ISSN 2518-170X (Online),
ISSN 2224-5278 (Print)

ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
ҰЛТТЫҚ ҒЫЛЫМ АКАДЕМИЯСЫНЫҢ
Қ. И. Сәтпаев атындағы Қазақ ұлттық техникалық зерттеу университеті

Х А Б А Р Л А Р Ы

ИЗВЕСТИЯ

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
РЕСПУБЛИКИ КАЗАХСТАН
Казахский национальный исследовательский
технический университет им. К. И. Сатпаева

N E W S

OF THE ACADEMY OF SCIENCES
OF THE REPUBLIC OF KAZAKHSTAN
Kazakh national research technical university
named after K. I. Satpayev

SERIES
OF GEOLOGY AND TECHNICAL SCIENCES

2 (434)

MARCH – APRIL 2019

THE JOURNAL WAS FOUNDED IN 1940

PUBLISHED 6 TIMES A YEAR

ALMATY, NAS RK

NAS RK is pleased to announce that News of NAS RK. Series of geology and technical sciences scientific journal has been accepted for indexing in the Emerging Sources Citation Index, a new edition of Web of Science. Content in this index is under consideration by Clarivate Analytics to be accepted in the Science Citation Index Expanded, the Social Sciences Citation Index, and the Arts & Humanities Citation Index. The quality and depth of content Web of Science offers to researchers, authors, publishers, and institutions sets it apart from other research databases. The inclusion of News of NAS RK. Series of geology and technical sciences in the Emerging Sources Citation Index demonstrates our dedication to providing the most relevant and influential content of geology and engineering sciences to our community.

Қазақстан Республикасы Ұлттық ғылым академиясы "ҚР ҰҒА Хабарлары. Геология және техникалық ғылымдар сериясы" ғылыми журналының Web of Science-тің жаңаланған нұсқасы Emerging Sources Citation Index-те индекстелуге қабылданғанын хабарлайды. Бұл индекстелу барысында Clarivate Analytics компаниясы журналды одан әрі the Science Citation Index Expanded, the Social Sciences Citation Index және the Arts & Humanities Citation Index-ке қабылдау мәселесін қарастыруда. Webof Science зерттеушілер, авторлар, баспашылар мен мекемелерге контент тереңдігі мен сапасын ұсынады. ҚР ҰҒА Хабарлары. Геология және техникалық ғылымдар сериясы Emerging Sources Citation Index-ке енуі біздің қоғамдастық үшін ең өзекті және беделді геология және техникалық ғылымдар бойынша контентке адалдығымызды білдіреді.

НАН РК сообщает, что научный журнал «Известия НАН РК. Серия геологии и технических наук» был принят для индексирования в Emerging Sources Citation Index, обновленной версии Web of Science. Содержание в этом индексировании находится в стадии рассмотрения компанией Clarivate Analytics для дальнейшего принятия журнала в the Science Citation Index Expanded, the Social Sciences Citation Index и the Arts & Humanities Citation Index. Web of Science предлагает качество и глубину контента для исследователей, авторов, издателей и учреждений. Включение Известия НАН РК. Серия геологии и технических наук в Emerging Sources Citation Index демонстрирует нашу приверженность к наиболее актуальному и влиятельному контенту по геологии и техническим наукам для нашего сообщества.

«ҚР ҰҒА Хабарлары. Геология мен техникалық ғылымдар сериясы».
ISSN 2518-170X (Online),
ISSN 2224-5278 (Print)
Меншіктенуші: «Қазақстан Республикасының Ұлттық ғылым академиясы» РҚБ (Алматы қ.).
Қазақстан республикасының Мәдениет пен ақпарат министрлігінің Ақпарат және мұрағат комитетінде 30.04.2010 ж. берілген **№10892-Ж** мерзімдік басылым тіркеуіне қойылу туралы куәлік.

Мерзімділігі: жылына 6 рет.
Тиражы: 300 дана.

Редакцияның мекенжайы: 050010, Алматы қ., Шевченко көш., 28, 219 бөл., 220, тел.: 272-13-19, 272-13-18,
http://www.geolog-technical.kz/index.php/en/

Редакцияның мекенжайы: Қазақстан, 050010, Алматы қ., Қабанбай батыра көш., 69а.
Қ. И. Сәтбаев атындағы геология ғылымдар институты, 334 бөлме. Тел.: 291-59-38.

Типографияның мекенжайы: «Аруна» ЖК, Алматы қ., Муратбаева көш., 75.

