

Electronic Wedge Brake - EWB

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eStop – Hermes Award 2004

SIEMENS VDO

Motivation

Product Description

Application Fields

Automotive Application

Benefits



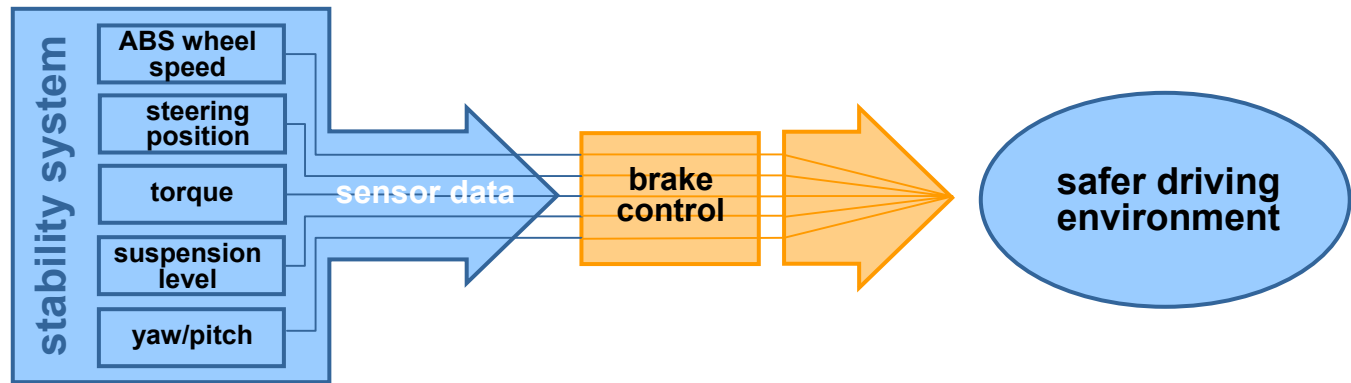


- Motivation
- Product Description
- Application Fields
- Automotive Application
- Benefits

■ Increasing Demand for More Comfort and Safety

Call for ever more sophisticated and complex braking and driver assistance systems.

■ Full Integration of Vehicle Systems: Complete Dynamic Safety System



■ Flexibility for Automakers

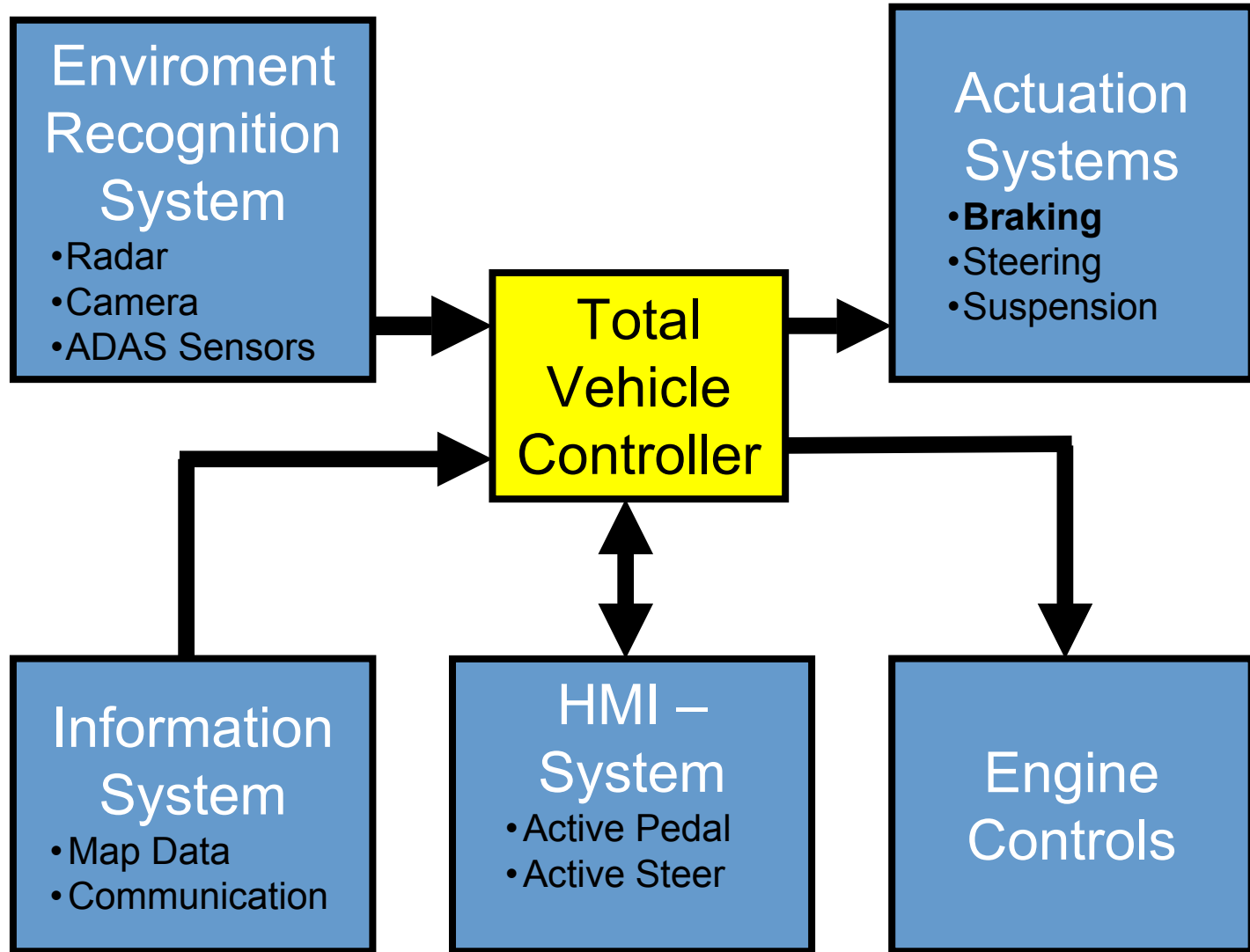
Brake by wire allows for branding by tailoring the overall "feel" of a vehicle through software changes rather than changing hardware on a vehicle.

