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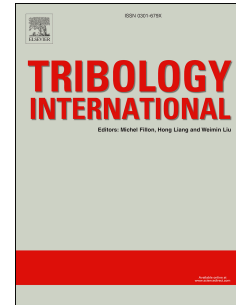
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# The Effect of Soot and Diesel contamination on Wear and Friction of Engine Oil Pump

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## Abstract

The effect of oil contamination and oil degradation on friction and wear of engine oil pump are addressed in this paper. It provides a summary of an experimental study on the effects of oil contamination and oil degradation on tribological performance of a Variable Displacement Vane Pump (VDVP); a particular focus is on the vane-rotor contact. Firstly, a lab-based artificial ageing of fully-formulated engine oil (FFO) with the addition of contaminants such as carbon black (CB) and diesel is conducted. Secondly, the impact of these contaminants on the bulk property of the oil during the ageing process is investigated, using rheometry and Attenuated Total Reflectance/ Fourier Transform Infrared Spectroscopy (ATR/FTIR). Thirdly, the performance of these oils on friction and wear of the vane-rotor contact under boundary lubrication regime is evaluated. The wear mechanism and chemical nature of tribofilms formed in tribological tests are addressed using Scanning Electron Microscopy/Energy Dispersive X-ray analysis (SEM/EDX) and Raman spectroscopy. It is found that the consumption of the additives by soot (additive adsorption) in the engine oil during the ageing process has a significant effect on wear of the components. This mechanism has a higher impact on producing high wear than abrasion by soot particles.

**Keywords:** wear, abrasive, degradation, lubrication

## 1 Introduction

In recent years, there has been an increasing demand in the automotive industry to improve fuel economy. Poor fuel economy is closely linked to high friction of tribological components and can also lead to high wear. Designing fuel efficient vehicles is arguably the primary focus for all automotive industry [1, 2].

A Variable Displacement Vane Pump (hereafter denoted VDVP) is an innovative type of oil pump that has been introduced to the automotive industry to improve the efficiency of engines.

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