EXPERIMENTAL INVESTIGATION OF THE AERODYNAMICS OF A TRAIN ENTERING A CONFINED AREA

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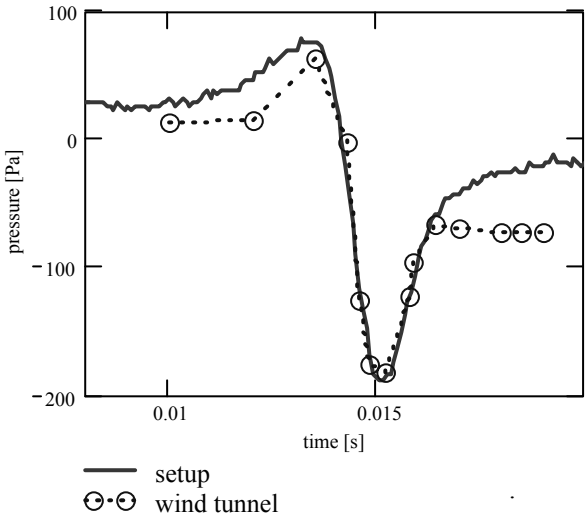
This study concerns the experimental investigation of the aerodynamics of a train entering a confined area. The study is divided into two parts. The first one is dealing with the alleviation of the pressure waves from the entrance of a train in a tunnel by means of installing flare entrances. The second deals with the investigation into the pressure pattern and induced flow created by the passing of a train through a station.

The flare entrance as a means of alleviating the pressure waves by the entrance of train to a tunnel is studied. The design of the different hoods used is investigated, the corresponding results are studied and the parameters of importance are discussed. Comparison with experimental and numerical data, as well as analytical calculation given by other researchers is taking place. Pressure pattern and induced flow are characterized through transient pressure and hot wire measurements. Comparison with other data from literature is given. The assumption of quasi-steady flow pattern is introduced and justified with wind tunnel experiments. Conclusions on the safety and comfort of the passengers are drawn with the help of criteria found in bibliography.

Installation of flared entrances in tunnels is having small effect in controlling the maximum static pressure that appears due to the primary pressure wave. The effect, however, on the pressure gradient could be considered important since it can reach significant values close to 48%. When a train is entering a train station with a significant speed the pressure level as well as the pressure gradients introduced are not small. However velocity and pressure magnitude together with velocity and pressure gradients decay fast with increasing distance from the train walls and almost disappear at 2m distance from the train.



Comparison of dynamic tests at the rig, and static wind tunnel tests, to prove the quasi-static assumption for the pressure pattern created at a train station from a passing train