



# DIGEST

Volume 1, 2024

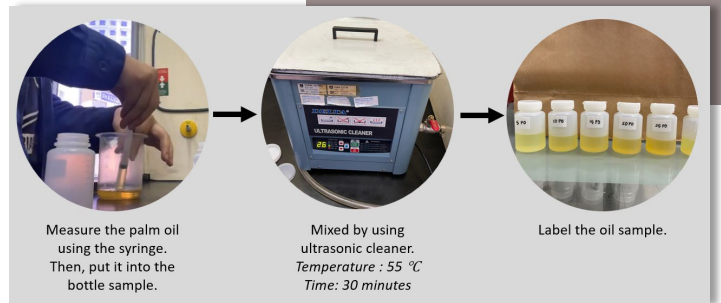


Mohamad Mazwan Mahat  
School of Mechanical Engineering  
[mazwan@uitm.edu.my](mailto:mazwan@uitm.edu.my)

Expert UiTM link 

Iffah Aqilah Ismail  
School of Mechanical Engineering

# Study on the Tribological Characteristic of Food-grade Bio-lubricant using Four-ball Experiments



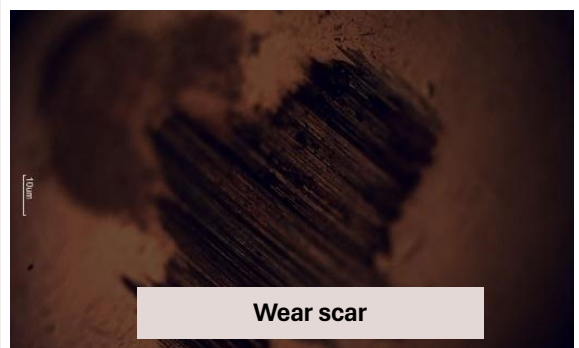
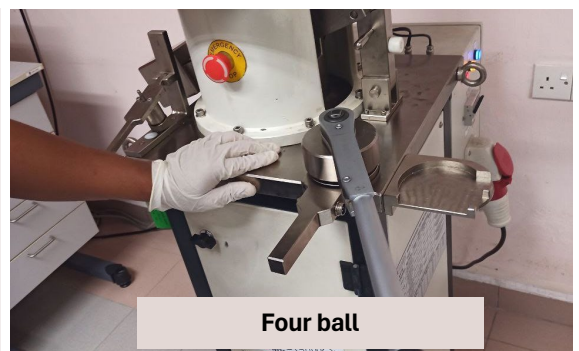
Palm oil blends

Food-grade lubricants are crucial in the food processing industry and are used in various industries, including automotive and industrial applications. They can be solid, liquid, or semi-solid and are classified based on their physical appearance. Research focuses on gear oils designed to protect gearbox components and withstand high loads, temperatures, and ambient conditions. Industrial gear oils must have appropriate viscosity, oxidative and thermal stability, solid load-carrying capacity, demulsibility, foam resistance, and corrosion protection. Companies are developing higher-quality lubricants to reduce costs and improve efficiency. Vegetable oil is a popular alternative to mineral oil due to its biodegradability, non-toxic, renewable, and inexpensive properties.

A recent study explores the potential of palm oil as a substitute for mineral-based oil in food-processing industries. It focuses on the tribological characteristics of palm oil in addition to food-grade industrial gear oil. The research aims to develop environmentally friendly lubricants by determining the mechanical properties of the chosen lubricant composition based on wear and friction coefficient. This will help achieve anti-wear properties and non-toxicity for industrial gear oil applications. The new formulation would focus on cost reduction, longer lubricant life, and improved gearbox efficiency.

The results showed that adding 30% palm oil to 85W140GL5 Gear oil resulted in the lowest coefficient of friction and stable friction torque over 60 minutes of the fourball experiment. This study concluded that adding an optimum amount of palm oil to gear oil can improve anti-wear and anti-friction characteristics by lowering the coefficient of friction and producing a smaller wear scar diameter. However, the increase in palm oil volume did not guarantee an enhancement in tribological characteristics, as both COF and WSD trends showed random increases and decreasing values.

The wear scar diameter size trend is not linear, as the wear scar diameter does not decrease linearly when the volume of palm oil is increasing. It shows the optimum volume of palm oil will increase the anti-wear characteristic. This study proves that palm oil blended with mineral oil lubricants can exhibit favourable tribological properties, including reduced wear scar diameter, when a suitable ratio of oil and additives is incorporated into the lubricant composition.





e ISSN 2805-573X



9 772805 573003

A white rectangular box containing an ISSN label, a barcode, and a corresponding numerical string. The ISSN label is at the top, the barcode is in the middle, and the numerical string is at the bottom.