Integration of the Properties of the Dutch Train Protection System *ATB EG* in Driver Advice Systems for Eco-driving

Driver Advice Systems for energy efficient train operation require a correct system modeling. The objective of this "Studienarbeit" was the modification of the existing software for analyzing and optimizing train runs in order to demand the particular requirements given by the Dutch Automatic Train Protection (ATP) system. The developed algorithm had been implemented and evaluated by different case studies, e.g. at the Dutch railway network. An estimation of the benefits which can be made if the Dutch ATP system is substituted by a state-of-the-art train protection system completed this research project.

ATB EG - *Automatische Trein Beïnvloeding - Eerste Generatie*

The ATB EG is a Dutch ATP system which is predominantly installed on the Dutch railway network. This system uses the existing track occupation circuits for data transmission. The information about signal aspects and maximum allowed track speed are restamped on the track circuits. Besides the supervision of the maximum track speed and the driver's alertness, failure to reduce speed after a warning signal is observed. The supervision of the ATP system and the operational rules will force the driver to react to a down speed sign or signal indication (e.g. yellow signals) by initial braking with reduced braking rate, if the current driving speed v_{Train} is above the supervised, reduced ATB EG speed v_{ATB} .

Fig. 1: ATB EG devices in the Dutch regional train Mat'64.

This specific Dutch driving behaviour has to be considered during the simulation of driving trajectories in analyzing tool, e.g. BEAoffline, which leads to an improved process model. Furthermore, the consideration of the initial braking leads to an improved prediction of the train run and has to be implemented in Dutch Driver Advice Systems, e.g. BEAonline. Especially in regional train operation, an initial braking due to the operation situation can lead to a driving advice which differs up to 10 km/h from the optimal driving regime without considering the ATB EG properties.

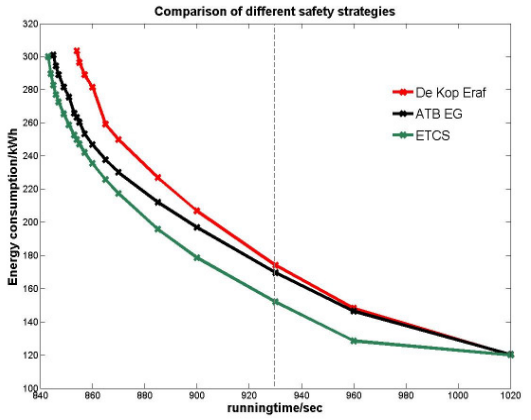

Fig. 2: Minimal energy consumption depending on safety strategy and given running time

Benefits of State-Of-The-Art Train Protection Systems

The graphs (Fig. 2) reflect the common characteristic dependency of given running time and energy consumption. The consumed energy at a fixed running time highly depends on the installed safety system. The implementation of ETCS leads to an improved rate of given running time to energy consumption and less energy consumption at a fixed running time. The implementation of the real braking trajectory supervision can be used to shorten the running time without increase of the consumed energy.

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