Technischer Innovationskreis Schienengüterverkehr (TIS)

Bundespreis ecodesign nominiert 2015

Kick-off meeting

"5L"-demonstrator: Innovative and Silent Freight Train
by SBB Cargo AG with support of TIS

11th November 2015
11.00 am until 03.00 pm
VTG AG, Nagelsweg 34, 20097 Hamburg

Agenda

A Short introduction TIS

B Concept, Project Structure and Timeline „5L“-demonstrator

C Requirements TIS - preconditions for and benefits of participation

D Next steps

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Participants in the Technical Innovation Circle for Rail Freight Transport

TIS Zukunftsinitiative 5L

Wagon keepers	Railway undertakings	Shippers	Wagon/Component manufacturers
AAE	BASF	BASF	KNORR BREMSE
BASF	DB SCHENKER		WAGGONBAU GRAAFF Member of the VTG Group
DB SCHENKER	SBB CFF FFS Cargo		WBN Tradition seit 1835
GATX			
SBB CFF FFS Cargo			
VTG			

Scientific support

TECHNISCHE UNIVERSITÄT DRESDEN

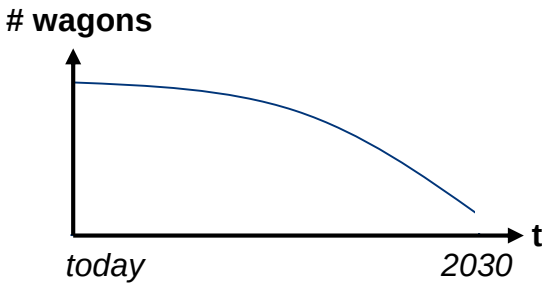
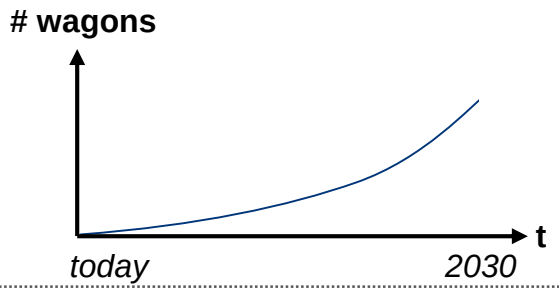
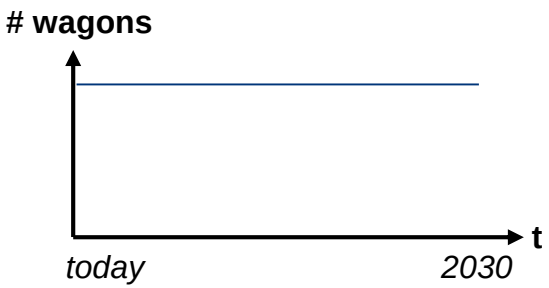
TU berlin

Project management

hwh Gesellschaft für Transport- und Unternehmensberatung mbH

Growth factors for the rail freight industry – The “5L” Future Initiative

Basic innovations –
TIS definition of innovation options

Option	Target group for innovation	No. of wagons affected	Period per innovation (development and licensing)
A	▪ Existing fleets ▪ Newbuilds based on existing system & module designs ➜ *Impact on at least 1 L*		approx. 2 to 4 years
B	Newbuilds based on new system & module designs ➜ *Impact on all 5 L if possible*		approx. 5 to 8 years
C [A+B]	All wagons: ▪ Existing fleets ▪ Newbuilds based on existing / new system & module designs ➜ *Impact on all 5 L if possible*		approx. 2 to 8 years

Standard procedure for identification and migration of basic innovations in rail freight wagons

1	2	3	4
Launch of interdisciplinary task forces	**Definition of technical, operational and commercial requirements**	**Launch of dialogue process with wagon manufacturing industry**	**Decision, development, trial, migration** **Status quo**
▪ Identification by TIS steering group of basic innovations required for rail freight wagons. ▪ Interdisciplinary composition of TIS with wagon keepers, railway undertakings, shippers/ railway agents, wagon manufacturers and components industry, permitting a 360° perspective.	▪ TIS task force with experts from the TIS companies draws up a profile for defined basic innovations, consisting of operational, technical and commercial requirements.	▪ TIS invites the wagon manufacturing industry to participate in a dialogue. ▪ TIS requirements for basic innovations are presented and discussed. ▪ Bilateral talks are conducted with willing manufacturers about how to proceed with the development and migration of basic innovations.	▪ Manufacturers, and if appropriate TIS, make decisions about the development of a basic innovation. ▪ Practical trials are conducted if required. ▪ Elaboration of migration scenarios. ▪ Decision to introduce the basic innovation in TIS companies.

