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RESEARCH ON POLISHING PROPERTIES OF GEAR OILS AND WAYS TO IMPROVE THEM

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Abstract
This article explores ways to improve the polishing properties of gear oils. The operating conditions of gears are characterized by high loads in the zone of contact of the teeth and relatively high speeds of mutual movement of the rubbing surfaces. The polishing properties of oils should protect transmission parts from wear and the undesirable phenomenon of seizing, and abrasion of gears. In complex additives (chlorine, phosphorus, sulfur), sulfide films prevent scuffing, while chloride films, due to their elasticity, reduce wear and energy costs to overcome friction forces.

Keywords: Gear oil, gears, transmission, viscosity, polishing properties, additives,

Introduction

Gear oil is the lifeblood of a transmission. It plays an extremely important role in its durability and performance. The operating conditions of gears are characterized by high loads in the contact zone of the teeth, relatively high speeds of mutual movement of the rubbing surfaces and significant temperatures in the contact zone. Energy losses in the transmission are up to 20% of the total power consumption of the car. If 25% of the so-called useful power of the engine goes to the transmission without taking into account losses, then in the overall system of transmission units, due to its losses in the units, this power transmitted to the drive wheels is already reduced to 12%.

Gear oils must, on the one hand, maintain a high viscosity at operating temperatures so that the film does not break down and the gaps are normally sealed, and on the other hand, they must not become too viscous so that at the beginning of the operation of the mechanism, the cold oil of the unit would not interfere with the free rotation of the gears.

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Materials and Methods

The time for the oil to enter the oil channels of the bearings of the gearbox and drive axles significantly depends on both the viscosity of the oil and its temperature (Fig. 1).

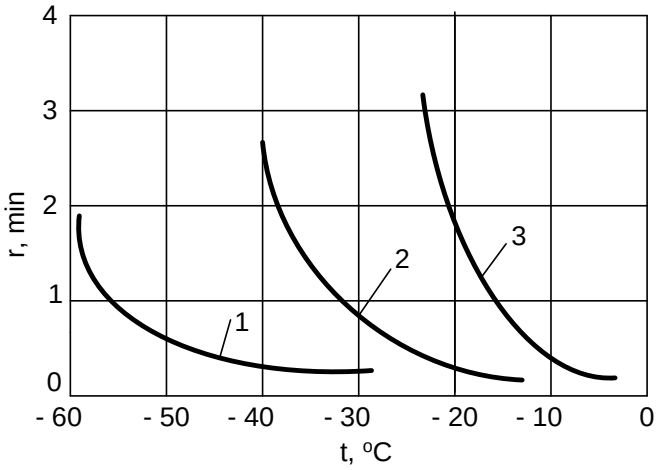

Figure 1. Dependence on the time the oil reaches the bearing groove on the temperature t: 1 – oil TM-5-9A; 2–TM-5-12V; 3-TAD-17i.

At high temperatures, the oil must be sufficiently viscous to maintain the strength of a highly loaded oil film. The temperature dependence of the viscosity of gear oils is quite severe. Reducing the viscosity of gear oils is one of the main ways to increase the efficiency of a car. Viscous oil makes it difficult for a cold car to move smoothly, it is more difficult to penetrate narrow gaps between friction surfaces.

The polishing properties of the oil lie in the ability of individual elements of the lubricant to interact with metals and at the same time form new substances that differ in mechanical properties from the base metal. For the formation of a polishing film on the metal, chemically active substances phosphorus, sulfur, chlorine, etc. are necessary. However, there are no such components in gear oils.

They are introduced with additives that have polishing properties. As a result of the chemical interaction of these substances with the metal surface, new products are formed, which are distinguished by a lower melting point and an increase in plasticity. For example, sulfur forms metal sulfides. The melting point of iron sulfide is 350 ℃ lower than the melting point of iron, and iron phosphide is 515 ℃ lower.

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Alloy flow at the points of contact performs chemical polishing of the surface, as a result of which the specific pressure and temperature are reduced.

Particularly effective is the combination of wedging and polishing action, when the effect of chemical polishing agents and polar substances with long chains is simultaneously manifested. This circumstance is a consequence of the formation of an adsorbed film of polar substances on the chemically polished surface.

Currently, substances containing sulfur, chlorine, and phosphorus in one combination or another are used as polishing additives - they can form compounds with metals with more favourable antifriction properties.

Under conditions of increased loads and temperatures, sulfur-containing compounds: disulfides, and polysulfides compounds interact with the metal. With increasing temperature, an iron sulfide film having a lower melting point than the base melts and is an additional lubricant that prevents wear and scuffing.

