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Effect of TMP-based-cottonseed oil-biolubricant blends on tribological behavior of cylinder liner-piston ring combinations (Article)

Gul, M.^{a,b} , Zulkifli, N.W.M.^a , Masjuki, H.H.^{a,c}, Kalam, M.A.^a, Mujtaba, M.A.^{a,d}, Harith, M.H.^a, Syahir, A.Z.^a, Ahmed, W.^e, Bari Farooq, A.^b

^aCenter for Energy Science, Department of Mechanical Engineering, University of Malaya, Kuala Lumpur, 50603, Malaysia

^bDepartment of Mechanical Engineering, Faculty of Engineering and Technology, Bahaaddin Zakariya University, Multan, 60000, Pakistan

^cDepartment of Mechanical Engineering, Faculty of Engineering, IIUM, Kuala Lumpur, 50728, Malaysia

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Abstract

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Cottonseed oil-based biolubricant was synthesized by the TMP-based transesterification process. 10–50% by volume blends of TMP-based cotton-biolubricant and SAE-40 were prepared and tested on the high-frequency-reciprocating-rig with engine cylinder-liner and piston-ring combination to investigate their tribology. While tribological characteristics were also evaluated by four-ball tribo-testers at high constant load of 785 N. 10% addition of cotton-biolubricant showed the lowest friction and wear as compared to SAE-40 but >10% volume of cotton biolubricant in blend increased the wear and friction considerably as tested by both HFRR and four-ball. Hence, 10% addition of TMP-cotton-biolubricant can be utilized as an energy-saving lubricant additive to partially reduce the dependency on petroleum-based lubricant for automotive engine application. © 2020 Elsevier Ltd

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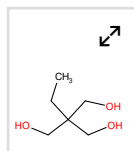
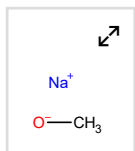
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- ☐ 1 Rudnick, L.R.
Synthetics, mineral oils, and bio-based lubricants. Chemistry and Technology. 2020, Boca Raton: CRC Press.

- ☐ 2 Heikal, E.K., Elmelawy, M.S., Khalil, S.A., Elbasuny, N.M.
Manufacturing of environment friendly biolubricants from vegetable oils ([Open Access](#))

(2017) *Egyptian Journal of Petroleum*, 26 (1), pp. 53-59. Cited 66 times.
<http://www.journals.elsevier.com/egyptian-journal-of-petroleum>
doi: 10.1016/j.ejpe.2016.03.003

[View at Publisher](#)

- ☐ 3 Mobarak, H.M., Niza Mohamad, E., Masjuki, H.H., Kalam, M.A., Al Mahmud, K.A.H., Habibullah, M., Ashraful, A.M.
The prospects of biolubricants as alternatives in automotive applications

(2014) *Renewable and Sustainable Energy Reviews*, 33, pp. 34-43. Cited 171 times.
doi: 10.1016/j.rser.2014.01.062

[View at Publisher](#)