Summary of progress in the various sub-projects

TIS Innovation Projects	Project Status
1 Innovative Bogies	Requirements on innovative bogies and disc brakes defined and discussed with industry, field test in preparation
2 Sensors / Telematics	Requirements defined, industry platform launched for standardisation of interfaces, standardisation of first interface accomplished
3 Innovative Couplings	Review compiled of current practical and scientific knowledge, feasibility studies for migration of automated coupling systems accomplished
4 Lightweight Construction – Use of Innovative Materials	No activities yet
5 Innovative Structure	No activities yet
Cross-cutting project	*Cross-cutting project*
6 Earnings-Adjusted/ Basic LCC Model	Detailing of LCC model for bogies with brake system components

Contact

For further information see website TIS

www.innovative-freight-wagon.eu

Contact

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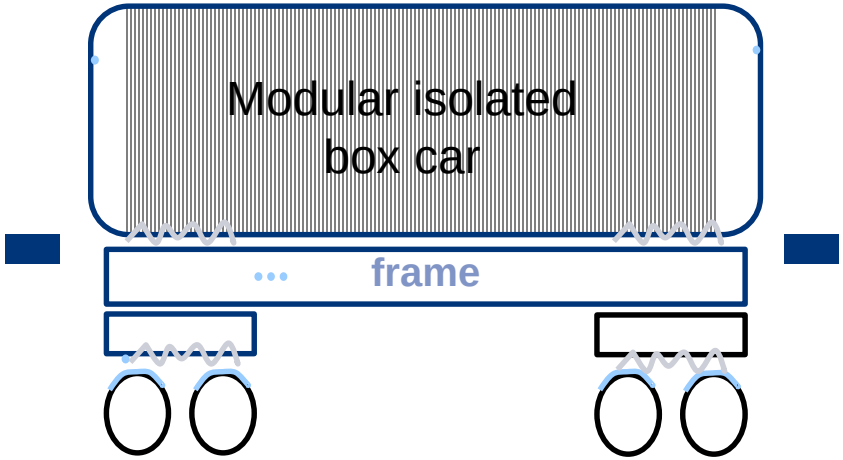
Overall concept „5L“-demonstrator

Basic Innovations

- Validation of 5L wagon
- Modular platform
- Innovative bogies, disc brakes and wheelsets
- Sensorics and telematic applications
- Intelligence (for bearing and brake)
- Automatic coupling system



Values expected from new wagon

Criterias for additional values

- Optimized Lifecycle cost:
  - Optimized acquisition cost
  - Optimized Mileage costs
  - Optimized wear and tear
  - Optimized Maintainability
- Universal usable
  - Wagon can be used for any good transportation
- Optimized production cost
  - Optimized stretch prize
  - Optimized load capacity
- Low noise
  - 10dB lower noise than todays standard waggon

Concept of testing and comparison

Regular Measurements

- Load
- Speed
- Acceleration force
- Distance
- LifeCycle cost
  - wear and tear
  - Price
- Time of breakdown
- Analysis of transport conditions
- Track friendlieness
- Condition of bearing
- Condition of wheel
- Condition of brakes (visible from outside/digitaly)

Once-only tests

- Brake test
- Noise test
- Uncouple tests if needed (Abhängeversuche)
- Classification of trackfriendliness (Einstufung Trassensystem)

Targets and contents of demonstrator train

Targets of demonstrator train

- Demonstration of innovative rail components with potential for significant noise reduction for freight rail cars
- Industry can experience innovative solutions according to TIS-requirements.
- Industry gets the opportunity to test innovative bogies, disc brakes and wheel sets and measure effects of the components in a long-time test trial.
- TIS/SBB Cargo and the industry receives relevant information about wear and tare of different combinations of bogies, disc brakes, wheel sets as well as noise and energy reduction.

