

Squeal noise monitoring on the Stockholm metro

Squeal noise is characterized by large sound pressure levels with components at a few dominating frequencies typically in the range below 10 kHz. For rail vehicles, it is generated during curving (i.e. “curve squeal” or “flanging noise” generated due to excitation by the wheel–rail contact at the low and high rail, respectively) or braking (i.e. either disc- or tread brakes). The construction of track networks in densely populated areas makes solving the squeal noise issue a highly prioritized task for railway networks worldwide.

In this master's thesis project, the generation of squeal noise on the green line of the Stockholm metro is investigated. Sound pressure levels measured by a metro train instrumented with on-board microphones mounted close to the four wheels of a bogie is used. This monitoring system has been developed in cooperation between the consultancy firm Thyréns and the Stockholm metro, SL. The investigation sets out by counting all squeal events in the data collected during a year. By identifying individual characteristics of the different types of squeal noise the total number of events are broken down into “curve”, “flanging” and “brake squeal”. A statistical analysis purposed to investigate the influence of operational (e.g. vehicle speed, curve radius, retardation) and environmental conditions (e.g. track constructed in or outside a tunnel, season of the year, temperature, humidity) on the generation of squeal noise is performed. Results based on field measurement data are combined with simulations using an existing model developed in a multi-body dynamics software.

The project is suitable for 1 – 2 persons. Work places will be offered both at Chalmers and the Swedish National Road and Transport Research Institute (VTI) located at Lindholmen and the plan is for the work to be divided between both places. Trip(s) to Stockholm to discuss with Thyréns and SL and to extract data to be used in the project are planned.

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Figure 1. C20 train trafficking on the green line of the Stockholm metro