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Tribological evaluation of wear protection diamond-like-Carbon coatings with designed Diesel lubricated model-testingMartin Djoufack¹, Ulrich May², Gernot Repphun², Kerstin Bobzin³, Nazlim Bagcivan³¹Robert Bosch GmbH, Stuttgart-feuerbach, Germany ²Robert Bosch GmbH, Stuttgart, Germany ³Institut für Oberflächentechnik, Aachen, Germany

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Diesel engines are more and more used in passenger car and light-duty application, because of their higher efficiency compared to gasoline engines. A Diesel injection system consists of a high pressure pump, a common-Rail and a set of injectors. These systems are able to inject Diesel compressed up to 2000 bar and even more into the combustion chamber of a Diesel engine in order to increase the specific engine power. Simultaneously, fuel consumption is reduced. As a result of high pressure, the whole system is exposed to high stress. This can lead to severe wear of the components in mechanical contact. An option to solve this problem is the use of wear protection coatings, which reduce the wear and by the same way will extend the lifetime of the whole injection system. Diamond-like-carbon (DLC) are the most widely used coatings in these injection systems as they combine good wear protection of the coated components with low friction and low counterbody wear. As future applications will lead to even higher surface loads, it is essential to know the load limits and wear rates at multiple loading conditions.

In this paper, the wear behaviour of DLC/steel tribo-contacts in different model tests under Diesel lubrication is described. Diesel with and without anti wear additives was used as lubricant. The considered DLC are Bosch homemade hydrogenated and hydrogen free coatings, which are deposited on different steel substrates. The effects of load, temperature and speed on DLC/steel tribological behaviour in skewed cylinders, pin-on-disc and inclined impact model tests are investigated. Regardless of the considered model test, the DLC tribological strength shows a strong dependence on the temperature and load. However, the steel counterbody tribological strength displays different wear behaviour.

Keywords

Diamond-like-Carbon

Diesel fuel

Model wear test

Skewed cylinders

Pin-on-disc