Investigation of running-in behaviour under glycerol and oil based lubrication

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Running-in is a vital part of a fresh tribopair contact, that needs to be handled in a proper way to prolong the lifetime of the components. Improper running-in can cause cracks, rolling contact fatigue, or even premature seizure. Besides, severe asperity deformation can introduce surface initiated fatigue which can result in micropitting in the long run. Thus, several factors are connected with running-in that affect the overall performance of gears and bearings.

Though running in under mineral and synthetic lubrication has been widely studied over decades, its behavior with water soluble lubricants is still unexplored for engineering applications. Water based lubricants, especially glycerol is getting popular because of its biocompatibility, low friction, and availability. Moreover, low pressure viscosity coefficient of glycerol results in lower load dependent loss in transmission which makes it a suitable candidate for future e-mobility.

This experimental study investigates the running-in behaviour of steel surfaces under glycerol and conventional oil lubrication. Moreover, a range of practical running conditions was employed for better understanding of wear, scuffing, and asperity deformation to predict ultimate failure mode. Also, the sensitivity of running-in behaviour in terms of lambda and temperature has been discussed in a later part. In addition, the effectiveness of a newly developed lambda parameter was investigated in line with the standard Tallian lambda parameter.

Keywords: Running-in, Water Based Lubrication, Glycerol, Wear, Green Lubricant, Sustainability

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