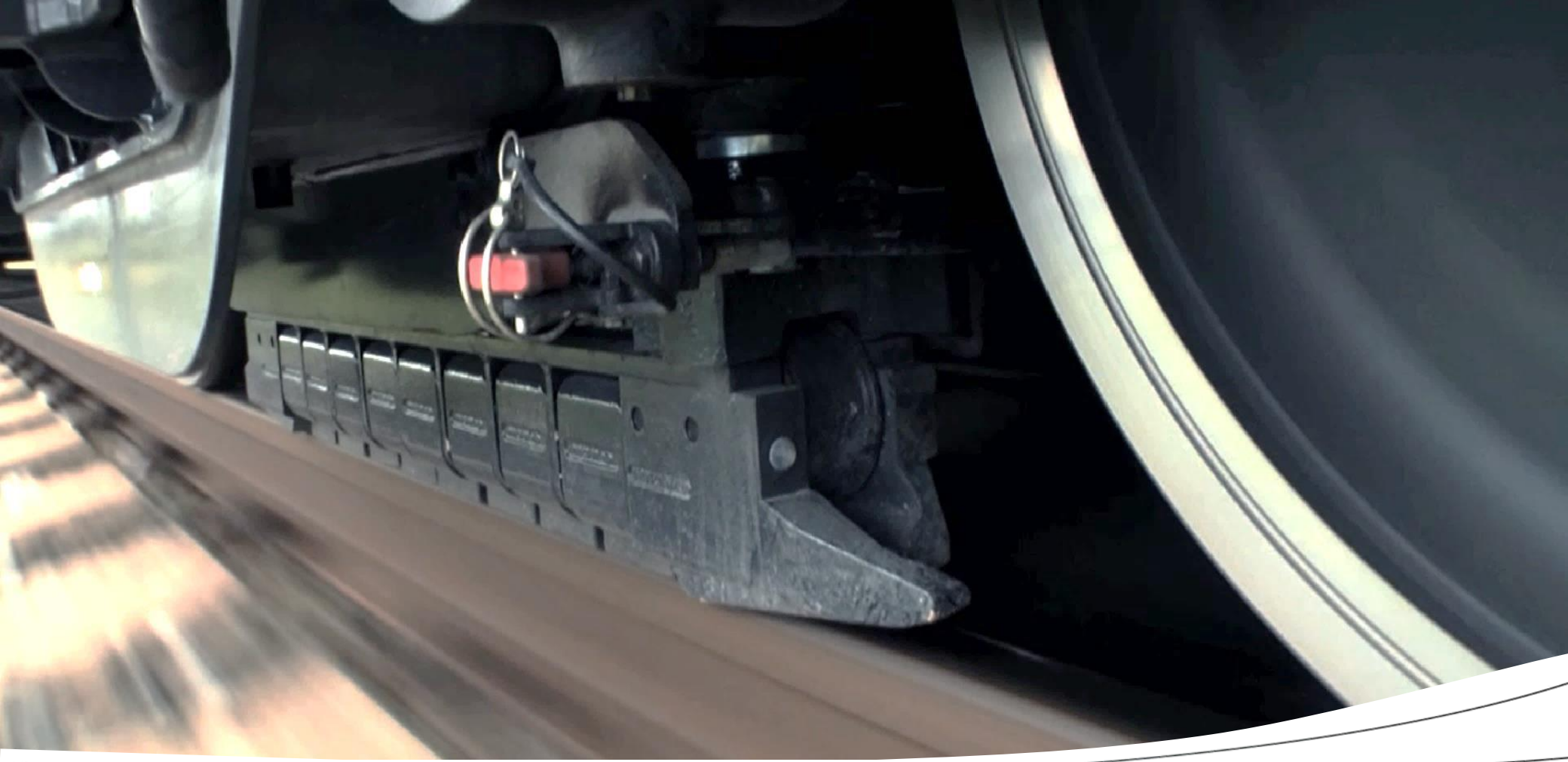


International Brake Technique Conference

Solution of Knorr-Bremse for modern track brakes

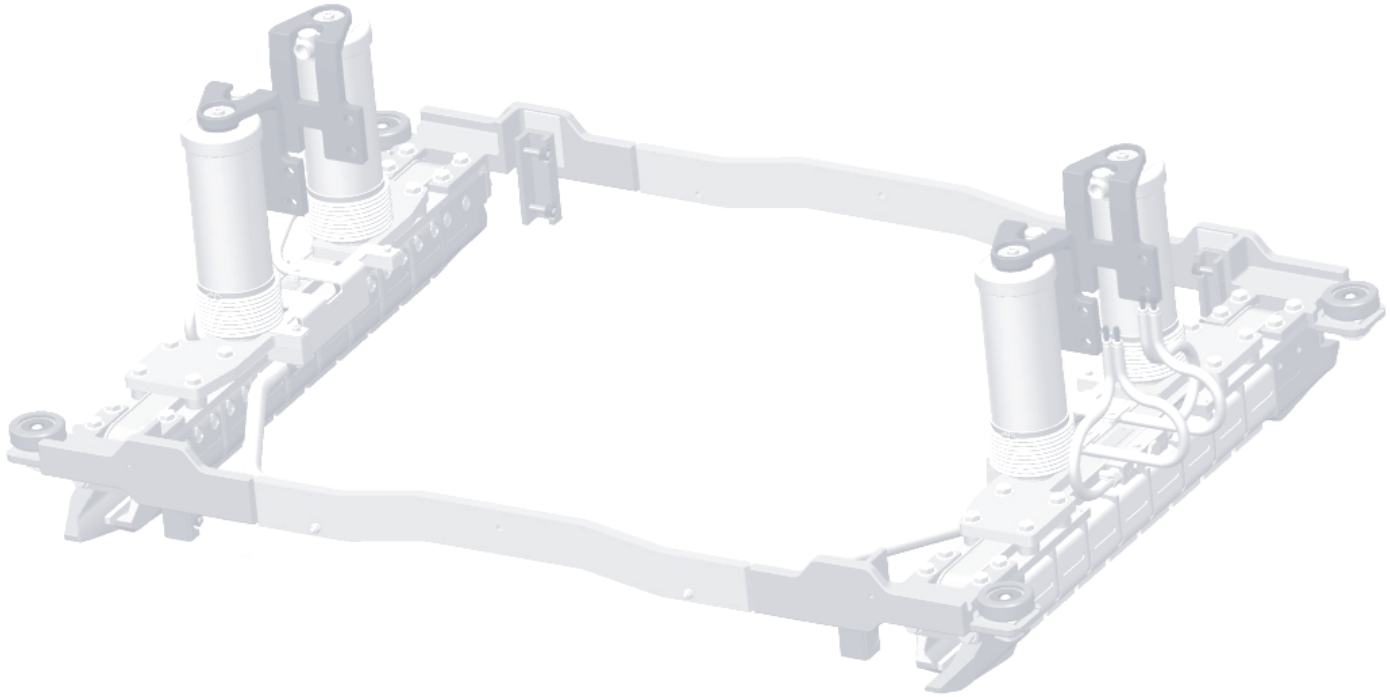
DI Volker Jörgl

4.6.2019

KNORR-BREMSE

Overview

- Introduction
- Today‘s requirements
- Tomorrow‘s challenges
- Knorr Bremse solution
- Summary