- ☐ 4 Fox, N.J., Tyrer, B., Stachowiak, G.W.
Boundary lubrication performance of free fatty acids in sunflower oil
(2004) *Tribology Letters*, 16 (4), pp. 275-281. Cited 107 times.
[http://www.springerlink.com/\(snpxut45gxflnr45vb2gia45\)/app/home/journal.asp?referrer=parent&backto=searchpublicationsresults,1,2;](http://www.springerlink.com/(snpxut45gxflnr45vb2gia45)/app/home/journal.asp?referrer=parent&backto=searchpublicationsresults,1,2;)
doi: 10.1023/B:TRIL.0000015203.08570.82
[View at Publisher](#)
-
- ☐ 5 Jayadas, N.H., Prabhakaran Nair, K., G, A.
Tribological evaluation of coconut oil as an environment-friendly lubricant
(2007) *Tribology International*, 40 (2 SPEC. ISS.), pp. 350-354. Cited 146 times.
www.elsevier.com/inca/publications/store/3/0/4/7/4
doi: 10.1016/j.triboint.2005.09.021
[View at Publisher](#)
-
- ☐ 6 Bekal, S., Bhat, N.R.
Bio-lubricant as an alternative to mineral oil for a CI engine-An experimental investigation with pongamia oil as a lubricant
(2012) *Energy Sources, Part A: Recovery, Utilization and Environmental Effects*, 34 (11), pp. 1016-1026. Cited 32 times.
doi: 10.1080/15567031003735303
[View at Publisher](#)
-
- ☐ 7 Singh, Y., Singla, A., Singh, A.K., Upadhyay, A.K.
Tribological characterization of Pongamia pinnata oil blended bio-lubricant
(2018) *Biofuels*, 9 (4), pp. 523-530. Cited 13 times.
http://www.tandfonline.com/loi/tbfu20?open=5&repitition=0#vol_5
doi: 10.1080/17597269.2017.1292017
[View at Publisher](#)
-
- ☐ 8 Reeves, C.J., Menezes, P.L., Jen, T.-C., Lovell, M.R.
The influence of fatty acids on tribological and thermal properties of natural oils as sustainable biolubricants
(2015) *Tribology International*, 90, pp. 123-134. Cited 76 times.
www.elsevier.com/inca/publications/store/3/0/4/7/4
doi: 10.1016/j.triboint.2015.04.021
[View at Publisher](#)
-
- ☐ 9 Durak, E., Karaosmanoğlu, F.
Using of cottonseed oil as an environmentally accepted lubricant additive
(2004) *Energy Sources*, 26 (7), pp. 611-625. Cited 30 times.
doi: 10.1080/00908310490438605
[View at Publisher](#)
-
- ☐ 10 Erhan, S.Z., Sharma, B.K., Perez, J.M.
Oxidation and low temperature stability of vegetable oil-based lubricants
(2006) *Industrial Crops and Products*, 24 (3), pp. 292-299. Cited 226 times.
doi: 10.1016/j.indcrop.2006.06.008
[View at Publisher](#)
-

- 11 Arumugam, S., Sriram, G.
Synthesis and characterization of rapeseed oil bio-lubricant dispersed with nano copper oxide: Its effect on wear and frictional behavior of piston ring-cylinder liner combination
(2014) *Proceedings of the Institution of Mechanical Engineers, Part J: Journal of Engineering Tribology*, 228 (11), pp. 1308-1318. Cited 27 times.
<http://pij.sagepub.com/content/by/year>
doi: 10.1177/1350650114535384
View at Publisher
-
- 12 Haseeb, A.S.M.A., Fazal, M.A., Jahirul, M.I., Masjuki, H.H.
Compatibility of automotive materials in biodiesel: A review
(2011) *Fuel*, 90 (3), pp. 922-931. Cited 183 times.
doi: 10.1016/j.fuel.2010.10.042
View at Publisher
-
- 13 Gul, M., Masjuki, H.H., Kalam, M.A., Zulkifli, N.W.M., Mujtaba, M.A.
A Review: Role of Fatty Acids Composition in Characterizing Potential Feedstock for Sustainable Green Lubricants by Advance Transesterification Process and its Global as Well as Pakistani Prospective
(2020) *Bioenergy Research*, 13 (1). Cited 6 times.
<http://www.springer.com/life+sci/plant+sciences/journal/12155>
doi: 10.1007/s12155-019-10040-7
View at Publisher
-
- 14 Syahir, A.Z., Zulkifli, N.W.M., Masjuki, H.H., Kalam, M.A., Alabdulkarem, A., Gulzar, M., Khuong, L.S., (...), Harith, M.H.
A review on bio-based lubricants and their applications
(2017) *Journal of Cleaner Production*, 168, pp. 997-1016. Cited 73 times.
doi: 10.1016/j.jclepro.2017.09.106
View at Publisher
-
- 15 Habibullah, M., Masjuki, H.H., Kalam, M.A., Gulzar, M., Arslan, A., Zahid, R.
Tribological Characteristics of Calophyllum inophyllum–Based TMP (Trimethylolpropane) Ester as Energy-Saving and Biodegradable Lubricant
(2015) *Tribology Transactions*, 58 (6), pp. 1002-1011. Cited 18 times.
www.tandf.co.uk/journals/titles/10402004.asp
doi: 10.1080/10402004.2015.1025934
View at Publisher
-
- 16 Salih, N., Salimon, J., Yousif, E.
The physicochemical and tribological properties of oleic acid based triester biolubricants
(2011) *Industrial Crops and Products*, 34 (1), pp. 1089-1096. Cited 82 times.
doi: 10.1016/j.indcrop.2011.03.025
View at Publisher
-
- 17 Zulkifli, N.W.M., Kalam, M.A., Masjuki, H.H., Shahabuddin, M., Yunus, R.
Wear prevention characteristics of a palm oil-based TMP (trimethylolpropane) ester as an engine lubricant
(2013) *Energy*, 54, pp. 167-173. Cited 103 times.
www.elsevier.com/inca/publications/store/4/8/3/
doi: 10.1016/j.energy.2013.01.038
View at Publisher
-