Content of demonstrator train

- Common operations in container traffics
- Noise emission tests according to TSI
- Measurement of wear and tear of wheelsets, brakes, frame and spríng elements
- Maintenance expenses bogie, wheelset, brakes
- Wear and tear infrastructure
- Savings of traction energy
- Weight of bogie/wheelsets/brakes
- Operating behavior
- Extension of maintenance intervalls accoustic testing of wheelset bearing
- Application of telematic systems
- Application of automated coupling system
- Further noise reducing activities

Proposal for participation in the demonstrator train (no decision yet, only status quo)

TIS Zukunftsinitiative 5L

Project Management

SBB CFF FFS Cargo

SBB Infrastructure

SBB CFF FFS

Bundesamt für Verkehr BAV

BAV - OFT - UFT

Bundesamt für Umwelt BAFU

Bundesamt für Umwelt BAFU

Support/Steering by TIS

AAE

BASF

DB SCHENKER

GATX

SBB CFF FFS Cargo

VTG

WAGGONBAU GRAAFF

Scientific Support

Bogies

ISTRA RAIL INDUSTRIES

ELH

THE GREENBRIER COMPANIES

TATRAVAGÓNKA POPRAD

WBN

Disc Brakes

DAKO-CZ, a. s.

Faiveley

KNORR BREMSE

Wabtec CORPORATION

Wheel Sets

Bochumer Verein Verkehrstechnik GmbH · seit 1842

BONATRANS

LUCCHINI RS

Lubricants

ARAL

BAYER

FUCHS

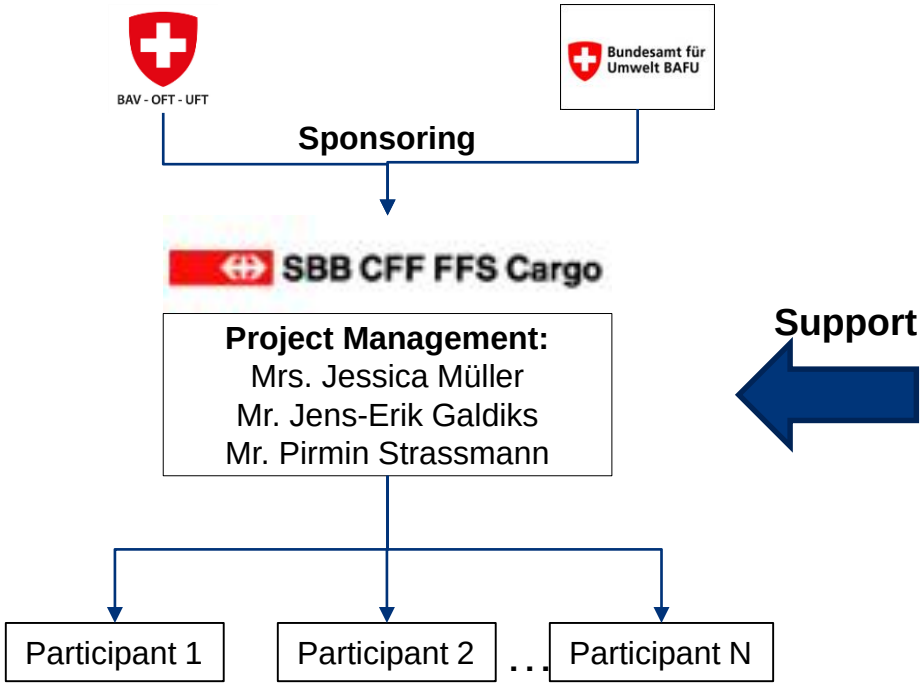
Wheel Set Bearings

FAG

KINEX

SKF

The „5L“-demonstrator“ is a project by SBB Cargo AG with strong support of TIS

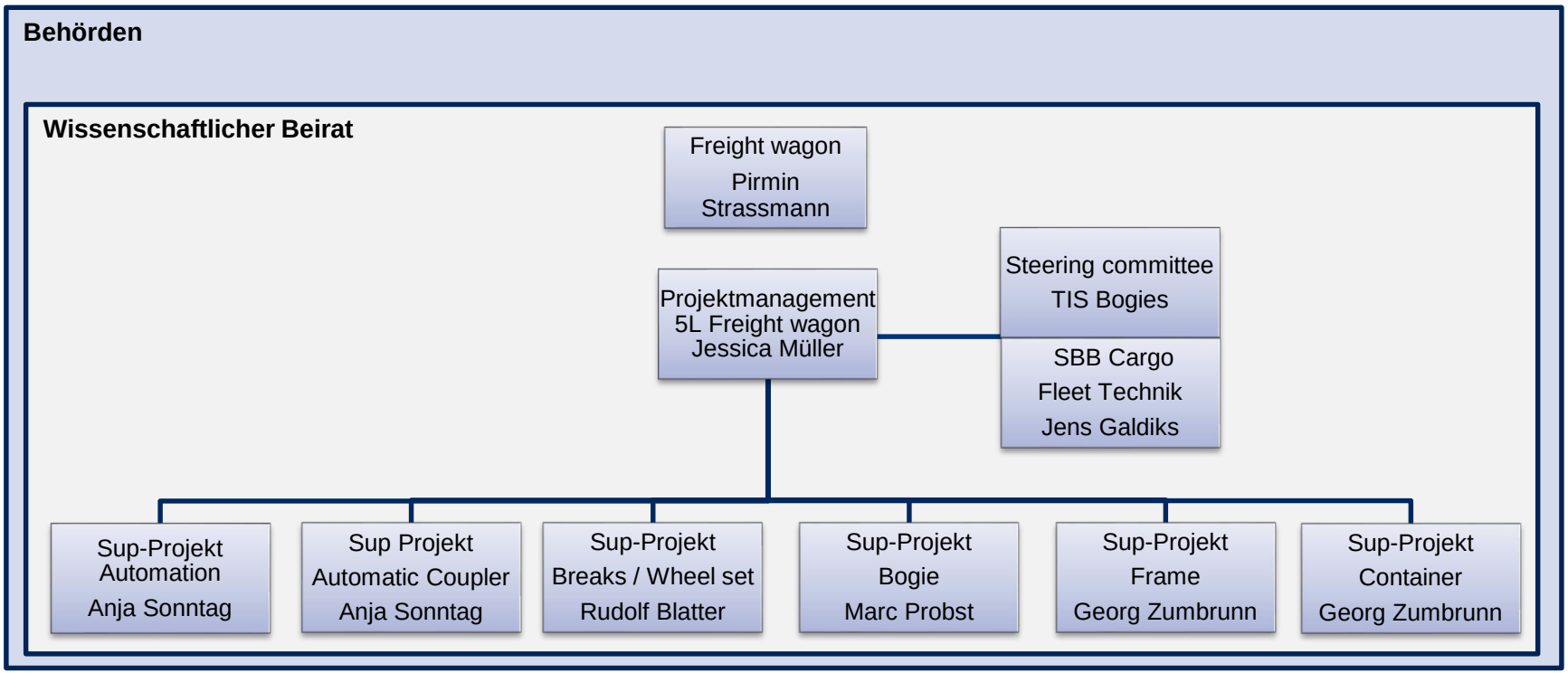


Steering Committee

Brandhorst, VTG AG
Edinger, BASF SE
Galdiks, SBB Cargo AG
Kogelheide, GATX Rail Germany
Dr. Nicolin, AAE AG
Uebel, DB Schenker Rail AG

„5L“-demonstrator
Innovative and Silent Freight Train

Project Team SBBC



Contact SBB Cargo
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Mobil: +41 79 172 34 42 jessica.mueller@sbbcargo.com

