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Effect of palm-sesame biodiesel fuels with alcoholic and nanoparticle additives on tribological characteristics of lubricating oil by four ball tribo-tester

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ALEXANDRIA ENGINEERING JOURNAL

Volume: 60 **Issue:** 5 **Page:** 4537-4546

DOI: 10.1016/j.aej.2021.03.017

Published: OCT 2021

Document Type: Article

Abstract

Dilution of engine oil with unburned fuels alters its lubricity and tribological properties. In this research paper, SAE-40 lubricating oil samples were contaminated with known percentages (5%) of fuels (diesel, palm-sesame biodiesel blend (B30), B30 + ethanol, B30 + dimethyl carbonate, B30 + carbon nanotubes and, B30 + titanium oxide). The effect of all these fuels on wear and frictional characteristics of lubricating oil was determined by using a 4-ball tribo tester and wear types on worn surfaces were analyzed by using SEM. Lubricating oil diluted with B10 (commercial diesel) showed highest COF (42.95%) with severe abrasive and adhesive wear than mineral lubricant among other fuels. Lubricating oil diluted with palm-sesame biodiesel (B30 blend) with alcoholic additives showed comparatively less COF, less wear scar diameter and polishing wear due to presence of ester molecules. Lub + B30 + Eth exhibited increment in COF value (35.81%) compared to SAE-40 mineral lubricant. While lubricating oil contaminated with B30 with nanoparticles showed least frictional characteristics with abrasive wear. Lub + B30 + TiO2 showed least increment in COF value (13.78%) among all other contaminated fuels compared to SAE-40 mineral lubricant. It is concluded that nanoparticles in biodiesel blends (B30) helps in reducing degradation of lubricants than alcoholic fuel additives and commercial diesel. (C) 2021 THE AUTHORS. Published by Elsevier BV on behalf of Faculty of Engineering, Alexandria University.

Keywords

Author Keywords: Palm-sesame biodiesel; Tribology; Lubricant degradation; Alcoholic additives; Nanoparticles; Four ball

Keywords Plus: WEAR CHARACTERISTICS; METHYL-ESTER; THERMAL TRANSPORT; GRAPHENE OXIDE; BIO-LUBRICANT; NANO; BEHAVIOR; TIO2; FRICTION; BUTANOL

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Alexandria Engineering Journal

ISSN: 1110-0168

eISSN: 2090-2670

Current Publisher: ELSEVIER, RADARWEG 29, 1043 NX AMSTERDAM, NETHERLANDS

Journal Impact Factor: Journal Citation Report ™

Research Areas: Engineering

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