LUND UNIVERSITY

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MASTER THESIS PROPOSAL

August 11, 2010

Modeling of Internal EGR on a Single Cylinder Volvo D5 with Fully Flexible Variable Valve Train

HCCI has been recognized as a potential combustion mode for increased efficiency and lower NOx emissions. HCCI is not without drawbacks; limited operating range, noise and lack of immediate control actuation. Ongoing research focuses on gasoline fueled Partially Premixed Combustion (PPC). With PPC, fuel is injected similarly to a diesel engine, but with longer ignition delay to generate a sufficiently homogeneous mixture for lower emissions. But, at the same time the mixture should be adequately stratified in order to reduce sharp pressure rise rates and associated noise.

One problem with PPC is ignitability at lower load operating conditions, where it is assumed that required boost is unavailable. To compensate for this, one possibility is to use VVT and trap residual gases. The function of the trapped residual gases is to elevate the temperature sufficiently for auto-ignition around top dead center.

In an ongoing measurement campaign, a single cylinder Volvo D5 engine is run in different residual-gas enhanced HCCI modes at ambient conditions. The assignment is to develop an engine model in BOOST (similar to GT-POWER). The model will be used to extract the fraction of trapped residual gas and initial mixture temperature. This information cannot be measured directly without significant engine alterations. A good engine model used for residual gas estimation is a valuable and essential tool for ongoing research. The assignment is suitable for one student and it is possible to start immediately.

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