60‘-intermodal wagon will be used for the demonstrator

Wagon: 60‘ intermodal wagon

- High yearly mileage
- Standard wagon in european
- Low complexity

Wagons could be provided by

VTG AAE

DB SCHENKER

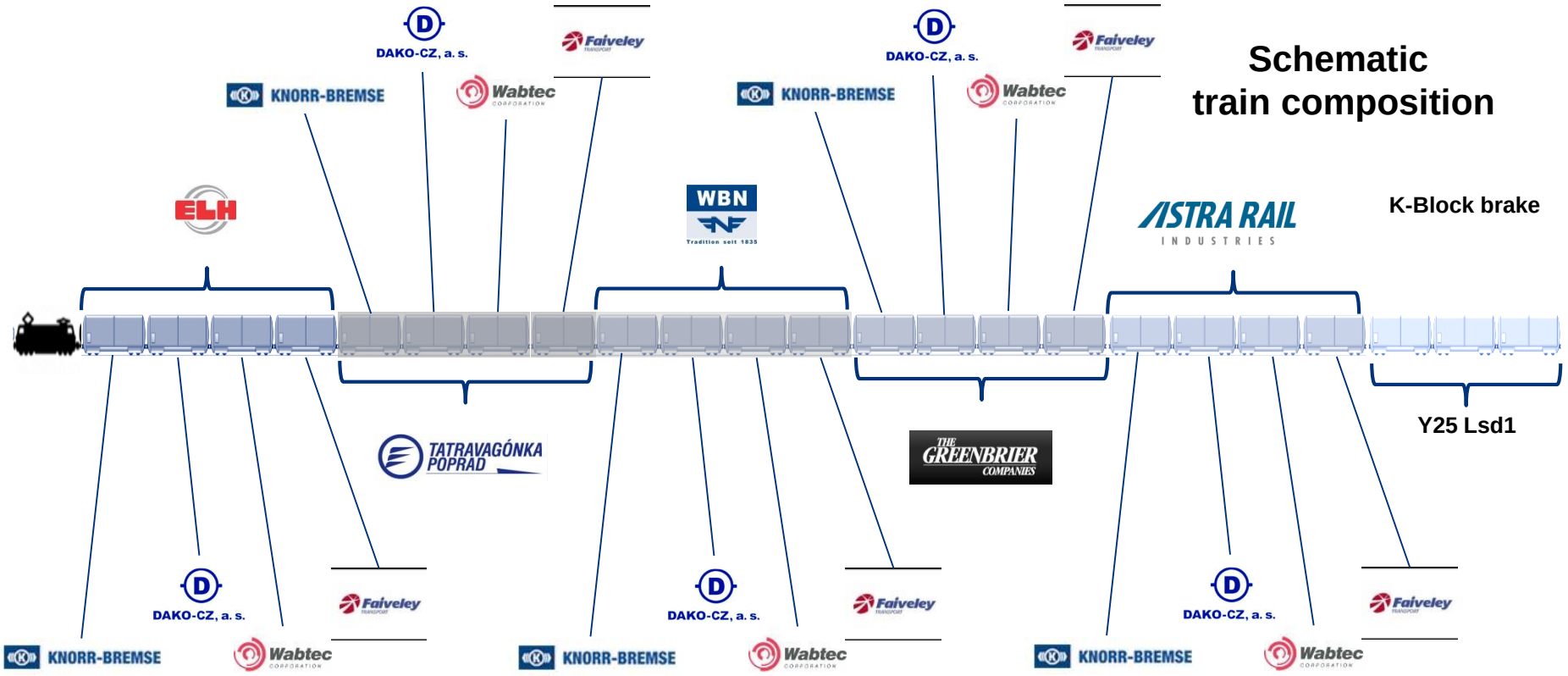
SBB CFF FFS Cargo

General operational conditions for demonstrator train / TSI approval

General conditions for demonstrator train / TSI approval

- Mixed operations:
  - In Switzerland (demanding track topography)
  - Intermodale „race tracks“ – e.g. Rotterdam – Genua (for high annual mileage)
- Max. velocity: 120 km/h, ss-traffic 22,5 to. axle load
- Preferably identical conditions for every railcar/component combination. All rail cars should be allocated in different positions in the train (at the beginning of the train, in the middle and at the end of the train).
- Minimum mileage of demonstrator train 400.000 km (appr. 4 years with an annual mileage of 100.000 km), extendable on 1,2 Mio. km if necessary.
- Ideally components like bogie, disc brake, … have TSI approval.
- If not special approval might be given by BAV for the demonstrator train with special permit for the corridor BE/NL – DE – CH- IT. This has to be verified by project management SBB Cargo.

Train composition dependent on willingness of suppliers to participate in demonstrator train



- Each bogie type will be equipped in max. four rail cars (dependent on participation of disc brake suppliers)
- 3 reference rail cars with Y25 bogie and conventionel block brakes (K-blocks)

As a reference bogie the following components will be equipped in the demonstrator as well

Reference bogie with the most common components:

- Y25 Lsd1
- Block Brakes (K-block 2xBG, two-sided with one block)
- Wheelset BA004 (22,5 to.)
- Other components as standard configuration

Quelle Foto: Eisenbahnlaufwerke Halle GmbH&Co.KG

Besides the use of innovative bogies, disc brakes and wheel sets further activities for noise reduction will be evaluated

