סמינריון

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות שתתקיים ביום ד' 27.01.21 (י"ד בשבט, תשפ"א), בשעה 13:30 באמצעות הזום : https://technion.zoom.us/s/94566702876

מרצה : אמנון אייל

מנחה : פרופ'/ח לאוניד טרטקובסקי

על הנושא:

Reforming-Controlled Compression Ignition - a Novel Concept for Internal Combustion Engines

The seminar will be given in Hebrew

תקציר ההרצאה :

The homogeneous charge compression ignition (HCCI) is a promising engine combustion approach enabling high efficiency and ultra-low pollutant emissions. The HCCI method combines the advantages of the Diesel and the Otto cycles while eliminating their drawbacks. The HCCI enables using diverse fuels including renewables. However, HCCI is kinetically-controlled combustion. Hence, the control of combustion phasing is the major challenge.

We have developed and investigated the innovative Reforming-Controlled Compression Ignition (RefCCI) concept enabling robust combustion control and providing additional benefits in terms of efficiency and emissions compared to the HCCI. The RefCCI approach combines advanced low-temperature combustion similar to HCCI and the High-Pressure Thermochemical Recuperation (HP-TCR) developed and investigated in the Technion. It enables an efficiency improvement beyond the known HCCI engines owing to waste heat recovery and hydrogen combustion. The non-reformed high-reactivity primary fuel dimethyl ether (DME) and the low-reactivity hydrogen-rich reformate are injected directly into the cylinder in a controllably varied ratio. Varying the ratio between the injected reformate and DME solves the combustion phasing issue of HCCI engines and other challenges, such as limited operation range, combustion noise caused by too fast heat release rate, etc.

The 1st and the 2nd law thermodynamic analysis of the RefCCI concept was performed using the developed numerical model. Main exergy destruction sources and possible ways of efficiency improvement were identified and analyzed. A 3D CFD model was developed using Converge SW and applied for the mass and thermal stratification and the ringing phenomenon analysis. Eventually, experiments were performed to confirm the concept and to investigate pollutants formation, including nanoparticles, in the RefCCI combustion. The measured results confirm the possibility of efficient combustion phasing control and approximately 30% improvement in efficiency together with a significant reduction in pollutant emissions compared to conventional diesel combustion.

בברכה,

פרופ"ח אתי סאס

מרכז הסמינרים