■ Previous Attempts to Develop an Electrical Driven Brake

Extremely high actuator forces and energy requirement. Up to now an "all electric" brake by wire system could only be realized with a 42 V board architecture.



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The Electronic Wedge Brake – EWB

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Motivation

Product Description

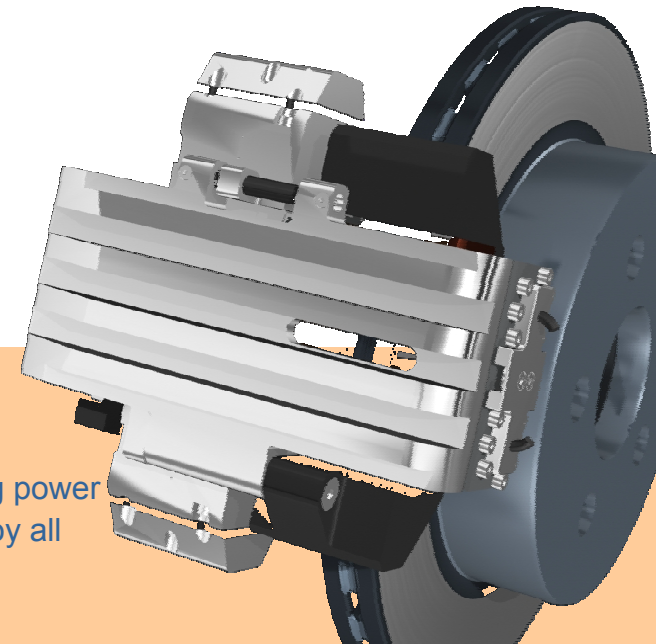
Application Fields

Automotive Application

Benefits

- The Electronic Wedge Brake (EWB) is a fully controlled electro-mechanical braking system with a high degree of mechanical self-reinforcement.
- By intelligently controlling the wedge, it becomes possible to convert the kinetic energy of the vehicle into actual braking force.
- The underlying physical effects lead to a significant reduction in the actuator's energy demand.
- The EWB will be far superior to any brake by wire technologies presently being developed or already on the market in terms of energy consumption, efficiency, weight and price.

