Biogrease Based on Palm Oil and Lithium Soap Thickener: Evaluation of Antiwear Property

Sukirno, Rizkon Fajar, Setijo Bismo and Mohammad Nasikin

Department of Chemical Engineering, University of Indonesia, Kampus Baru UI, Depok 16424, Indonesia
Center for Thermodynamic Motor and Propulsion, BTMP-BPPT, Puspitek Serpong, Indonesia

Abstract: An environmental friendly palm-grease has already been formulated from modified RBDPO (Refined Bleach Deodorized Palm Oil) as base oil and lithium soap as thickener. Such palm-grease is dedicated for general application and or equipment working in areas where biodegradability is required such as in agriculture, forestry and coastal marine, recreation areas. The grease was manufactured via 4 steps of processes: saponification in pressurized reactor, soap dilution by heating, re-crystallization by cooling and homogenization. The result of lubrication performance tests using 4-ball wear-test showed that the amount of wear on ball specimen was smaller in test with the palm-grease than the test with mineral (HVI 160S) grease. This ability of the palm-grease to provide better surface protection or antiwear property was considered as the existence of relatively polar groups in base oil such as ester -COOC-, hydroxides –OH and oxirane ring (epoxy) -COC-.

Key words: Palm-grease %Modified RBDPO %Lithium soap %Dropping Point %Antiwear Property %4-ball wear-test %Gear-wear-test

INTRODUCTION

Lubricating grease is obtained by dispersion of a thickening agent, usually soap in a liquid lubricant and may also contain additives that upgrade some special properties. Typical grease contains base oil 75-95%, thickener 5-20% and additives 0-20%. The thickeners are usually soaps, such as lithium, sodium and calcium salts of long chain fatty acids. The most common additives found in grease are anti-oxidants to prolong the life of grease, anti-corrosion agents to protect metal against attack from water or corrosive elements, antiwear agent and extreme pressure to guard against excessive wear due to metal to metal contact.

Lithium soap based lubricating greases have been numerous due to the very good properties of these greases, i.e., a smooth appearance and a high dropping point. The soap thickener gives grease its characteristic rigidity or consistency which is a measure of resistance to deformation by an applied force. Based on present theories, the grease structure can be better visualized as a three-dimensional network of soap fibers, randomly oriented fibres, which is at least partially crystalline. The structure will flow under an applied stress, the magnitude of which will depend on the rigidity of the soap fibre network which is governed by the forces holding the fibres together [1]. Soap thickeners not only provide rigidity to grease and they also affect desired properties such as water and heat resistance and pumpability [2]. It can also lower the coefficient of friction over that of the base oil alone [3].

Base oils used to formulate grease are normally petroleum or synthetic mineral oils. Due to growing environmental awareness and stringent regulations on the petroleum products uses, the manufacture and the use of eco-friendly grease has begun to gain importance. Since biodegradable synthetic ester lubricant are higher in cost, vegetable oils are drawing attention as biodegradable alternates for synthetic esters because of their economical. Vegetable oil may offer significant environmental advantages with respect to resource renew ability, nontoxic and or biodegradability, adequate performance in a variety of applications. For example, sunflower oil has been used to develop biogrease by European researcher, with polymer thickener for grease application lubrication in earth moving equipment [4]. The biogrease was reported to have better properties (especially effective lubrication, wear protection,
Untuk mendapatkan publikasi selengkapnya, silakan mengunduh di situs berikut: