

EXPERIMENTAL INVESTIGATION OF BIO-LUBRICANT

Priyanshu Rawat¹, Manmeet Singh², Kshitij Singh³

^{1,2,3}Dept. of Mechanical Engineering, UPES, Dehradun, Uttarakhand, India

Abstract - Conventional Lubricants used in automotive industry and in machinery for lubricating purposes have deleterious effect on environment when discarded as they are Non-Biodegradable. On the other hand, vegetable oil such as Castor oil are biodegradable and can easily be decomposed and thus, have very less harmful effect on the environment when mixed with Synthetic Lubricants..

Key Words: Analysis, investigation, research, castor, viscosity, lubricant

1. INTRODUCTION

In this project blend of Castor oil with 20W40 which can minimize the harmful effect of synthetic lubricants like 20W40 on the environment and also improves the lubricating properties of synthetic lubricant. The reason for choosing Castor oil is being a vegetable oil has long hydrocarbon chains which make them non-toxic and biodegradable. They also possess high lubrication properties, low volatility and a high viscosity index. Their high VI helps for their smaller change in viscosity with temperature. Different blends in the ratio of 5%, 10% and 15% were made of 20W40 and Castor Oil using 'Magnetic Stirrer' and their Frictional force and Wear were measured on the Pin-On-Disc apparatus. Various properties of synthetic lubricant (20W40) were found to be enhanced by making the blend with castor oil.

2. METHODOLOGY

a) Raw Material

In the present study, Castor Oil is used and blended with synthetic HP 20W-40 lubricating oil. Castor oil is procured from a vendor in Delhi, India. Whereas lubricating oil is bought from a local vendor in Dehradun city, India.

b) Experimental Setup

Tribo testing was done on The Pin-On-Disc tribo-meter is broadly utilized for mineral lubricant oil portrayal in the limit oil routine. The plate turns while the pin is squeezed against it. The turning module gives the unidirectional sliding movement of the circle which is fixed in the oil shower, while the ball test is held stationary. Bio-

lubricant or mineral oil developed will be utilized to explore results whether it diminished erosion and its outcome, wear. Different charts and results were gathered showing grating coefficient.