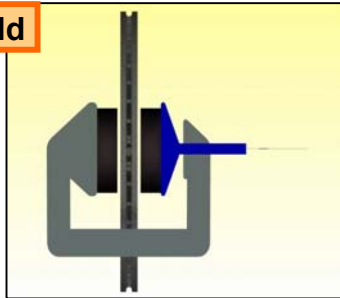
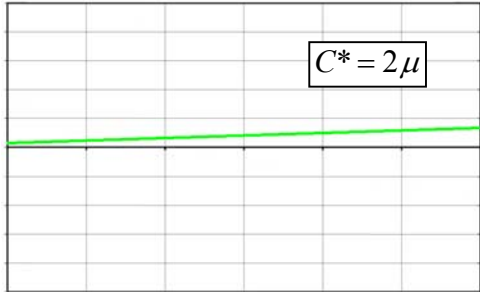
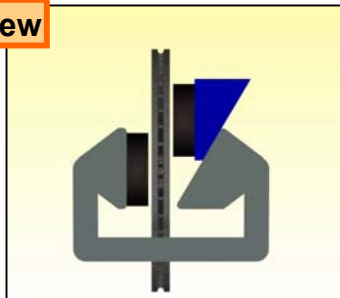
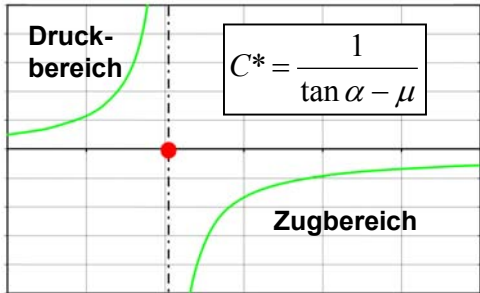
- Self Reinforcement – wedge principle
- Dynamic Wedge Position Control
- Brake Actuation Force – uses kinetic energy for stopping power
- Scalable Solution - small to ultra-large applications enjoy all benefits of the EWB technology
- Performance, Implementation and Cost Benefits





Comparison of Basic Brake Principles

- Motivation
- Product Description
- Application Fields
- Automotive Application
- Benefits

Method of Braking	Power Generating	Enforcement at the Brake Disc
<p style="text-align: center;">normal power</p> <p>old</p> 	<p style="text-align: center;">Conventional Brake</p> <p style="text-align: center;">The actuator has to actively generate the full clamping force.</p>	<p style="text-align: center;">linear</p> 
<p style="text-align: center;">wedge power</p> <p>new</p> 	<p style="text-align: center;">eStop Technology</p> <p style="text-align: center;">controlled electro-mechanical wedge brake with infinite self-reinforcement</p>	<p style="text-align: center;">non linear</p> 



