EUDD – MODTRAIN – EUDDplus:
Steps forward on the way to the European Train Drivers’ Desk

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Status quo

- Every locomotive class with specific drivers‘ desk design
- Insufficient consideration of ergonomic aspects
- Different arrangements of control elements according to national requirements
- Operators‘ and manufacturers‘ specific solutions available for available
- Small production runs

Challenges

Standardisation
Harmonisation
Europe wide
RTD approach

The keys for the future competitive European Rail System – the motivation for the ModLink SP

- Modularisation
- Standardisation
- Harmonisation
- Interdisciplinary approach
- LCC optimisation
- Authorisation
- Learning from other sectors

New culture of cooperation – consensus approach
Industry – operators – researchers – associations – standardisation bodies
Partner structure

Project partner – the EUDDplus example:

Coordinator

Research

Manufacturers

Suppliers

Train Operating Companies

Associations

Further regional partners:

Fahrzeugwerke Mirastraße
IFS Designatelier

SGW Werder GmbH
TU Berlin

TSB Workshop Rail Transport Technologies ● 7 December 2010 - 4 - Meißner/Hübner (TSB-FAV)
EUDD approach

„Learning from other sectors“ paves the way

- Fly-by-wire
- Improved ergonomics
- Modularisation
- Display and terminal technology

from the thirties …
Junkers Ju-52

… to Airbus A380

Consensus building process paved the way
to modularised and harmonised European Driver’s Desk (EUDD)

- Optimised MMI by applying latest knowledge in ergonomics
- Enhanced functional modularisation
- Shift of functionalities: from controls to displays
- Min 15% cut of Life Cycle Costs
From EUDD via EUCAB to EUDDplus

**European Driver's Desk (EUDD)**
01/2001 – 12/2003 (EU project, FP 5)
→ Functional demonstrator verified with tests in virtual reality at Siemens simulator, Munich

**MODTRAIN/EUCAB**
02/2004 – 04/2008 (EU project, FP 6)
→ Functional cab demonstrator verified with tests in virtual reality at the SIMUFER simulator, Lille

**EUDDplus**
07/2006 – 01/2010 (EU project, FP 6)
→ Multisystem demonstration and field test verification in vehicle platform at Siemens Test Validation Center, Wegberg-Wildenrath
Typical project structure plan

Project management

Supporting activities for Europe wide authorisation of innovative railway technologies

Scientific analysis
Functional specification

Technical development
Specification of hard- and software

Construction and implementation

Test bed

Permanent involvement of the users

Preparation and conducting of functional and acceptance tests

Scientific evaluation of test results

Scenario development for realisation
Recommendations for standardisation
Translations of Requirements into tangible Hardware

- Thermal Comfort
- Exterior Design
- Aerodynamics
- Structural Layout / Crash
- Packaging of Systems and Interior Components
- Drivers Desk Layout / Ergonomics
Modlink EUCAB – driver cabin concept
Validation/Testing
MODLINK/EUCAB

• Tests at Simufer in Lille
  – Scientific analyses by IAS
• Validation of Desk designs against operational practise
  – Three test campaigns with four design variants
  – Almost 60 comprehensive test cycles with drivers from 11 countries
• Generally extremely positive feedback!
  – But no desk was perfect
  – Constructive comments lead to continuous improvements between the campaigns
  – All desk variants are proven in practise!
• Results form the basis for upcoming EN (CEN WG 37)
EUDDplus aimed on a Europe wide standardisation and harmonisation of the functional grouping and layout of the control elements on the drivers' desk including the verification of

- ergonomic advantages
- subsystem behaviour
- economic advantages (LCC)

by pre-competitive field tests of cross-border operation with a real vehicle platform
Drivers' desk design

01 - Train radio Display
02 - Technical and Diagnostic Display
04 - Control Command Display
06 - Electronic Timetable Display
10 - Emergency stop valve
40 - Keyboard

Source: ALSTOM Transport
Functional grouping of left side control elements

18 - Train Power Supply
17 - Main Circuit Breaker
16 - Pantograph
19 - Automatic Speed Controller
20 - Combined Traction Brake Controller
21, 22, 23 - Doors control
14 - Release Intervention
13 - Override
15 - Acknowledgement

