Type EU-funded FP7 research project

Contract number 234015

Project website http://www.triotrain.eu

Coordinator

Mr. Martin Couturier
UNIFE - The European Rail Industry
Avenue Louise 221
BE 1050 Brussels
E-mail: martin.couturier@unife.org
Tel: +32 (0)2 642 23 21
Fax: +32 (0)2 626 12 61

Partners

ALSTOM Transport S.A. FR
Bombardier Transportation GmbH DE
Stemmann-Technik GmbH DE
Societe Nationale des Chemins de Fer Francais FR
Rail Safety and Standards Board Ltd UK
Politecnico di Milano IT
Instituto Superior Tecnico PT
Universita degli Studi di Roma 'La Sapienza' IT
Union Internationale des Chemins de Fer FR
Network Rail Infrastructure Ltd UK
Alma Consulting Group S.A.S. FR
Tecnologia e Investigacion Ferroviaria S.A. ES
Contact Srl IT
Associacao Portuguesa para a Normalizacao e Certificacao Ferroviaria PT
Deutsche Bahn AG DE

UIC Contact

ERRAC evaluation On going

Keywords

Summary
PantoTRAIN aims at developing and introducing a computer-aided certification process to allow the reduction of the time and cost of pantograph certification against ENs and TSI by transferring current physical track tests to laboratory testing and numerical simulation.

State of the art - Background

When certifying a rail vehicle according to European regulation, two elements constitute a significant challenge: vehicle cost and time to market. A large part of vehicle certification mandates testing for safety, performance and infrastructure compatibility in each individual Member State. The certification process can thus take up to 30 months and cost several million euros, imposing a huge competitive disadvantage on the development of rail products, and thus jeopardizing the development of a reliable and sustainable transport network.

PantoTRAIN is part of the TrioTRAIN cluster of projects. TrioTRAIN, an acronym for Total Regulatory Acceptance for the Interoperable Network, is the common title given to a cluster of projects (three hence 'Trio') dealing with key railway interoperability issues. The objective of these projects is to propose an innovative methodology that will ease rail vehicle certification processes in Europe to make them faster, cheaper and better for all involved stakeholders.

Objectives

PantoTRAIN aims at developing and introducing a computer-aided certification process to allow the reduction of the time and cost of pantograph certification against ENs and TSI by transferring current physical track tests to laboratory testing and numerical simulation.

The high-level objectives include:
- introducing new procedures based on numerical simulations and Hardware-in-the-Loop testing into the current certification process of the pantograph/catenary system, thus reducing migration time for the implementation of new interoperable solutions;
- using the numerical and physical simulation to extend pantograph homologation to different catenary systems, thereby enhancing the interoperable use of existing infrastructure and the development of new interoperable pantographs;
- fostering the use of innovative and mechatronic pantographs, by understanding how the homologation process relates to these systems and by revising the limits provided by the TSIs;
- using the simulated behavior of new/modified pantographs or catenaries ‘close’ to those already certified by line tests, thereby avoiding the repetition of certification tests on the new modified designs, and allowing the saving of a large portion of the costs associated with homologation;
- fostering the use of 'Hardware-in-the-Loop' (HIL) testing as a more objective and less expensive alternative to line tests.
Description of Work

Virtual homologation techniques will be applied to extend pantograph homologation across different national railway networks. The collection of pantograph and catenary databases at European level will be an essential step towards this ambitious goal. The project is organised into the following work packages (WP):
WP1: Criteria to build and validate pantograph/ catenary numerical simulation tools
WP2: Hardware-in-the-Loop testing of pantographs
WP3: Virtual homologation for interoperability
WP4: Virtual extension of homologation for a pantograph that presents minor changes from an already homologated one
WP5: New innovative pantograph designs with control functionalities
WP6: Assessment of virtual homologation procedures and Regulatory Acceptance.

WPs 1-5 deal with the definition of numerical and experimental tools for the virtual certification of the pantograph/catenary couple. WP6 aims at the final assessment of the tools previously developed and, at the same time, ensuring the acceptance of the project results by European and national authorities. In this last WP, methodologies will be defined and applied to all the technical WPs in order to check and guarantee the quality of the results and propositions, and to undertake appropriate actions in terms of proposing new standards, consensus building and contacts to standardisation bodies, NSAs and ERA.

Expected Results

The expected results are as follows:
Numerical simulation of pantograph/catenary interaction:
- using simulation tools to ‘virtually’ perform part of the tests needed for the certification of pantographs and catenaries;
- using simulation tools in combination with the European Catenary Database for pantograph certification of cross-border operations, thereby achieving virtual certification for interoperability;
- using simulation tools to achieve the certification of new/modified pantographs and catenaries that can be considered sufficiently close to ones for which physical certification was already performed.

Hardware-in-the-Loop testing of pantograph systems:
This technology has a clear potential to improve methods for product development and testing and to simplify homologation procedures.

The main innovation will be the introduction of HIL testing into the homologation process, not only for pantograph/catenary systems, but also for railway rolling stock.

Pantograph design and mechatronic application:
- systematic design optimization to reduce weight and improve the overall contact force;
- improving pantograph interoperability through the exploitation of control technologies;
- developing appropriate strategies for active control of pantographs;
- performing a complete revision of the homologation process for innovative/mechatronic pantographs.
Additional details

Total cost: 3 611 908 €
EU contribution: 2 166 370 €
Call: FP7-SST-2008-RTD-1