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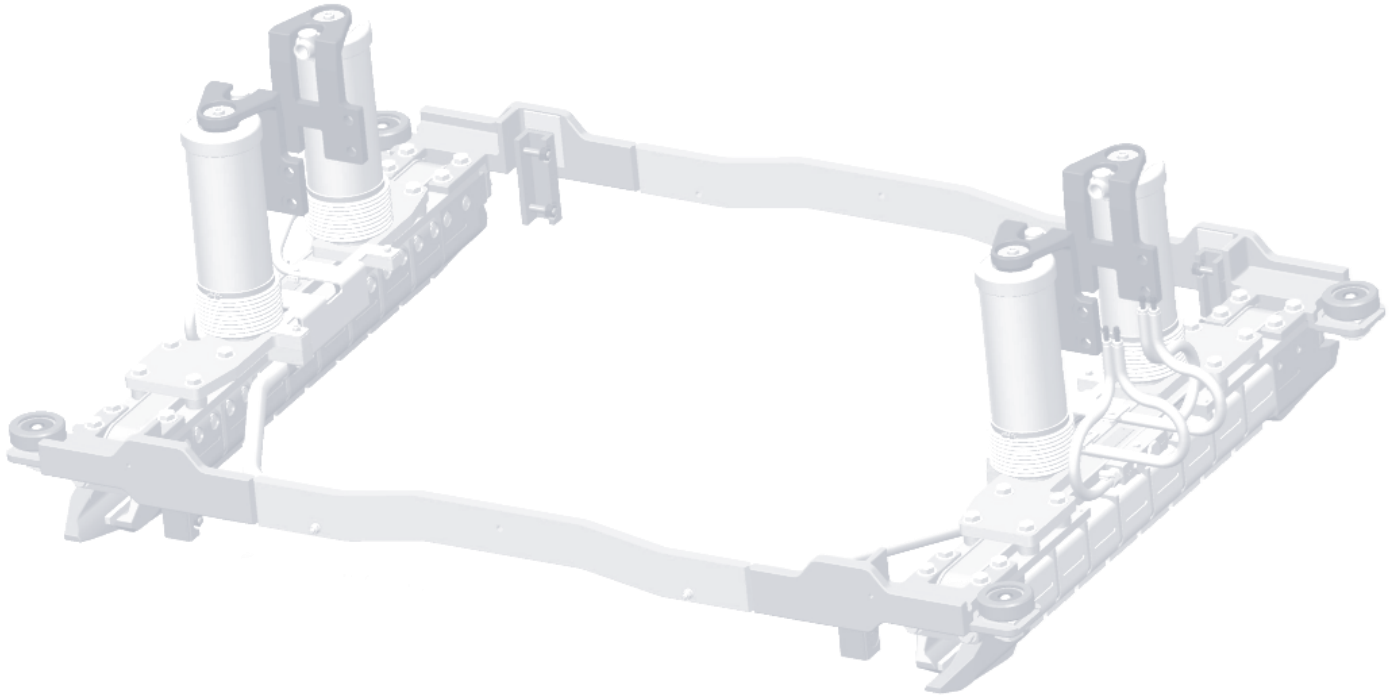
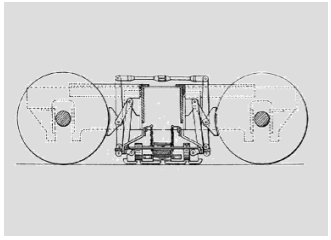
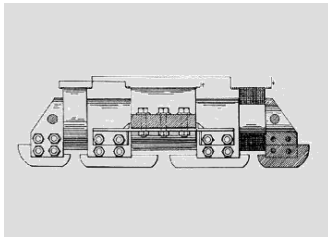


