



Carbon capture for cleaner diesel trains

Background

Diesel-powered trains are a major source of carbon emissions in the UK. Electrification is a long-term solution, but it's expensive and not practical for all rail lines. This project, led by **Barrow Hill Ltd** and the **University of Derby**, explores a way to retrofit diesel locomotives with a system that captures CO₂ directly from the exhaust, helping the rail sector cut emissions and meet net zero targets.

The challenge

The UK needs **cost-effective ways to decarbonise its large fleet of diesel locomotives** without waiting for electrification. Any solution must work with existing trains and avoid major engine modifications while being affordable and scalable.

What's innovative about this project?

The project developed a concept for an Onboard Carbon Capture and Storage system using **calcium looping technology**.

How it works: Calcium oxide absorbs CO₂ from the train's exhaust. After each journey, the captured CO₂ is offloaded and the system is regenerated for reuse.

Key advantage: No need for major infrastructure changes or engine replacements.

Technical work: Emissions data is collected at Barrow Hill, and digital simulations are used to optimise the system's size, weight, and performance.

Key achievements

- Completed feasibility study
- Collected real-world emissions data
- Created a digital simulation model for the system
- Produced a design concept for a physical prototype

"The **support of University of Derby** has been invaluable, and we appreciate their guidance... our own loco was used to **test emissions** under various running scenarios. This **experience bodes well for the future as DRIIVe**, our new rail innovation centre is built for indoor testing and monitoring." - Barrow Hill Ltd

Next steps

Build and test a working prototype, refine the carbon capture filter, and conduct field trials on locomotives. The team will work to secure additional funding for demonstration and scale-up.

Why this matters for the East Midlands

The **East Midlands is home to key rail industry players**, including Barrow Hill and supply chain partners like Porterbrook and Unipart. Success would:

- Position the region as a **leader in green rail technology** and **support the UK's net zero goals**
- Create opportunities for **jobs and local manufacturing**
- Provide a **scalable solution for rail operators** across the UK and globally