«Известия НАН РК. Серия геологии и технических наук».
ISSN 2518-170X (Online),
ISSN 2224-5278 (Print)
Собственник: Республиканское общественное объединение «Национальная академия наук Республики Казахстан (г. Алматы)
Свидетельство о постановке на учет периодического печатного издания в Комитете информации и архивов Министерства культуры и информации Республики Казахстан **№10892-Ж,** выданное 30.04.2010 г.

Периодичность: 6 раз в год
Тираж: 300 экземпляров

Адрес редакции: 050010, г. Алматы, ул. Шевченко, 28, ком. 219, 220, тел.: 272-13-19, 272-13-18,
http://nauka-nanrk.kz /geology-technical.kz

Адрес редакции: Казахстан, 050010, г. Алматы, ул. Кабанбай батыра, 69а.
Институт геологических наук им. К. И. Сатпаева, комната 334. Тел.: 291-59-38.

Адрес типографии: ИП «Аруна», г. Алматы, ул. Муратбаева, 75

News of the National Academy of Sciences of the Republic of Kazakhstan. Series of geology and technology sciences.
ISSN 2518-170X (Online),
ISSN 2224-5278 (Print)
Owner: RPA "National Academy of Sciences of the Republic of Kazakhstan" (Almaty)
The certificate of registration of a periodic printed publication in the Committee of information and archives of the Ministry of culture and information of the Republic of Kazakhstan N 10892-Ж, issued 30.04.2010

Periodicity: 6 times a year
Circulation: 300 copies

Editorial address: 28, Shevchenko str., of. 219, 220, Almaty, 050010, tel. 272-13-19, 272-13-18,
http://nauka-nanrk.kz/geology-technical.kz

Editorial address: Institute of Geological Sciences named after K.I. Satpayev
69a, Kabanbai batyr str., of. 334, Almaty, 050010, Kazakhstan, tel.: 291-59-38.

Address of printing house: ST "Aruna", 75, Muratbayev str, Almaty

N E W S
OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN
SERIES OF GEOLOGY AND TECHNICAL SCIENCES
ISSN 2224-5278
Volume 2, Number 434 (2019), 79 – 85 **https://doi.org/10.32014/2019.2518-170X.41**

UDC 621.436

S. A. Petukhov[1], L. S. Kurmanova[1], M. P. Erzamaev[2]

[1]SamSTU «Samara State Transport University» , Samara, Russia,
[2]SSAA «Samara State Agricultural Academy», Samara, Russia.
E-mail: sakmara-cite@mail.ru, leyla_kurmanova@mail.ru, erzamaev_mp@mail.ru

TRANSPORT DIESELS OIL SYSTEM OPERATION EFFICIENCY INCREASE

Abstract. The article deals with the problem of energy saving and fuels and lubricants oils (FLO) efficient use in vehicles. It considers approaches how to solve the issues of reducing fuel cost. Diesel engines are the main utilizers of FLO in vehicles, in which up to 80% of the power loss of a diesel engine happens due to the friction overcoming in cylinder-piston group. In this regard, the analysis of engine oils operating conditions in lubrication system of vehicle diesel engines has been conducted. The requirements for lubricants as well as the engine oil operation features have been defined. It has been found that due to the use of highly purified engine oil in lubrication system and additives for its basic features increase there is a possibility to increase the resource as well as supply the prolongation of vehicle diesels life with no oil change. A comprehensive solution how to optimize the vehicle diesel engine lubrication system has been presented. A self-regulating lubrication system has been developed to improve the quality of engine oil in operation and prolong its service life. The experimental data on the assessment of self-regulating lubrication system influence on vehicle diesel engine performance have been summarized and analyzed.
Keywords: energy saving, lubrication system, wear rate, engine oil, filtration, diesel performance.

Vehicle diesel engines lubrication system efficiency improvement is one of the prior and urgent tasks in the field of energy and fuels and lubricant oils (FLO) saving. Efficient use of fuels and lubricant oils (FLO) is one of the most important tasks the Russian economy has been facing. The problem of energy saving has now become of the strategic importance one. The Federal Law “On Energy Saving and Energy Efficiency Increasing and On Amending the Certain Russian Federation Legislative Acts” and the Russian Federation Government Decree, November 13, 2009 No. 1715-p “Energy Strategy of Russia for the Period until 2030” determine the energy efficiency of the economy as one of the main strategic guidelines of the long-term state energy policy [1, 2].

Energy efficiency in the modern environment is the most important factor in vehicles competitiveness improvement on the domestic and international market of transport services.

