CARBON CO_2 CONNECTIONS

case study

A new generation of fuel injection systems using µMist® spray technology

Project Summary

Problem: Transport fuel consumption is a major contributor to the national and global carbon emissions, and hence improved fuel efficiency is a key initiative.
Solution: Improved fuel burning can be achieved through better control over the fuel spray particularly smaller fuel droplets, potentially available using µMist® technology.

Partnership

- University of Leeds
- Swedish Biomimetics 3000® Ltd, a Virtual, Venture, Intersectional, Organisation (V2I0) founded in Sweden 2004 and in the UK 2006

Inspiration

The research group investigated the physics of the bombardier beetle's internal chamber and spray mechanism. The beetle has the ability to generate a high frequency pulsed spray at very low injection pressures. Using computer CFD (Computational Fluid Dynamics) models and subsequent rig construction inspired by some of the beetle's spray generating capabilities, in particular the valve system of the beetle, the team were inspired to develop the conceptual ideas for the design of the technically advanced, innovative and environmentally friendly µMist® spray system. This system can be used for fuel injection within the automotive, aviation, space-craft industries as well as having the potential for many other spray applications such as drug delivery, household, products, fire control and so on.

Innovation

Inspired by the beetle's controlled valve system, the µMist® innovation uses the same principles. Research teams at Cornell University and Leeds University believed the beetle's mechanism to be essential to the firing of the vapour and liquid droplets. This led to the building of a rig which builds upon the physics of the beetle system for generating high performance vapour explosions.

By using the µMist® technology, improved fuel burning is achieved through the generation of smaller fuel droplets and the injector operating at lower pressures. This low pressure option reduces the manufacturing and implementation cost of the new injectors and hence ensures the rapid adoption of this new technology. A retrofit approach is then possible for existing high pressure rail systems to achieve rapid market uptake.

Development

A major outcome of the current Carbon Connection supported program is the demonstration of the validity of the proposed µMist® technology as the next generation fuel injector application with the environmental benefit of a significant reduction in carbon emissions and other harmful engine emissions (eg. UBHC, particulates). It should also gain maximum scientific and public interest stimulating additional development programs of the µMist® technology into further novel applications within aviation, space craft, medical, fire control and consumer industries. All these industries have a demonstrable need for technically advanced, low carbon impact and more environmentally friendly spray systems.

The development program has progressed rapidly through the engagement of an innovative program management philosophy, where state-of-the-art partners are engaged within a consortium development team to drive forward the relevant technologies, in combination with managed, parallel, synergistic yet distinct research and development programs.

Patent Pending. Covered by U.S. Patent Publication No. 2009-0212125.

Carbon Connections is HEIF-funded investment project utilising £3 million for carbon reduction activities. Based at the UEA, Carbon Connections supports innovative projects in carbon reduction using a partnership model. The aim is to facilitate knowledge transfer between universities and research laboratories and the business community to speed commercial development of carbon-saving projects, whether technological or behavioural in focus.

UEA
University of East Anglia

For further information please contact:

Matt Dolan
Marketing Manager
01603 591358
email:
m.dolan@uea.ac.uk