Vol. 45, No. 1 (2023) 121-128, DOI: 10.24874/ti.1404.11.22.02

Tribology in Industry

www.tribology.rs

RESEARCH

Effect of Saturated Fatty Acids on the Antiwear and Rheological Properties of Olive Oil

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Keywords:

Bio-Lubrication
Fatty acids
Wear
Viscosity
SEM

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Received: 21 November 2022
Revised: 23 December 2022
Accepted: 18 February 2023

A B S T R A C T

The study determines the effect of saturated fatty acids (coconut oil) on the rheological and tribological properties of olive oil. The olive oil is blended with different proportions of coconut oil (10%, 20%, 30%, 40%, and 50%) and the different properties (flow behaviour and antiwear) are studied on Anton Paars rheometer and Four-ball tester respectively. The study reveals that the blends depict Newtonian behaviour with a decrease in the dynamic viscosity of the olive oil. Also, WSD decreases at a higher proportion of coconut oil in the blends with an improvement of 10.74% at a 50:50 ratio. The blending of two oils for the enhancement of the lubrication properties of biolubricants can prove beneficial in making them a suitable replacement for mineral oils.

1. INTRODUCTION

The replacement of petroleum-based oils has been studied extensively in recent years. One of the emerging candidates that can replace petroleum-based oils is bio-oils obtained from plant sources. Bio oils possess excellent lubricating properties like flash point, viscosity index, Fire point, and low toxicity. Further, the bio-oils also possess excellent biodegradability (90-98%) in comparison to petroleum oils [1]. However, the limitations that restrict their use as industrial lubricants are their poor thermo-oxidative properties. Bio oils are susceptible to oxidation at higher temperatures and thus modification needs to be done to make their use as industrial lubricants. Various reports have suggested that poor oxidative properties of the bio-oils are attributed to their unsaturation [2]. The Unsaturation represents the number of double bonds in the fatty acid chain. The lubricating properties of the bio-oils are dependent on their fatty acid composition. The saturated fatty acids form strong protective films on the surface whereas the films formed by the polyunsaturated fatty acids are weaker in comparison to the saturated fatty acids [2].

Various studies have been conducted on the blending of oils to achieve satisfying lubrication properties. The blending of mineral oils with different vegetable oils has been studied by