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Use case: Electrification

Bosch Rexroth Forum 2023 – Use Case: Electrification

Bosch Rexroth Demonstrator – Battery Electric Telehandler

CHARACTERISTICS

Project Scope:

- Proof of DC system & technological know-how, Sales support, development vehicle
- Electrification of all vehicle functions (traction, implement, aux, HV system)

Rexroth Contribution:

- eLION Motor-generators, Inverters, Gearbox, Pumps, HV&LV cables, PDU, OBC, DCDC
- Electrical & Functional Safety
- Vehicle Control Software

System Topology:

- ❖ Battery Electric

System Development Activities

- Traction system
- Hydraulic system (Implement)
- High Voltage system
- Low Voltage system
- Thermal Management
- Controller system layout (Control Architecture & CAN Architecture)
- Software & Functions

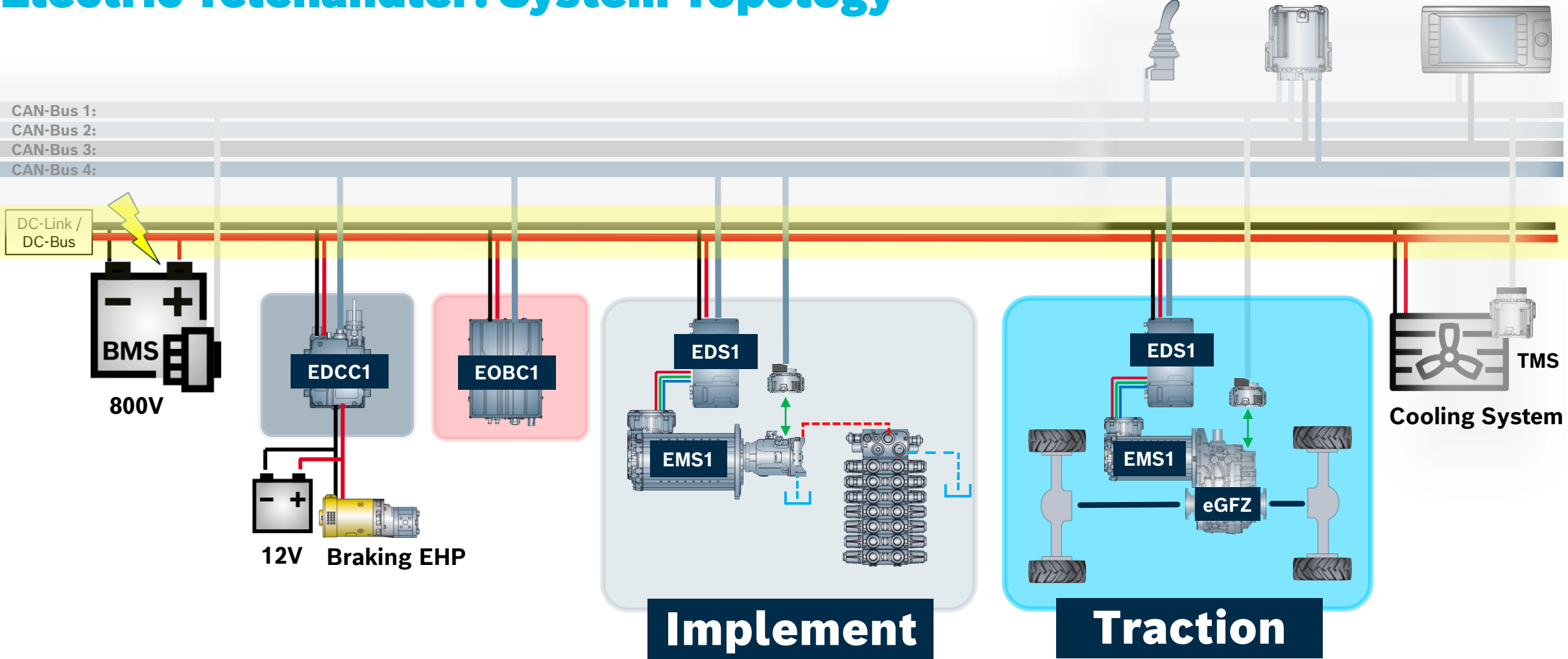


Main Vehicle Data

- | | |
|-------------------------------|-----------------------------------|
| • Vehicle Weight (unloaded): | 11.5 t |
| • Prev. Diesel Power: | 105 kW |
| • Vehicle Dimensions (LxWxH): | 6.1m x 2.48m x 2.53m |
| • Battery Capacity / Voltage: | 90 kWh / 800V |
| • Max. Traction Force: | 100 kN (SW limited) |
| • Max. Speed: | 40 km/h |
| • Lifting Capacity / Height: | 6 t / 9 m |
| • Implement Hydraulics: | Variable pump, 200 l/min, 270 bar |

