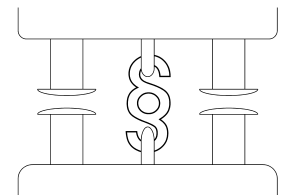


Sinn und Unsinn technischer Innovationen am Beispiel der Electric Powersupply in Freight Trains

Dr. Kurt Fuchs
Rechtsanwalt
Diplom-Ingenieur

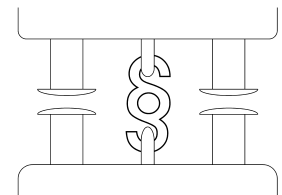


Electric Powersupply in Freight Trains

About me:

- ◆ Studied mechanical engineering with a major in rail vehicle technology at RWTH Aachen
- ◆ Studied Law at University Münster
- ◆ Called to the bar in Cologne
- ◆ 2015 JD in Law on Network Access in Rail Traffic

Dr. Kurt Fuchs
Rechtsanwalt
Diplom-Ingenieur

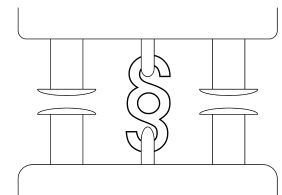


Electric Powersupply in Freight Trains

Electric Powersupply in Freight Trains

- ◆ Discussed for decades
- ◆ So far no serious attempt
- ◆ First real attempt with DAK
- ◆ Europe is the only region world wide without automatic coupling in rail freight traffic
- ◆ Increasing lack of personnel
⇒ Introduction of automatic coupling compulsory
- ◆ Electric powersupply in freight trains and introduction of automatic coupling are different topics!

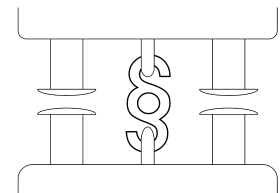
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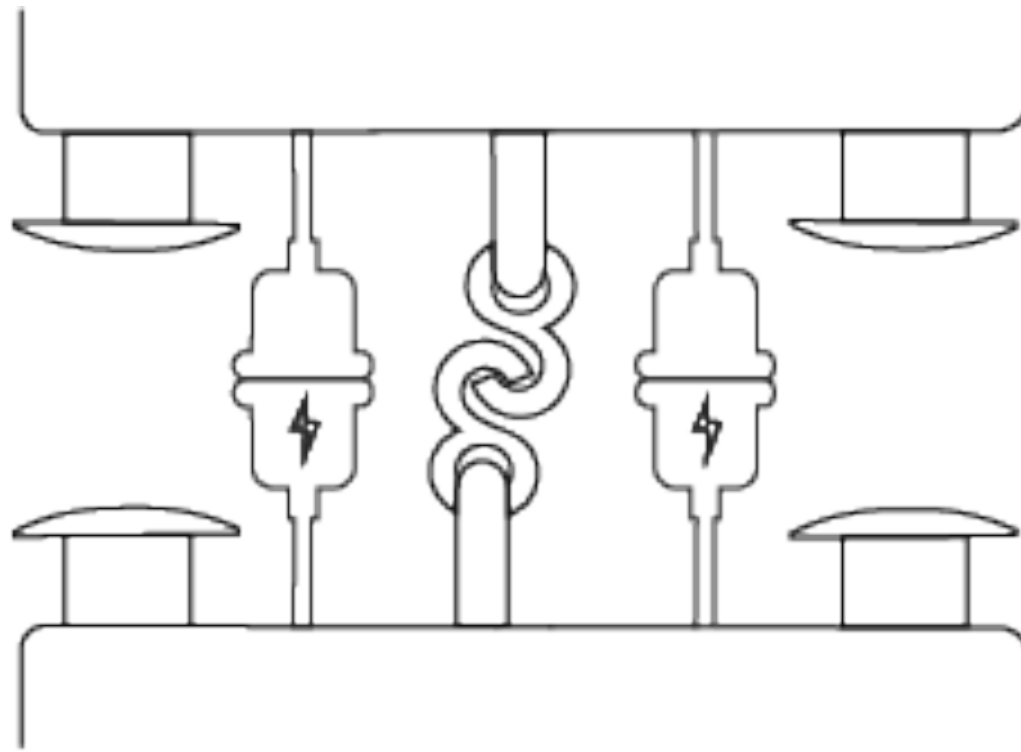
Electric Powersupply in Freight Trains

Advantages of electric powersupply in freight trains:

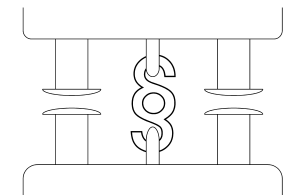
- ◆ Introduction of EP-brakes
 - ⇒ better and smoother braking effect
 - ⇒ longer and/or more heavy trains
 - ⇒ less attrition on brakes and coupling
- ◆ Introduction of train integrity controll
 - ⇒ Introduction of ETCS Level 3
 - ⇒ radical simplification of the rail infrastructure
- ◆ Introduction of sensor systems for waggons and freight
- ◆ Introduction of actuators for loading and unloading



Electric Powersupply in Freight Trains



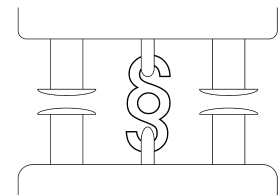
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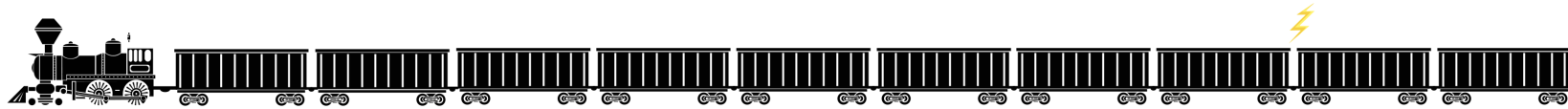
Electric Powersupply in Freight Trains