- 18 Shahabuddin, M., Masjuki, H.H., Kalam, M.A., Bhuiya, M.M.K., Mehat, H.
Comparative tribological investigation of bio-lubricant formulated from a non-edible oil source (Jatropha oil)
(2013) *Industrial Crops and Products*, 47, pp. 323-330. Cited 82 times.
doi: 10.1016/j.indcrop.2013.03.026
[View at Publisher](#)
-
- 19 (1999) , pp. 821-828.
Filiz Karaosmanoglu, M.T.E.G.S.Y.E.A., Fuel properties of cottonseed oil. *Energy Sources* 21(9):
-
- 20 Dodos, G.S., Anastopoulos, G., Zannikos, F.
Tribological evaluation of biobased lubricant basestocks from cottonseed and soybean oils
(2010) *SAE International Journal of Fuels and Lubricants*, 3 (2), pp. 378-385. Cited 5 times.
<http://saefuel.saejournals.org/content/3/2/378.full.pdf+html>
doi: 10.4271/2010-01-1545
[View at Publisher](#)
-
- 21 S.G. Dattrao Experimental, investigation on usage of cottonseed oil and esterifies cottonseed oil as lubricant in IC engines, in 2018 Bangkok, Thailand.
-
- 22 Bowden, F.P.
D.T., Ch 14. The nature of metallic wear. The friction and lubrication of solids. Vol. 1. 2001, New York: Oxford Classic Texts, Oxford University Press.
-
- 23 Gulzar, M.
(2017)
Tribological study of nanoparticles enriched bio-based lubricants for engine piston ring–cylinder interaction
Ph.D. thesis Faculty of Engineering, University of Malaya.: Malaysia.
-
- 24 Syahir, A.Z.
Tribological improvement using ionic liquids as additives in synthetic and bio-based lubricants for steel–steel contacts
(2019) *Tribol Trans*, pp. 1-16.
-
- 25 Sudan Reddy Dandu, M., Nanthagopal, K.
Tribological aspects of biofuels – A review
(2019) *Fuel*, 258, art. no. 116066. Cited 7 times.
<http://www.journals.elsevier.com/fuel/>
doi: 10.1016/j.fuel.2019.116066
[View at Publisher](#)
-
- 26 Xu, Y.F., Yu, H.Q., Wei, X.Y., Cui, Z., Hu, X.G., Xue, T., Zhang, D.Y.
Friction and wear behaviors of a cylinder liner-piston ring with emulsified bio-oil as fuel
(2013) *Tribology Transactions*, 56 (3), pp. 359-365. Cited 23 times.
doi: 10.1080/10402004.2012.754532
[View at Publisher](#)
-

- 27 Xu, Y., Wang, Q., Hu, X., Li, C., Zhu, X.
Characterization of the lubricity of bio-oil/diesel fuel blends by high frequency reciprocating test rig

(2010) *Energy*, 35 (1), pp. 283-287. Cited 68 times.
<https://www.journals.elsevier.com/energy>
doi: 10.1016/j.energy.2009.09.020

[View at Publisher](#)

