

TECHNOLOGY RECOVERY OF POWER DEVICE OF MACHINES FOR FORESTRY WORK

L. L. Titova, I. L. Rogovskii

National University of Life and Environmental Sciences of Ukraine

e-mail: irogovskii@gmail.com

Abstract. *Ways of carrying out technological operations CIP service may be different, they depend on the mechanisms of action of devices and their aggregate forms. For example, oil-soluble devices, such as metalloprotease additives and conditioners, mainly introduced in prepared for loading or preloaded into the machine for forestry contractors fuel and lubricants. Powder devices (demetallized, geomodifiers) can be injected directly into the friction zone (spark plug hole, rolling bearings, etc.). In the case of polymer-containing devices sometimes use a special method of treatment – the introduction of aerosols into the fuel-air mixture.*

The most progressive system of in-place service depending on the technical condition of machines for forestry work in which the need for a particular impact is assessed on the basis of the results of technical diagnostics. In this case, you can either choose preventive medications, milder, or preparate that provides a more intense effect on the friction connections and assemblies of machines for forestry work.

In some cases, the need to use the repair caused by devices and other reasons (compulsory), for example, participation in competitions, races or any other non-standard tests (autogenically tuning).

Key words: *recovery machine, preparate, method, system, technology*

Introduction. Currently there are two main application systems technology CIP recovery, and in General undertake all the technical service and repair of machines for forestry work:

- preventive;
- depending on the technical state of the object.

Preventive system maintenance depending on the developments for a long time existed. This service system focused mainly on the prevention of high intensity wear and failures, but its application is not always economically justified.

Formulation of problem. Ways of carrying out technological operations CIP service may be different, they depend on the mechanisms of action of devices and their aggregate forms.

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Repair-and-renewal preparations can also be used as a subsidiary CIP funds for seasonal maintenance and in some other cases.

Analysis of recent research results. Depending on the problem being solved (the technical condition of machines for forestry work, conditions and expected results) by modern science offers a range of exclusive technologies CIP service, including the process of continuous operation, which is equally important. The main ones are [1–7]:

1. The indiscriminate diagnosis of systems and components of machines for forestry work.
2. Break-in period (run-in) units of new or repaired machines for forestry work.
3. Purification systems of machines for forestry work.
4. Prevention of wear and maintenance of components of machines for forestry work.
5. Autogenically engine tuning.
6. The technology of non-recovery surfaces.

All these technologies are primarily aimed at restoring a functioning state of the art, including by restoring worn surfaces to the nominal or repair size.

Purpose of research. To formulate analytical provision of substantiation of the technology recovery power plant of machines for forestry work.

Results of research. The whole process of wear parts, as well as general functioning of the connection or the entire machine overhaul can be divided in time into three characteristic period:

- extra products,
- normative work (the established, the deterioration process),

– emergency operation (catastrophic wear).

The use of repair-regenerative preparations allows to recover a number of indicators of the processed object and thereby raise (extend) its resource (Fig. 1).

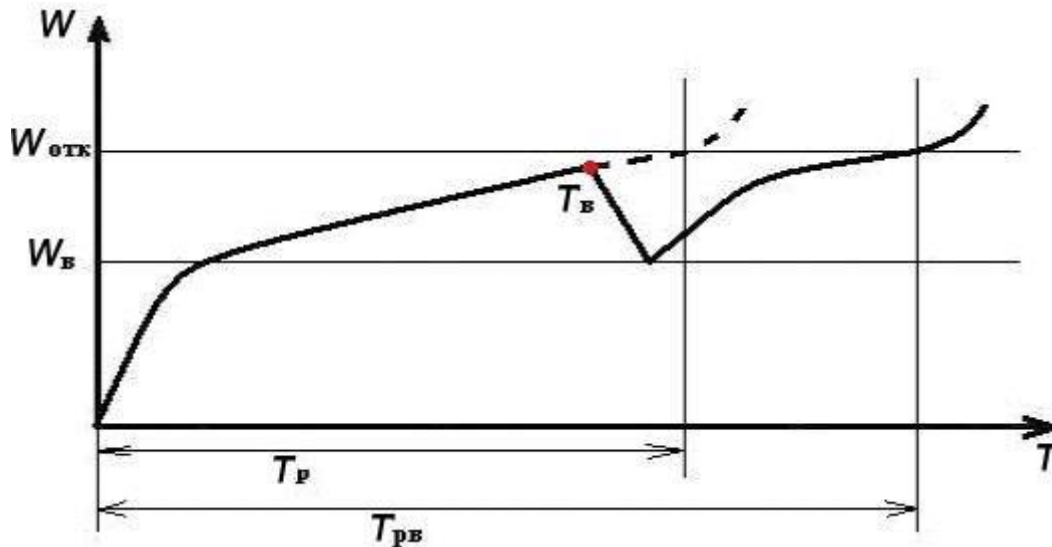


Fig. 1. The overhaul cycle of the equipment in terms of repair and rehabilitation technologies: W_{OTK} – indicators of the onset of the unhealthy condition (failure) object W_B – data recovery after CIP, T_B – point of non-recovery, T_P – resource object in normal operating conditions, T_{PB} – resource object after applying the repair products.