c) Blends

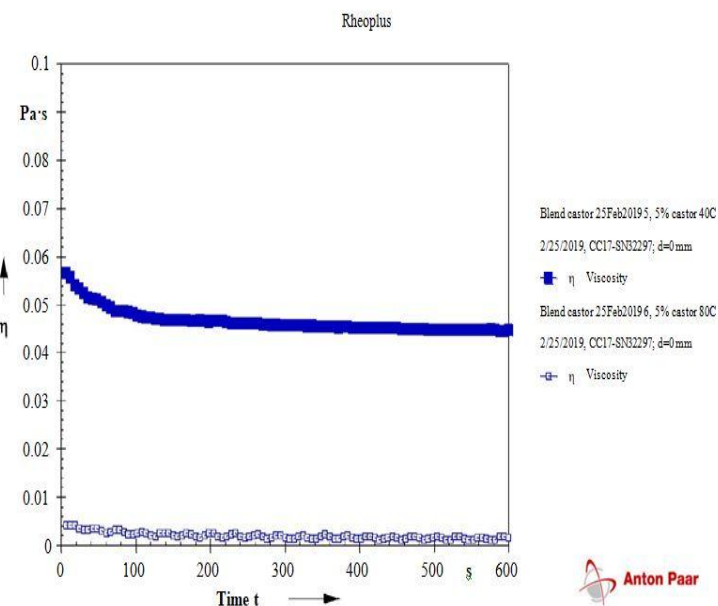
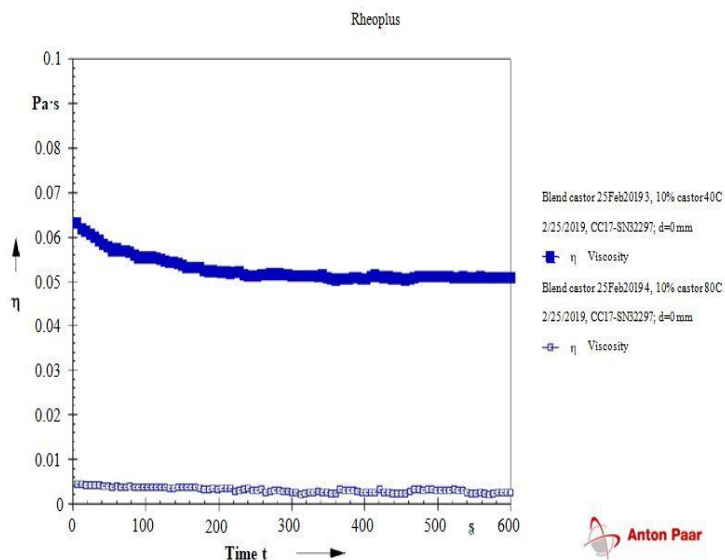
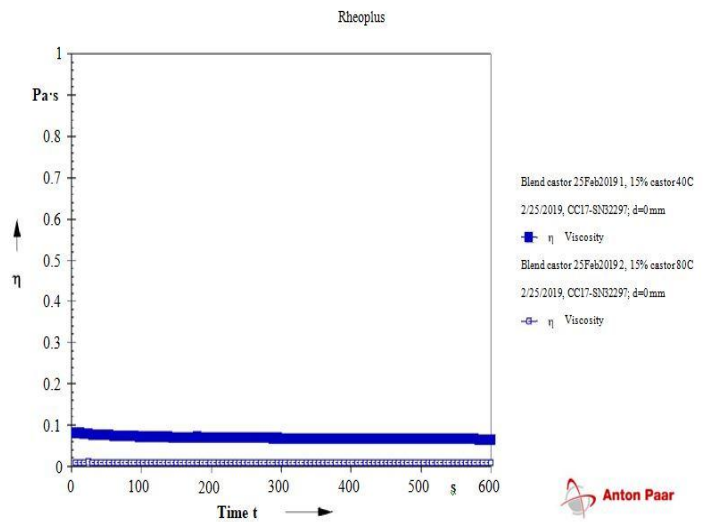
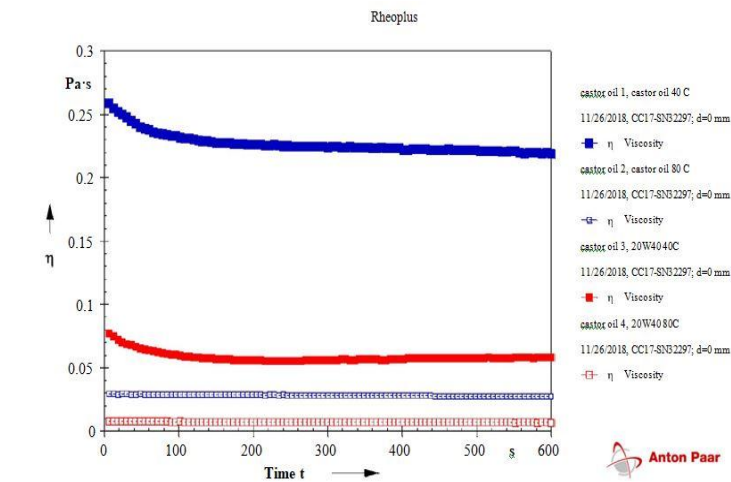
The blends of Castor oil and HP20W40 were made using the Magnetic stirrer apparatus. A magnetic bar is used to agitate and mix the mixture under the influence of magnetic field.



Magnetic Stirrer

d) Viscosity Measurement

Viscosity (in Pa.S) was measured using the Rheometer Apparatus individually for Castor oil, HP20W40 and 5%, 10%, 15% blend of Castor oil at 40°C and 80°C respectively.