Source: ALSTOM Transport
Functional grouping of right side control elements

32a – Driver Automatic Brake controller

33 – Travel Direction Forward

34 – No Travel Direction: Neutral

35 – Travel Direction Reverse

37 – Direct Brake

15 – Acknowledgement

38 – External Warning Horn

Source: ALSTOM Transport
**EUDDplus**

Reference tests

**Velim (Czech Republic, August 2009)**

- Testlok Škoda 109E
- EUDD-Design of the drivers’ desk
- Instruction of drivers

- During a test run
- Analysis of eye movements
- Filling in questionnaires

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7 December 2010

Meißner/Hübner (TSB-FAV)
EUDDplus
In field tests Wildenrath

Test oval T1
Length: 6.082 m
Max. speed: 135/160 km/h

Test oval T2
Length 2.485 m
Max. speed: 85/100 km/h

Test track T5
Length 410 m
Max. gradient: 40/70 %

Test features:
• 4 weeks in November/December 2009
• 17 drivers from CZ, H, A, CH, I, SLO, F, B, NL, D
• Loco with wagons → 200 m long freight train
• 6 scenarios (normal operation, incidents, gradient)
Comprehensive organisational measures before the field tests

► Clarification of technical and operational feasibility and organisational questions with the test centre operator

► Familiarisation with the technical and operational rule of the Wildenrath test centre

► Contact to train operating companies regarding availability of test drivers, clarification of aspects regarding insurance

► Organisation of additional facilities and personnel staff: wagons, signals, pilot driver, auxiliary services of the test centre, clarification of aspects regarding insurance

► Project acting as a kind of „train operating company“ for 30 days and a mileage of 4,000 km!
EUDDplus
In field tests Wildenrath

Freight train running on the large test ring T1
(Scenarios 0, 1, 2 - normal operation, maximum speed: 120 km/h)

- Locomotive PRIMA II
- 9 empty 4-axle container-carrying wagons, types Sgns/Sgnss
- Train length: 192 m
- Train weight: 263 t
- Braking percentage: 103%
Flexible signalling was necessary to simulate 50 to 60 km long trips on the 6 km long test ring T1.

- 6 LED screens steered by GSM-R at km 0.3 / 1.5 / 2.5 / 2.9 / 3.2 / 5.4
- 6 rail contacts gave the impulses for switching of the next signal on the same position.
- Use of the same signalling principles than in SIMUFER tests for the MODTRAIN project:
  - Main and distant signals
  - Announcement and begin of speed restrictions
  - Announcement, begin and end of neutral sections
  - Announcement, begin and end of power supply transitions
  - Begin and end of cab-signalling
EUDDplus
In field tests Wildenrath

Instruction of train drivers at the training simulator

Test train with wagons

Test loco Alstom PRIMA II during shunting procedure

Design of the EUDDplus-drivers’ desk

Additional signals beside the large test ring

Measurement of eye movements
EUDD\textit{plus-}
In field tests Wildenrath

Data collection and analysis

Objective data

- Luminance measurements in the drivers’ cabin
- Measurement of drivers‘ eye movements
- Recording of driving data
- Observation of drivers‘ behaviour

Subjective data

- Evaluation of ergonomical aspects of the drivers‘ desk and the displays, of the interactions with hard- and software functions by questionnaires
- Evaluation of stress and strain by rating scales
- Drivers‘ comments during the test runs at the locomotive and at the simulator

The drivers’ conclusion regarding quality, comfort, beauty and usability was a general positive one.
EUDDplus
LCC analysis

► 12% savings regarding LCC are possible, if 70 to 90 units are considered to be produced without adaptions (small production runs)

► The funding costs for development within the projects EUDD, EUCAB and EUDDplus will be amortised with the 2000th unit (earlier for bigger production runs)

► The maximum saving potential is to be seen with bigger production runs (> 100 units) is to be expected with 30%.
On the way towards standardisation

• Conformity check against Technical Specifications for Interoperability (CR TSI Loc&Pas RST) demonstrated a conformity of nearly 80% for EUDDplus

• Adjustment of EUDDplus testing programme with TSI was very helpful

• Results of EUDDplus on the basis of EUCAB and UIC leaflet 612 expand into the common Technical Recommendations of UIC and UNIFE for drivers’ cabs (TecRec N°100_002)

• The integration of the EUDDplus specifications into European standards (TSI, EN) gives the crucial impulse for acceleration of authorisation processes and for cross acceptance procedures between the member states.
Milestones

Dissemination during EUDDplus

Kick-off Meeting
Munich August 2006

Intermediate Seminar
Brussels, September 2009

Final Conference
UIC, Paris
January 2010

Public Demonstration Day, Testcenter Wildenrath, December 2009
Dissemination Activities

EUDD\textit{plus}

- Presentations, e.g. at the Euro Zel 2010 Railway Congress in Žilina (SK) and at the 9th World Congress on Rail Research (WCRR 2011) in Lille (F)


- EUDD\textit{plus} Project documentation video

- InnoTrans 2010: Presentation of the EUDD\textit{plus} training simulator and project poster

- TSB Workshop Rail Transport Technologies, 7 December 2010
Thank you for your attendance!