The modern philosophy of energy conservation should include all the variety of approaches and technologies to save fuel and energy resources, primarily through the introduction of innovative solutions into the area [3].

In the transport sector of Russia, the implementation of fundamentally new approaches has begun to address the issues of fuel and energy resources costs reduction. First of all, it is the use of lubricant additives [4, 5].

One of the main conditions of high efficiency of vehicles diesels operation is the reliability of moving parts, which account for up to 85% of all failures [6,7].

Up to 80% of the diesel engine power loss accounts for friction overcoming in the cylinder-piston group (CPG). As a result, diesel engine wear leads to the decrease of power and economic indicators characterizing static and dynamic loads on moving parts, their thermal stress, opacity and toxicity, have a significant impact on the performance of transport units. Today, high requirements are placed on diesels technical conditions, which consist in obtaining maximum useful work with minimum energy resources

and in increasing their durability by reducing friction and the rubbing surfaces wear resistance increase. The significance of the problem of diesel engines rubbing parts wear is as more as a rule, their wear limits the service life of transport units [8-11].

It is obvious, that the problem of transport diesel engines wear requires comprehensive consideration, while it is necessary to develop the methods of wear reduction, suitable for widespread use and providing a significant extension of diesels service life. Therefore, the repair service has been given the task to create and introduce new technologies leading to the improvement of technical and economic parameters of transports and reduce their energy intensity [12, 13].

Lubrication system has been designed to solve the task of ensuring minimum wear of friction loaded nodes and long-term operation of lubricants, as well as improving the reliability and lifespan of transport diesels.

Operating oils are complex systems whose behavior is described from the standpoint of colloidal chemical research. It has been established that stability with excessively high colloid resistance troubles cleaning means work efficiency [14].

Reduced stability of the system increases the cleaning efficiency and at the same time accelerates the pollution of the engine. Similarly, dispersing (stabilizing) capacity is associated with the most important indicator - the tendency to form high-temperature deposits (HTD). On the one hand, the maximum stabilizing capacity minimizes HTD formation, on the other hand, it reduces the cleaning efficiency [15, 16].

A comprehensive solution to the problem can be solved by applying advanced engine oil cleaning means in the lubrication system, including a high-speed centrifugal oil filter (HSCF), a hydro heat accumulator for trouble-free cold start of a diesel, as well as a functional additive feeder (FAF) (figure 1).

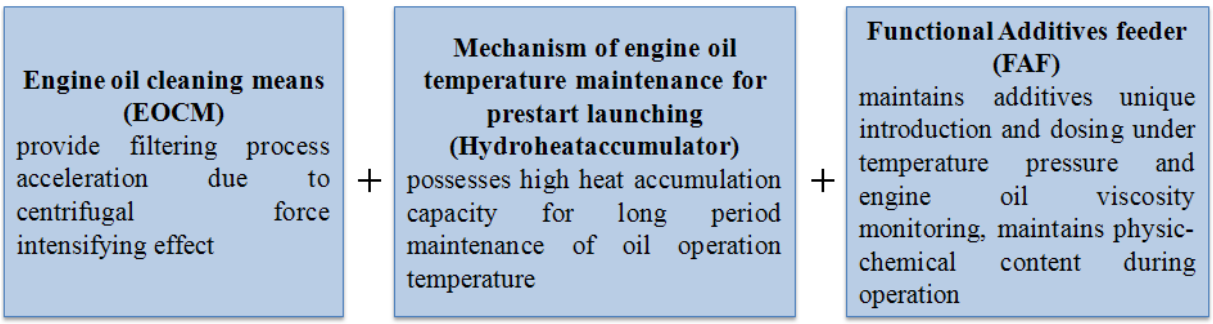

Figure 1 – Transport diesel lubrication system optimization

Developed measures to optimize the lubrication system of transport diesels will provide:

1. extension of the engine oils service life (2 times);
2. reduction of oil consumption (by 10-15%);
3. minimal friction loss (reduction of friction coefficient by 1.5 times);
4. increase the mileage of vehicles until engine oil change;
5. the service life of the filter elements for an increased mileage.

The proposed technical solutions to improve the efficiency of the lubrication system can be installed on transport diesels with no major changes in the design.

