Wall-Flow DPF system to replace Existing Wet Element Filter Systems used in Underground Coal Operations

Project Outline

ACARP project C25073 was proposed by industry stakeholders seeking an exhaust aftertreatment solution that:

- Enhances worker health through improved underground air quality;
- Reduces operational costs associated with currently implemented diesel particulate emissions systems.

2017 will see the industrialisation of the system for commercial trials.

Industry Challenges

Underground coal mining has largely electrified many operations, but diesel engines are still used for multipurpose load-haul-dump (LHD) vehicles and man transporters.

Diesel engines operating in underground coal mining need to comply with additional flame and explosion protection measures due to the presence of elevated ambient methane and highly combustible coal dust.

The health of underground workers is at risk without appropriate exhaust emission controls for particulates and gaseous pollutants.

Compounding this situation, the low operational duty cycle of the diesel LHD engine results in a very low average EGT which works against the performance of conventional DPF solutions.

Approach to Development

Given explosion risks for product innovation in a working coal mine an alternate approach to development was adopted.

Characterisation of LHD operations in a working mine were used to develop a series of real world engine cycles for use during development.

Development was then undertaken off-line using a state-of-the-art engine test facility, with hardware transferred to the mine for confirmation testing of results.

Proof-of-Concept Results

The rapid development project delivered PM reductions in excess of 95% over both regulator and real world cycles with the selected DPF.

Operation over continually repeated real world cycles showed that exhaust back pressure was stabilised confirming satisfactory regeneration was possible despite low exhaust gas temperatures (EGTs).

Surface Temperature

Despite exhaust gas temperatures in excess of 600°C external surface temperatures were measured to be controlled to less than 150°C through the use of an insulated DPF.

The industrialised system will use a combination of an insulated DPF and water-cooling.

System Changes

The coal industry has to date mostly used wet exhaust scrubbers and disposable filters to address tailpipe emission and temperature requirements.

The revised system uses a specially packaged wall-flow diesel particulate filter (DPF) with a platinum based pre-catalyst.

What is ACARP?

Access to R&D taxation rebates and generated research

Nominal ACARP budget: $18m/year; 100% industry funded

Fundamental research projects

Applied research projects

Commissioned projects

ACARP – Australian Coal Industry’s Research Program

Contact: Nick Coplin
4 Whipple St
Balcatta WA 6021
+61 (08) 9441 2311

www.orbitalcorp.com.au