Technical Innovation Circle for Rail Freight Transport (TIS)
Implementation of Innovations for Rail Freight Wagons

Speakers:

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Agenda

A  Introduction TIS – Intermediate Results of TIS

B  „5L“-Demonstrator Freight Train of SBB Cargo AG / TIS

C  Wagon Intelligence

D  Conclusion and Prospects
Introduction TIS – Intermediate Results of TIS

Jürgen Hüllen
Spokesman of TIS
State of play: The development and implementation of basic innovations for European rail freight are still totally inadequate

Reasons for this lack of innovative power in the sector include:

- The European market for new rail freight cars is small and volatile  
  ➔ small volume market /high development costs.

- Innovations must not restrict compatibility of freight car deployment.

- Basic innovation requirements of wagon keepers are insufficiently defined.

- Slow implementation of basic innovations.

- Innovations must generate economic gains for wagon keepers.

- Economic benefit of a freight wagon innovation is not necessarily reaped by wagon keepers.

This calls for a new approach to innovation across the whole industry.

Technical Innovation Committee for Rail Freight Traffic
(TIS = Technischer Innovationskreis Schienengüterverkehr)

**FUTURE-ORIENTED INITIATIVE**
The key features of a competitive rail freight wagon:

- **LOW-NOISE**
- **LIGHTWEIGHT**
- **LASTING THE COURSE**
- **LOGISTICS-CAPABLE**
- **LIFE CYCLE-COST-BASED**

- **Life-cycle-cost-based**
  Ensuring the profitability of an investment over the life cycle

- **Lightweight**
  Higher load volume due to lower wagon tare weight

- **Lasting the Course**
  Reduction of downtimes and standing times, increase in annual mileage

- **Logistics-capable**
  Integration into supply chains, high level of operability

- **Low-noise**
  Significant reduction of rail freight wagon noise emissions
Participants of the Technical Innovation Circle for Rail Freight Transport

- Wagon keepers
- Railway undertakings
- Shippers
- Wagon/Component manufacturers

Academic support

Project management

Technischer Innovationskreis Schienengüterverkehr (TIS)
InnoTrans 2016
In 2016 TIS has entered a new stage of operations

Stage 1: Definition of requirements for innovations in the following segments

- Innovative Bogies and Brake Systems
- Telematics and Sensor Technology
- Innovative Coupling Systems
- LCC-models Components and Wagon

Stage 2: Implementation of Innovations

R&D-Project Switzerland „5L“-Demonstrator of SBB Cargo / TIS

SBB CFF FFS Cargo
In 2016 TIS has initiated new innovation activities

### Previous topics and working groups

|-------------------------------------|----------------------------------|-----------------------------|-----------------------------------|---------------------------|----------------------------------|

### Transition into new topics / working groups

<table>
<thead>
<tr>
<th>Innovative Bogies and Brake Systems</th>
<th>Wagon Intelligence</th>
<th>Automated Operational Processes*</th>
<th>Wagon Design</th>
<th>LCC-Models Components and Wagons</th>
</tr>
</thead>
<tbody>
<tr>
<td> Innovative bogies and brake systems will be tested in “5L”-demonstrator</td>
<td> Works on standardisation of data exchange will be continued together with ITSS</td>
<td> New project; integration of project “innovative coupling systems”&lt;br&gt;  Investigation of implementation of power supply line and data bus</td>
<td> Aggregation of working group innovative constructional systems and light weight construction into one project&lt;br&gt;  Objective: Standardized, light weight underframe with variable innovative constructional systems</td>
<td> LCC-model for bogies and brake systems available&lt;br&gt;  Perspectively further components will be integrated into LCC-model</td>
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</tbody>
</table>

*Automated operational processes, e.g. automated break tests, automated support in technical wagon inspection, support in train integrity, train composition,…

Technischer Innovationskreis Schienengüterverkehr (TIS)<br>InnoTrans 2016
In project „Automated Operational Processes“ innovations shall be identified and migrated on a short and middle term scale.

- **Power Supply Line / Data Bus**
- **Innovative Coupling Systems**
- **Electronic Brake**
- **Digitalisation – new use cases**

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**Adjustment of Rules and Standards**

- Identification of rules and standards which restrict the implementation of innovations
- Re-Assessment of suitability of identified rules and standards
- Petition of need for changes through official channels (e.g. associations, committess, …)

TIS also campaigns for the development of innovative disc brakes for rail freight wagons

- TIS sees high potential for disc brakes as the future standard braking systems for freight rail cars in Europe. Disc brakes reduce noise emission as well as wear and tear of wheelsets in comparison to block brakes.

- But today disc brakes for freight rail cars show two major disadvantages: disc brakes are heavier than block brakes which leads to reduced payload and therefore reduced profitability. Furthermore prices for disc brakes are too high for an economical application in all rail cars.

