COMBUSTION WEBINAR

Ingredients for future internal combustion engines: high tumble, energy assistance and hydrogen

Speaker: Prof. Shawn Kook

The University of New South Wales, Sydney, Australia

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Biography: Sanghoon "Shawn" Kook is a Professor of Mechanical Engineering at the University of New South Wales (UNSW) where he directs the UNSW Engine Research Laboratory. His expertise lies in optical/laser-based imaging diagnostics, advanced internal combustion engines and alternative fuels such as hydrogen, ethanol, methanol and biodiesel. Before joining UNSW in 2009, he received research training at Sandia National Laboratories as a postdoc and at KAIST for his BS, MS and PhD degrees. He has authored 245 journal/conference papers, supervised 30 PhD/MPhil candidates until successful completion, and led externally funded projects of worth more than $13 million from the Australian government and various global industry partners.

Abstract: The UNSW Engine Research Laboratory currently focuses on three main areas to meet the increasing demands for more efficient and less carbon dependent internal combustion engines. These include 1) high tumble gasoline engines for electrified cars, 2) energy assisted ignition of renewable fuels for diesel engines and 3) hydrogen-diesel dual direct injection engines. The first part of this seminar introduces a method developed for endoscopic high-speed particle image velocimetry (eHS-PIV) and flame imaging (eHS-Flame) and its application to a high-tumble multi-cylinder gasoline engine. The second part of this seminar shows the flow fields and turbulence distribution measured in an energy assisted diesel engine, using the results from flame image velocimetry (FIV), a method tracking the flame pattern changes to extract in-flame flow vectors and turbulence. The last part of this seminar presents a diesel engine fitted with an additional high-pressure hydrogen direct injection system, which achieves up to 90% hydrogen energy fraction, 57.2% indicated efficiency and 71.2% CO_2 reduction compared to the diesel baseline. The NO_x mitigation through the late injection induced diffusion flames is discussed.

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