

STUDIES OF SOME LUBRICATING PROPERTIES OF SEED OIL FROM ARID ZONE OF RAJASTHAN

Garvit Vyas,
B.Tech. , I Year (EE), JIET, JODHPUR

Dr. Akleshwar Mathur, Assistant Professor,
Department of Applied Science, JIET-COED,
JODHPUR)akleshwar.mathur@jietchodhpur.com

Gaurav Agarwal, B.Tech., I Year (EE), JIET,
JODHPUR

Abstract-The desert of Rajasthan is well known for specific phytochemicals in plants. Acid value and viscosity index are important parameters for studying scope of oils in the field of lubrication. Lubrication is the important activities of machinery. A number of lubricating agents are used for it. Seed oils are known for their oiliness in lubrication. In this paper viscosity index of three unknown seed oils has been reported. The AOCS and ASTM methods were used for analysis.

Key Words: seed oil, Lubrication, AOCS, ASTM Methods

INTRODUCTION

(A) What are lubricants?

Lubricants are the substances which are used to reduce wear and tear in the machinery. There are a number of substances used as lubricants such as petroleum products, mineral oils, blended oils, plant oils and animals fats etc.

(B) Parameters of lubricants

To identify the quality, use and need of the lubricant for its current need or for future scope there are many aspects. Some of which are listed below

(1) Viscosity and viscosity index-The property of a fluid to resist its own cost of motion is called its viscosity. The rate of change of viscosity with temperature is expressed by an arbitrary scale known

as viscosity index. A lubricant which shows little change in viscosity with temperature or having high viscosity index is preferred.

(2) Flash and Fire point-It is the lowest temperature at which the vapors of oil ignite for a moment when a small flame is brought near it while fire point is the minimum temperature at which vapors of oil burn simultaneously for 5 sec. A good lubricant should not volatilize and if it does its vapors should not catch fire under the working temperatures. Hence a lubricant should have high flash and fire points.

(3) Cloud and Pour point - The temperature at which a liquid becomes hazy in appearance is known as cloud point whereas the temperature at which a liquid ceases to flow is known as pour point. A good lubricant should not freeze under low temperature conditions. Therefore, a lubricant having low cloud and pour point is preferred.

(4) Emulsification and Steam Emulsification (SEN) - The process of forming emulsions is known as emulsification. Emulsions are the combination of two immiscible liquids. To form a mixture of such a pair, a third substance known as Emulsifier is added. For determining SEN steam is passed through a test tube containing 20ml of oil till temperature rises to 90 degree Celsius is noted and time is noted when oil and water separate out. This time in seconds is known as SEN. A good lubricant should have a low SEN.

(5) Precipitation number - The precipitation number of an oil is a measure of the amount of solids classified as asphalts or carbon residue contained in the oil. The number is reached when a known amount of oil is diluted with naphtha and the precipitate is separated out by centrifuging the volume of separated solids equals the precipitation number. This test detects the presence of foreign materials in used oils. An oil with a high precipitation number may cause trouble in an engine. It could leave deposits or plug up valves and pumps.

VISCOSITY INDEX AND ITS SCOPE:

For this article, apparent viscosity is described, as used in drilling fluid applications in the Oil exploration industry. There may be other applications in other fields of study such as fluid mechanics (The study of the movement of fluid) or fluid dynamics (The study of the flow of fluid). With reference to the application of a seed oil in lubrication the Viscosity Index play important role. It correlates the thickness of layer with change in temperature.

MATERIAL AND METHOD-

(A) Selection of plants: List of selected plants are

BOTANICAL NAME	FAMILY	LOACAL/COMMON NAME
<i>Moringaoleifera</i>	Moringaceae	Sahijnna
<i>Ricinuscommunis</i>	Euphorbiaceae	castor
<i>Simmondiasachinensis</i>	Buxaceae	Jojoba

given in table 1

(B) Collection of seeds: The seeds of the plants namely; castor, jojoba, moringa were collected from the naturally growing plants in different parts of Jodhpur and adjoining areas. There photographs of the source plant and seeds are given below.



