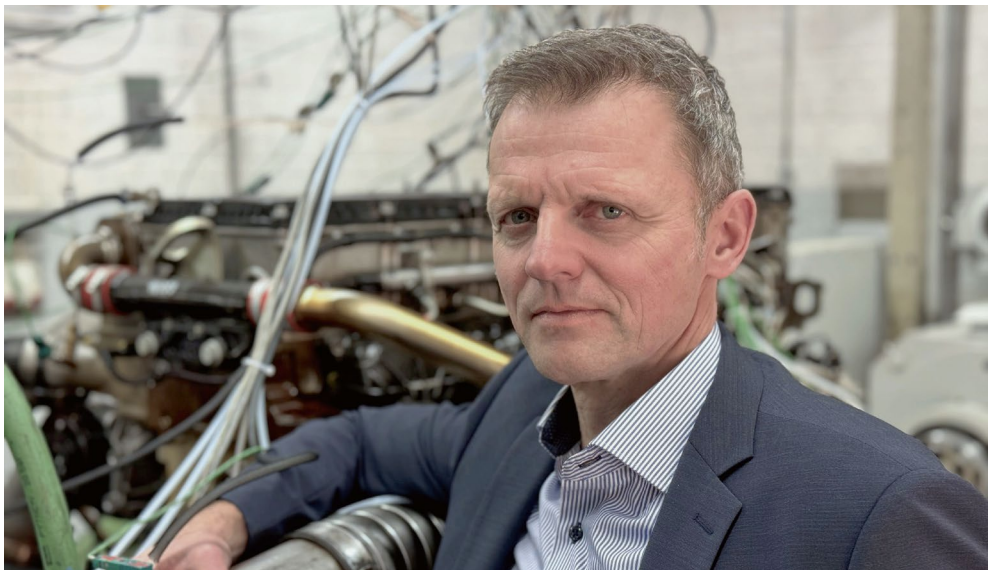

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Internal Combustion Engines for the Fight Against Climate Warming

The global climate protection measures planned so far will reduce global CO_2 emissions in 2030 by only 2 % compared to 2019. This stands in strong contrast to the targeted reduction of 45 %. Without further measures, the remaining CO_2 budget to meet the 1.5-°C target will be used up by 2032 at the latest.

To meet the climate target, 85 % of global new vehicle sales in 2030 will have to be Battery-Electric Vehicles. Optimistic market research, however, predicts only 45 % in sales by 2030. To achieve even that much, bold assumptions were made such as a tripling of mining capacities for Lithium as battery material, an approximately 20 % increase of electricity generation from renewable sources, and a comprehensive charging infrastructure, not to mention consumer acceptance. The need to transform this entire industrial ecosystem toward BEV will not be enough to make the necessary contribution to the 1.5-°C target without additional measures. The question is: How to minimize CO_2 emissions faster?

The answer involves the rapid inclusion of the global existing vehicle fleet in CO_2 reduction plans through fast replacement with modern, highly efficient combustion and hybrid engines, powered by the addition of regeneratively produced fuels. Even the use of carbon-reduced fossil fuels, such as CNG for light vehicles or LNG for commercial trucks, can help achieve an immediate reduction in CO_2 emissions by 20 % compared to diesel, which can be further increased significantly by adding biogas.

Additionally, the high level of similarity to today's modern diesel engines in use, refuelling and maintenance is raising a high market interest in hydrogen as a fuel to power commercial truck and off-highway engines. Even Hydrogen that is partially produced from renewable sources can make a timely contribution to reducing CO_2. Hydrogen-combustion engine technology is close to series production and offers additional potential for efficiency increase. Many sunny countries have started building capacities for fully regenerative production of hydrogen.

Tenneco's Powertrain business group supports hydrogen-fuelled combustion engine development and solutions, among others, through its hydrogen combustion engine dyno test benches. Additionally, unique laboratory expertise in examining materials under the influence of hydrogen to develop more hydrogen-resistant materials is provided. Specially developed simulation methods are used in the development process to avoid so-called uncontrolled early combustion by optimizing the lubricating oil supply and the blow-by gas flows in the cylinder. Undesired effects of so-called ghost ignition can be prevented by appropriately controlling the ignition system. Cold spark plugs, specially tailored to hydrogen combustion, are also being developed.

More modern and increasingly efficient combustion engines as well as the inclusion of the existing fleets through using fuels with minimized fossil CO_2 footprint can enable an additional reduction of relevant CO_2 emissions. This requires that political leadership to support all valuable contributions to the CO_2-reduction target rather than the promotion of a single technology.