Applications for the EWB

Motivation

Product Description

Application Fields

Automotive Application

Benefits



elevator



escalator



conveyors



rail vehicles



passenger cars



trucks



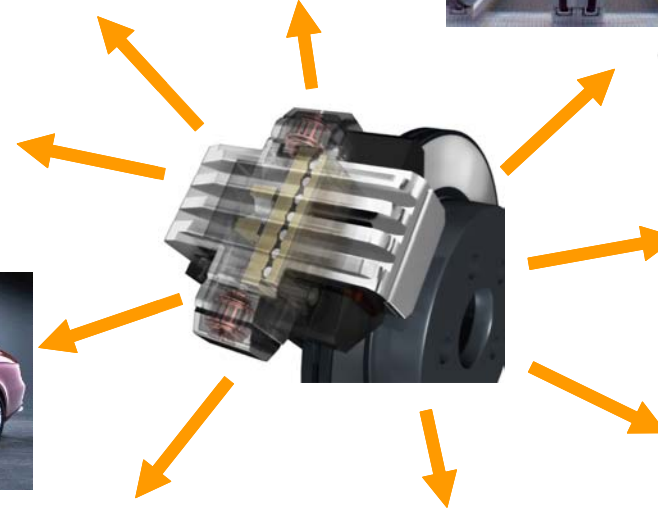
tractors



turning & milling machines



cranes





Motivation

Product Description

Application Fields

Automotive
Application

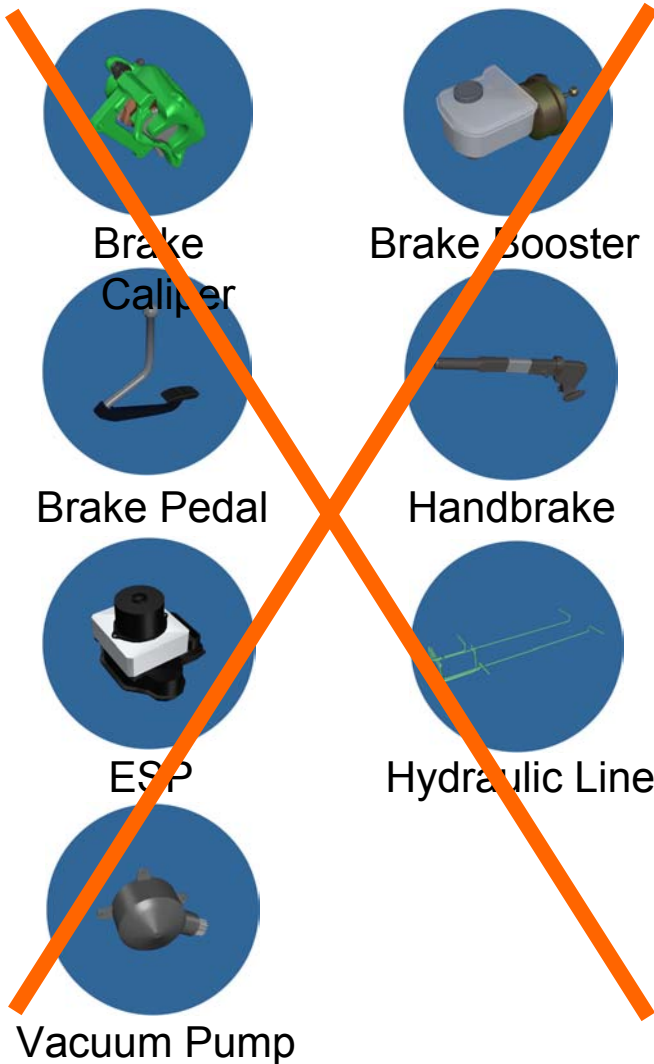
Benefits



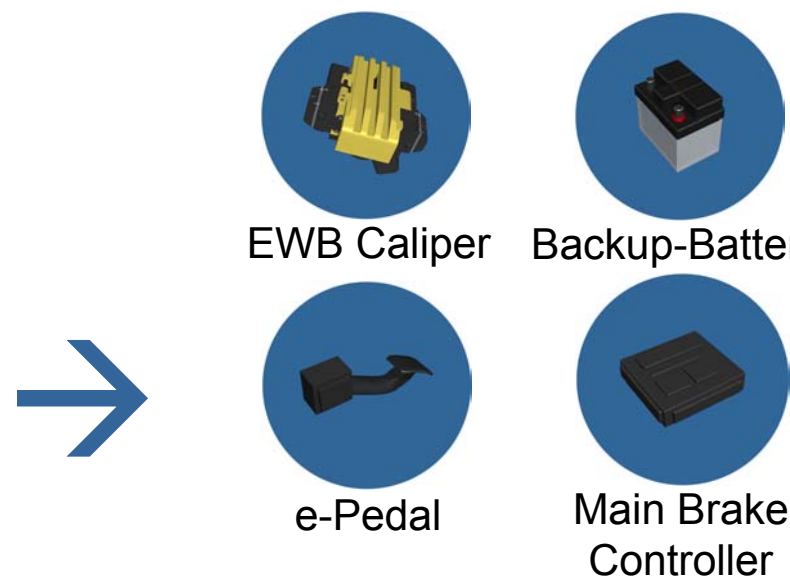
Comparison of Components

- Motivation
- Product Description
- Application Fields
- Automotive Application
- Benefits

