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Editorial: Fluids and greases for electrified vehicles

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Editorial on the Research Topic
Fluids and greases for electrified vehicles

It is rare in tribology for a new Research Topic of magnitude to arise. Yet that is what has happened with the advent of the electric vehicle and the belief in its ability to meet the world's personal transport requirements while addressing the needs to reduce CO_2 emissions and provide a sustainable future.

With the significant increase in hybrids and pure EVs has come a need for deeper understanding of the fluid and lubricant requirements for lubricating and cooling these new vehicles. There are some unique challenges for these lubricants as addressed by the 'Performance characteristics of lubricants in electric and hybrid vehicles: A review of current and future needs' by Chen et al. This paper, by authors from Texas A&M University and Tesla, outlines the needs and challenges in electric and hybrid vehicles, discusses their lubricating systems and requirements and properties of the lubricants for these vehicles.

In a second paper, Newcome from the Lubrizol Corporation gives 'A brief review of the rapid transformation of driveline lubricants for hybrid electric and electric vehicles.' In this paper he covers the requirements of lubricants unique to EVs with wet motors and makes the case for increased co-development of e-lubricants with the EV hardware in order to meet the hardware requirements.

In the third paper, Lee et al. from Southwest Research Institute undertake 'Tribological evaluation of electric vehicle driveline lubricants in an electrified environment'. In this work the team at SwRI adapted a block-on-ring test rig to allow a current to be passed between the test components while the test was run. This led to the discovery that both AC and DC current resulted in a significant increase in wear when using conventional driveline lubricants, which has been the staple lubricants used in EV drivelines to date.

In the fourth paper, Hofman et al. from the Gear Research Center in Germany (FZG) looks in more depth at the lubrication and cooling of the speed reduction gears in the electric driveline and the 'influence of water content on electrohydrodynamic friction and film thickness of water-containing polyalkylene glycols. In this work he showed there is great potential for water-containing PAGs to give reduced friction in elastohydrodynamic friction as well as good lubricant film formation. He also showed their calorimetric properties were promising for cooling.

In the final paper in the Research Topic, Daccord et al. from EXOES SAS and Capax Infiniti in France reported on the 'Aging of a dielectric fluid used for direct contact immersion cooling of batteries. In this work the key properties of fluids for immersion cooling of EV batteries are discussed and a fluid was exposed to various aging conditions devised to reproduce several years

of operation in a vehicle. The results showed that the fluid tested would behave well over many years of use.

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