The adsorption layer, getting into the microcracks of a solid body, quickly spreads deep into the crack and exerts a significant wedging effect on the walls, contributing to the destruction of the surface layers.

We conducted a study of samples of industrial oils, and samples with the addition of XFS-9 additives, which perform a polishing function.

The following were chosen as the object of study: transmission oil TSp - 14 and additive XFS-9. To carry out the experiments, the oils with the additive were subjected to analysis in terms of physicochemical parameters in accordance with the requirements and norms of GOST 10541. The results of testing gear oils with an additive are shown in Table 1.

Table 1. Gear Oil Test Results with additive XFS - 9 (chlorine 2.8 %, phosphorus 2.5 %, cera 3.7 %)

Quality indicators	*Additive content XFS -9, %*			
TSp-14	3	four	5	6
Viscosity, mm ^{2} / s at t \u003d 100 °C	15.4	15.6	15.8	16.8
Polishing properties, %	20	30	40	50

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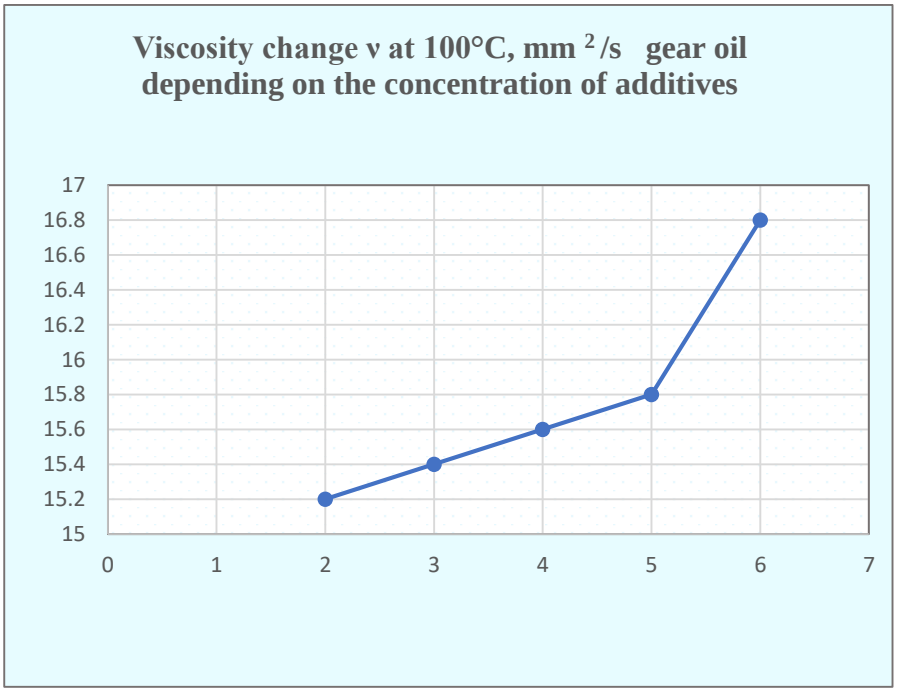
Conclusions

From the results of the analysis, we chose the content of additives 5% XFS-9, which shows the optimum viscosity value.



With a further increase in concentration, the viscosity increases strongly, which can lead to increased friction losses.

References

1. Kh, A. Z. Ways to improve the properties of lubricants used in vehicles-T.:". *VNESHINVESTROM",-2019*.
2. Джерихов, В. Б. (2012). Автомобильные эксплуатационные материалы. Рекомендации для подготовки студентов к экзамену, зачету.
3. Магеррамов, А. М., Ахмедова, Р. А., & Ахмедова, Н. Ф. (2009). Нефтехимия и нефтепереработка, учебное пособие для вузов. *Баку: Бакы Университети.–2009.–660 с*.
4. Alimova, Z. K., Sidikov, F. S., & Alimov, S. I. (2020). Reducing wear of engine parts by improving the antioxidant properties of engine oils.
5. Туракулов, М. Р., Кенжаев, С. Н., & Инсапов, Д. М. (2021). Анализ законов движения, задаваемых профилем кулачкового механизма топливного насоса. *Universum: технические науки*, (10-1 (91)), 37-40.
6. Alimova, Z. X., & Ismadiyarov, A. other. Improvement of the operating properties of transmission oils used in agricultural machinery. *International jurnal for innovative engineering and management research*, *9*(12), 181-184.

