Co-funded by the European Union

A new generation of eco-friendly HVAC systems

Unlike traditional heating, ventilation, and air conditioning (HVAC) units, a new generation of eco-friendly HVAC systems use natural refrigerants like CO_2.

In doing so, they not only reduce carbon emissions but also energy consumption.

THE CHALLENGE

- New HVAC units must be installed within the space already available and cannot add any additional weight to the vehicle.
- The HVAC system must be designed with the close collaboration of the HVAC supplier, vehicle integrator and train operator.

HOW DO WE DO THIS?

To address these challenges, the Shift2Rail Programme delivered several **prototype HVAC systems** based on heat pumps that use CO_2 as a natural refrigerant.

NEW GENERATION HVAC PROTOTYPES

	Field Testing	Main Outcomes*
Wabco Faiveley prototype	Prototype installed on one end vehicle of a DB single-deck train.	• Met established comfort conditions • 7% lower annual energy consumption • No significant maintenance requirements
Knorr-Bremse prototype	Prototype installed on Bombardier vehicle used by DB for regional/commuter services.	• Achieved satisfactory level of comfort • 7% lower energy consumption • Higher efficiency at ambient temperatures below 23°C • Slightly higher maintenance requirements

*Compared to state-of-the-art HVAC unit using R134a refrigerant

THE POTENTIAL BENEFITS OF CO_2-BASED HVAC SYSTEMS

- Reducing emissions
- Decreasing energy use
- Increasing vehicle comfort
- Improving passenger satisfaction

Who Benefits

There is a clear opportunity for:

Final users

Railway operators

Suppliers

To develop a new generation of eco-friendly HVAC systems tailored to the unique needs of the rail sector.

Did You Know?

Conventional HVAC systems that use artificial refrigerants produce climate change causing greenhouse gases.

Fast Fact

Other sources of natural refrigerants, such as propane, could offer even lower energy consumption than CO_2.

Key Finding

Heat pumps using CO_2 as a refrigerant are the most promising HVAC technology.

WANT TO LEARN MORE?

rail-research.europa.eu

Solutions developed by Shift2Rail, Europe's Rail's predecessor programme