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LUBRICANT FORMULATION: A DRIVER FOR EARLY BEARING DAMAGE ASSOCIATED TO WHITE ETCHING CRACKS?

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ABSTRACT
Early bearing damage associated to White Etching Cracks (WECs) has been extensively studied in the past decade [1, 2]. Several hypotheses have been formulated on the role of the lubricant and tribochemistry under mixed lubrication and high slip conditions, based on tests of 81212 bearings on FE-8 rigs [3-6]. It has been suggested that WECs develop in points of high frictional energy accumulation [5], promoted by specific additives. Some suggest that certain oils will lead to hydrogen ingress and subsequent weakening of the material [6]. Others suggest that specific stress profiles and history profile can prevail over oil formulation [1, 7]. The aim of this study is shed light on the assumption that certain oil chemistries can accelerate bearing damage and to discuss the relevance of the findings.

Tests have been performed on 81212 bearings as proposed in the literature [3-6]. To enable a systematic post analysis the number of test variables has been reduced to: 2 oils formulated specifically for these experiments A and B (same viscosity) and 2 temperatures (90C and 70C). The tests are suspended after 120% of the estimated lifetime or stopped on vibrational level. Subsequently, components are inspected: raceway microscopy, wear profiles, SEM-EDX and metallographic sections in specific locations across the contact. Similar tests have also been performed on 6207 bearings.

Analyses show that oil A and B lead to similar mechanical stresses but that only oil A leads to WEC-associated damage, thus suggesting that oil formulation is a driver for WECs under such conditions. The results further enable to identify the frame of contact conditions at risk and cannot confirm some statements from the literature (influence of water contamination, friction energy accumulation, etc.). Depending on the conditions, WEC can be generated more due to stresses (as such oil formulation becomes secondary), or more due to chemical influences (e.g. under mixed lubrication and high slip) [1, 2, 7].

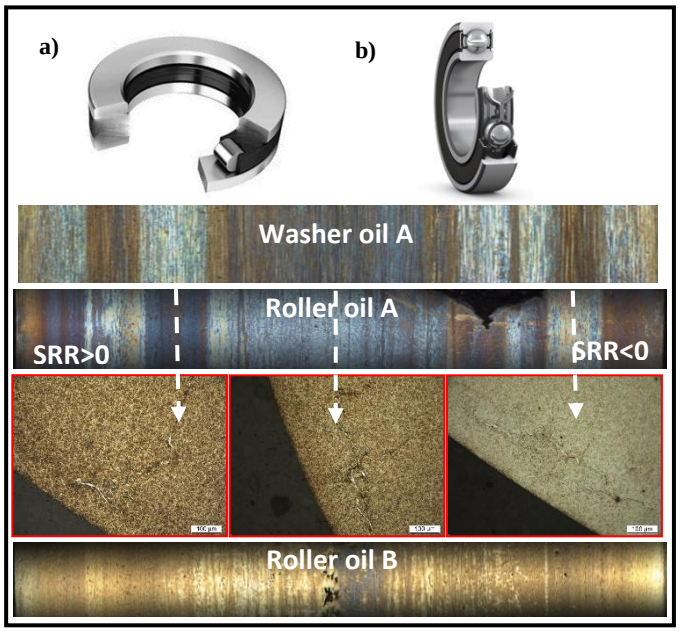

Figure 1 : Type of bearing tested, CRTBs (a), DGBBs (b) and typical WECs only observed for oil A and not B.

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