7. Рахимов, У. Т., Турсунов, Н. К., Кучкоров, Л. А., & Кенжаев, С. Н. (2021). Изучение влияния цинка Zn на размер зерна и коррозионную стойкость сплавов системы Mg-Nd-Y-Zr. *Scientific progress*, *2*(2), 1488-1490.
8. Алимова, З. Х., Исмадиёров, А. А., & Тожибаев, Ф. О. (2021). Влияние химического состава моторных масел на вязкостные показателей. *Экономика и социум*, (4-1), 595-598.
9. Нурметов, Х. И., Турсунов, Н. К., Кенжаев, С. Н., & Рахимов, У. Т. (2021). Перспективные материалы для механизмов автомобильных агрегатов. *Scientific progress*, *2*(2), 1473-1479.
10. Alimova, Z. K., Ismadierov, A. A., & Tozhibaev, F. O. (2021). Influence of the chemical composition of motor oils on viscosity indicators. *Z. Kh. Alimova, AA Ismadierov, FO Tozhibaev//Economy and society*, (4-1), 83.
11. Жураев, М. Н., Омонов, Б. Ш., & Кенжаев, С. Н. (2021). Формирование моделей управления объемами перевозок в соответствии с потребностями потребителей. *Universum: технические науки*, (5-2 (86)), 87-92.
12. Khodjaev, S. M., & Rakhmonova, S. S. (2022). Saving resources in the operation, maintenance of automotive equipment. *American Journal of Interdisciplinary Research and Development*, *5*, 18-27.
13. Xujamkulov, S., Abdubannopov, A., & Botirov, B. (2021). Zamonaviy avtomobillarda qo'llaniladigan acceleration slip regulation tizimi tahlili. *Scientific progress*, *2*(1), 1467-1472.
14. Xodjayev, S., Xusanjonov, A., & Botirov, B. (2021). Gibrid dvigatelli avtomobillardan foydalanib ichki yonuv dvigatellari ishlab chiqargan quvvat samaradorligini oshirish va atrof-muhitga chiqarilayotgan zararli gazlarni kamaytirish. *Scientific progress*, *2*(1), 1523-1530.
15. Xujamqulov, S. U., Masodiqov, Q. X., & Abdunazarov, R. X. (2022, March). Prospects for the development of the automotive industry in uzbekistan. In *E Conference Zone* (pp. 98-100).
16. Meliboyev, A., Khujamqulov, S., & Masodiqov, J. (2021). Univer calculation-experimental method of researching the indicators of its toxicity in its management by changing the working capacity of the engine using the characteristics. *Экономика и социум*, (4-1), 207-210.
17. Fayziev, P. R., Tursunov, D. M., Khujamkulov, S., Ismandiyarov, A., & Abdubannopov, A. (2022). Overview of solar dryers for drying lumber and wood. *American Journal Of Applied Science And Technology*, *2*(04), 47-57.

ISSN: 2776-0987 Volume 3, Issue 9, Sep. 2022

18. Xujamqulov, S. U. O. G. L., & Masodiqov, Q. X. O. G. L. (2022). Avtotransport vositalarining ekspluatatsion xususiyatlarini kuzatish bo'yicha vazifalarni shakllantirish. *Academic research in educational sciences*, *3*(4), 503-508.
19. Safarova, D. T., Madrakhimov, S. N., Nazarova, Z. A., & Khusenova, S. S. (2022). Study of import-substituting drugs of hypertensive action based on medicinal plants. *Asian journal of pharmaceutical and biological research*, *11*(1).
20. Khujamkulov, S. U., & Khusanjonov, A. S. (2022). Transmission system of parallel lathe machine tools. *ACADEMICIA: An International Multidisciplinary Research Journal*, *12*(2), 142-145.
21. Umidjon o‘g‘li, K. S., Khusanboy o‘g‘li, M. Q., & Mukhammedovich, K. S. (2022). The formation of tasks for overview of operating properties of vehicles. *American Journal Of Applied Science And Technology*, *2*(05), 71-76.
22. Khujamqulov, S. (2022). A method of conducting experiments on the production of car tires and the disposal of obsolete car tires. *Science and innovation*, *1*(A3), 61-68.
23. Qobulov, M., Jaloldinov, G., & Masodiqov, Q. (2021). Existing systems of exploitation of motor vehicles. *Экономика и социум*, (4-1), 303-308.
24. Xodjayev, S., Xusanjonov, A., & Botirov, B. (2021). Transport Vositalari Dvigatellarida Dimetilefir Yoqilg’isidan Foydalanish. *Scientific progress*, *2*(1), 1531-1535.
25. Сотволдиев, У., Абдубаннопов, А., & Жалилова, Г. (2021). Теоретические основы системы регулирования акселерационного скольжения. *Scientific progress*, *2*(1), 1461-1466.
26. Ismadiyorov, A. A., & Sotvoldiyev, O. U. (2021). Model of assessment of fuel consumption in car operation in city conditions. *Academic research in educational sciences*, *2*(11), 1013-1019.
27. Абдурахмонов, А. Г., Одилов, О. З., & Сотволдиев, У. У. (2021). Альтернативные пути использования сжиженного нефтяного газа с добавкой деметилового эфира в качестве топлива легкового автомобиля с двигателем искрового зажигания. *Academic research in educational sciences*, *2*(12), 393-400.
28. Omonov, F. A., & Dehqonov, Q. M. (2022). Electric Cars as the Cars of the Future. *Eurasian Journal of Engineering and Technology*, *4*, 128-133.