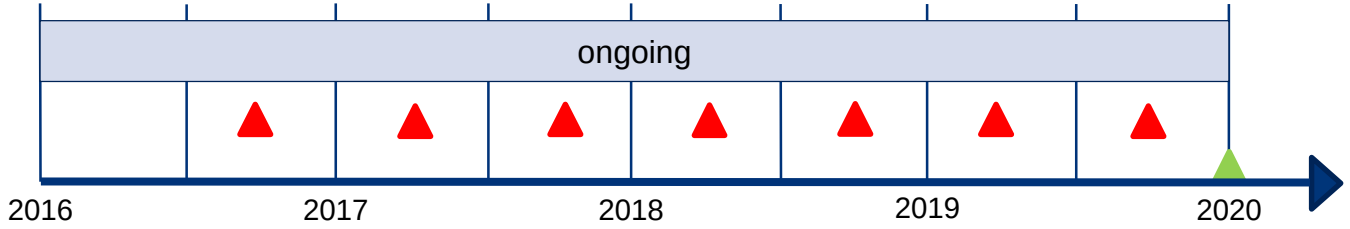
Further actitivities for noise reduction for demonstrator train

- Focus of public subsidies lies in evaluating silent rail cars
- Besides the use of innovative bogies and disc brakes further activities for noise reduction will be evaluated (e.g. coverage of wheels).
- In order to get an overview about possible solutions for further noise reductions SBB Cargo/TIS is in contact with:
  - TU Berlin (Prof. Hecht)
  - RWTH Aachen (Prof. Dellmann)
  - TU Dresden (Prof. Stefan),
  - ETH Zürich (EMPA)
- Also aerodnamic improvement is part of the „5L“-demonstrator train. SBB Cargo/TIS therefore is in contact with different scientific institutions about this topic:
  - DB Systemtechnik München
  - FH Luzern
  - TU Berlin (Prof. Hecht)

Examinations during operations

Examinations during operations

- Measurement of wheel profile, mobile measurement with laser measurement device, every 6 months
- Wheel diameter (see above)
- Wear and tear of brake pad (depth), mobile measurement with sliding caliper, every 6 months
- Wear and tear of brake disc, mobile measurement with sliding caliper, every 6 months
- Wear and tear of new running equipment (method to be discussed with suppliers)
- Photo documentation of damages of bogie
- Data analyses of Swiss control units (infrastructure) related to wheelset, loading, brakes
- Final tests and examinations to be discussed and decided

