

Environment-friendly and efficient air conditioning systems

Reliability and quality improvement *made by DB*

Environmental policy reasons promote awareness for rethinking the currently used technology

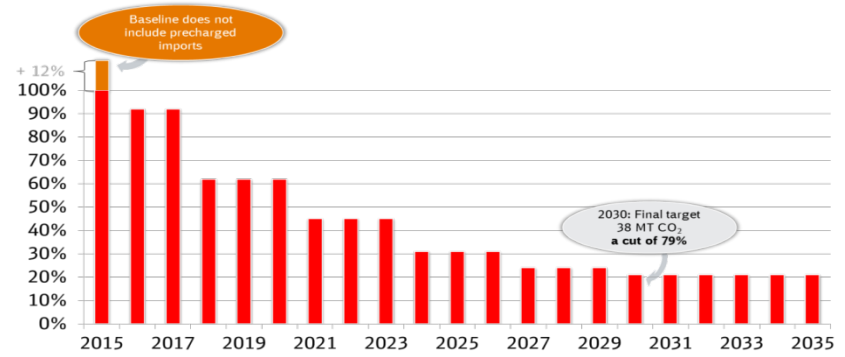
Environmental Goals

- Expand the ecological pioneering role
- Improve the three major sectors emissions, power consumption and environment-friendly refrigerants



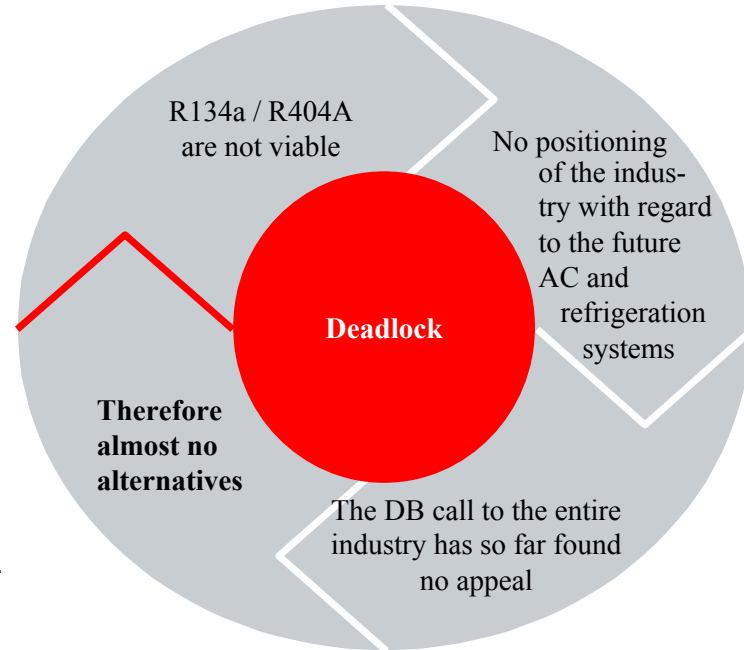
Political Pressure

- The EU HFC phase-down profile entails risks for all railway operators
- Further environmental policy challenges including environmental organizations



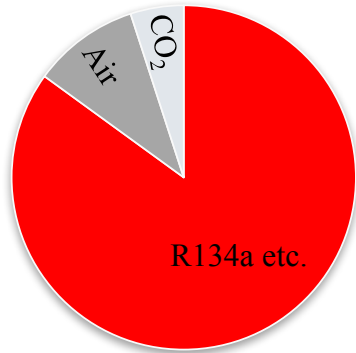
DB has positioned itself with regard to viable refrigerant to solve the barrier in the sector

- DB is interested in efficient and economical air conditioning systems with natural refrigerants
- Producers stick to proven solutions (path dependency). There is no vehicle except DB's ICE 3 offering an air conditioning system with natural refrigerants
- Rail vehicle sector is awaiting further development in the automobile sector
- A call in 2013 has found no appeal, as a result, there is still no signal for the future development of the entire railway vehicle stock
- ... without a clear signal, there will be no solution of the existing self-blockade