The use of the EOCM with a rotational speed of 10,000 rpm driven by an electric motor allows the engine oil to be cleaned of mechanical impurities (particles less than 2 microns), oxidation products formed during adsorption of the active parts of the additives by the oil, as well as light fuel fractions, thereby reducing the wear of parts. The main features of the EOCM in comparison with the standard are:

- acceleration of the filtration process and reduction of contaminants deposition path, due to the even distribution of the oil flow entering the refining system closer to the rotor walls;
- minimum hydraulic losses and hydraulic resistance, due to the channels design and changes in the geometry of the feeding holes of the rotor axis;
- an increase in the residence time of the oil in the centrifuge by two times and the elimination of the possibility of entrainment of small particles of contaminant due to the use of a vertical cylindrical partition;
- increased dirt holding capacity.

The use of a hydro heat accumulator ensures engine oil pre-start launching temperature maintenance. The hydro heat accumulator is a cylindrical body with a screen-vacuum insulation. In it, the heat from the hot oil is transferred to the heat-accumulating substance with a low coefficient of expansion based on bitumen and paraffin, having a phase transition temperature of 70–80 °C. Thus its charging occurs.

FAF has the ability to work continuously until the life of the filter elements of the filters for fine oil cleaning has expired. When changing the filter element, there is no need to change the oil, because during operation, its physic-chemical properties are restored by adding functional additives from the FAF. The package with functional additives and the conditions of their dosing are selected according to the characteristics of colloidal structure of engine oil.

A sample of the developed lubrication system was tested on the D-242 diesel engine (figure 2).

Figure 2 – Autonomic testing self-regulating lubrication system in diesel engine D-242

During the experiments, the following indicators were evaluated: physic-chemical indicators of engine oil; specific fuel consumption be; combustion pressure pz; carbon oxides (CO) and nitrogen oxides (NOx) content in diesel exhaust gases; exhaust smoke opacity D.

While analyzing the dynamics of the impurities accumulation and wear products in the engine oil (table 1), for the selected operating conditions of the internal combustion engine self-regulating lubrication system tests, calculations on alkalinity change have been made. Calculations demonstrated that during the operation of the self-regulating lubrication system of the internal combustion engine, simultaneously with the stabilization of mechanical impurities, the stabilization of alkalinity also occurs (figure 3).

There with, the level of stabilization ensures the requirements of operational work. The minimum limit of alkalinity concentration in the crankcase was $C_{пред}$ = 0.7 mg/KOH/g., and the equilibrium according to the results of calculations and analyzes amounted to $C_{равн}$ = 1.16 mg/KOH/g.

Table 1 – Physic-chemical indicators of engine oil M-10DM(Standard 8581-78)

#	Quality indexes	Standard	With designed lubrication system	After lubrication system optimization
1	Cinematic velocity mm^2/c at 100°C	Not less than11,4	12,1	11,9
2	Mass content of chemical infusions, % not more than	0,025	0,020	0,018
3	Mass water fraction	traces	absent	absent
4	Temperature of flashing in open containment basin, °C not lower than	220	220	220
5	Total alkality, mgKOH/g of oil density	8,2	8,5	8,7
6	Density at 20 °C, g/cm^3, not more	0,905	0,896	0,896

Thus, there was sufficient margin of alkalinity for satisfactory diesel operation regardless of engine resource.

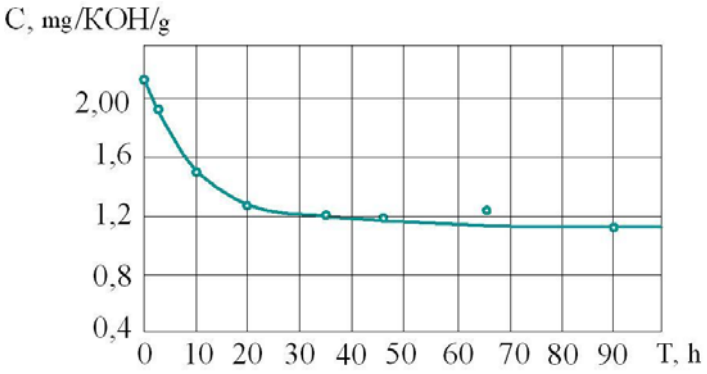

Figure 3 – Alkalinity change in crankcase oil (data of 10 analyses)

The dependence of specific fuel consumption be on diesel load (efficient power) D-242 has been performed in figure 4.

