**Scuffing resistance and rolling contact fatigue of WC/C coated spur gears**

Remigiusz Michalczewski¹, Witold Piekoszewski², Marian Szczerek², Waldemar Tuszyński²

¹Institute for Sustainable Technologies, Radom, Poland ²Institute for Sustainable Technologies – National Research Institute, Radom, Poland

remigiusz.michalczewski@itee.radom.pl

The durability of heavily loaded gears depends on two phenomena: scuffing and rolling contact fatigue – pitting. Many types of thin hard coatings deposited on the surface of gears improve their scuffing resistance. However, a factor still limiting the scope of application of some coatings is their poor performance under conditions of cyclic contact stress, which leads to accelerated fatigue failures (pitting). Unfortunately, up to now, there is no possibility to predict the rolling contact fatigue behaviour of PVD coated steel gears basing on numerical methods.

The aim of the study was to investigate the resistance to rolling contact fatigue and scuffing resistance of WC/C coated gears. The WC/C (a-C:H:W) low-friction coating was deposited using PVD process by reactive sputtering. The investigation of rolling contact fatigue was realized by means of T-12U using FZG PTC/10/90 pitting test and S-A10/16,6R/120 “shock” scuffing test. Four material combinations of gears were tested: wheel and pinion uncoated, wheel and pinion coated, wheel coated and pinion uncoated as well as wheel uncoated and pinion coated. The tests were performed for an automotive mineral gear oil of API GL-5 performance level and SAE 80W/90 viscosity grade.

The best scuffing resistance was achieved for coated/coated pair (pinion and wheel coated) and steel/coated pair (uncoated pinion/coated wheel). However for the coated/coated pair (pinion and wheel coated) a significant decrease in the fatigue life compared to the uncoated gears was observed. The best results were obtained in the case of the steel pinion/WC/C coated wheel – even fourfold increase in the fatigue life was observed compared to the results for the uncoated gears. This shows a very high potential of application of DLC coatings for gears.

**Keywords**
gears  
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