- Today disc brakes are only in use in rail cars with a high yearly mileage of more than 80,000 km p.a. and with no need for full payload capacities.

- TIS is convinced that with reduced weight and reduced price (under the assumption of high quantities and serial production) disc brakes can be operated economically also in rail cars with lower yearly mileage.

- Therefore TIS is in dialogue with the suppliers for brake systems in order to reinforce their R&D-activities for the developments of a brake disc for rail freight cars.

- Perspectively TIS sees potential that appr. 80% of all new builds in the European market could be equipped with disc brakes (estimated amount of new builds in Europe p.a. appr. 7,000 freight rail cars).
Agenda

„5L“-Demonstrator Freight Train of SBB Cargo AG / TIS

Jens-Erik Galdiks
Head of Rolling Stock Technology

SBB CFF FFS Cargo
The „5L Demonstrator“ is a project supported by numerous actors of the sector in order to test and implement innovative rail freight cars.

**Introduction of project „5L Demonstrator“**

### Growth Factors „5L“

- **Low Noise**
  - Significant reduction of noise emissions

- **Light Weight**
  - Lower net wagon weight means greater payloads

- **Long-running**
  - Less downtime, fewer outages, greater annual mileage

- **Logistics enabled**
  - Integrated into supply chains, enhanced service quality

- **Life Cycle Cost - oriented**
  - Rapid paybacks on investments, savings on operating and maintenance costs

**TIS and „Future Initiative 5L“**

- **TIS**: Technical Innovation Circle for Rail Freight Transport (TIS): european practice group for introduction of innovations in freight rail cars
  - Objective of Future initiative „5L“: Development and migration of innovative rail freight cars

**Project 5L Demonstrator**

- **Leadership**: SBB CFF FFS Cargo

- **Suppliers**
  - DAKO-CZ, a. s.
  - VOITH
  - BONATRANS
  - Lochner Verkehrsentwicklung GmbH
  - ELH
  - KNORR-BREMSE
  - WBN
  - LUCCHINI
  - Faiveley
  - THE GREENBRIER COMPANY

- **Project management**

- **Supported by**
  - Schweizerische Eidgenossenschaft
  - Confederazion svizzera
  - Confederation suiza

Technischer Innovationskreis Schienengüterverkehr (TIS)
InnoTrans 2016
The R&D-project „5L-Demonstrator“ aims at testing of innovative, but already available technologies in real operations.

Basic idea of the project

Innovative components

1. Test of innovative components in 4-year long operations (real traffics)

2. The industry partners supply innovative components for sustainable freight rail cars

3. Leadership by SBB Cargo, which takes care about assembly, approval process and operation of „5L“-demonstrator

4. Reduction of noise emissions by 5 dB to 10 dB in comparison to conventional rail freight wagon with block brakes (noise remediated)

5. Operation of the demonstrator trains beginning in 2017, initially in Switzerland, from middle of 2018 operations aboard is planned
Together with numerous partners of the sector a demonstrator train for operations in customer traffics shall be assembled.

Structure of the demonstrator train
Altogether six different modules will be tested in the 5L-demonstrator in respect to function and characteristics.

Components in 5L-demonstrator

**Bogies**
- Low wear and tear
- Radial steering
- Low noise emissions

**Disc Brakes**
- Low noise
- Low wear and tear

**Platform**
- 60' Container with sliding door
- Isolated / non-isolated
- Further types according to customer requirements

**Wheelset**
- Low noise
- Low wear & tear

**Intelligence**
- Generation and processing of data
- Systems from SP Automation

**Automatic Coupling**
- Optimized production
- Basis for new underframe concepts
- Based on technology used in passenger trains

**Sgnss SBB Cargo**
From middle of 2017 the demonstrator train shall be operational in real customer traffics

Time schedule R&D-project «5L-Demonstrator»

- **Initiation of project** November 2015
- **Approval of BAFU for R&D-project** August 2016
- **Beginning** April 2016
- **Provisorily operational approval for CH** December 2016
- **Operational international approval** Middle of 2018
- **Start operation in real traffics of SBB Cargo** Q3 2017
- **Assembly, Approval, Tests**
- **4-year operational phase**

End of operations after 400,000 km mileage August 2021
The „5L Demonstrator“ train is only a first step into badly needed innovations for the rail freight sector.

Next steps and prospects

- **Next steps 5L Demonstrator**
  - **Start of operations** by SBB Cargo beginning from middle of 2017
  - Generation and processing of data about condition of innovative components, identification of further areas for innovations
  - Test of automatic coupling system in real operations in Switzerland

- **Prospects**
  - The sector has to speed up in order to generate **completely new components and wagon designs**
  - This integrates amongst others the use of new materials (e.g. CFK), the further implementation of automatised processes as well as the additional use of telematic applications
  - Objective is to reduce investment costs for wagons and components as well as the operational costs (focus on TCO, investment and Life-Cycle-Costs)
The „5L Demonstrator“ train is only a first step into badly needed innovations for the rail freight sector

1. The „5L Demonstrator“ project is the first innovation approach of the whole sector together with numerous actors of the industry.