Introduction
a look back into history …

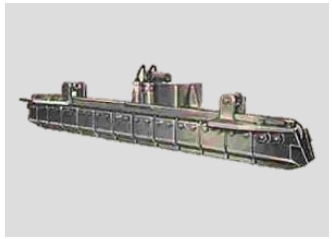
1903



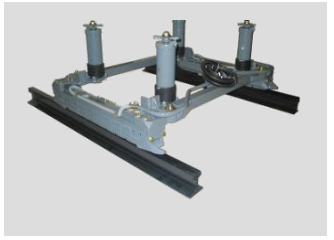


1931

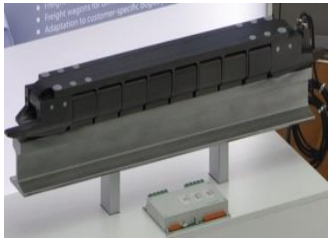
1957



1995



2015

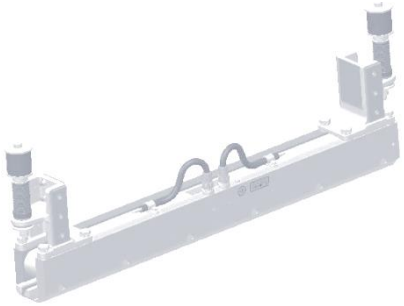


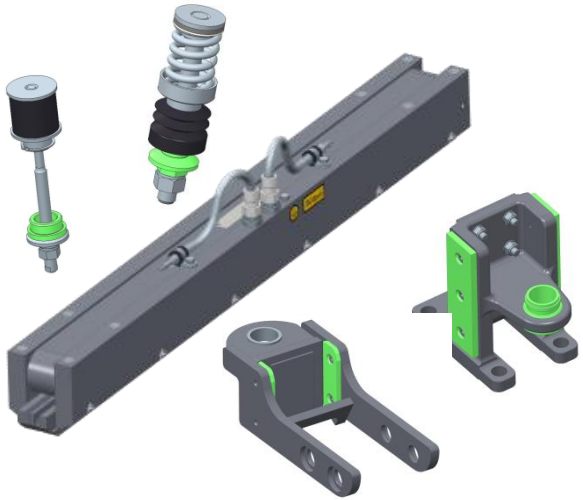
Introduction

