ICE for FUTURE On/Off-road MOBILITY @ Bosch

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Abstract

As part of its "Green Deal", the goal of the European Union (EU) is to achieve zero net emissions of greenhouse gases (GHG) across all sectors by 2050. This goal can only be achieved with carbon-neutral energy carriers and accordingly compatible powertrains, replacing combustion engine powered vehicles using fossil energy carriers such as diesel and gasoline prevalent today.

A transition period will see the utilization of different fuels for the internal combustion engines. From one side Bosch is supporting the transition and, as example, a comparison between generic EN590 diesel fuel and an innovative Eni HVO fuel from renewable feedstocks has been carried out on a heavy-duty powertrain (for off highway applications) installed on a dyno bench in CVIT.

From the other side, in the direction to achieve the "2050" target, Bosch is supporting the path to a global hydrogen economy by developing key technologies along the entire hydrogen value chain. These include electrolyzes for hydrogen production, fuel cell technology for stationary and mobile applications, and components for the hydrogen internal combustion engine, such as the hydrogen injection system.

Bosch has set up a broad program for the development of components, combustion processes and operating strategies for hydrogen engines. The H_2 ICE development starts from the optically accessible single-cylinder unit, which is essential for clarifying the fundamental phenomena and goes through the steps to the full engine with the associated exhaust gas aftertreatment. Hydrogen direct injection shows a very attractive engine concept using the synergies of operating strategy, hydrogen injection system, air system and exhaust gas aftertreatment.

For the combustion design a toolchain including numerical and experimental paths are developed. 0D/1D/3D CFD simulations are applied to the optimization of the mixing process and combustion in real engine conditions at CVIT.