

Wind tunnel testing of bridge cables with wire meshes

Improving performance and traffic safety of cable-supported bridges

Background

Numerous bridges around the world are exposed to weather conditions that might result in the accumulation of ice and snow on their cables. These accumulations pose a serious risk for traversing traffic and pedestrians once they start to melt and fall down in large chunks. In such events, the authorities are usually forced to close the bridge until the risk has diminished. This generates measurable regional economic losses due to traffic congestion, and financial losses of the local authorities due to car damages and insurance claims. Moreover, the ice modifies the aerodynamic properties of the cables, which may lead to undesirable cable vibrations. However, certain cable vibration phenomena commonly occur on bridges even without the presence of ice. For this reason, many cable-supported bridges are equipped with maintenance-expensive damping devices for cables to counteract these effects.

The project

The researchers from Aarhus University collaborate with the Technical University of Denmark to develop an innovative cable surface able to mitigate the risk of falling ice and suppress cable vibrations at the same time. The proposed solution utilises a steel wire mesh that can be installed on cables of new as well as existing bridges. To assess the performance of cables fitted with wire meshes, tests of full-scale bridge cable sections will be conducted at the Climatic Wind Tunnel research facility in Kgs. Lyngby.

Purpose

The donation from COWIfonden will be used to maintain existing test equipment and to purchase a specialised apparatus for aerodynamic tests. The apparatus will allow to precisely measure the aerodynamic forces acting on the cables and to study the flow phenomena around them. Besides that, the new apparatus will be able to accommodate cables of various sections and aspect ratios. Furthermore, the broader scope of the project aims to investigate the icing properties of cables with wire meshes in varying atmospheric conditions in more detail.

Prospects

Considering the lack of any suitable bridge cable technology dealing with falling ice while maintaining the current levels of aerodynamic performance, this project has a great practical and research relevance. Therefore, the successful outcome of this research might likely lead to its implementation in the industry and further research opportunities.