Typical track brake components of today

Light Rail

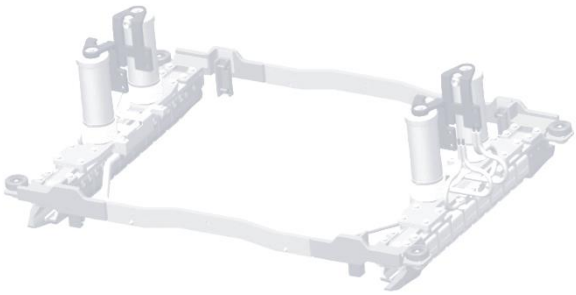
Rigid magnet in
low suspension

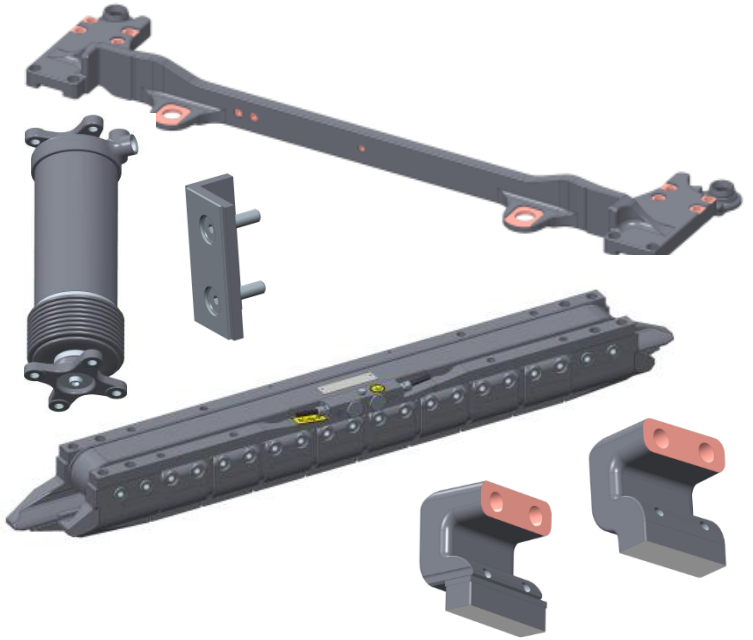




Main Line

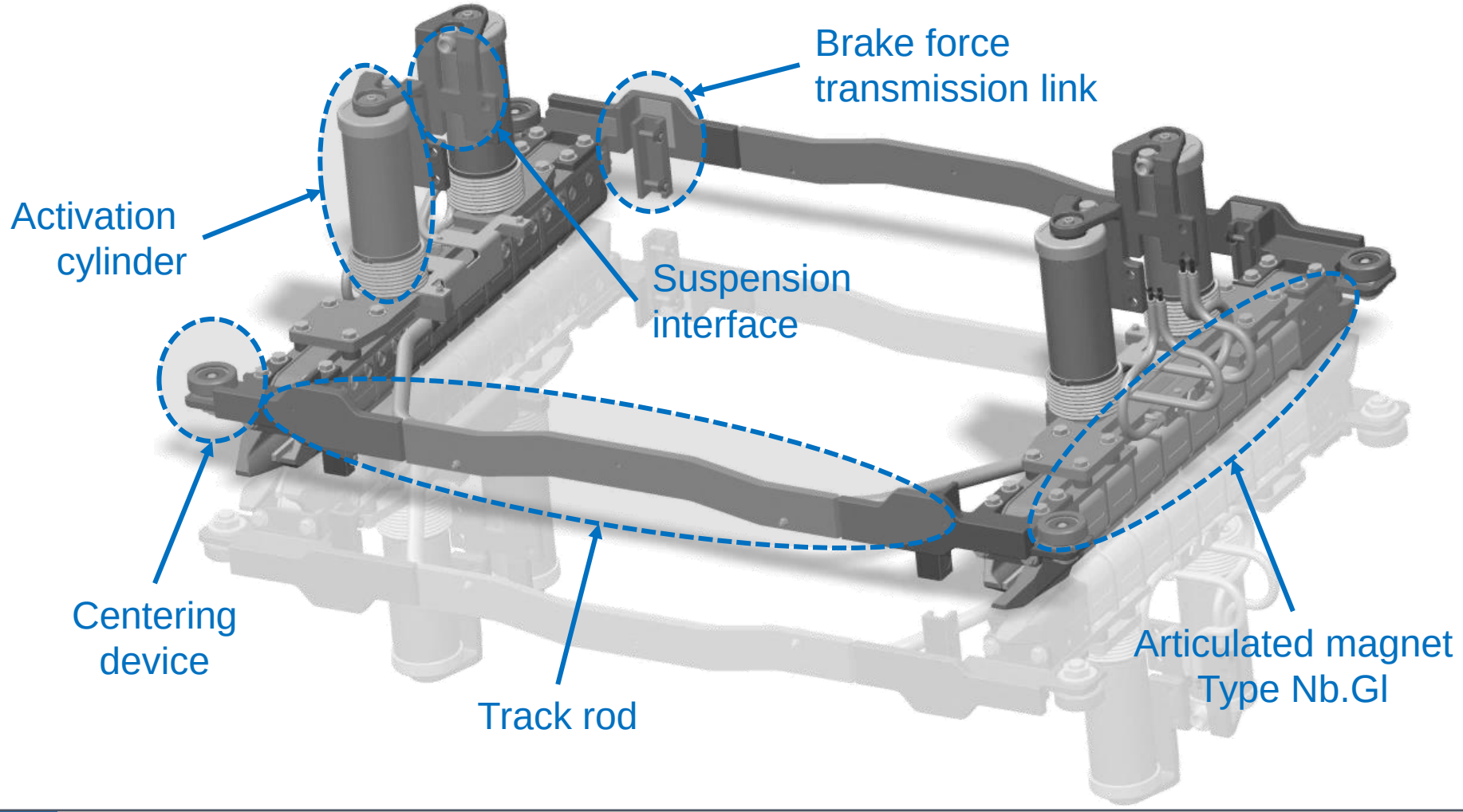
Articulated magnet in
high suspension





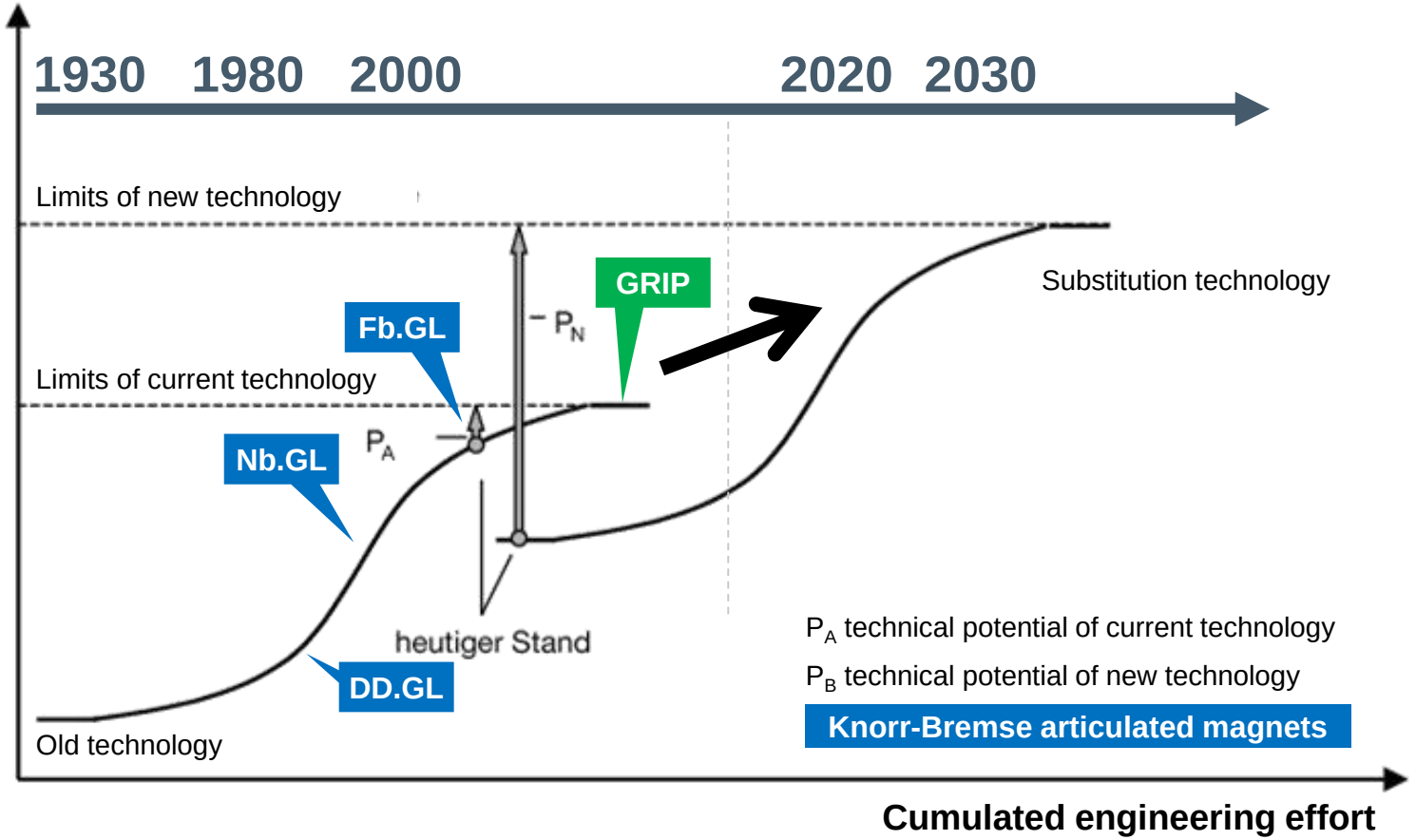