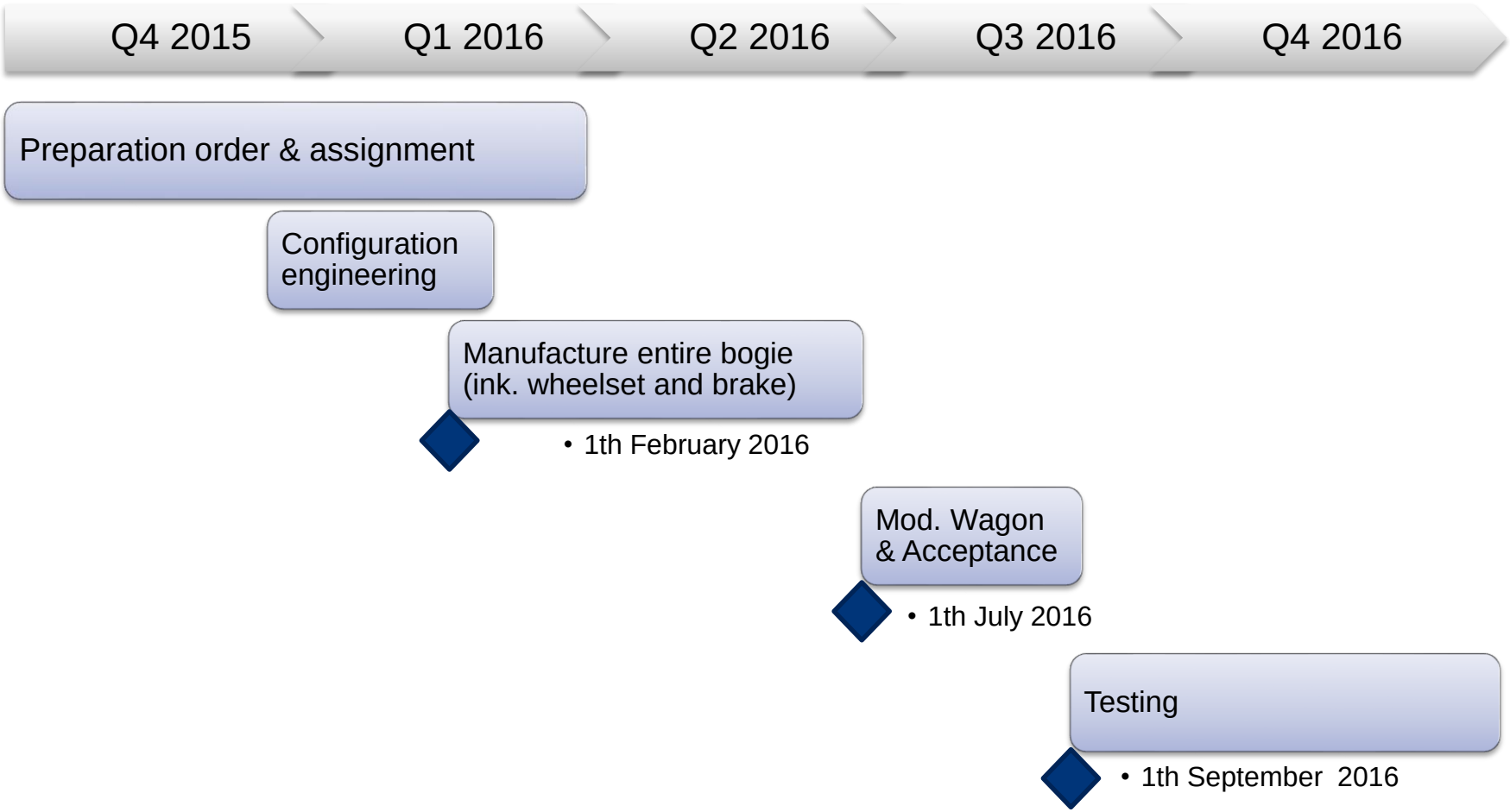


Additionaly the demonstrator train will run through different tests for noise and energy consumption measurement

Additional measurements

- Noise tests
  - Noise tests according to TSI
  - Noise tests on „real“ track in Switzerland
- Special tests on energy consumption (traction energy) with extension springs between the rail cars with different bogies
- Data analyses of Swiss control units (infrastructure) related to wear and tear infrastructure and noise

Milestones until start of demonstrator train



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Preconditions for participation in „5L“-demonstrator train for suppliers/industry (bogie, brakes, wheelsets)

- Free disposal and title for operation during the testing period including possible extension (see general operational conditions)
- Delivered to the location of assembly, free of charge
- Approvals, documentations etc. required by authorities, free of charge
- Ownership remains at the supplier
- Approval and operational support from preparation to ending phase
- Development of an adapted maintenance plan
- Support in maintenance operations (spare parts, repairs, etc.)
- Neutral participation on all test issues and actions
- Acceptance of a licensing model (to be shortly developed)

Benefits in return for the participating parties

- Unique opportunity to test the products in real operational conditions during an informative long period/mileage
- Unique opportunity to compare product performances with competitors
- Supplier neutral testing, conditions and management by TIS, NoBos, scientific institutes, etc.
- Testing according to european requirements (TSI Noise etc.) by neutral testing institutions
- Free access to project data and test performance results (supplier related)
- Confidential handling of information and results by TIS members
- Accepted test result data basis for TIS LCC model for profitability evaluation
- License model enables all participants to take part on the market
- Commitment of TIS members to opt for TIS/LCC proved components

Identified innovative bogie types for „5L“-demonstrator

	Bogie Producer	Bogie Type	Remarks
	Eisenbahnlaufwerke Halle GmbH&Co.KG	RC 25	▪ TSI approval existing ▪ Disc brakes mandatory
	Tatravagonka Poprad	TVP NG-DBS	▪ TSI approval existing ▪ Disc brakes mandatory
	WBN Waggonbau Niesky GmbH	DRRS25	▪ TSI approval existing ▪ Disc brakes mandatory
	S.C. Astra Rail Industries srl	Y25Lsd-DDG1	▪ Disc brakes mandatory
	Greenbrier Europe	GB25RS	▪ Disc brakes mandatory

Producers/Suppliers named above are invited to participate to „5L“-demonstrator

Focus lies on the following TIS requirement for „bogies“

- **Track friendly** running characteristics with noteworthy benefits on lower wear and tear of the wheelsets and (if possible) infrastructure. Verification with TIS LCC Model.
- **Low noise** running characteristics achieving a noise reduction of >= 2 db(A) generated by the bogie/running gear. Benefits through the disc brake and wheelset not considered
- Simple, easy and cheap to build, overhaul-free and light **frame** (eg Y25)
- Maintenance: Overhaul interval min. 18 years / 1,8 km

Remark: The bogie part consists of the frame and the running gear. Brake and wheelset are considered separately.

