

→ KTI Project Report No. 11

Tuned Mass Dampers dampen bridge vibrations

Customer	→ GLS Bau und Montage GmbH; Perg, Austria
Location	→ Speyer, Austria
Year	→ 2017
KTI product	→ Two Tuned Mass Dampers, model TL.1300.1,3
Natural frequency	→ 1.34 Hz
Tuned mass	→ 2 x 1,300 kg = 2,600 kg

The pedestrian bridge over the river Enns in Speyer has a short (32 m) and a long (66 m) section. The natural frequency of the long bridge section measured 1.3 Hz, its damping effect was at $D=0.2\%$ very low. Vibration tests with a group of persons walking in step showed very high vibration speeds of over 130 mm/s. A subsequent vibration test with a synchronously hopping group (vandalism simulation) led to uncontrolled swinging in the bridge. Installation of Tuned Mass Dampers (TMD) was therefore urgently necessary.

KTI engineers construed two Tuned Mass Dampers acting in a vertical direction. The tuned mass is 1,300 kg in each case, quality helical compression springs support this weight. The viscose damping can be adjusted. The maximum vibration path of the two TMDs' is +/- 45 mm. Vertical guides prevent inadmissible horizontal movements. Installation is made in prepared shafts in the centre of the long bridge section.

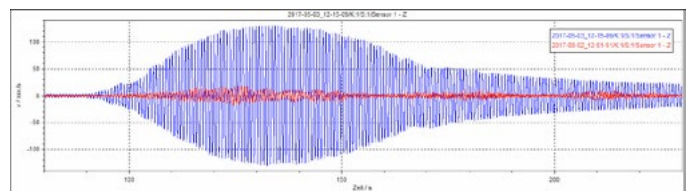
After installation and fine adjustment, new vibration measurements were carried out. The damping in the bridge had increased from 0.2 % to approx. 6 % by the factor 30. Long reverberations were as little evident in the bridge in human tests as were uncontrolled swinging up. Vibration speeds decreased by 90 %.



Footbridge over the Enns with two TMDs' after installation



Tuned Mass Dampers (TMD) before delivery



Measurement diagram of a group walking in step before (blue) and after (red) installation of the TMDs' in mm/s