Below are some General requirements to the use of devices for non-recovery of the engine.

The first stage. Assessment of the technical condition of the engine.

The diagnosis is one of the most important elements CIP service vehicles, which includes determining the technical condition of the car, revealing the hidden faults in its units, and systems without disassembly, and on the basis of the results, justification of a particular method of impact (application of certain of the repair technology).

For these purposes, can be used in stationary, mobile, portable, and embedded onboard diagnostics. Stationary diagnostics tools designed to control large number of parameters (up to 150 or more) at stations of technical control, repair shops and shops and farms.

For General diagnostics of machines for forestry work, forestry tractors and other vehicles it is possible to apply a portable kit KI 13901 placed in the suitcase dimensions 520×350×220 mm, weight 19 lbs. Kit KI-13905 is designed for in-place diagnostics of tractors (at-3) and self-propelled machines. It is located in the back of the van. Stationary set KI 5308A is used for diagnosis of tractors and combines in the

workshops of the enterprises with a large Park and can be located in the specially equipped area.

During diagnosis, check the condition of the candle. Identified malfunctioning or causing fears of a candle (burning or erosion of the electrodes, cracks or destruction of the insulator), of course, replaced with new.

It is known that certain groups of the reducing agent due to the peculiarities of functioning in the same conditions can show their maximum quality and be less effective in another third can be useless and sometimes even harmful. Especially, if they violated the guidelines for their application or if they are being misused.

Erosion (lat. erosio – corrosion) is the process of breaking the surface of the part (structure) under the action of the external environment. Erosion depending on an external factor, her calling, decided to subdivide the gas, cavitation, abrasive and EDM, or galvanic corrosion.

The condition of the cylinder group can determine pneumotextured TO-272M air flow to the cylinder being diagnosed. The pressure drop at the throttle characterized the technical condition of the cylinder. The pressure supplied to the instrument air is 0.25...0,08 MPa, air consumption 1.6 m³/h.

The easiest way to determine the technical condition of the cylinder group of the engine of machines for forestry work is the measurement of compression – the maximum pressure developed in the cylinder at the end of the compression stroke (Fig. 2).



Fig. 2. Measurement of compression in the engine cylinder: (reading compression $K = 1.2$ MPa).

In order to determine the value of compression in the engine, you need to purchase a compression gauge: stamp ICC-1MB, 179 NF4, MT-1, model 88801 (for petrol engines) or model KI-5973 (for diesel).

For petrol engines, the required compression pressure gauge with a measurement range compression $K = 0 \dots 1.6$ MPa, for diesel engines $K = 0 \dots 4.0$ MPa.

Normative values of compression are presented in table. 33, while its values in the different cylinders should not differ by more than 0.1 MPa for gasoline engines and 0.2 MPa for diesel engines.

Currently, some domestic and foreign companies produced special indicator tests, designed to conduct rapid research motor oil, for example, patented in Germany product MOTOR check UP, which you can use to establish the presence of soot in the oil, water, fuel or antifreeze.

The indicator is made from a special type of paper used in the manufacture of electronic chips, which is further treated with special inorganic composition. This impregnation contributes to a more precise formation of borders between the rings.

The method of conducting such a study is quite simple. Engine machinery for forestry works should be warmed up to operating temperature, and then silence. Before testing to remove marked protective strip of paper. Then remove from crankcase control oil dipstick and hold it at a distance of 3...5 cm from the test plate, to apply one drop of motor oil in its middle (Fig. 3).



Fig. 3. Experienced application of tracer test for engine oil.

To put the test on a horizontal surface protected from moisture and give the drop to be completely absorbed without allowing it to glass control. The total time required for image formation at room temperature is from 2 to 15 minutes, depending on the States of the engine oil. For more "old" oil the process of complete formation of (manifestation) image longer and can take up to 45 minutes.

Oil mixture entering the filter cotton the surface of the indicator, slowing the spread of oil stains between the fibers, divided into more

simple components, which, depending on their volatility are distributed at different distances from the location (epicenter) applying drops.

After the sample oil will completely melt and will be absorbed into the paper, formed of up to four concentric rings (Fig. 4).