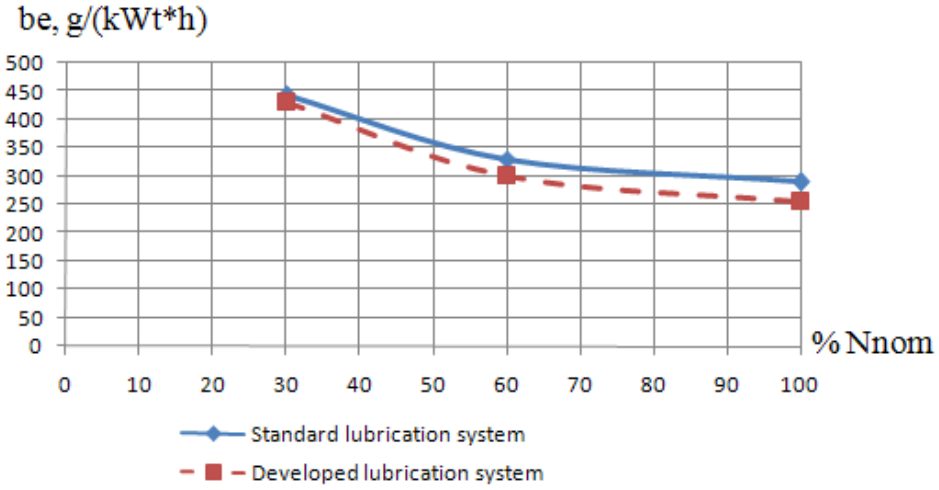

Figure 4 – Dependence of specific fuel be consumption on efficient diesel power

As we see, with a self-regulating lubrication system, the specific efficient fuel consumption decreases on average by 6–8%, what can be explained by a decrease in the friction coefficient. Most likely, the reason for this is the formation of functional additives products on the surface of cylinder sleeves friction. From the additives a thin hard-to-oxidize self-healing metal servovit film has been formed during the operation of the units friction. It is several atomic layers up to 1–4 microns thick. It protects the friction surface from wear. The film has got a loose structure, it is porous, there are almost no dislocations, and there are many vacancies [17-19].

This assumption is confirmed by 6% of fuel combustion pressure increase on average p_z under application of developed lubrication system (figure 5).

Increase mentioned can be explained by a decrease in clearances in the CPG, which causes a decrease in leakage of air-fuel mixture from the combustion chamber and, as a consequence, an increase of the indicator power, characterizing the work of gases expansion in diesel cylinder.

In order to assess the degree of the influence of self-regulating lubrication system on the operation of a diesel engine cylinder-piston, the intensity of linear wear of a cylinder tube was calculated by statistic modeling using standard and developed lubrication systems. Remind that the intensity of linear wear is a dimensionless quantity that is the ratio of absolute wear (height of the worn out layer) to the length of the friction path, i.e. the path where the wear occurred. The wear rate was determined for the case of resilient interaction of contacting bodies. The predicted model was designed using the Statistica 6 software [20]. The results have been shown in figure 6.