Introduction

Magnetic track brake for Main Line Applications



Introduction
Maturity of the track brake

Performance of a technology



Source: Wikipedia.de

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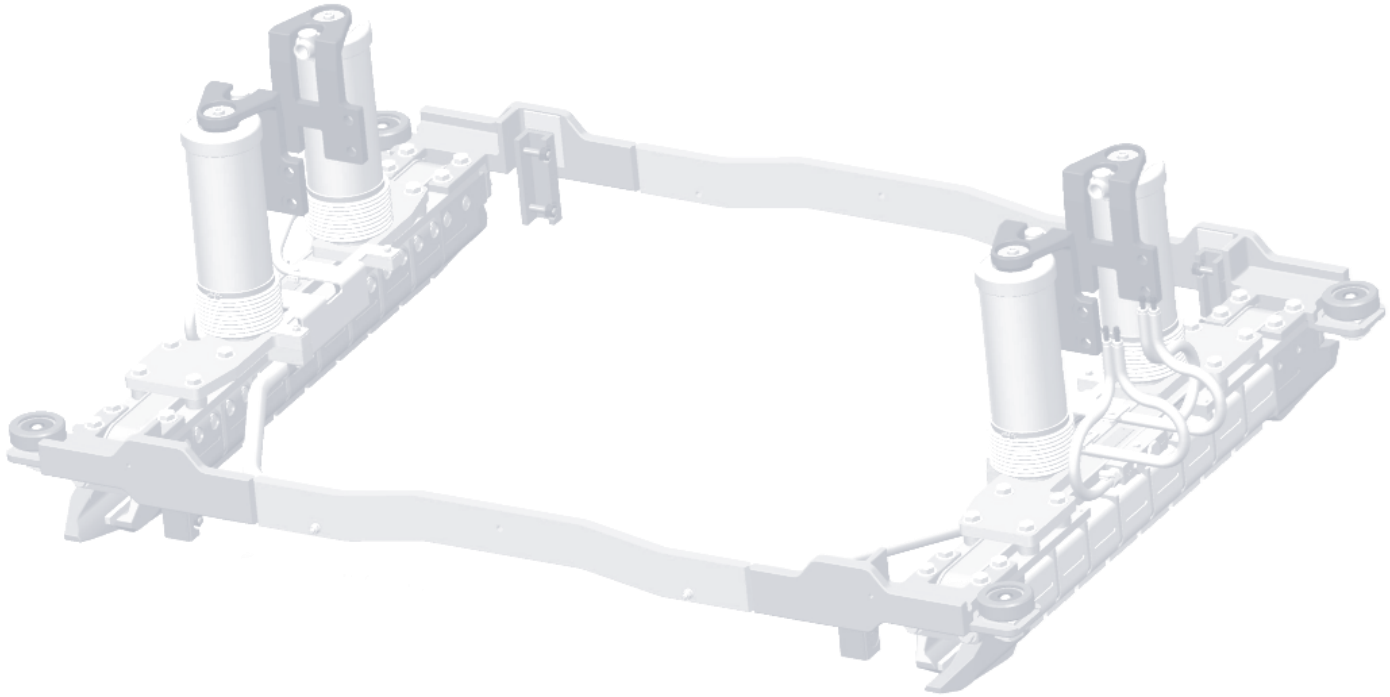
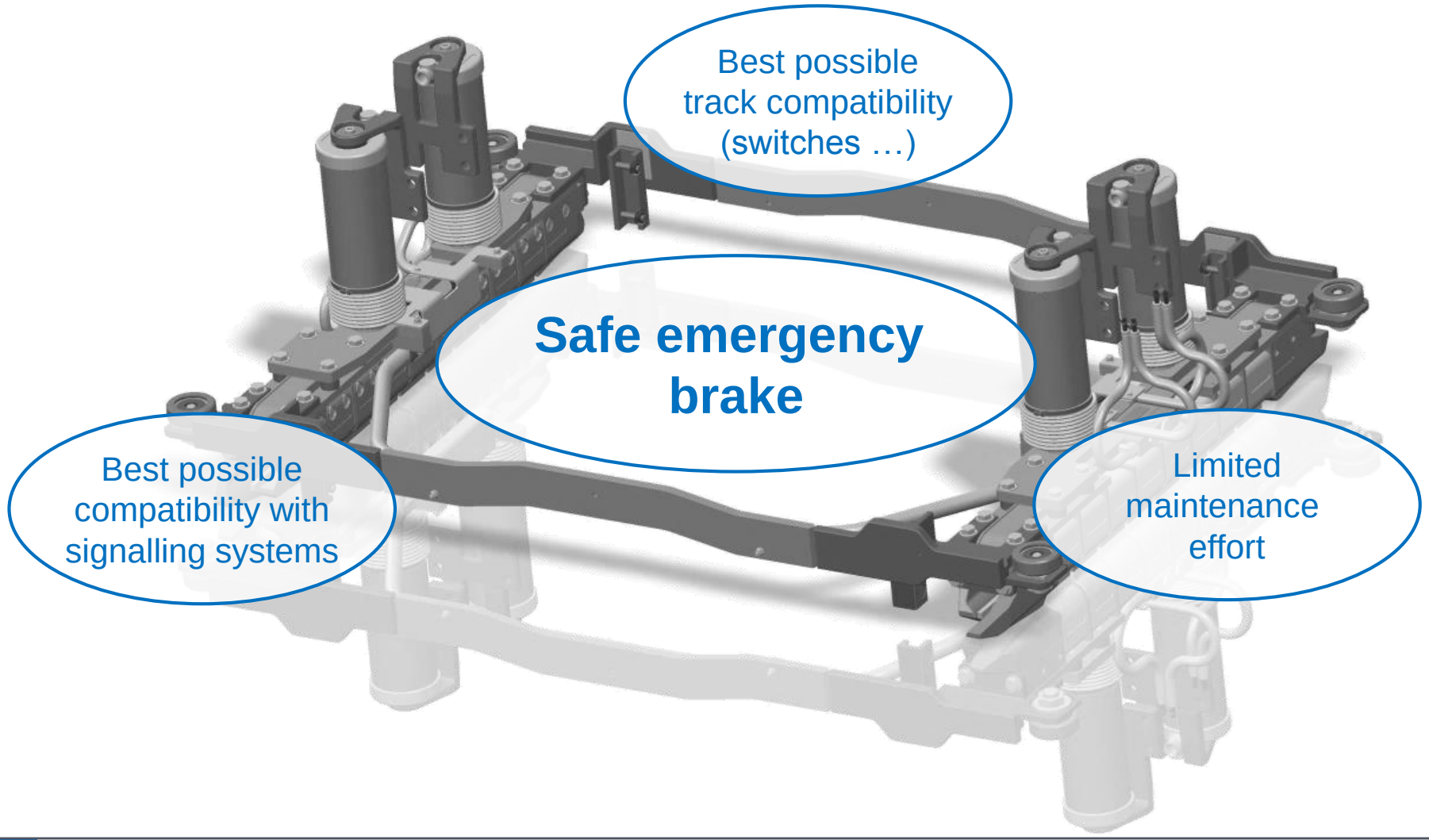


