OPTIRAIL — Result In Brief

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Smart tool for rail maintenance

An EU project developed new, smart, rail-maintenance and decision-support technologies. Results incorporate elements adapted from the gas industry, and fuzzy-logic modules; testing validated the complete management system.

In recent decades, Europe has embarked on a much-needed overhaul of its ageing national rail systems. Goals include a modern, integrated rail network, achieved in part through new technologies and systems.

The EU-funded OPTIRAIL (Development of a smart framework based on knowledge to support infrastructure maintenance decisions in railway corridors) project developed some of the necessary smart tools. Such outcomes helped to optimise railway maintenance, thereby ensuring greater network availability, also improved international cooperation and efficiency.

An early phase involved conducting analyses to define the tools' ultimate requirements and specifications. The team examined methods of calculating track quality indices, and different forms of measurement, for various countries. Researchers also assessed the data and expert knowledge needed to meet such goals, plus detailed the relevant standards and regulations.

OPTIRAIL analysed the maintenance and decision-support tools used in other industries, and their applicability to the rail context. Methods from the natural gas industry were most adaptable to the rail sector, since the two industries share several features including timescales of maintenance scheduling. The team developed an assessment matrix, combining data from four case studies, which presented 25 common elements related to five categories of maintenance.

A conceptual design phase built upon the previous needs-, constraints- and specification-analyses. The project compared all services necessary for an optimised maintenance plan, and prepared a general conceptual framework concerning smart maintenance. Resulting designs incorporated fuzzy-logic tools – themselves subject to a design phase – into a railway infrastructure management system. The tools included evolution and maturation models of rail infrastructures, fault-detection and isolation elements, fuzzy-knowledge databases, risk-analysis and optimisation modules, decision tools, and several others.

All project developments were separately tested and validated, prior to implementation. The stage included evaluation of the project's open source software. A pilot phase consisted of final testing of the whole system. The team lastly compiled a summary of lessons learnt during the entire venture.

OPTIRAIL has strengthened the global position of Europe's rail sector, supported EU policy objectives, and contributed to European railway leadership. The main benefit was a step towards an efficient maintenance schedule, permitting more
network traffic without disruption. Watch the project’s video here.

Related information

Report Summary
Final Report Summary - OPTIRAIL (DEVELOPMENT OF A SMART FRAMEWORK BASED ON KNOWLEDGE TO SUPPORT INFRASTRUCTURE MAINTENANCE DECISIONS IN RAILWAY CORRIDORS)

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Scientific Research

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