KNORR-BREMSE

A Transitional Wagon-Level Architecture for Wheel Flat Prevention within the DFT/DAC Roadmap



50th Conference on Modern Rolling Stock

Sanjay Albert
sanjay.albert@knorr-bremse.com

Freight wagons need modernisation

- Ambitious modal shift targets are set in the EU, UK, India and beyond.
- To capitalise on growth, freight wagons must evolve into smarter assets.
- Current challenges hinder efficiency, safety, and operational transparency
- The need for innovation to meet increasing demand and higher standards



UK
75% freight growth by 2050 (GBRTT)

EU
50% more rail freight by 2030; double by 2050 (EU Mobility Strategy)

India
45% freight by rail by 2030 (National Rail Plan)

The hidden costs of traditional freight operations





Accidents still too common: Recent incidents highlight braking system vulnerabilities and wheel issues.

The hidden obstacle: Delays, damage, and reactive maintenance significantly impact profitability and reputation.

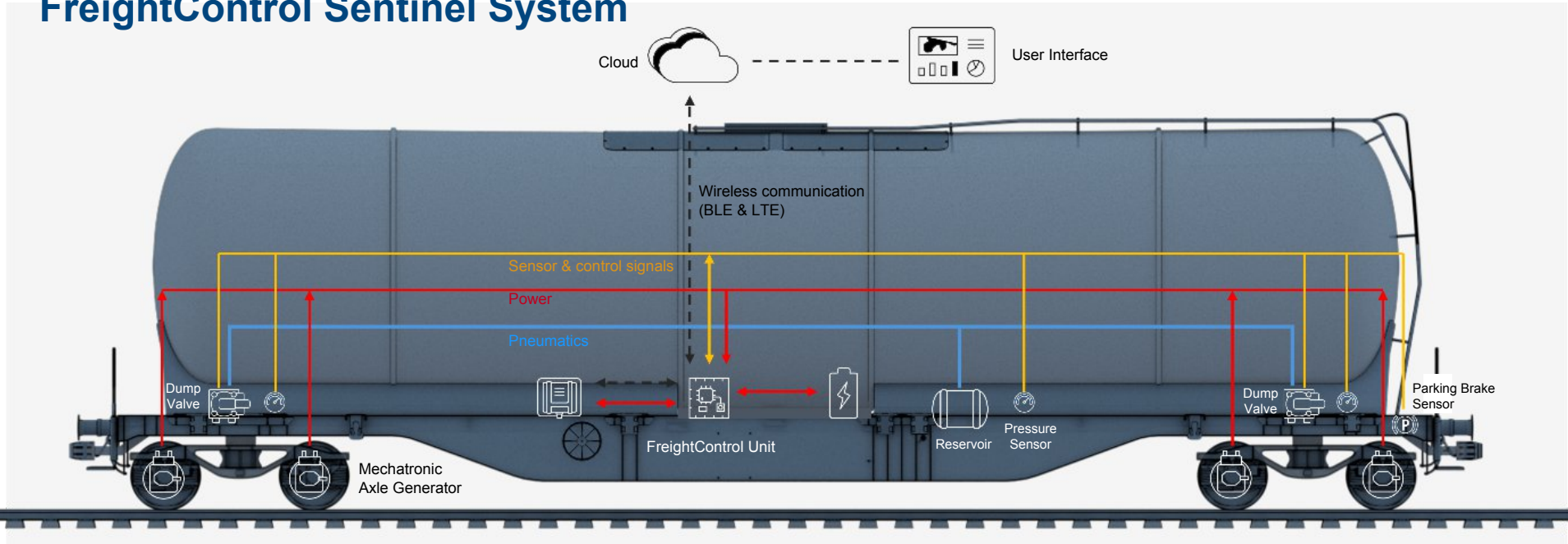
The industry faces limitations in real-time monitoring and proactive issue detection.

The European DAC Vision

- DAC delivers train-wide power turning passive freight wagons into smart, digital nodes.
- Series-ready deployment is 2027–2030
- Fleet-wide migration a decade long program.
- Requires coordinated industry-wide capital investment before full value is unlocked.
- A solution is needed to address challenges in major international markets who will not transition to DAC.



