

ROTATING PRESSURE VESSEL OXIDATION TEST (RPVOT) FOR PALM-BASED LUBRICANTS

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One of the important properties of lubricating oil is its oxidative stability. Oxidative stability is achieved when the lubricating oil is able to resist oxidation, depending on the degree of saturation, the presence of natural or added antioxidants, prooxidants or prior abuse. Vegetable oil-based lubricants have been known to exhibit inferior oxidative stability although other fluid properties have proven satisfactory and are comparable to their petroleum counterparts because most of them have compositions more than half of which are unsaturated fatty acids which are susceptible to oxidation. Ways of improving the oxidative stability of vegetable oil-based lubricants are by altering the functional groups that are susceptible to oxidation via chemical and genetic modifications.

SCOPE

The oxidative stability of vegetable oil-based lubricants is measured by the rotating pressure vessel oxidation test (RPVOT) (Figure 1). This test determines how sensitive the oil is in the presence of oxygen in forming free radicals. The measurement is required for new and in-service oils (petroleum-based lubricants and bio-lubricants) as it reflects the life of the oil to be used as a lubricating fluid.

PRINCIPLE

The RPVOT procedure employs severe oxidation conditions to rapidly determine oxidative stability. The sample is oxidized in the presence of water and a copper catalyst coil (Figure 2) at a temperature of 150°C in a stainless steel pressure vessel under an initial pressure of 90 psi (620 kPa). Pressure inside the vessel is recorded electronically or mechanically while the vessel is rotated at 100 rpm at constant temperature. The amount of time required for a specified drop in pressure (25 psi) is the oxidative stability of the sample. The plotted graph (Figure 3) obtained is used to calculate the oxidation life

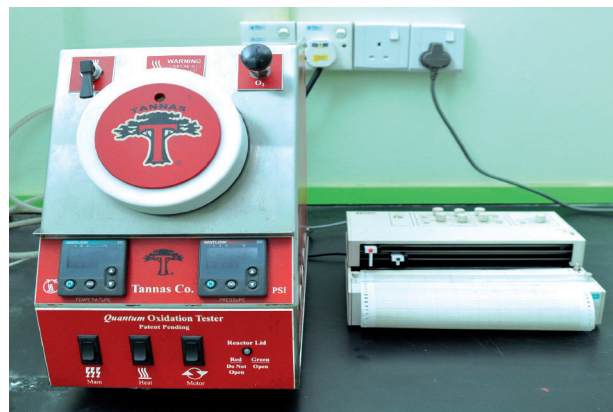


Figure 1. Equipment for the rotating pressure vessel oxidation test (RPVOT).

(induction period, IP, in min) according to ASTM D 2272 (1964).

COST OF ANALYSIS

Amount of sample required: 50 g
Cost of analysis: RM 1380 (<600 hr), RM 1580 (>600 hr) per sample*

Note: * Subject to availability of manpower and quantity of samples received at any one time. The cost may be revised from time to time.

TRANSFER OF SERVICE

MPOB may assist the lubricant industry in analysing the oxidative stability of the lubricants produced.



Figure 2. Copper catalyst coil.

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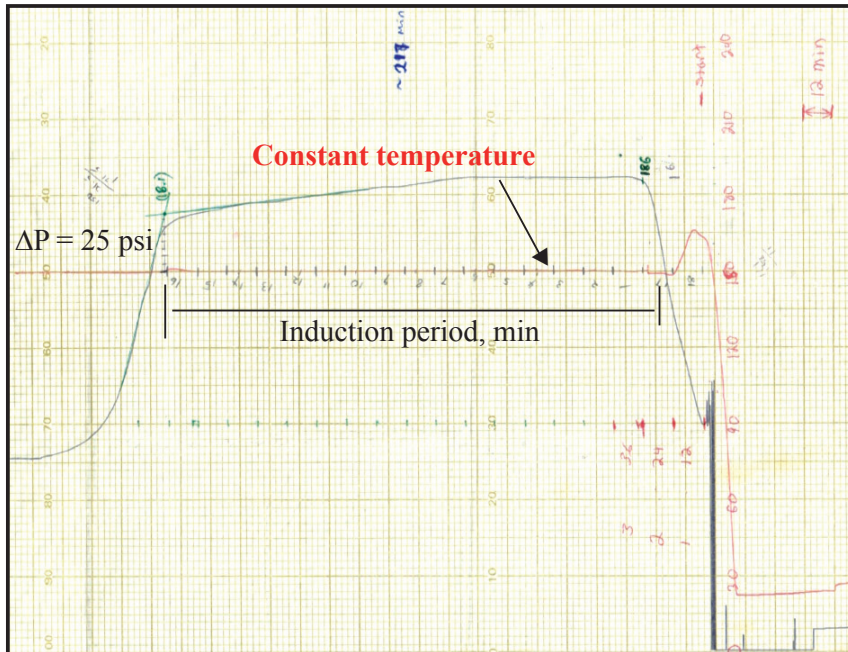


Figure 3. Example of a plotted graph for the calculation of induction period.

REFERENCE

ASTM D 2272 (1964). *Standard Test Method for Oxidation Stability of Steam Turbine Oils by Rotating Pressure Vessel*. American Society for Testing and Materials.

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