2. The reduction of noise emissions by 5dB up to 10dB in comparison to a block braked freight rail car is a big step and badly needed in order to sustain the acceptance of the public.

3. The „5L Demonstrator“ can only be the first step towards an innovation-driven improvement process for the rail freight sector in order to stay competitive.

4. A common approach of the sector is essential in order to implement innovations for the rail freight sector.

We thank all the participants of the project „5L-Demonstrator“ and wish us all a successful progression of the project!
„5L Demonstrator“ – a common sector approach for the development of a sustainable rail freight car

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Asset digitization is a key lever for an increase in productivity and efficiency as well as added costumer value within the rail freight business.

**Targets and levers of asset digitization**

- **Increase in efficiency and reliability of assets** as basis for cost reduction
- **Increase in process stability and quality** based on a harmonized database
- **Reduction of manual handling** and thus increase in productivity and competitiveness
- **Creation of customer added value and growth** through digital service offers
- **(Semi-) Automation of processes** along the overall value chain
- Setting knowledge through **intelligent usage** of existing and new data
Applying sensor technology intelligent wagons optimize operations and maintenance and generate new markets

Vision and potential of „Wagon Intelligence“

Wagons are
- Equipped with sensor technology
- Integrated element of a digital value chain

Fields of optimization

Increase efficiency in operations
- Automated operational processes and reduction of manual handling
- Increase in wagon availability

Optimization of maintenance
- Avoidance of overloading damages
- Consideration of information on wear and component condition in operations

Improvement in competitiveness
- Creation of new additional services according to customer needs
- Growth and shift to rail through better quality

Equipment hardware
Realization of IT-landside
Business process re-engineering
Change Management
Wagon keepers in Europe are busy in migrating the technology into their wagon fleet - examples

**DB Cargo**
Deutsche Bahn Gruppe
Pilot project with 500 wagons and 50 tank containers and different suppliers

**SBB CFF FFS Cargo**
Pilot project with different types of wagons and different suppliers

**wascosa**
Equipping of intermodal fleet with telematics and sensor technology until 2017

**VTG**
Pilot project with different types of wagons and different suppliers

Examples of activities in telematics and sensor technology in European Rail Freight Sector
Example DB Cargo – steps realized and ongoing activities within the field test phase

Goals:
- Test of maturity of different technologies
- Definition and implementation of interfaces
- Transfer new functionalities into the value chain
- Business Case validation

1. Stage
- 120 Wagons
- 11 Types
- Market Unit Steel and Coal

2. Stage
- 380 Wagons
- 19 Types
- Market Units Intermodal, Automotive and Industry Goods

3. Stage
- 50 Wagons + 50 Containers
- 2 Types
- Market Unit Chemicals
- ATEX-Protection

Position
- Mileage per GPS
- Shock
- Humidity
- Weighing (exact, full/empty, overload)

Status:
- realized
- realized
- Ongoing action

Technischer Innovationskreis Schienengüterverkehr (TIS)  
InnoTrans 2016
There are a many suppliers and all have (had) a different approach for data communication

**Mission for telematics suppliers: Development of standardised interfaces**

- Initially - compatibility of telematic units and sensors of different suppliers was not guaranteed as there has been no standardisation of data exchange

- TIS has defined the requirement for the implementation of telematics and sensor technology

- Suppliers have accepted this mission and are generating standards for data exchange between application servers and CRM-servers in the backoffice (interface 1) and between device level and agents (interface 2)

- Only with a common standard for the different interfaces of telematics and sensor technology devices of different suppliers can communicate with each other and a widely spread migration into the European wagon fleet seems possible.

**Industrieplattform Telematik und Sensorik (ITSS)**

Technischer Innovationskreis Schienengüterverkehr (TIS)
InnoTrans 2016
Who ist the ITSS practice group?

- Initiated by the dialogue between the TIS members and telematics system suppliers
- Association of telematics solution partners in December, 2014, to create better conditions for the use of telematics systems in rail freight transport.

„Industrieplattform Telematik und Sensorik im Schienengüterverkehr“

ITSS practice group “

Industry platform telematics and sensors in the rail freight sector
Standardisation of interfaces for telematic data exchange

Standardized ITSS Interface 1
Data exchange between the servers of the telematics providers and ERP systems of customers.

ITSS Interface 2
Data exchange between the telematic device and sensors which are attached to the transport unit.
What was the procedure of ITSS?

