PROJECT

Traindy Programme

Programme for calculating longitudinal dynamics in freight trains

Funding: International
Duration: Nov 2007 - Sep 2008
Status: Complete with results

Background & policy context:

Against a background of increasing trade, greater road congestion, high oil prices and growing concerns about environmental conservation, rail freight transport offers genuine advantages and is continuing to expand. In this context, the UIC has clearly identified the existence of substantial demand for international freight trains with an overall tonnage of more than 1200 tonnes.

Project TrainDy is a major step towards harmonisation of international freight traffic improving freight train performance and efficiency.

Project TrainDy is a key building block in international freight traffic harmonisation, increasing international freight train performance whilst ensuring a high level of safety.

Objectives:

The purpose of the project is a development and commercialisation of a software system needed for calculation of longitudinal dynamic forces for freight trains.

This software tool has been specially developed to simulate pneumatic effects and longitudinal forces which should lead to greater unification of international braking modes facilitating the operation of trains in international traffic. This means that the performance of freight trains is increased whilst ensuring that current levels of safety are maintained.

Methodology:

The project was worked out in three steps:

1. The first step is for the system to respond to the present demand of the railways supporting its development
2. The second step is to develop the legal framework which will allow other users and promoters to access this system
3. The third step is to make the system available for other users

The first step is divided into three phases of verification carried out by UIC:

- Determine the requirements to be met in simulation by pneumatic (brake pipes, distributors, etc.) and dynamic (buffers, coupling hooks, suspension springs, etc.) components.
- Incorporate input data as well as potential optimisations of individual functions into the programme.
- Validate the entire TrainDy system on the basis of the pneumatic and dynamic components to be replicated. The UIC-approved version of the programme should thus be available by late 2008.

In the medium term TrainDy should not only be able to calculate longitudinal dynamics for the European market, but also for the railways of Asia, North and South America, Africa and Oceania, and their specific equipment.
The long term prospect is to implement a complete three-dimensional model for rolling stock, with pantograph and wheel/rail interfaces.

This implies investigating the interaction between wheel and rail, in order better to understand the forces arising between the two and the resulting train behaviour, for example in the case of reduced friction in autumn. In addition, the vertical forces in freight wagons must be taken into account in order to predict abnormal wear of components.

**Parent Programmes:**
UIC - International Union of Railways (various projects)

**Institute type:** Non-profit organisation

**Institute name:** UIC - Union Internationale des Chemins de fer

**Funding type:** Industry

**Partners:**
UIC

Namely:
Faiveley Transport Italy, German Railways (DB AG), French Railways (SNCF), Italian Railways/Operator (Trenitalia SpA), Slovakian Cargo Operator (ZSSK Cargo).

**Organisation:** UIC

**Key Results:**

The new TrainDy software system simulates all longitudinal force related parameters with a high level of accuracy, making it possible to calculate complex braking component interaction. The complete manoeuvre of a train can therefore easily be modelled by simply selecting locomotives and wagons from a database, defining track sections and movement conditions based on distance, speed or time. After the definition of all boundary and initial conditions the system then simulates the resulting pneumatic, speed and longitudinal forces etc.

TrainDy allows the user to define the degrees of freedom of the vehicle components for the calculation (like longitudinal forces, vertical forces, roll and pitch). This precise simulation offers railway operators the opportunity to calculate the level of safety in relation to longitudinal forces for individual trains.

In the project it was defined an internationally accepted risk analysis to guarantee that the actual levels of safety remain constant. This definition is found by using the new TrainDy software and via negotiations to establish a procedure for the calculation of safety levels. Another of this tool's major advantages is that it reduces the number of test runs. New train designs with larger capacities, such as longer and heavier trains, require high cost test runs.

**Innovation aspects**

A risk analysis will be defined in the framework of a new software system to ensure the safety of railway transport.

**Policy implications**

Enhancing of use and safety of railway transport

**Documents:**
- Traindy Programme (Project presentation)

**STRIA Roadmaps:** Network and traffic management systems

**Transport mode:** Rail transport

**Transport sectors:** Freight transport

**Geo-spatial type:** Other