FR8RAIL, project 730617
Midterm conference Vienna
18 April 2018
Jan Bergstrand &
Anders Ekmark
Trafikverket
Driving Innovation within Shift2Rail: FR8RAIL project
“IP 5Technologies for sustainable and attractive European Rail Freight”

Structure FR8RAIL

- Identification of high level requirements in market segments, KPI’s and Migration
- Telematics and electrification providing more intelligence
- Automated couplers with specifications and migration plans
- Low-noise, lightweight, track friendly running gear, core and new market wagon 2020
- Condition based maintenance and predictive maintenance
- Synchronization of technical findings/specifications between the workpackages
- Project management

Vision IP5

- Automated train composition and operation
- Longer coupled trains with distributed power
- Smart eco-efficient propulsion technologies
- Logistics capable, Future wagon
- Condition monitoring for predictive maintenance
- Asset Control tower & customer communication

Targets of Shift 2 Rail

- Reduction of Green House Gases
- Market Growth & Modal Shift
- Improved services and customer quality until 2030
- Cost reduction
Automation and digitalisation

This project has received funding from the Shift2Rail Joint Undertaking under Grant Agreement 730617
The content of this document reflects only the Project’s view
The relationship and contribution to TD in general
Focus areas and projects in MAAP.
FR8RAIL in yellow.
Project status Management

Project meetings:
- TMT + SC meetings: 02.08, 05.08 (TMT only), 14.09, 07.12.

Overall status:
- Second reporting period 01.01.17 - 31.12.17 All WPs are making progress.
- Some deliverables are delayed in order to allow for better collaboration across WPs and with other projects (e.g. CONNECTA, X2RAIL)
- There is a need to accelerate the project with respect to the Wagon Design in WP4 due to developments in the market.
FR8RAIL WP1 – Business Analytics, KPIs, Top Level Requirements

1.1 Market Segments (Leader: CON)

1.2 Top level requirements, development of technical specifications for Wagon application (Leader: CON)

1.3 Top level requirements, development of technical specification for Propulsion (Leader: BT)

1.4 Development of Key Performance Indicators (Leader: CON)

D1.1 - Market Segments architecture

D1.2 - Specifications Wagon
- D1.2.1 core market wagon
- D1.2.2 extended market wagon
- D1.2.3 automatic coupling

D1.3 - Specifications Propulsion
- D1.3.1 New Propulsion last mile applications
- D1.3.2 Locomotive boogie

D1.4 Key Performance Indicators for IP 5
- D1.4.1 Novel wagon vs typical UIC standard wagons
- D1.4.2 Running gear and automatic coupler
- D1.4.3 Locomotive
- D1.4.4 Propulsion
First trache of our CBM initiatives are already in implementation WP2

Funnel (BR 185, 189, 152, 29x und 26x)

- Clear quality gates are defined to manage all CBM ideas through the process
- Weekly update calls and meetings are in place to monitor progress

Outlook: 3.1 Define target process incl. approval process

---

DB Cargo AG | Holger Niggemann | Projekt CBM | 14. März 2018
Telematics and Electrification
WP3

- Communications (T3.1)
- Positioning (T3.2)
- Z Sensors: Wagon monitoring (T3.3)
- X Sensors: Cargo monitoring (T3.4)
- Y Sensors: Loco monitoring (WP2)
- Automatic coupler (WP5)

WSN: Wireless Sensor Network
OBU: on-board unit
wOBU: Wagon OBU
LOBU: Locomotive OBU
Freight Telematic System (FTS) = OBUs = wOBUs + LOBU

(*)train-train comm = not possible
Max Train length = 1500m

LTE 5G
GNSS
X sensor
Automatic coupler
Electrom. Actuator
RFID Module
Valve status switch
wOBU
WSN
Z Sensor

LTE 5G
GNSS
X sensor
Automatic coupler
Electrom. Actuator
RFID Module
Valve status switch
wOBU
WSN
Z Sensor

LOBU

Wireless
Wired

train-earth
TELEMATICS
automated brake test
WP 4 Wagon design-Core Market Concepts

- Improved tightness by multiple labyrinths
- Secondary rubber sealing

**Tightness**

- Favourable kinematics without rail interruption
- Minimal resistance during sidewall movement
- Without friction of pulley during opening
- Simple control and adjustment

**Volume**

- The largest volume at the market

**Weight**

- The lowest weight
- Max. stiffness of design

**NEW mechanism**

Covered Wagon Habbii(II)ns with Optimised construction
Headstock-free bogie with disc brake and radially adjustable wheelsets by means of „cross-coupling“
Acoustic optimization of wheels

- For the wheel with straight web, according to internal Know-How.
- Noise calculations in progress

Modal shapes of the three most relevant modes for the wheel with straight web.
- Optimization of the usable train length by **flexible adjustment** of the load length of the wagons with coupling rod
- Increase of the payload by the **low mass of the wagons**
- Reduction of the wagon costs by **using 2 axle wagons**
- Universal applicability for different container types
- **Improved aerodynamics** and thus reducing air resistance and energy consumption
Modular Wagon Concepts for ext. Market
Aerodynamical/-acoustics methods & Analysis

SWG wind tunnel
Self driving trucks will increase the competitiveness significantly.

- Approx. 1/3 of truck costs are costs for drivers.¹
- With migration of autonomous trucks, road transportation will reduce costs dramatically.
- Without massive increase of productivity, competitiveness of rail freight will be weakened significantly.

**Assumptions:** Costs for rail freight increase in average by 2% p.a. because of raising costs for infrastructure and electric power supply. Diesel costs and costs for road toll will not increase, other cost increases will be adjusted by gains in productivity. Beginning of migration of autonomous trucks in 2024, all long-distance road transportation with autonomous trucks in 2030.

¹ Source: Cost calculation truck, hwh
The railway has not increased its productivity in a significant way in the past 20 years.

Competitors increased their competitiveness...

...rail freight didn't.

Wettbewerbssysteme konnten Ihre Wettbewerbsfähigkeit deutlich steigern...

Der Schienengüterverkehr hingegen kaum...
There is a great need for new thinking and migration of innovations

**Capacity Infrastructure**
- Further development of rail freight corridors
- Extension of nodes and passing tracks
- ETCS

**Dimensioning of freight trains**
- Longer trains (>750m)
- Heavier trains
- Faster trains

**Digitization**
- Intelligent locomotives and wagons
- Telematics and sensor technology
- Predictive Maintenance

**Automation**
- Automated marshalling yards
- Automated shunting locomotives
- Autonomous driving
- Automation of production processes

**Premises / Basis-Innovations**
- Automatic coupling systems
- Electric power supply on train
- Data transmission on train
- Electro-pneumatical brake

This project has received funding from the Shift2Rail Joint Undertaking under Grant Agreement 730617
The content of this document reflects only the Project’s view