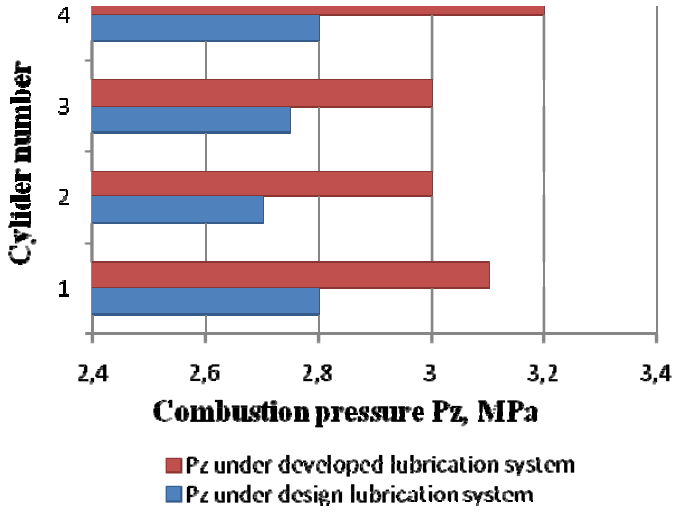

Figure 5 – Combustion pressure change on cylinders

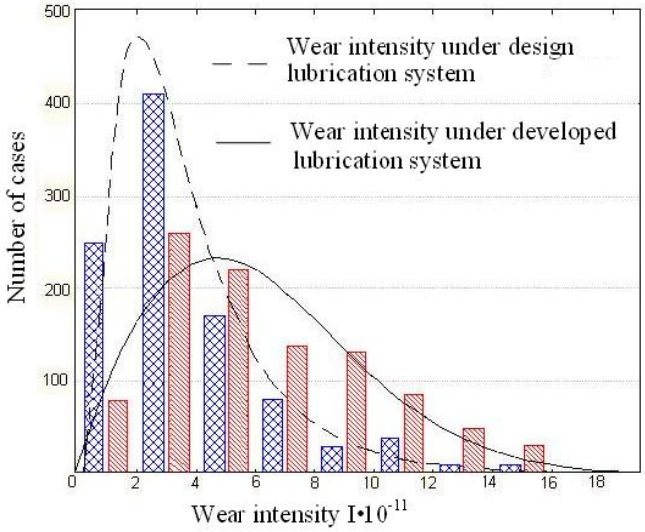

Figure 6 – CPG wear linear intensity measured distribution of a diesel D242

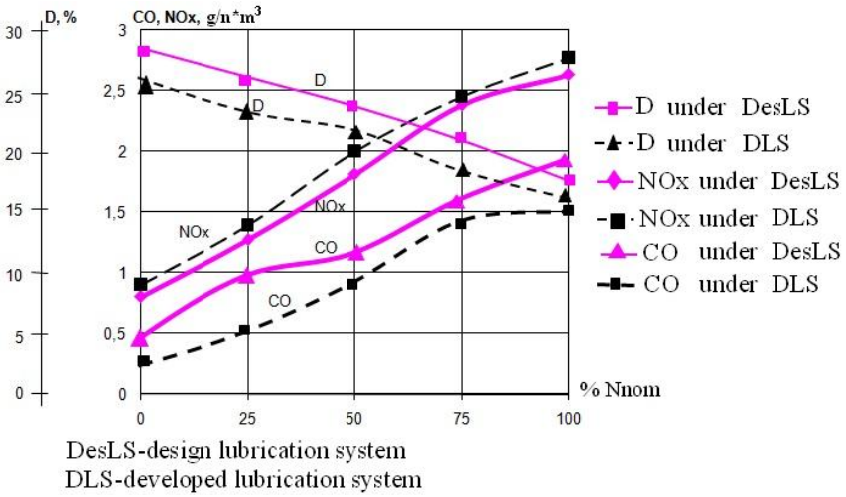

Figure 7 – Pollutants emission rate depending on engine D242 load

As seen in the figure, when using a self-regulating lubrication system, the average linear wear rate of the CPG is reduced by 1.5 times. Figure 7 demonstrates the data on harmful substances emissions into the atmosphere when the D-242 diesel engine is operating with under standard and developed lubrication system. While testing a self-regulating lubrication system, CO emissions are reduced an average by 8–10%, NOx emissions increase an average by 4–8%, while remaining within the available rate, but opacity D decreases an average by 8–10%.

The results reported indicate the fundamental possibility of improving the physic-chemical properties of engine oil by improving its base material by means of additives. The use of the proposed self-regulating lubrication system will reduce the operating costs of transport diesel engines due to the high degree of purification and restoration of the physic-chemical properties of engine oil, extend its service life, reduce friction, improve the wear resistance of diesel units friction, thereby increasing its service life, as well as ensuring a long-term operation of transport diesel engines with no oil change.

С. А. Петухов[1], Л. С. Курманова[1], М. П. Ерзамаев[3]

[1]Самара мемлекеттік көлік университеті, Самара, Ресей,
[2]Самар мемлекеттік ауылшаруашылық академиясы, Самара, Ресей

ТАСЫМАЛДАУ ДИЗЕЛЕРІНІҢ МҰНАЙ ЖҮЙЕСІНІҢ ЖҰМЫСЫНЫҢ ТИІМДІЛІГІН АРТТЫРУ

Аннотация. Мақалада энергияны үнемдеу және жанар-жағармай материалдарын тиімді пайдалану мәселелері талқыланады. Отын сатып алу құнын төмендету мәселелерін шешудің қарастырылған тәсілдері. Қозғалтқыштағы жанар-жағар май материалдарының негізгі тұтынушылары дизельді қозғалтқыштардың 80%-ға дейін жоғарылауы цилиндрлі поршенді топта үйкелісуден құтылуға арналған дизельді қозғалтқышта рболып табылады.

Түйін сөздер: энергияны үнемдеу, майлау жүйесі, тозу жылдамдығы, мотор майы, сүзгілеу, дизельді өнімділік.

