Comparing the tribological behaviour of various carbides coated automotive brake discs

Goals and aim of the work: The study aims at investigating the tribological response of different carbides (WC, SiC, Cr_3C_2, TiC and Mo_2C) coated automotive brake discs and compared it with the uncoated disc. The microstructure, tribofilm formation, wear and friction behaviour of the various coatings shall be evaluated and compared with the blank grey cast iron (GCI) disc.

Context and use of the results: Gray cast iron (GCI) is the material that has been used for decades for the manufacturing of automobile brake discs. This is because GCI has a high melting point, good thermal conductivity, high scuffing resistance, and high friction factor and strength, among other factors. However, some of the significant drawbacks of GCI brake disc are its weak corrosion and wear resistance. Nowadays, the functional requirements for automotive brake discs are becoming stricter, prompted by the stringent regulations to reduce vehicle emissions (exhaust and non-exhaust). Exhaust emissions have been drastically reduced, but the non-exhaust (tire wear, road abrasion and brake wear) emissions are yet to be controlled, which will attract a stringent regulation in the coming years. The automotive industry is currently seeking for better and cheaper approaches to controlling these problems. Coating technology remains a method by which the wear resistance of components can be improved. In this study, different carbides materials had already been coated on the friction surfaces of several GCI brake discs via extreme high-speed laser (EHLA) material deposition. The tribological and wear performances of coated discs are yet to be analyzed and evaluated, which are the focus of this study.

Limitations and scope: EHLA coated, and blank GCI discs plus compatible brake pads shall be provided by Automotive Components Floby AB. The task shall include a literature survey, wear test, sample preparation, hardness measurement, wear particles collection and analysis, and microstructure characterization.

Methods and resources: Tribology test, scanning electron microscope (SEM), powder X-ray diffractometer, sample preparation lab, 3D microscope, hardness testing and material etching.

Stakeholders and dissemination: Automotive Components Floby AB