Hydraulic Brake System



Electronic Wedge Brake





Benefits of the Electronic Wedge Brake

SIEMENS VDO

Motivation

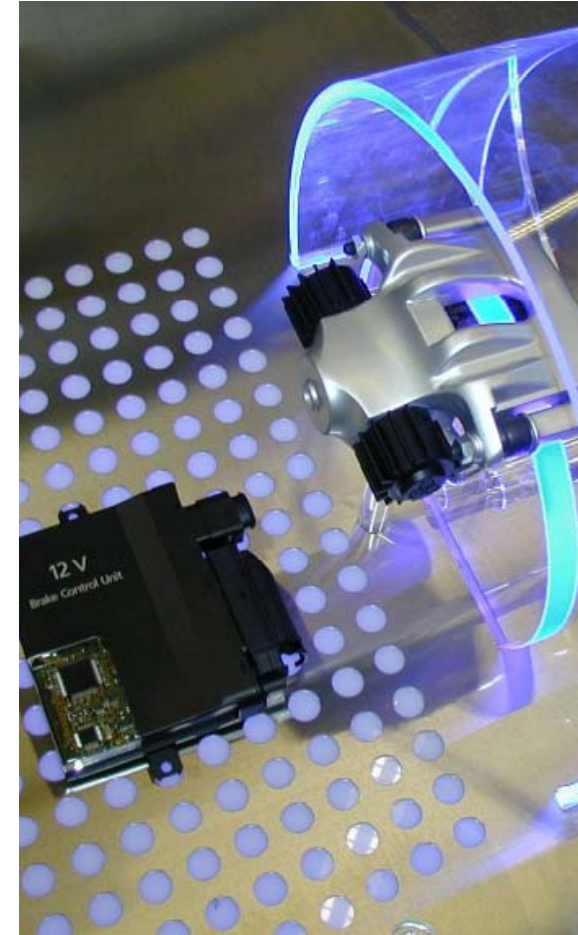
Product Description

Application Fields

Automotive Application

Benefits

- Improved ABS performance especially on slippery roads and shorter stopping distance.
- Continuous brake power distribution.
- No brake fluid leads to long maintenance intervals and environmental friendly brake system.
- Independent mounting position (left- and right-steering).
- Individual adaptive brake characteristic.
- Approx. 15-22l additional volume in the engine compartment.
- Brake-by-wire with 12 V board architecture.





Benefits for Manufacturer & Operator of Rail Vehicles (1/3)

- Motivation
- Product Description
- Application Fields
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- Benefits

Rail Vehicle Manufacturer

Rail Vehicle Operator

Space & Weight

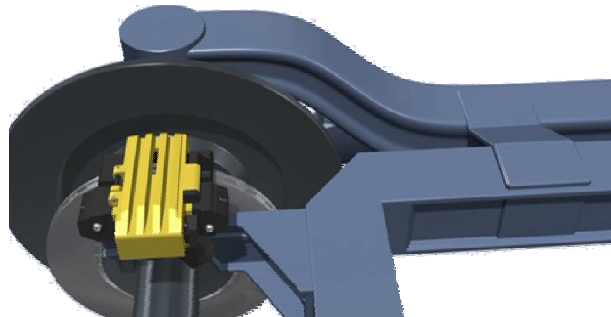
- additional volume in bogie/axle unit (design freedom)
- no bulky air compressor/ reservoirs

- lower energy consumption
- reduced life cycle costs

Modular System & Service friendly

- plug and play caliper, end of line test, simple assembly
- diagnosable brake
- faster development and adaptation by SW

- reduced service time in repair shop
- service friendly (smaller/no compressor -> fluid change!)
- brake pad wear recognition
- simpler diagnostics and maintenance procedures
- brake pad change like conventional brake, standard spare parts
- brake characteristic can be adjusted individually





Benefits for Manufacturer & Operator of Rail Vehicles (2/3)

Motivation

Product Description

Application Fields

Automotive Application

Benefits

Rail Vehicle Manufacturer

Rail Vehicle Operator

Safety

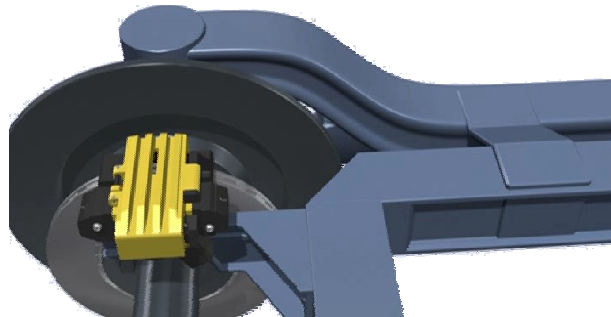
- increasing technology leader image and rail operator trust
- Enhanced reliability

- faster brake reaction
- enhanced, faster ABS
- wheel-specific braking → brake power distribution (fading)
- brake pad position detection (substitute "Entlagenschalter")

Comfort

- increasing best of class image and end customer trust

- enhanced traction control – slip&stick
- noise reduction
- no grinding brake pads





Benefits for Manufacturer & Operator of Rail Vehicles (3/3)

- Motivation
- Product Description
- Application Fields
- Automotive Application
- Benefits

Rail Vehicle Manufacturer

Rail Vehicle Operator

Cost Savings

- no pneumatic architecture (step towards pure E-system)
- no compressor fluid filling
- no expensive air compressor/reservoirs
- lower assembly times

- longer brake pad life time (avoid hot spots)
- improved efficiency
- reduced maintenance cost (no change of compressor fluid)

Environment friendly

- increasing green image and rail operator trust

- dry brake system
- lower energy consumption (reduced life cycle costs)
- no compressor fluid disposal