С. А. Петухов[1], Л. С. Курманова[1], М. П. Ерзамаев[3]

[1]СамГУПС «Самарский государственный университет путей сообщения», Самара, Россия,
[2]СГСХА «Самарская государственная сельскохозяйственная академия», Самара, Россия

ПОВЫШЕНИЕ ЭФФЕКТИВНОСТИ РАБОТЫ МАСЛЯНОЙ СИСТЕМЫ ТРАНСПОРТНЫХ ДИЗЕЛЕЙ

Аннотация. В статье рассмотрена проблема энергосбережения и эффективного использования горюче-смазочных материалов (ГСМ) на транспорте. Рассмотрены подходы к решению вопросов снижения затрат на приобретение ГСМ. Основными потребителями ГСМ на транспорте являются дизельные двигатели, в которых до 80% потерь мощности дизеля приходится на преодоление трения в цилиндро-поршневой группе. В связи с этим, произведен анализ условий работы моторных масел в системе смазки транспортных дизелей. Определены требования, предъявляемые к смазочным материалам, а также параметры работы моторного масла. Установлено, что за счет применения в системе смазки средств высокой степени очистки моторного масла и функциональных присадок для улучшения его базовой основы можно увеличить ресурс, а также обеспечить длительную эксплуатацию транспортных дизелей без смены масла. Представлено комплексное решение по оптимизации системы смазки транспортных дизелей. Разработана саморегулирующаяся система смазки для повышения качества моторного масла в эксплуатации и продления срока его службы. Обобщены и проанализированы экспериментальные данные по оценке влияния саморегулирующейся системы смазки на показатели работы транспортного дизеля.

Ключевые слова: энергосбережение, система смазки, интенсивность изнашивания, моторное масло, фильтрация, показатели работы дизеля.

Information about authors:

Petukhov Sergey Aleksandrovich, associated professor, SamSTU «Samara State Transport University» , Samara, Russia; sakmara-cite@mailru; https://orcid.org/0000-0002-3753-348X

Kurmanova Leila Salimovna, post-graduate course student, SamSTU «Samara State Transport University» , Samara, Russia; leyla_kurmanova@mail.ru; https://orcid.org/0000-0001-7641-3889

Erzamaev Maxim Pavlovich, associated professor, SSAA «Samara State Agricultural Academy», Samara, Russia; erzamaev_mp@mail.ru; https://orcid.org/0000-0003-2843-3513

REFERENCES

[1] Prosvirov Yu.E., Nosyrev D.Ya., Muratov A.V., Petukhov S.A. Innovative energy-saving technologies in the locomotive economy: monograph. Samara: SamSTU, 2012. 123 p.

[2] Shkolnikov E.N. The policy of JSC “Russian Railways” in the field of fuel and lubricants // Railway transport. 2008. N 9. P. 48-50.

[3] Nosyrev D.Ya., Petukhov S.A., Muratov A.V. Problems and prospects for the use of lubricants in the locomotive industry: a monograph. Samara: STU, 2016. 183 p.

[4] Mamyhkin S.M. Effect of metal cladding additives on the tribotechnical characteristics of engine oil M-14B2 / S.M. Mamyhkin et al. // Problems of mechanical engineering and reliability of machines. 2006. N 2. P. 69-74.

[5] Shabanov A.V. "Additives": oil painting // Driving. 2006. Vol. 3. P. 174-177.

[6] Gapanovich V.A. Ensure the reliable operation of technical equipment // Railway transport. 2008. N 9. P. 2-5.

[7] Zorin V.A. Fundamentals of technical systems: a textbook for students. higher school manual. M.: Academy, 2009. 208 p.

[8] Petukhov S.A., Muratov A.V., Kurmanova L.S. Evaluation of engine oil performance in diesel locomotives during operation // Volga Region Transport Bulletin. 2017. N 3(63). P. 40-44.

[9] Ovcharenko S.M., Minakov V.A. Theoretical and experimental study of parts wear patterns of diesel engine type D49 // Proceedings of Transsib. 2013. N 3(15). P. 55-61.

[10] Astashkevich B.M. Scuffing formastion and friction surface quality of parts of the cylinder-piston group in diesel engines // Vestnik VNIIZhT. 2003. N 1. P. 74-88.

[11] Antipin V.P. Engine wear at steady load, speed and lubrication modes / V.P. Antipin and [other]. // Engine building. 2006. N 1. P. 7-9.

[12] Kremnev K.S., Andronchev I.K., Bulatov A.A. Comprehensive optimization of lubricant consumption for maintenance and repair of rolling stock // Volga Transport Bulletin. SamaraSTU, 2011. N 2(26). P. 9-13.

[13] Sharov G.I. Friction reduction as a form of energy saving of a ship power plant / G.I.Sharov and [others] // Engine building. 2008. N 4. P. 29-31.

