Tribological behaviour of steel against ceramic oxide Atmospheric Plasma Spray (APS) coating under boundary lubrication conditions

*P. Deshpande[a], C. Minfray[a], F. Dassenoy[a], Th. Le Mogne[a], B. Vacher[a], B. Thiebaut[b], F.Jarnias[b]

* pushkar.deshpande@doctorant.ec-lyon.fr

[a] *Laboratory of Tribology and System Dynamics,*

Ecole Centrale de Lyon, 69134 Ecully, France
[b]TOTAL, Solaize Research Center,

BP22-69360 Cedex, France

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ABSTRACT
Nowadays to reduce weight, gas emission and oil consumption of the passenger car engines, Atmospheric Plasma Spray (APS) coatings are used on cylinder liner [1-2]. MoDTC (Molybdenum Di-Thiocarbamate), a well-known organometallic friction modifier is commonly used to reduce friction by formation of layered molybdenum disulphide flakes. This study focuses mainly on tribochemical interaction of MoDTC with ceramic oxide APS coated cylinder-liner under boundary lubrication conditions.

Fused and crushed micron sized powders are used in the Atmospheric plasma spray process to obtain a 70 µm thick ceramic oxide coating with optimum surface roughness parameters. Linear tribometer with a ball-on-flat configuration is used to carry out tribotests at 100°C with a maximum Hertzian pressure of 0.7 GPa. Lubricants used for the tribotests are base oil alone and with the friction modifier (MoDTC). Optical microscopy is used to estimate the wear on both ball and flat. Raman spectroscopy is used to study the coating before the tribotests and also to investigate tribofilm composition on the disc and the ball. XPS (X-ray photoelectron Spectroscopy) is also performed to study composition of tribofilms on APS discs. FIB (Focused Ion Beam) sample preparation is carried out on the surface of the tribofilm for TEM (Transmission Electron microscopy) observations of the tribofilm.

Friction, wear and surface chemistry/tribochemical process will be reviewed.

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