especially in winter, the bridge is subjected to extreme storms which are frequent at that coastal location. The winter storms in 2005 and 2006, which were characterized by a large amount of wet snow and wind velocities of up to 110 km/h, led to very high oscillation amplitudes in the stay cables. Amongst other things, these large oscillations can be attributed to wet snow sticking to the cables, adversely changing their aerodynamic characteristics.

As a result, adaptive cable dampers were installed in the spring of 2006 that work according to the principle of magnetorheological (MR) fluid dampers. The electronic control, which was installed in early November 2006, significantly reduces the oscillation amplitudes. Thus, the oscillation behavior of the entire bridge is posi - tively affected, increasing both the service life of the stay cables and traffic safety.

These MR dampers were developed in close cooperation between DSI, Maurer & Söhne GmbH & Co KG, a Munich-based company, and the Swiss research institution for material science and technology, Empa. After one damper had been tested on the Eiland Bridge in Kampen/Netherlands, the dampers found their first use in the Dr. Franjo Tudjmann Bridge.

These novel dampers employ a fluid that has the characteristic to change its fluidity under the influence of a magnetic field. Therefore, coils are arranged in the dampers that produce a magnetic field in an electronically controlled way. The stronger the current, the stronger the magnetic field and hence the damping force. The strength of the current and thus the damping force are controlled by customized software. The current required is extremely low. Due to its basic friction, the damper also functions in the event of a power failure, albeit with a lesser degree of efficiency. Therefore, it is fail-proof.

Tests on site showed that the dampers, which are installed rectangular to the DYNA Bond ® Stay Cables and mounted at about 3.5 m above Cable vibration dampers secure one of the largest stay cable bridges in Europe Dr. Franjo Tudjmann Bridge, Dubrovnik, Croatia the bridge deck, can reduce the oscillation of the cables by a factor of up to 10. The development of these cable vibration dampers is another good example for the successful cooperation between industrial enterprises and research institutions

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for more information please call: + 49 89 - 30 90 50 - 200 or fax: + 49 89 - 30 90 50 - 252 or e-mail: info@dywidag-systems.com