Requirements on Electric Powersupply in Freight Trains:

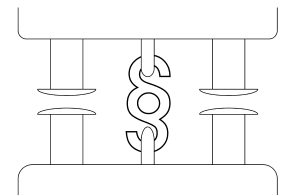
- ◆ Different depending on the application
- ◆ Safety related applications require high reliability
⇒ Train integrity control require 100 % reliability
Requirements for EP-brakes are lower
⇒ but reduced speed
- ◆ Malfunction of actuators can inhibit loading and unloading
- ◆ Malfunction in cooling can cause rotting of goods



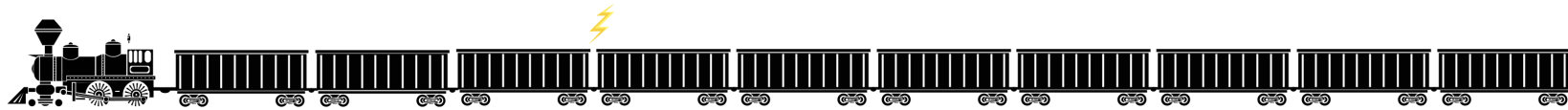
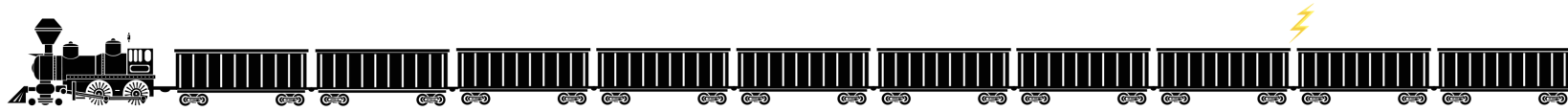
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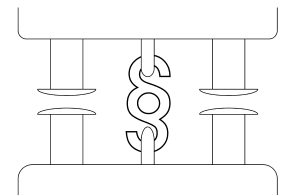
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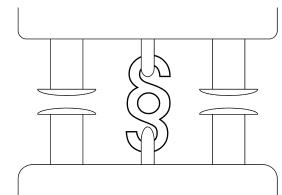
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Electric Powersupply in Freight Trains

Requirements on Electric Powersupply in Freight Trains:

- ◆ Freight trains are the roughest environment for electric and electronic equipment
 - ⇒ high reliability can only be reached with high effort
 - ⇒ no use of standard industry equipment
- ◆ Standardised electric power and data system
 - DC or AC, voltage
 - Data transmission protocol
- ◆ Capacity of electric powersupply
 - Layout for highest possible demand



Electric Powersupply in Freight Trains

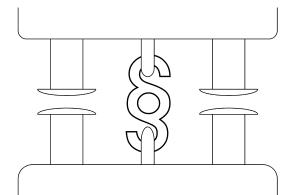
Disadvantages of Electric Powersupply in Freight Trains:

- ◆ Reliability

required reliability quite probably impossible to reach
even 99.9 % reliability would cause significant disruption to
rail freight traffic

more probable: 98% reliability or less

⇒ economic profitable rail freight traffic would be impossible



Electric Powersupply in Freight Trains

Disadvantages of Electric Powersupply in Freight Trains:

- ◆ Maintenance

today: even in simple workshops possible without any problems with electric powersupply in freight trains:

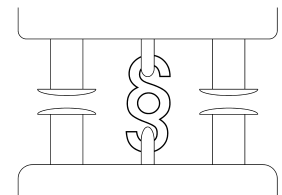
⇒ significantly increased maintenance effort

⇒ much higher variety of required spare parts

⇒ much more complex spare parts logistics

⇒ number of suitable workshops significantly reduced

⇒ lack of workshop capacity, much longer transfers



Electric Powersupply in Freight Trains

Disadvantages of Electric Powersupply in Freight Trains:

- ◆ Costs

- no standard equipment

- ⇒ high development effort

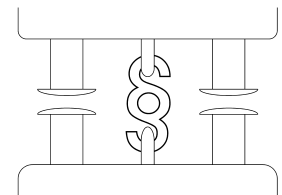
- high reliability

- ⇒ extensive testing required

- the more electric components, the more efficient use of the general investment for electric powersupply

- ⇒ in total high costs

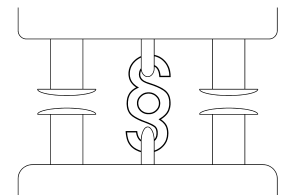
- ⇒ easily double the price of good waggon



Electric Powersupply in Freight Trains

Disadvantages of Electric Powersupply in Freight Trains:

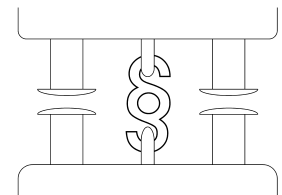
- ◆ Coordination effort
 - mechanical coupling type
 - electric powersupply (AC or DC, voltage, capacity)
 - data transmission (wiring, data protocol)



Electric Powersupply in Freight Trains

Introduction of Automatic coupling

- ◆ Selection of a established kind of coupling
⇒ priority on good mechanical coupling characteristics
- ◆ Downward compatibility to screw coupling
⇒ more time for migration
- ◆ Preparation for
electric powersupply / data transmission possible
- ◆ As less requirements as possible
⇒ chances for realisation increasing



Electric Powersupply in Freight Trains

Many thanks for your attention.

Dr. Kurt Fuchs
Rechtsanwalt
Diplom-Ingenieur

