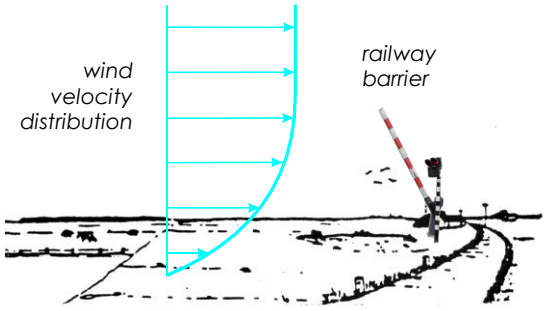
Gone with the Wind (1. part)

Vialis NMA Railway Signalling designs, manufactures, installs and maintains railway level crossing protection systems.

By Dutch law a railway barrier arm has to fall into its horizontal closing position in case of an electrical grid failure to avoid any chance of an accident. However, strong winds might keep the barrier arm open due to the acting aero dynamical forces. This might not only be a problem for areas close to the coast, where strong winds are common, but also in built-up areas, where local wind gusts can occur between tall buildings. These operational conditions have resulted in a design requirement for a streamlined barrier arm with low wind loading.

After Vialis NMA had produced a first prototype of such a barrier arm FlowMotion has performed several tests in the Low Speed Wind Tunnel of the Aerospace department of the Delft University of Technology to determine the relation between the air flow velocity around the barrier arm and the generated aerodynamic forces. For this a part of the barrier arm has been placed in the measurement section of the wind tunnel and connected to a weighing system, which is able to measure 3 forces and 3 moments simultaneously with an accuracy of 0,01 Newton. This system also allowed the barrier to be rotated around its longitudinal axis.



In addition to the measurement of the forces acting on the barrier, it has been investigated, whether the so-called "Von Karman vortex street" might occur. This has been done by measuring the frequency spectrum of the passing flow using a microphone. In case the frequency of the vortex shedding is close to the eigenfrequency of the barrier arm structure, it might start to vibrate with an increasing amplitude, finally resulting in a total collapse of the barrier arm.

Having established the aerodynamic characteristics of the newly designed barrier arm in the wind tunnel, subsequently its behaviour in an open atmosphere has been analysed. In this study both various topologies of the surrounding area as several weather conditions have been included. In the latter case wind statistics from the Royal Netherlands Meteorological Institute (KNMI) have been used.

From this project a barrier arm has emerged which not only has favourable static and dynamic behaviour during various operational conditions but also has documented aerodynamic characteristics.

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