Today's requirements…



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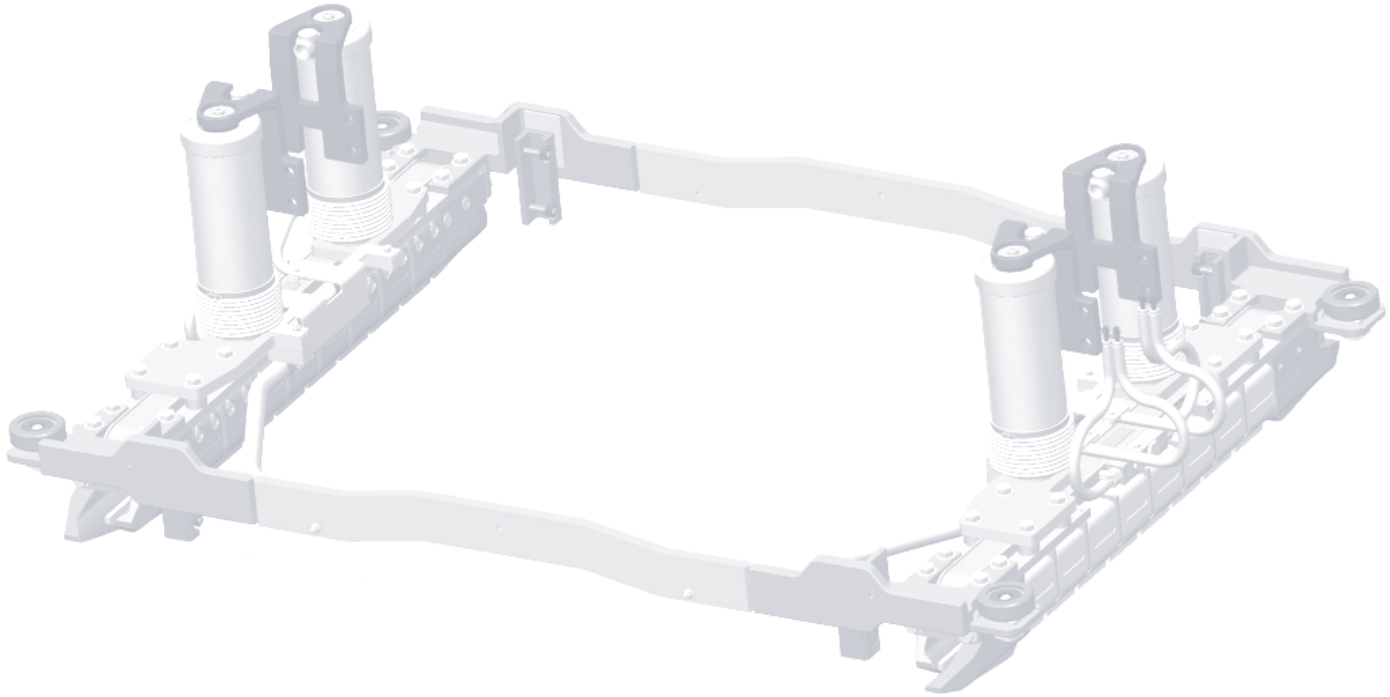
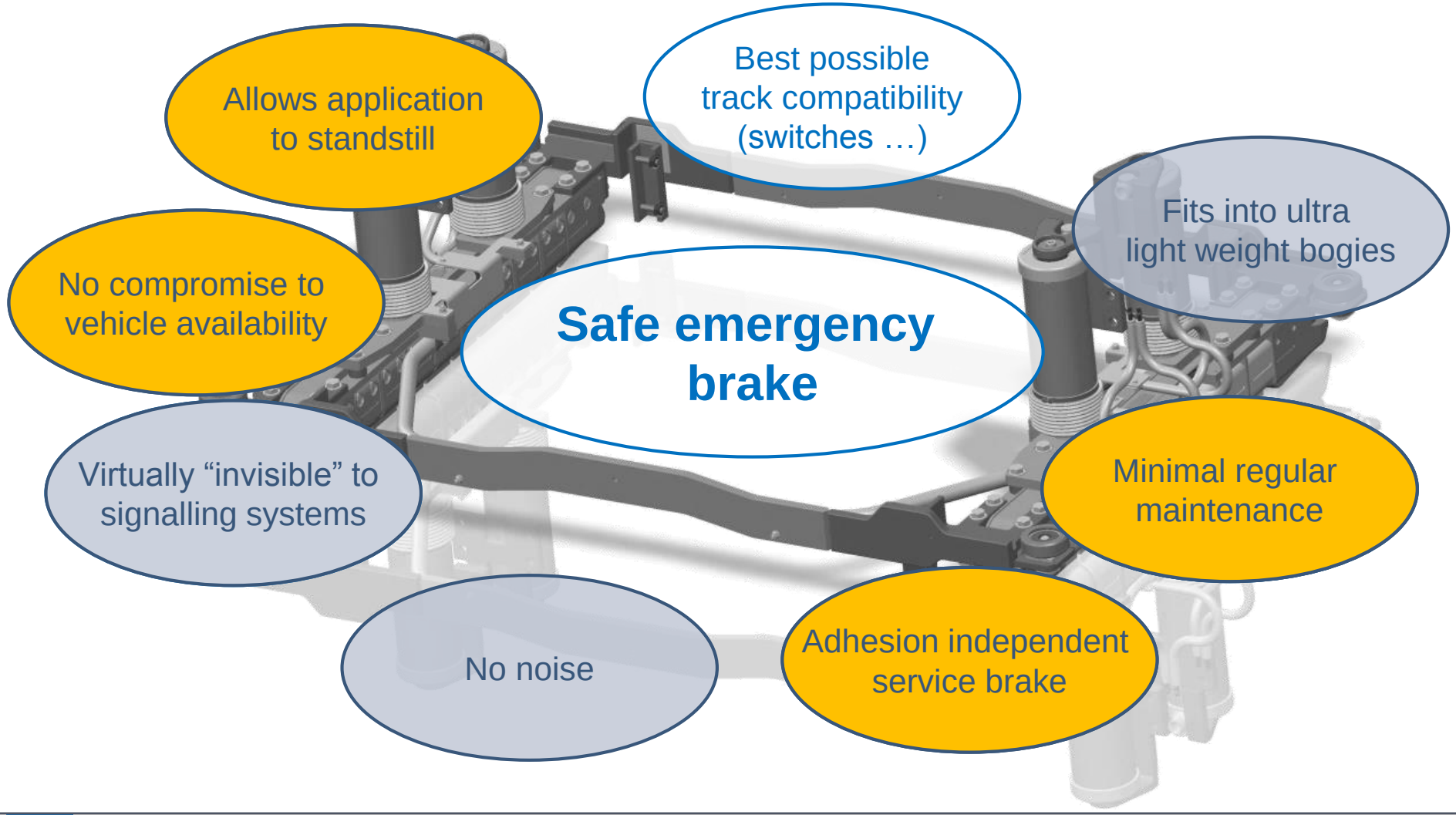