Identified disc brake suppliers to supply a disc brake according to TIS requirements

DAKO-CZ, a. s.

Faiveley TRANSPORT

KNORR BREMSE

Wabtec CORPORATION

- TIS has developed a catalogue of requirements on innovative disc brakes for freigth trains in 2015 with following structure and requirements:
  - Design, braking power, operating conditions, interfaces, weight, approval
  - Maintenance, durability, revision interval
  - Innovations
- These requirements have been discussed in bilateral talks between TIS and the suppliers
- Suppliers should achieve as many requirements of TIS as possible in respect to innovation type „A“ as a precondition of participation in „5L“-demonstrator

Focus lies on the following TIS requirements for „disc brake systems“

- “1-disc brake system”; the highest potential in weight and complexity/purchase price reduction. Fundamental questions of fulfilling required brake performance and wear/tear issues to be answered and tested/verified asap.
- Brake disc: optimised design with less weight and production cost, lower LLC combined with new (or existing) brake pads
- Brake pads: optimised design with lower LCC (eg. wear/tear) combined with new brake disc
- One handbraked disc per 4-axled wagon. Required brake performance to be evaluated and tested/verified.
- Maintenance: Overhaul interval (brake calipers, pipes etc.) min. 18 years / 1,8 Mio km
- Maintenance: Lifetime of brake pads min. 800.000 km
- Maintenance: Lifetime of brake discs min. 2,4 Mio km
- Variable brake performance (acc. to operational situation)

New European Standard Freight Axle (ESFA)

Targets

- Definition of a new wheelset type
  - with reduced maintenance efforts (better LCC)
  - at same or higher degree of safety

- Variant A for existing running gears (current discussion)

- Variant B for new running gears (postponed)

New European Standard Freight Axle (ESFA)

Current status

- Reduction of stress may allow enlarged ndt intervals
  - -30% stress versus EN 13103 requirements
  - 1,2 Mio. km for ndt
  - MT testing during heavy maintenance (exchange of disks)

- Test by Lucchini and BV in 2014 done with positive results

New European Standard Freight Axle (ESFA)

Current status

- New – harmonized testing – agreed for winter 2015/16 (Lucchini and BV)
- Main measures anf features widely agreed on
- ESFA already available by 3 supplier
  - RI27/28 Bochumer Verein
  - Freiset Lucchini
  - ESFA Bonatrans

No disk brake version today available

New European Standard Freight Axle (ESFA)

Other ideas

- Improved screwing of the endlid of shaft (other and more screws)
- Softer transition areas
- Blasted surfaces for better paint adhesion
- Improved coating systems

- For variant B
  - Other bearings/bearing system
  - Conical shaft not prefered

Noise to be reduced in A? but for sure in B

Selection of wheel set types, ESFA requirements

- ESFA wheelsets are the upcoming european wheelset standard, 25,0 t axle load required by TIS
- The innovative bogies have to be equipped with ESFA-wheelsets
- Up to now ESFA leads the discussions with the suppliers and developed the technical requirements
- Straight wheel disc shape is conditional
- TIS technical requirements „brake system“ concerns in some points the wheelsets, this has to be respected by the suppliers
- TIS assumes that the aforementioned companies are potential suppliers for the tests
- Open question is the benefit to use different wheelset types though wheel material and profile are assumed to be identical (increase of test complexity and efforts)
- TIS will discuss the participation possibilities with the wheelset suppliers in very short time.

Focus lies on the following ESFA / TIS requirements for wheelsets

- ESFA requirements for wheelsets
- Low-noise design (straight wheel disc)
- Overhaul/inspection period wheelset: min. 1‘200‘000 km
- Overhaul/inspection period bearings & grease: min. 1‘200‘000 km
- TSI approval
- MTBSR (Mean Time Between Scheduled Removal)
- MCW (Maintenance Cost Warranty)

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Next steps

- Declaration of intent until **18th of November 2015** to

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in copy to Project Management TIS
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- One-on-one interviews in Olten/Switzerland **30.11.-02.12 2015** with designated participants
- Involvement of component manufacturer in feasibility
- Proposal for licence agreement **until 15.01.2016**
- Final declaration of intent until **31.01.2016 (planned)**
- Intermediate meetings (2x) with main suppliers before launch of demonstrator