<table>
<thead>
<tr>
<th>Date</th>
<th>Activity</th>
<th>Complete</th>
</tr>
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<tbody>
<tr>
<td>12/2014</td>
<td>Determining principles and objectives (Statute)</td>
<td>✓</td>
</tr>
<tr>
<td>01/2015</td>
<td>System architecture &amp; interfaces prioritization</td>
<td>✓</td>
</tr>
<tr>
<td>02/2015</td>
<td>Detection and classification of relevant standards</td>
<td>✓</td>
</tr>
<tr>
<td>03/2015</td>
<td>Definition of the 7 basic applications in accordance with TIS-Report</td>
<td>✓</td>
</tr>
<tr>
<td>04/2015</td>
<td>Confirmation of cases of application by the TIS</td>
<td>✓</td>
</tr>
<tr>
<td>05/2015</td>
<td>Complete the specification of the interface</td>
<td>✓</td>
</tr>
<tr>
<td>06/2015</td>
<td>Confirmation of the specification concept by TIS</td>
<td>✓</td>
</tr>
<tr>
<td>12/2015</td>
<td>Start reference implementation at TIS-members</td>
<td>✓</td>
</tr>
<tr>
<td>03/2016</td>
<td>Reference implementation done by the Telematics provider</td>
<td>✓</td>
</tr>
<tr>
<td>04/2016</td>
<td>Complete implementation by reference users with success</td>
<td>✓</td>
</tr>
<tr>
<td>09/2016</td>
<td>Publication of the interface at the InnoTrans 2016</td>
<td>✓</td>
</tr>
</tbody>
</table>
What are the advantages of ITSS-interface 1?

- The ITSS - interface is consistently supported by renowned telematics system providers and further maintained.
- The ITSS - Interface is an open, freely available standard.
- Systems from the telematics providers can be integrated via standardized ITSS data interface.
- The ITSS standard enables customized solutions and provides all required data transparently.
- ITSS – Interface to download

http://www.innovative-freight-wagon.de download area
What happens next in the ITSS practice group?

Experience from implementations assume in the further development of ITSS interface 1

Standardization ITSS Interface 2
Components different suppliers can be used together.
Connections of sensors:
- cable connection
- radio link
Interface No. 2 (Sensors)

What has been achieved so far?

11/2015 Use cases have been defined and prioritized ✔
01/2016 Relevant technologies are examined, evaluation criterias are recognized ✔
02/2016 Evaluation criterias are agreed ✔
06/2016 Wireless technology to connect radio based sensor and telemtics system is defined ✔

... 
11/2016 Definition of communication structure is ongoing
Industrieplattform
Telematik und Sensorik im Schienengüterverkehr (ITSS)

Industry platform telematics and sensors in the rail freight sector

Thank you for your interest!
Conclusion and Prospects

Jürgen Hüllen
Consultant
Spokesman of TIS

VTG
Conclusion

- During the **last two years TIS has defined technical, operational and economical requirements** for innovative components like **bogies, wheelsets, disc brakes, telematics and sensor technology as well as innovative coupling systems.** These requirements have been discussed and evaluated with the suppliers.

- **In 2016 TIS has entered a new stage of activities.** In the “5L”-project of SBB Cargo AG supported by TIS innovative technologies are tested in a demonstrator train which will be in action by Spring 2017.

- In the field of **telematics and sensor technology TIS** together with a **group of suppliers (ITSS) establish standards for data exchange.** A first specification for the interface between the application servers of the suppliers and the servers of the users (e.g. ERP-systems) is published today. The specification for a second interface for data exchange between sensors and telematics units of different suppliers is in development and will be published in 2017.
Prospects

- TIS has shown a lot of **activities in innovations for rail freight wagons**. Many of those innovations are going to be tested in the **demonstrator train of SBB Cargo AG/ TIS**. Furthermore TIS will of course continue to enable migration of innovative technologies in rail freight wagons.

- Nevertheless TIS stands for Innovation Circle for Rail Freight Transport and not only for innovations in rail cars. Therefore TIS has decided to **broaden their scope** into more operational topics and has initiated a **new working group “Automated operational processes”**. Scope is to reduce the efforts for technical train inspections as well as for other operational processes e.g. automated break test, detection of train composition.

- TIS is willing to **actively develop further innovation topics**. As there exist various ideas and topics for innovations in rail freight traffic and ressources of the TIS-participants are limited, **TIS is seeking for support. New participants - also from other countries besides Germany/Switzerland - are cordially welcome.** Participants of TIS should be either shippers, forwarding companies, wagon keepers, railway undertakings or railway infrastructure undertakings, suppliers of the railway industry.
Thank you very much for your attention.

For further information about TIS please view our homepage: www.innovative-freight-wagon.eu

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