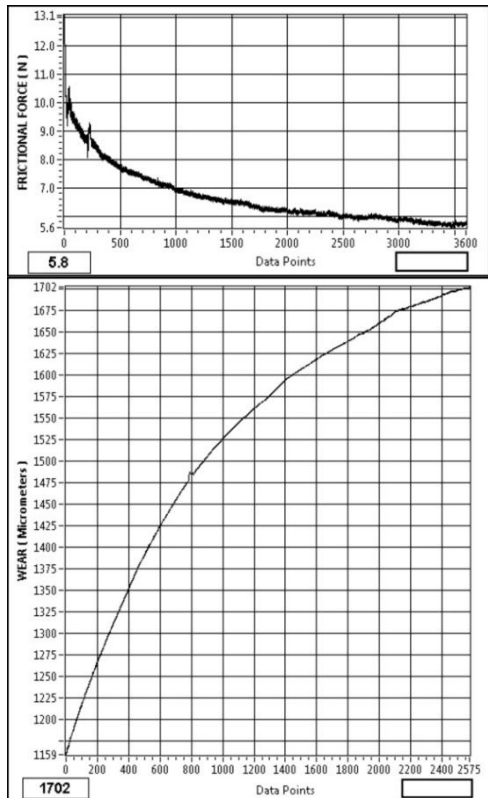


e) Pin-On-Disc Tribometer

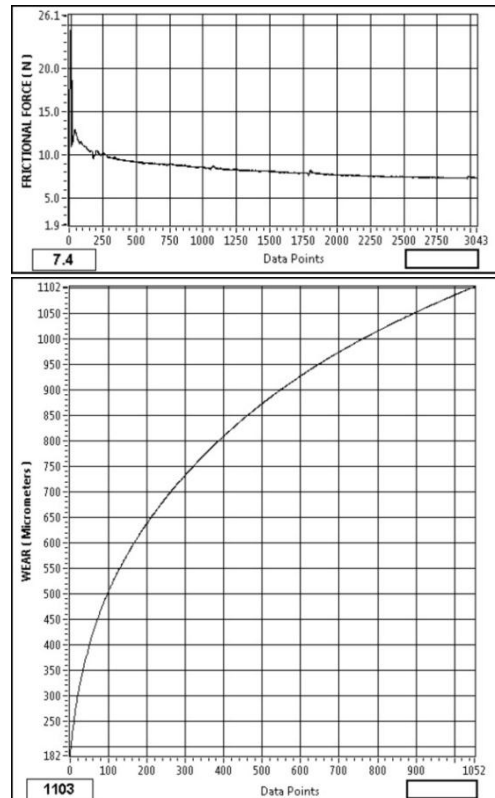
The Al7Si (Aluminum with 7% Silicon) metal balls with a spherical whole diameter of 6-10 mm and length from 25-30 mm were procured from IIT Roorkee, Uttarakhand. They were used after they were grinded and smooth-finished using sandpaper, and then attached into the upper portion provided for retaining the pin ball-holder on the Universal machine tester. The disc attached to the machine of dia.130 mm and thickness, 6.35 mm were machined. The surface was polished to R_a ranging between 0.05 and 0.09 μm .

Test conditions for the UMT pin-on-disc tribotest	
Parameter	Value
Duration	1 hr
Load	30,60,120,150 N
Pressure (at contact)	798 Mpa
Speed	1.675 m/s
Temperature	20±2°C (Room Temp.)
Upper Ball (test piece)	AISI52100, Dia. 6-10 mm
Lower Disc (test piece)	EN-GJL-250, Dia. 130 mm

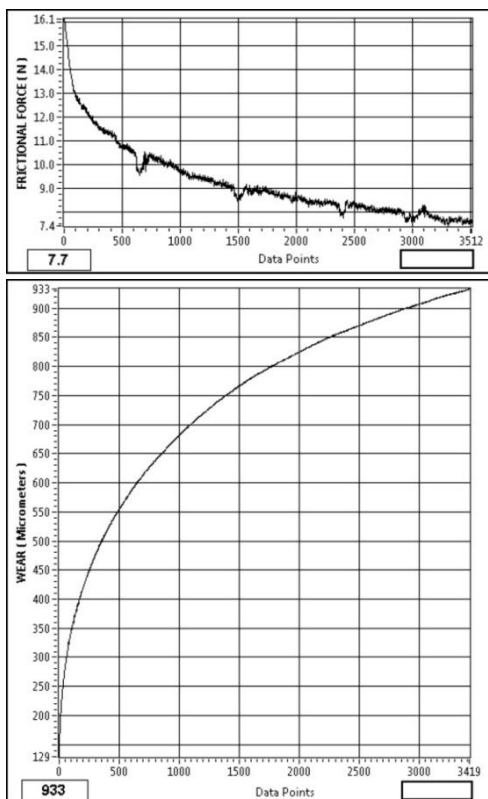
Castor oil (only)