Tomorrow's challenges



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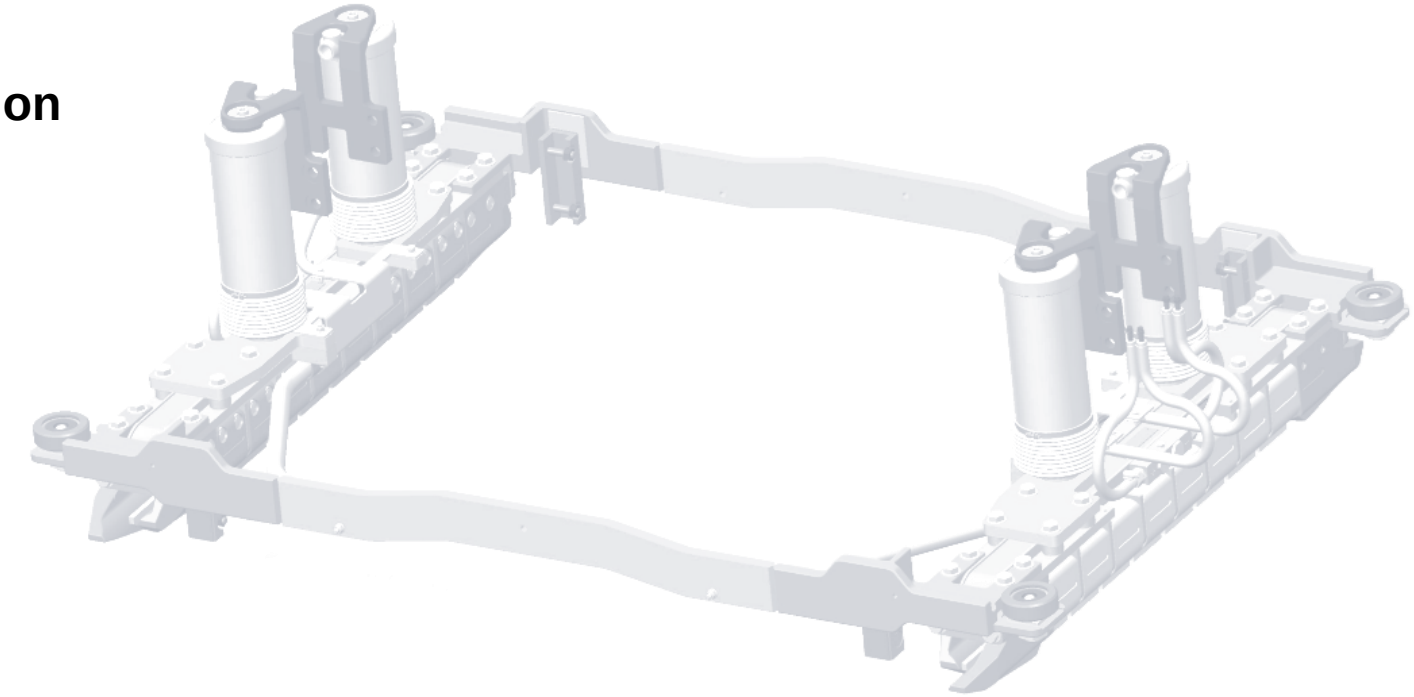


Knorr-Bremse solution

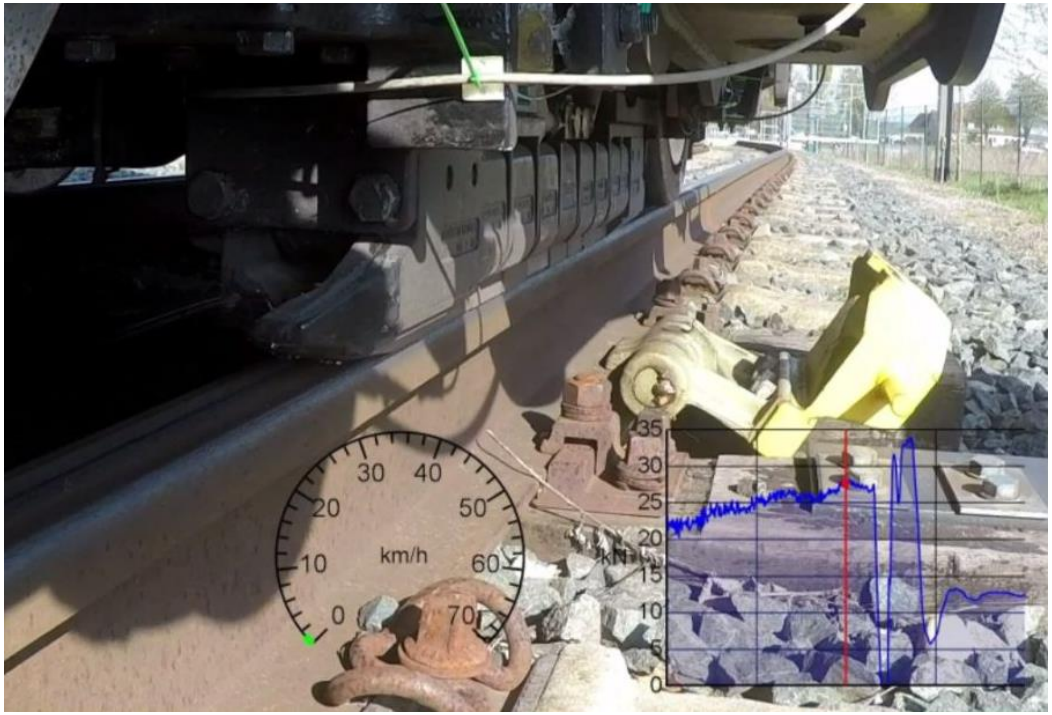
Allows application to standstill

Vision

- Application of MTB at very low speeds has no detrimental effects
- Crossing slowly or stopping on switches with engaged MTB is possible
- Track conditioning is possible without restrictions

Possible solutions

- Modified design of MTB frame (magnets, pole shoes + track rods) to reduce axial & lateral loads
- Electronic control reduces „switching on & off“ jerk and therefore reduces stress



Braking to standstill with applied MTB

Knorr-Bremse solution

No compromise to vehicle availability

Vision

- Track brake remains fully functional even under severe conditions (heavy snow fall)
- Function & condition of track brake can be constantly monitored
- “Easy to schedule” preventive maintenance instead of corrective maintenance

Possible solutions

- Ability to detect & handle heavy icing conditions
- condition based maintenance for detecting “weldings”

Extreme ice build up at MTB

Severe „weldings“ on steel pole shoes

Knorr-Bremse solution

Minimal regular maintenance

Vision

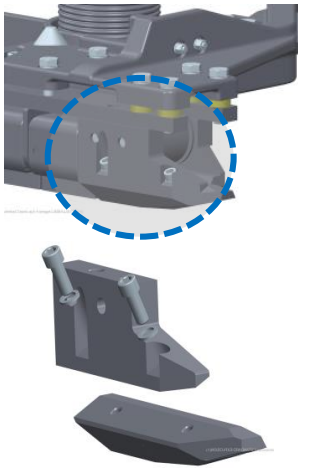
- Exchange of wear parts possible without major disassembly work
- No reworking or reconditioning of wear parts outside of regular overhauls
- No adjustment work needed

Possible solutions

- Fast exchange of MTB friction elements with simple tools and without removing MTB
- Customized fixtures / machines for fast “onsite” reconditioning

Magnet end piece with **welded** Friction elements

Magnet end piece with **bolted** Friction elements



Knorr-Bremse solution

Minimal regular maintenance

Vision

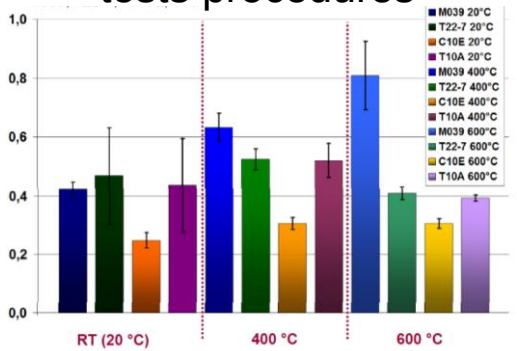
- MTB requires maintenance only after intervals more than 3 months
- Regular maintenance of friction materials can better be planned by the operator