[14] Ovcharenko S.M., Denisov I.N., Minakov V.A. Calculation of operating parameters of the centrifugal filter of the diesel oil system // News of Transsib. 2015. N 2(22). P. 33-39.

[15] Kasymkanova X., Dzhangulova G., Bekseitova R., Miletenko N., Baidauletova G., Turekhanova V., Zhalgasbekov E., Shmarova I. Express-assessment of geomechanic condition of the rock massive and development methods of its strengthening and reinforcing for safe ecological developing of the fields of mineral resources in hard mountain-geological and mining engineering conditions // News of the National Academy of Sciences of the Republic of Kazakhstan. Series of geology and technical sciences. 2018. N 5(431). P. 37–46. ISSN 2224-5278. https://doi.org/10.32014/2018.2518-170X.33.

[16] Ryhzhov V.A. Engine oils for modern diesel engines // Railway transport. 2008. N 9. P. 51-53.

[17] Tsvetkov Yu.N. On the mechanism of action of metal-clad drugs in internal combustion engines / Yu.N. Tsvetkov and [others]. // Friction, wear and lubrication. 2008. Vol. 10, N 2. P. 388-399.

[18] Garkunov D.N. Tribotechnics (wear and wearlessness) / 4th ed., republ. and add. M.: Publishing House of the Moscow Agricultural Academy, 2001. 616 p.

[19] Zholtaev G. Zh., Iskaziev K.O., Abayıldanov B.K. Paleosoic deposits as option for reserves replacement & expansion of raw material base for petroleum industryin Mangyshlak // News of the National Academy of Sciences of the Republic of Kazakhstan. Series of geology and technical sciences. 2018. N 6(432). P. 163-171. ISSN 2224-5278. https://doi.org/10.32014/2018.2518-170X.22.

[20] Software complex *Statistica* 6. http://www.statsoft.tu.

Publication Ethics and Publication Malpractice
in the journals of the National Academy of Sciences of the Republic of Kazakhstan

For information on Ethics in publishing and Ethical guidelines for journal publication see http://www.elsevier.com/publishingethics and http://www.elsevier.com/journal-authors/ethics.

Submission of an article to the National Academy of Sciences of the Republic of Kazakhstan implies that the described work has not been published previously (except in the form of an abstract or as part of a published lecture or academic thesis or as an electronic preprint, see http://www.elsevier.com/postingpolicy), that it is not under consideration for publication elsewhere, that its publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out, and that, if accepted, it will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyright-holder. In particular, translations into English of papers already published in another language are not accepted.

No other forms of scientific misconduct are allowed, such as plagiarism, falsification, fraudulent data, incorrect interpretation of other works, incorrect citations, etc. The National Academy of Sciences of the Republic of Kazakhstan follows the Code of Conduct of the Committee on Publication Ethics (COPE), and follows the COPE Flowcharts for Resolving Cases of Suspected Misconduct (http://publicationethics.org/files/u2/New_Code.pdf). To verify originality, your article may be checked by the Cross Check originality detection service http://www.elsevier.com/editors/plagdetect.

The authors are obliged to participate in peer review process and be ready to provide corrections, clarifications, retractions and apologies when needed. All authors of a paper should have significantly contributed to the research.

The reviewers should provide objective judgments and should point out relevant published works which are not yet cited. Reviewed articles should be treated confidentially. The reviewers will be chosen in such a way that there is no conflict of interests with respect to the research, the authors and/or the research funders.

The editors have complete responsibility and authority to reject or accept a paper, and they will only accept a paper when reasonably certain. They will preserve anonymity of reviewers and promote publication of corrections, clarifications, retractions and apologies when needed. The acceptance of a paper automatically implies the copyright transfer to the National Academy of Sciences of the Republic of Kazakhstan.

The Editorial Board of the National Academy of Sciences of the Republic of Kazakhstan will monitor and safeguard publishing ethics.

Правила оформления статьи для публикации в журнале смотреть на сайте:

www:nauka-nanrk.kz

ISSN 2518-170X (Online), ISSN 2224-5278 (Print)

http://www.geolog-technical.kz/index.php/en/

Верстка *Д. Н. Калкабековой*

Подписано в печать 12.04.2019.
Формат 70x881/8. Бумага офсетная. Печать – ризограф.
15,2 п.л. Тираж 300. Заказ 2.

Национальная академия наук РК
050010, Алматы, ул. Шевченко 28, т. 272-13-19, 272-13-18