- 28 Zulkifli, N.W.M., Kalam, M.A., Masjuki, H.H., Al Mahmud, K.A.H., Yunus, R.
The effect of palm oil trimethylolpropane ester on extreme pressure lubrication

(2014) *Proceedings of the Institution of Mechanical Engineers, Part J: Journal of Engineering Tribology*, 228 (2), pp. 160-169. Cited 6 times.
doi: 10.1177/1350650113500945

[View at Publisher](#)

- 29 Arumugam, S., Sriram, G.
Effect of Bio-Lubricant and Biodiesel-Contaminated Lubricant on Tribological Behavior of Cylinder Liner-Piston Ring Combination

(2012) *Tribology Transactions*, 55 (4), pp. 438-445. Cited 58 times.
doi: 10.1080/10402004.2012.667517

[View at Publisher](#)

- 30 Sripada, P.K., Sharma, R.V., Dalai, A.K.
Comparative study of tribological properties of trimethylolpropane-based biolubricants derived from methyl oleate and canola biodiesel

(2013) *Industrial Crops and Products*, 50, pp. 95-103. Cited 52 times.
doi: 10.1016/j.indcrop.2013.07.018

[View at Publisher](#)

- 31 Katyal, A., Morrison, R.D.
Forensic applications of contaminant transport models in the subsurface

(2007) *Introduction to Environmental Forensics*, pp. 513-575. Cited 5 times.
<http://www.sciencedirect.com/science/book/9780123695222>
ISBN: 978-012369522-2
doi: 10.1016/B978-012369522-2/50012-9

[View at Publisher](#)

- 32 Zulkifli, N.W.M., Azman, S.S.N., Kalam, M.A., Masjuki, H.H., Yunus, R., Gulzar, M.
Lubricity of bio-based lubricant derived from different chemically modified fatty acid methyl ester

(2016) *Tribology International*, Part B 93, pp. 555-562. Cited 45 times.
www.elsevier.com/inca/publications/store/3/0/4/7/4
doi: 10.1016/j.triboint.2015.03.024

[View at Publisher](#)

- 33 CN103173268A, P.
Lubricating oil anti-wear agent and preparation method thereof 何. 刘继滨, 宫先顺, Editor. 2013: China.

□ 34 Mannekote, J.K., Kailas, S.V.
The effect of oxidation on the tribological performance of few vegetable oils
([Open Access](#))
(2012) *Journal of Materials Research and Technology*, 1 (2), pp. 91-95. Cited 46 times.
<http://www.elsevier.com/journals/journal-of-materials-research-and-technology/2238-7854>
doi: 10.1016/S2238-7854(12)70017-0
[View at Publisher](#)

□ 35 Noorawzi, N., Samion, S.
Tribological Effects of Vegetable Oil as Alternative Lubricant: A Pin-on-Disk Tribometer and Wear Study
(2016) *Tribology Transactions*, 59 (5), pp. 831-837. Cited 29 times.
www.tandf.co.uk/journals/titles/10402004.asp
doi: 10.1080/10402004.2015.1108477
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□ 36 Arumugam, S., Sriram, G.
Synthesis and characterisation of rapeseed oil bio-lubricant - Its effect on wear and frictional behaviour of piston ring-cylinder liner combination
(2013) *Proceedings of the Institution of Mechanical Engineers, Part J: Journal of Engineering Tribology*, 227 (1), pp. 3-15. Cited 32 times.
doi: 10.1177/1350650112458398
[View at Publisher](#)

□ 37 Singh, Y., Singh, P., Sharma, A., Choudhary, P., Singla, A., Singh, N.K.
Optimization of wear and friction characteristics of Phyllanthus Emblica seed oil based lubricant using response surface methodology ([Open Access](#))
(2018) *Egyptian Journal of Petroleum*, 27 (4), pp. 1145-1155. Cited 9 times.
<http://www.journals.elsevier.com/egyptian-journal-of-petroleum>
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✎ Gul, M.; Center for Energy Science, Department of Mechanical Engineering, University of Malaya, Kuala Lumpur, Malaysia; email: mustabshirha@bzu.edu.pk
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