ISSN: 2776-0987 Volume 3, Issue 9, Sep. 2022

29. Maxamat o'g'li, D. Q. (2022). Production Resources of Motor Transport Enterprises Planning and Analysis of the Effectiveness of the Provision of Motor Transport Services Costs of Motor Transport Enterprises. *Eurasian Research Bulletin*, *8*, 48-51.
30. Omonov, F. A. (2022). Formation and Analysis of Urban Passenger Traffic Control. *Eurasian Journal of Research, Development and Innovation*, *6*, 6-13.
31. Abduraxmonov, A., & Tojiboyev, F. (2021). Korxonada shinalar va harakatlanuvchi tarkibni tahlil qilish va tekshirilayotgan harakat tarkibining xususiyatlari O '. Sotvoldiyev. *Academic research in educational sciences*, *2*(11), 1357-1363.
32. Xusanjonov, A., Qobulov, M., & Ismadiyorov, A. (2021). Avtomobil Shovqiniga Sabab Bo'luvchi Manbalarni Tadqiq Etish. *Academic research in educational sciences*, *2*(3), 634-640.
33. Xusanjonov, A., Qobulov, M., & Abdubannopov, A. (2021). Avtotransport vositalaridagi shovqin so'ndiruvchi moslamalarda ishlatilgan konstruksiyalar tahlili. *Academic research in educational sciences*, *2*(3), 614-620.
34. Qobulov, M. A. O., & Abdurakhimov, A. A. (2021). Analysis of acceleration slip regulation system used in modern cars. *ACADEMICIA: An International Multidisciplinary Research Journal*, *11*(9), 526-531.
35. Khusanjonov, A., Makhammadjon, Q., & Gholibjon, J. (2020). Opportunities to improve efficiency and other engine performance at low loads. *JournalNX*, 153-159.
36. Мелиев, Х. О., & Қобулов, М. (2021). Сущность и некоторые особенности обработки деталей поверхностно пластическим деформированием. *Academic research in educational sciences*, *2*(3), 755-758.
37. Qobulov, M., Ismadiyorov, A., & Fayzullayev, X. (2022). Analysis of the braking properties of the man cla 16.220 for severe operating conditions. *European International Journal of Multidisciplinary Research and Management Studies*, *2*(03), 52-59.
38. Omonov, F. A., & Sotvoldiyev, O. U. (2022). Adaptation of situational management principles for use in automated dispatching processes in public transport. *International Journal of Advance Scientific Research*, *2*(03), 59-66.
39. Qobulov, M., Ismadiyorov, A., & Fayzullayev, X. (2022). Overcoming the Shortcomings Arising in the Process of Adapting Cars to the Compressed Gas. *Eurasian Research Bulletin*, *6*, 109-113.