FreightControl Sentinel System






Mechatronic Axle Generators



Knorr-Bremse Hub V1.5



FreightControl Unit



Battery




Mechatronic Axle Generators

Wheel Flat Prevention: Active intervention, not just monitoring



Derailment & Track Risk: Flat spots cause severe dynamic impact loading, raising derailment risks at switch points.

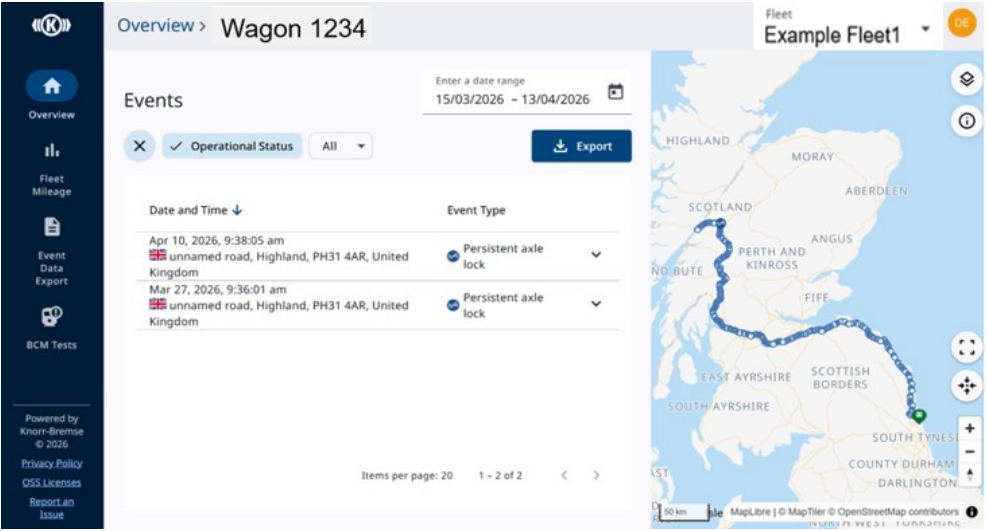
Active Wheel Flat Prevention: Momentarily vents bogie brake pressure so slipping wheels spin back to train speed.

Adhesion Loss Intervention: Automatically triggers when track contamination (leaves, frost, grease) breaks wheel-rail grip.

Field-Proven on 1,400+ Events: Real-time monitoring captures slide events from 12m up to 460 m in length.

Extended Wheelset Life & Uptime: Eliminates premature wheelset replacements, shifting fleets to predictive maintenance.

Fleet Availability & Condition Monitoring — Beyond WFP



Predictive Brake Diagnostics: Continuous detection of component degradation (e.g., distributor valves) prior to failure.

Track & Vehicle Shock Sensing: Pinpoints anomalies by location potential track defects and vehicle faults (e.g., broken springs).

Departure Hand Brake Safeguard: Sensors alert drivers if hand brakes remain engaged, preventing overheated axles and flat spots.

Elimination of Static Brake Tests: Real-time system validation removes periodic manual test downtime Returning ~2 wagons/day to service per 750-wagon fleet.

Digital Rail Suite Platform: Delivering fleet- and wagon-level analytics with dedicated operator and owner access tiers.

Case study: FreightControl Sentinel in revenue service



VTG & Knorr-Bremse Partnership: Joint engineering programme delivering the first digitally connected "iWagons.“

Retrofit & New-Build Fleet: Combines 31 retrofitted JPA hopper wagons alongside 35 factory-built new wagons.

Track Protection Endorsement: Network Rail confirmed reduced infrastructure damage, broadening commercial value.

Scale Contracted to 2029: Long-term commitment to supply 2,000 digital wagon systems across VTG’s UK fleet.

The Future of FreightContol Sentinel



Complementary to DAC goals: Technology can transition to coupler-supplied power, while serving non-DAC global markets.

Zero Infrastructure Barrier: Enables immediate wagon digitisation avoiding systemic rollout delays.

Predictive Condition-Based Maintenance: Maintenance interventions become system-led rather than schedule-driven.

Modular Technology: Foundation allows staged feature additions without redesign.



The next step for mobility of tomorrow

Thank you