

Presentation of results at the Final Conference on

28th of October 2009
in Torino (Italy)

Registration under www.modbrake.com



MODBRAKE



Overview

Modbrake (2006 - 2009), a research project partly funded by the European Commission, contributes to one of the main objectives of the EU policy in railway transportation: The realisation of interoperability and standardisation for the brake system.

Modbrake has been set in addition to the proceeding MODTRAIN project to consider brake systems for high speed trains. Within nearly four years of joint work in an international team Modbrake developed specifications for reliable, affordable and interoperable brake systems of brake modules which will serve as input for the European standardisation bodies CEN and CENELEC.

The project partners will present the results in a public demonstration at the Politecnico di Torino (Italy) on 28 October 2009.

Background

The braking system is one of the most important and complex subsystems of rail vehicles, in particular when it comes to safety. Today the brake supply sector is characterised by a broad variety of different designs, and testing, validation and maintenance procedures vary considerably. To reduce this complexity - and therefore costs - Modbrake divided the brake system into individual modules, elaborating specifications for each of them. This serves the demand for a shorter design phase and better life cycle costs (LCC).

The specifications developed by Modbrake will be used as basis for further standardisation. The standardised modules will be interchangeable in their functionality, interfaces and test procedures. Inside they retain the specifications of each manufacturer to guarantee technological progress in the future.

Partners

Modbrake groups the main players in the European high-speed railway sector: European brake suppliers, train manufacturers, railway operators, research centres and international industry associations. The project was coordinated by UNIFE, the European Rail Industry.

Project results

Modbrake elaborated specifications for the main modules of the brake system and its interfaces according to the individual vehicle structure that was defined within the MODTRAIN scope. The following specifications are proposed for European standardisation:

- The standardisation activities on the area of **Air Supply** resulted in the description of the main technical parameters of a standard Air Generation and Treatment Unit for High Speed Trains with regard to functional requirements, mechanical, electrical and pneumatic interfaces for different air supply units. In addition, a reference procedure for the calculation of air consumption on a train, a specification for the air quality on board of rolling stock and validation procedures of Air Generation and Treatment Units have been produced.



*Components of the brake control unit:
The brake handle (left) and the brake panel for the direct and the indirect
brake architecture (right)*



*The picture shows the time dependant brake handle, the emergency push
button and the position dependant brake handle
(from left to right); the direct brake handle was not in the scope
of standardisation in Modbrake*

- Three **Brake Control** architectures for Multiple Units have been defined with the aim to standardise the interfaces among the identified sub-modules. The following main architectures (all compliant to the TSI High Speed requirements) have been taken into account:
 - Indirect brake system based on UIC requirements.
 - Direct/indirect brake system UIC compatible.
 - Direct/indirect brake system.

In addition, Modbrake focused on the standardisation of the two following driver's desk devices for functional requirements and mechanical, electrical and pneumatic interfaces:

- Drivers Brake handle/controller (position and time dependant)
 - Emergency Brake push button.
- The **bogie brake module** generates the retarding force. Modbrake specified the requirements and interfaces as well as the operational environment of modern compact actuators/calipers that act on axle or wheels installed brake discs.
 - Modbrake also addressed interoperability issues for **Eddy Current Brakes (ECB)**. ECB's are used for emergency brake or service brake applications to shorten the braking distance and relieve the wear and high thermal stress on the mechanical parts of the friction brake. The Modbrake specification provides a working base addressing interoperability issues of the ECB describing technical features and gives explanations of the impact of the (vehicle borne) ECB on the infrastructure.

Demonstration of results

The specification results in terms of design principles and interface definitions were demonstrated and validated by functional prototypes for brake control and bogie equipment. The tests prove the exemplary implementation of functional, operational and system related requirements for the brake modules based on the standardisation proposals. The tangible hardware results will be presented to industry and operators at the final MODBRAKE conference on 28 October 2009 to show the achieved level of interoperability and standardisation.



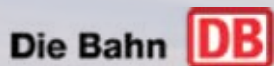
Testbench to assess functionalities and fault tolerance of the Brake Control Unit.

Measuring the results

The already developed LCC toolbox LifeCyCal of MODTRAIN has been converted into a specific-for-high-speed-trains-braking-systems LCC toolbox under the MODBRAKE environment. Simultaneously, a specific software tool "OpCostCalc" has been produced in order to generate the necessary data for the calculation in respect to operation and brake performance. A descriptive calculation has been run on the Italian high speed train ETR 500 obtaining promising results towards the modularisation of the braking systems, supporting, upon an economic perspective, the final MODBRAKE purposes.

Project specifications for European Standardisation

Area	Name	Scope
Air generation and treatment	Air consumption calculation and questionnaire	Questionnaire for vehicle manufacturer about air consumers. Algorithm for calculation of air consumption, dimensioning of reservoirs and calculation of fill-up time.
	Air supply module class 2400	Functional requirements and specification of interfaces (mechanical, electrical, pneumatic) of an Air Supply Unit class 2400 l/m
	Air supply module class 1600	Functional requirements and specification of interfaces (mechanical, electrical, pneumatic) of an Air Supply Unit class 1600 l/m
	Air quality	Requirements about quality for compressed air used on train brake systems.
Brake Control	Brake controller (brake handle)	Functions requirements and interfaces (mechanical, electrical, pneumatic) of the brake controller (brake handle)
	Brake Control modules for Multiple Units – UIC architecture	Functions requirements and interfaces (mechanical, electrical, pneumatic) of brake control modules for high speed multiple units)
	Brake Control modules for Multiple Units – UIC compatible architecture	Functions requirements and interfaces (mechanical, electrical, pneumatic) of brake control modules for high speed multiple units)
	Brake Control modules for Multiple Units – TSI architecture	Functions requirements and interfaces (mechanical, electrical, pneumatic) of brake control modules for high speed multiple units)
	Emergency brake valve/push button.	Functions requirements and interfaces (mechanical, electrical, pneumatic) of the emergency brake valve/push button
Bogie equipment	Brake unit for axle and wheel mounted discs	Functions requirements and interfaces (mechanical, pneumatic) of the brake unit for axle and wheel mounted discs
Eddy current brakes	Eddy current brakes	Functions requirements, interfaces (mechanical, electrical) and operational requirements about eddy current brakes



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