ISSN: 2776-0987 Volume 3, Issue 9, Sep. 2022

40. Otaboyev, N. I., Qudbiyev, N. T., & Qudbiyeva, G. A. Q. (2022). Yo'l-transport tizimida ekologiya masalalari. *Scientific progress*, *3*(2), 909-916.
41. Abduraxmonov, A. G., Xodjayev, S. M., Otaboyev, N. I., & Abduraximov, A. A. (2022). Formation of products from powdered polymers by rotational and blowing method. *European International Journal of Multidisciplinary Research and Management Studies*, *2*(03), 41-51.
42. Otaboyev, N. I., Qosimov, A. S. O., & Xoldorov, X. X. O. (2022). Avtopoezd tormozlanish jarayonini organish uchun avtopoezd turini tanlash. *Scientific progress*, *3*(5), 87-92.
43. Omonov, F. A. (2022). The important role of intellectual transport systems in increasing the economic efficiency of public transport services. *Academic research in educational sciences*, *3*(3), 36-40.
44. Khusanjonov, A. S. O., & Nosirjonov, S. I. O. (2021). Theoretical foundations of the acceleration slip regulation system. *ACADEMICIA: An International Multidisciplinary Research Journal*, *11*(9), 618-623.
45. Fayzullayev, E. Z., Raxmonov, I. S. O., & Nosirjonov, S. I. O. G. L. (2021). Tog'iqlim sharoitining transport xarakati xavfsizligiga ta'sirini o'rganish. *Academic research in educational sciences*, *2*(12), 53-56.
46. Omonov, F. A., & Odilov, J. A. (2022). Development of organizational conditions for the introduction of situational management methods in public transport. *European International Journal of Multidisciplinary Research and Management Studies*, *2*(05), 109-112.
47. Ergashev, M. I., Nosirjonov, S. I., & Mamasoliyev, J. J. (2022). Effective use of existing tire pressure monitoring and control systems at road transport enterprises in Uzbekistan. *Innovative Technologica: Methodical Research Journal*, *3*(03), 39-49.
48. Nosirjonov, S. I. U. (2022). Yo'l burilishlarida harakatlanayotgan transport vositasining tezligiga yo 'l qoplamasi va ob-havo sharoitlarining ta'siri. *Academic research in educational sciences*, *3*(4), 39-44.
49. Salomov, U., Yusupov, S., Odilov, O., & Moydinov, D. (2022). Theoretical Substantiation of the Advisability of Using Adhesives When Sealing the Core of Car Radiators and Diagnosing Radiators with a Thermal Load. *International Journal of Engineering Trends and Technology*, *70*(1), 81-92.
50. Salomov, U. R., Moydinov, D. A., & Odilov, O. Z. (2021). The Development of a Mathematical Model to Optimize the Concentration of the Components of the Forming Adhesive Composition. *Development*, *8*(9).

ISSN: 2776-0987 Volume 3, Issue 9, Sep. 2022

51. Абдурахмонов, А. Г., Одилов, О. З., & Сотволдиев, У. У. (2021). Альтернативные пути использования сжиженного нефтяного газа с добавкой деметилового эфира в качестве топлива легкового автомобиля с двигателем искрового зажигания. *Academic research in educational sciences*, *2*(12), 393-400.
52. Muxammadjonovich, K. N. M., & Abduxalilovich, I. I. (2021). Substantiation of Deep Softener Parameters that Cut the Vine Roots and Apply Fertilizer in a Wide-Band Manner. *Central asian journal of theoretical & applied sciences*, *2*(12), 56-59.
53. Abdukhalilovich, I. I., & Obloyorovich, M. H. (2020). Support for vehicle maintenance. *Asian Journal of Multidimensional Research (AJMR)*, *9*(6), 165-171.
54. Abdukhalilovich, I. I., & Abdujalilovich, J. A. (2020). Description Of Vehicle Operating Conditions And Their Impact On The Technical Condition Of Vehicles. *The American Journal of Applied sciences*, *2*(10), 37-40.
55. Ikromov, I. A., Abduraximov, A. A., & Fayzullayev, H. (2021). Experience and Prospects for the Development of Car Service in the Field of Car Maintenance. *ISJ Theoretical & Applied Science*, *11*(103), 344-346.
56. Fayziyev, P. R., Ikromov, I. A., Abduraximov, A. A., & Dehqonov, Q. M. (2022). Organization of technological processes for maintenance and repair of electric vehicles. *International Journal of Advance Scientific Research*, *2*(03), 37-41.
57. Fayziyev, P. R., Ikromov, I. A., Abduraximov, A. A., & Dehqonov, Q. M. (2022). Timeline: History of the Electric Car, Trends and the Future Developments. *Eurasian Research Bulletin*, *6*, 89-94.
58. Fayziyev, P. R., Ikromov, I. A., Otaboyev, N. I., & Abduraximov, A. A. (2022). The Analysis of Gas Balloon Supply Systems. *Eurasian Journal of Engineering and Technology*, *4*, 115-122.
59. Hurmamatov, A. M., & Hametov, Z. M. (2020). Results of preparation of oil slime for primary processing. *ACADEMICIA: An International Multidisciplinary Research Journal*, *10*(5), 1826-1832.
60. Hurmamatov, A. M., & Hametov, Z. M. (2020). Definitions the division factor at purification of oil slime of mechanical impurity. *ACADEMICIA: An International Multidisciplinary Research Journal*, *10*(5), 1818-1822.