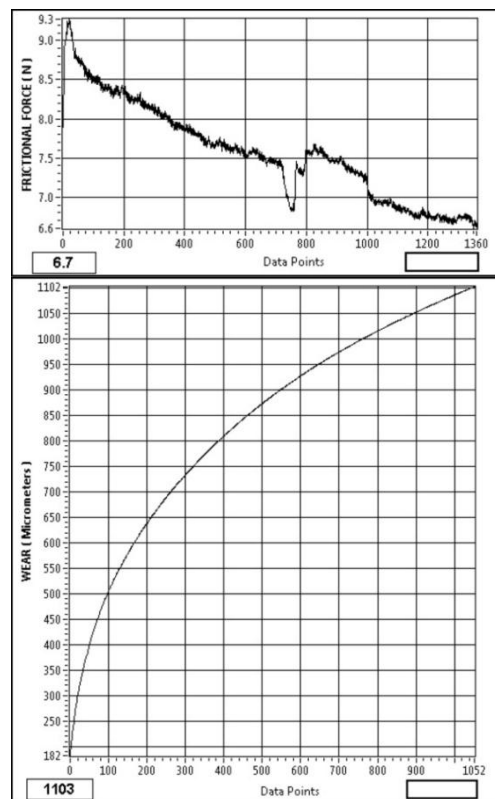
Castor Oil (5%)



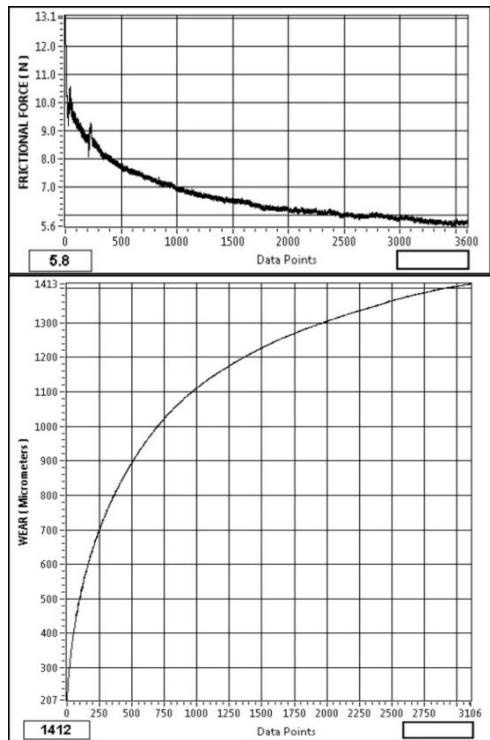
20W40 (only)



Castor Oil (10%)



Castor Oil (15%)



gratitude to the Mechanical department of our University for letting us access the labs

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- [1] <https://www.sciencedirect.com/topics/engineering/pin-on-disc>.
- [2] <https://www.sciencedirect.com/topics/engineering/magnetic-stirrer>
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3. CONCLUSIONS

Viscosity of the blends at 5%, 10% and 15% castor oil were found to be less than the viscosity of Castor oil alone. As the concentration of castor oil increased to 5% to 15% the viscosity of the blend found to be increased.

In the Pin-On-Disc experiment the Friction force was found to be decreasing as the concentration increased from 5% to 15%. Also the wear at 5% and 10% castor oil was comparable to the wear of HP20W40 alone. However, when the concentration of castor oil was 15% there was considerable increase in the wear.

Making Blend of Castor oil with Synthetic Lubricant like HP20W40 can improve the quality of the lubricant and have also has less harmful effect on the environment when disposed after use. Also, addition of nano-particles in the blend can improve certain properties of the Lubricant depending on the nano-particle added which further helps in improving the quality of lubricant.

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