High Efficiency Selective Catalytic Reduction Project

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Heavy Duty Vehicle Efficiency Programme:
High Efficiency Selective Catalytic Reduction Project

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High Efficiency Selective Catalytic Reduction Project

The objective of the project was to deliver a Selective Catalytic Reduction system capable of $>98\%$ NOx reduction to enable engines with high thermal efficiencies to meet regulated NOx emission levels.

A collaboration between, Johnson-Matthey, Caterpillar and Loughborough University.

Loughborough’s Role:
(1) Development of new reductant dosing system to achieve the technical objective of $>98\%$ NOx reduction.
(2) Develop improved CFD design tools to allow redesign and optimisation reductant dosing systems validated on a gas flow rig and on the testbed engines against real world cycles
In this highly successful project, Loughborough University achieved its goals through the application of state-of-the-art optical diagnostic techniques to understand the fundamental physics and chemistry of the NOx reduction technology to allow the design of a world-beating technology.

Loughborough University developed novel CFD modelling tools capturing the knowledge and data gained during the experimental programme to define new design tools for the next generation ultra-low emission diesel engines.

Facilities and Methodologies Established for the ETI Project

High temperature flow facilities:
- Exhaust simulation up to 15 litre engine
- Ambient - 600°C
- Up to 1500 kg/h flow rate
- Fully optically accessible
Long Term Outcomes from the Project

• Significant knowledge and understanding about engine after-treatment analysis and design was gained and is being applied to new engine designs,
• New state-of-the-art experimental facilities for after-treatment systems which are now being used to develop emission reduction systems for new engines as part of an Advanced Propulsion Centre project,
• New modelling tools are being used for a range of applications including engine analysis,
• Two new PhD researchers were trained through the ETI project. These highly trained research engineers are working on APC projects and within the automotive industry.
• The project won The Engineer ‘Collaborate to Innovate’ Awards in 2017
New NOx reduction technology: ACCT

A problem with current SCR NOx reduction systems is the ability to make ammonia during cold start and low temperature exhaust conditions.

Loughborough has developed a new device called ACCT that on-engine converts AdBlue™ into a new solution.

- The new solution is stored and dosed where AdBlue will not decompose.
- Provides ammonia from 50°C.
- Adds on to the existing AdBlue™ delivery system and requires no additional pumping units.
- The system is fully scalable.
- The ACCT system will not develop deposits.