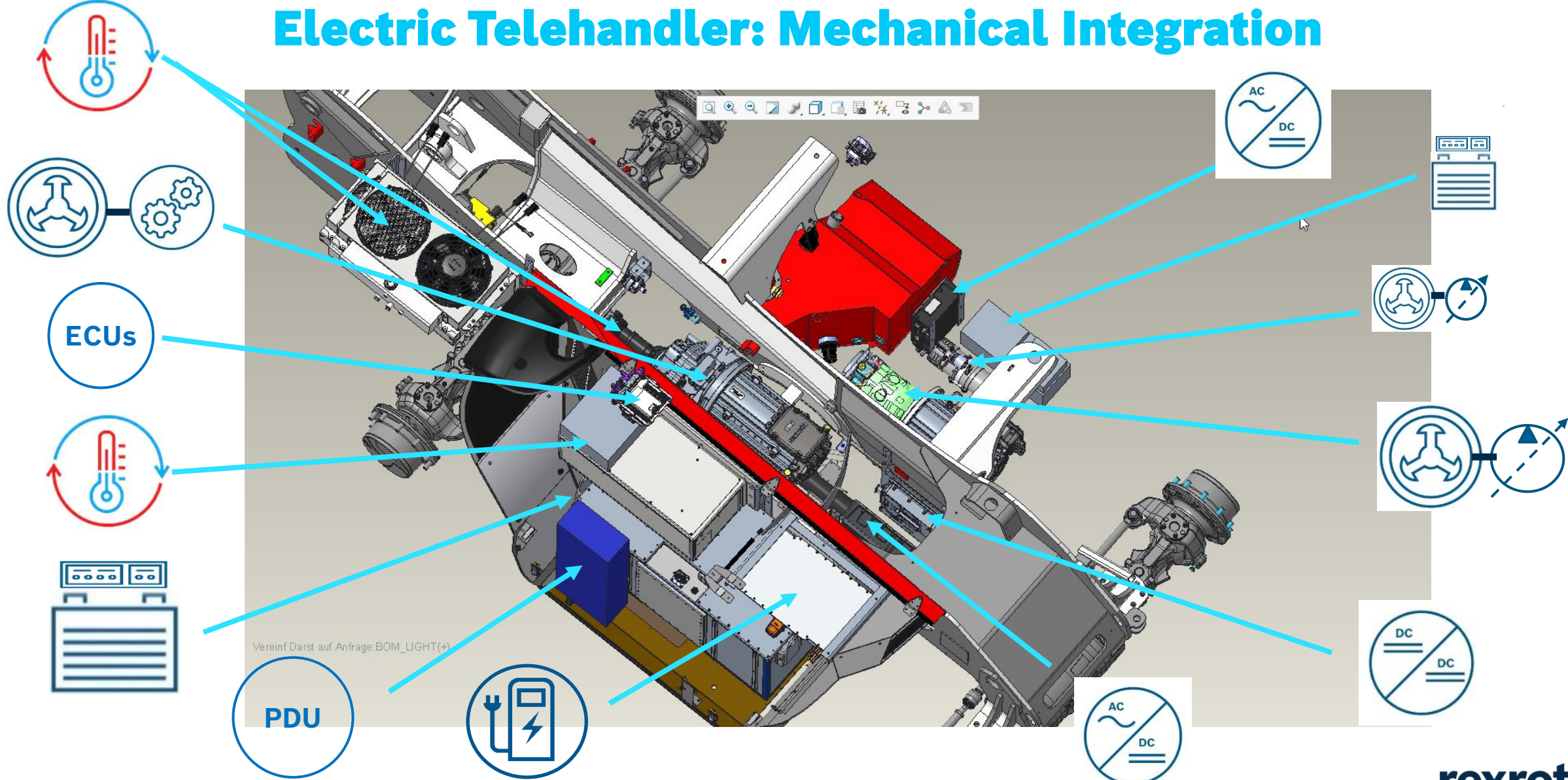
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Electric Telehandler: System Topology



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Electric Telehandler: Mechanical Integration



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Electric Telehandler: Lessons Learned



Opportunities		Challenges	
<ul style="list-style-type: none"> Productivity increased by ~20 % compared to ICE version High dynamics with good customization ability by SW parameterization 	Dynamics	<ul style="list-style-type: none"> Trade-off in terms of operation time and/or battery cost 	
<ul style="list-style-type: none"> Efficiency of implement pump drive increased by ~10 % with Sytronix eOC High efficiency of electric components Energy on demand due to decentralized architecture Further optimization potentials in hydraulic system 	Efficiency	<ul style="list-style-type: none"> Higher engineering efforts and increased system complexity 	
<ul style="list-style-type: none"> Reduced noise level by -14 dB[A] 	Noise level	<ul style="list-style-type: none"> Hydraulic sound coming up to the surface, further optimizations required Potential risk for driver / people due to missing awareness of danger 	
<ul style="list-style-type: none"> Scalable components provide certain flexibility for mechanical integration Optimized interfaces (e.g. pump flange) enable compact solutions High overload-ability of electric components reduce needed space (down-sizing) 	Integration	<ul style="list-style-type: none"> Available vehicle structures designed and optimized for Diesel-hydraulic integration Electrics with lower power density than hydraulics 	
<ul style="list-style-type: none"> Functional safety concept can be well adapted with available inverter safety functions High HV-electrical safety due to IT-net and Insulation Monitoring Device 	Safety	<ul style="list-style-type: none"> R&D and workshop people to be trained for HV components 	

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Electric Telehandler: Conclusion

Noise Level : -14dB

Productivity: +20%

Efficiency: +10%



It was worth the challenges, there might be even more to achieve!



Let's get electrified with eLION!

Thank you!