JOJOBA PLANT , JOJOBA SEEDS



CASTOR PLANT , CASTOR SEEDS



MORINGA PLANT MORINGA SEEDS

(C)Extraction of oil-The oil was extracted using petroleum ether as solvent with Soxhlet Apparatus by refluxing the dried seed powder with Organic solvent.Oil is then filtered to remove impurities.

DETERMINATION OF VISCOSITY INDEX:

Redwood annular viscometer-The sample to be tested is placed in a container surrounded by a water bath to maintain a constant temperature. A plug is removed from the orifice in the bottom on the container allowing the liquid to flow out through the orifice under gravity. The time is measured for a fixed amount of the sample to be collected in the graduated flask.

Viscosity is proportional to the time taken for the liquid to be collected and is determined in "Redwood" seconds. Two sizes of Redwood viscometer exist, low viscosity liquids being tested in Redwood viscometer No 1 with the smaller orifice, high viscosity liquids being tested in Redwood No 2.

PROCEDURE

1. Clean the viscometer cup properly with the help of suitable solvent e.g. CCl₄, ether, petroleum spirit or Benzene and dry it to remove any traces of solvent.
2. Level the viscometer with the help of leveling screws.
4. Fill the outer bath with water for determining viscosity at 100°C and below.
5. Place the ball valve on the jet to close it and pour the test oil into the cup up to the tip of indicator.
6. Place a clean dry Kohlrausch flask immediately below and directly in line with discharging jet.
7. Insert a clean thermometer and a stirrer in the cup and cover it with a lid.
8. Heat the water filled in the bath slowly with constant stirring. When the oil in the cup attains a desired Temperature, stop the heating.
9. Lift the ball valve and start the stop watch. Oil from the jet flows into the flask.
10. Stop the Stop Watch when lower meniscus of the oil reaches the 25 ml mark on the neck of receiving Flask.
11. Record the time taken for 25 ml of the oil to collect in the flask.
12. Repeat the experiment to get more readings.



REDWOOD VISCOMETER NO 1

RESULT AND DISCUSSION The viscosity index (RedWood Sec.) of selected seed oil were represented in table 2

SAMPLE	30° C	40° C	50° C	60° C	70° C	80° C
JOJOBA	260	240	150	120	90	30
CASTOR	380	360	180	150	120	60
MORING A	600	540	410	360	240	180

From the above table, it is clear that the viscosity decreases with increase in temperature. The oil of Jojoba has highest viscosity Index, while the oil of

Moringa has lowest viscosity Index. The comparative analysis would help in scope of seed oils in lubrication. In brief jojoba oil can be used for thick film lubrication, Moringa oil can be used as blending agent and that of Castor for oiliness.

Acknowledgement

Authors are thankful to Dr. M.R.K.Sherwani, HOD, Deptt. Of Chemistry, JNVU, Jodhpur, Dr. A.M.Khan, Asst. Dean, Deptt. Of Applied Sciences, JIET, Jodhpur for motivation and support.

References:

1. ASTM D3339: Standard Test Method for Acid Number of Petroleum Products by Semi-Micro Color Indicator Titration. ASTM Intl., West Conshohocken, Pa.
2. Smart, Clifford L. "Get Smart with Improved TAN Titration." *Practicing Oil Analysis* magazine. October 2000.
3. "Interview Helps Clarify Questions Surrounding AN/BN Test Methods in Used Oil Samples." *Practicing Oil Analysis* magazine. May 2003.
4. Kauffman, R.E. "Rapid Determination of Remaining Useful Lubricant Life." *Handbook of Lubrication and Tribology, Volume III*. E. Richard Booster, Editor. CRC Press, Boca Raton, Fla. 1994.
5. Snook, Willet A. "Used Engine Oil Analysis." *Lubrication*, Volume 54, Number 9, 1968.
6. Ball, Peter G. "New pH Test Offers Benefits over TAN/TBN." *Practicing Oil Analysis* magazine. September 1998.