Possible solutions

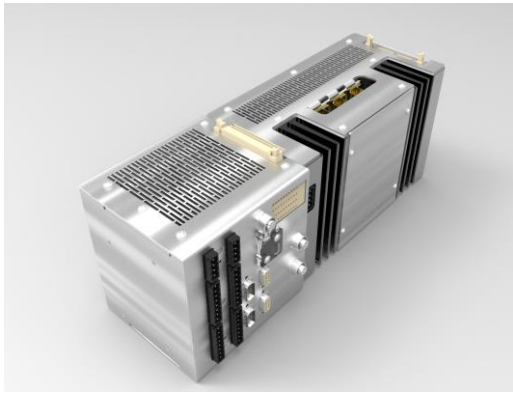
- New MTB control unit “iRCB” with function
  - to maximize intervals for weldings removal
  - to predict wear material life time
- Improved welding free pole shoe materials (wear reduced Sinter)

On train validation

Development using specially designed tests procedures



iRCB control unit



Knorr-Bremse solution

Adhesion independent service brake

Vision

- No wear during service braking
- No additional maintenance when used frequently as a service brake
- Activated TB does not conflict with infrastructure

Possible solutions

- Contactless track brake – independent eddy current brake system for main line service speeds

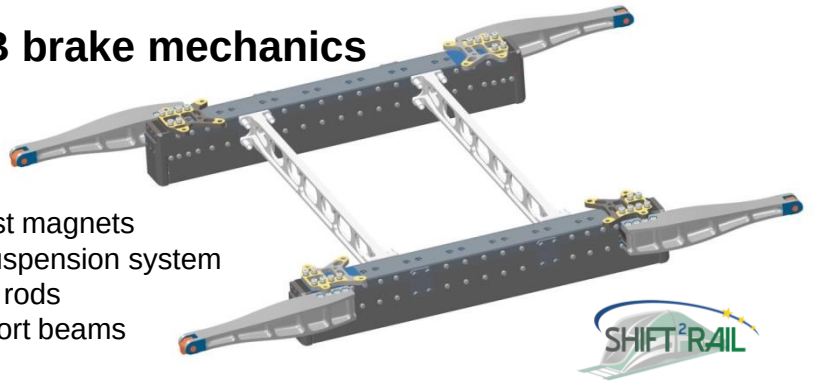
iECB Control Unit

Li-Ion battery + BMS + Battery charger
DC/DC Converter * Switches
Controller (SIL certified HW & SW)

Car body

Bogie

iECB brake mechanics



2 robust magnets
high suspension system
2 track rods
4 support beams

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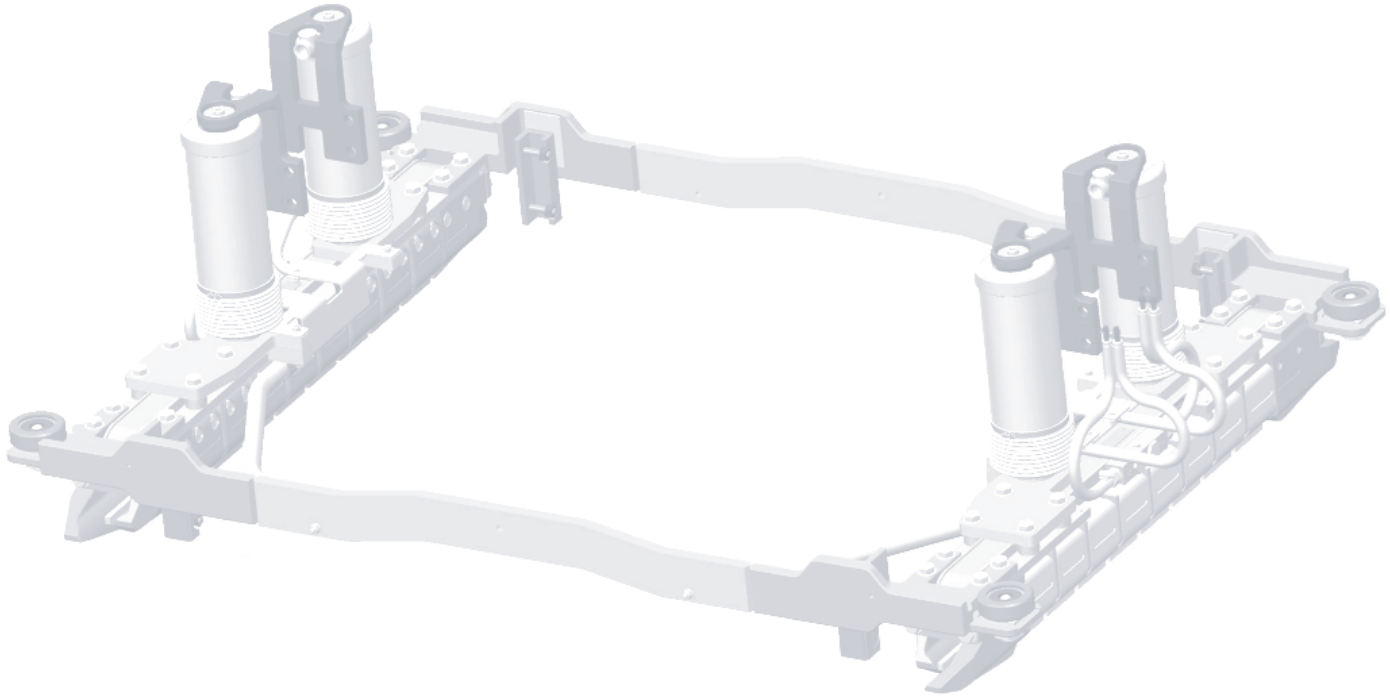

Summary

- To realize Knorr-Bremse's vision of a future track brake, small improvements in track brake hardware will not be sufficient.
- Focus must be to increase the product's value to the customer (car builder, operator)
- Significant value can be added to the "track brake" not only by improving hardware but through new & innovative functions
- Knorr-Bremse will in the future therefore be integrating hardware and controls to create a track brake system solution

MORE Magnet

iRCB Controller

GRIP Magnet

Thank you for your attention

Questions?

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