To accelerate the development, several projects have already been started

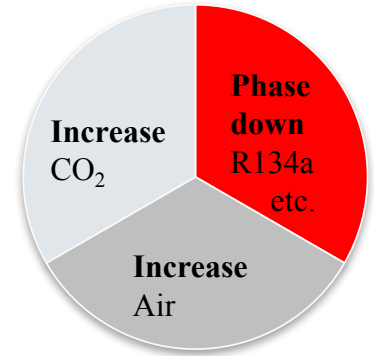
Current distribution of AC-systems



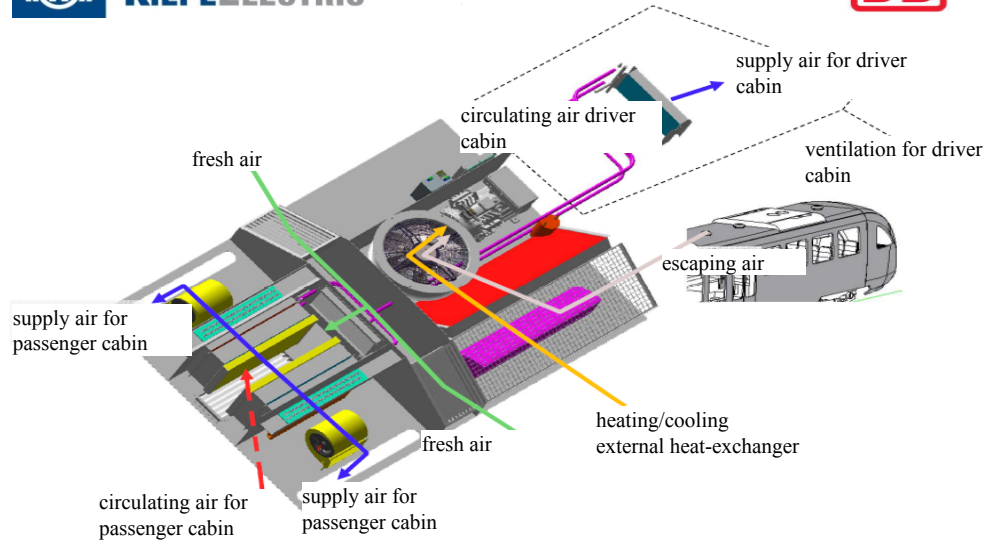
| DB Projects | |
|--------------------------------|---------------------|
| ■ EC 2017 | Air-AC |
| ■ Liebherr ICE 3 improvement | Air-AC |
| ■ EcoTrain | CO ₂ -AC |
| ■ CO ₂ Test Vehicle | CO ₂ -AC |
| Other Projects | |
| ■ ÖBB Passenger Railcar | CO ₂ -AC |



Target state for the distribution of AC-systems



CO₂-AC: Development of an electrically driven air-conditioning system with heat pump technology



Datasheet

Weight

- 560 kg

Cooling

- Air supply max. 2100 m³/h

Heating

- Air supply max. 1500 m³/h

Ventilation

- Air supply max. 2100 m³/h

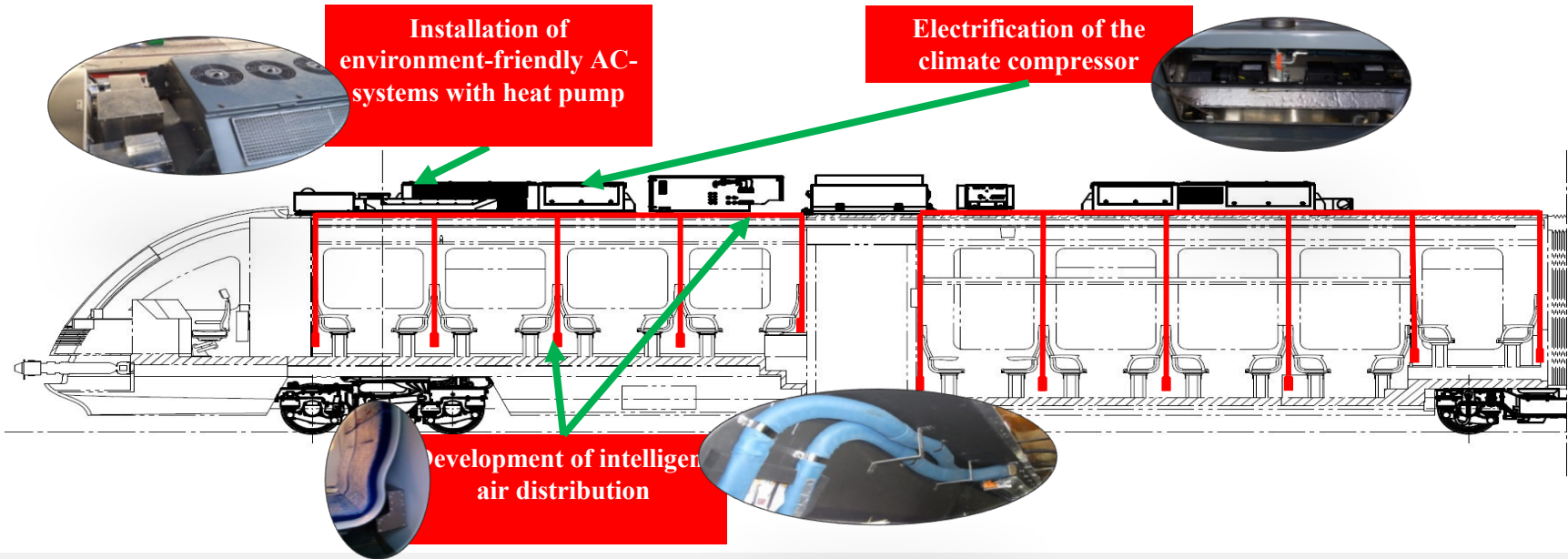
Heating/Cooling capacity

- 24 kW

Improvement of energy efficiency

- Min. 10 %

CO₂-AC: natural refrigerant and intelligent air distribution for an innovative air conditioning system



- The use of CO₂ as a refrigerant eliminates the dependence on the costly refrigerants R134a, R407c and R404a
- Integration of an innovative and patented air distribution system
- Increase in energy efficiency and reduced energy consumption by integrating a heat pump
- Reduction of operating and maintenance costs
- Technology transfer to other vehicles possible



We cordially invite you to support our mission