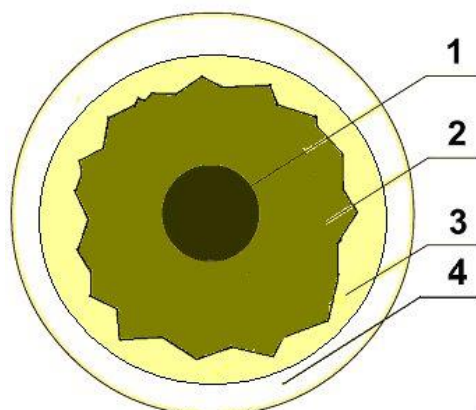


Fig. 4. The scheme of the imprint of the oil drip samples: 1 – soot or mechanical impurities (anti-friction additives), 2 – base base oil, 3 – water (or glycol), 4 – fuel.

The main stage of this research is the identification of concentric circles color intensity, estimation of their diameters and the comparison image with reference chart images.

Color interior (very dark) round 1 using a special scale is determined by the amount of soot and other contaminants in the oil. Excessive soot can be caused by incorrect adjustment of the fuel injection system, which leads to incomplete combustion. The consequences of this accumulation of soot on the valves and pistons, which deteriorates the heat transfer, increase fuel consumption and, consequently, leads to increased wear of engine parts. By the way, most anti-friction additives and modifiers, such as graphite, metal powders, diamonds, polymers, etc., also fall in the Central circle and will be identified as pollution.

The second circle on the indicator 2 describes the basic fundamentals of motor oil is oxidation and aging. The operation of the engine with the oil leads to increased fuel consumption, loss of engine performance, reduction of compression.

The outer contour of the second circle describes the presence of oil and condensate and/or antifreeze. The straight line indicates the absence of water in the oil. If the profile 3 of the zigzag (in this case outside the path can still be formed an additional yellow ring), then the oil is moisture. If the ring is small size – it is a simple condensation, which generally should not cause serious concern, but if large in size, it means the presence of oil and antifreeze. His appearance indicates defects of

the head gasket cylinders and other seals, as well as possible corrosion in the cooling system.

Moisture in lubricants leads not only to a significant reduction of their operational properties, but also to the intensification of corrosion processes in friction joints of the engine.

The presence of an external (light) ring of 4 indicates the presence in the engine oil fuel. It says incorrect adjustment of the injection system, incorrect ignition or some other defects. The presence of fuel in the engine oil leads to a decrease in lubricating properties of oil, and therefore to increased wear of the cylinder group.

Thus, contact lubricants, fuel, moisture, and the occurrence of oxidative processes in the work significantly reduce their stability. Surfactants reducing agents lose their properties, react with moisture and fuel, resulting in not only reduced their efficiency, but deteriorate the tribological properties of the base lubricants.

Thus, in Fig. 5 presents a sample semi-synthetic engine oil LjL Super 10 W-40 SG/CD after a run of 600 Moto hours taken and the total mileage 6900 moto hours.

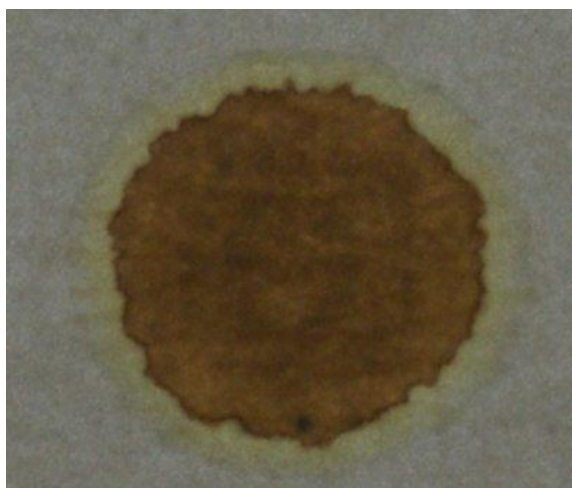


Fig. 5. Fingerprint samples of the engine oil after developments of machines for forestry work 600 hours moto.

On the print you can see the three characteristic fields (concentric circles). The internal field is uniform in color, without the presence of soot and solid impurities. Outer circumference with blurred zigzag edges, indicates the presence in the sample of oil water but in a small amount, most likely it's condensation of atmospheric moisture. The field basics oil has a brown color, indicating the acceptable quality level of engine oil, ie it can still be operated, roughly 150...200 moto hours. Traces of fuel in oil (the presence of another outer circle white color) is not detected.

For ease of monitoring samples and systematization of the data obtained on the test sheet, a line for entering the control records about

the diagnosed machine for forestry work (experience, type of oil, replacement time, etc.) (Fig. 6).

Результат анализа		Замена масла	
хороший	средний	хороший	плохой
Смазка		Замена масла	Замена масла
Состояние		Замена масла	Замена масла
Вода		Замена масла	Замена масла
Топливо		Замена масла	Замена масла

Прогноз (км)
 Сорт масла
 Время работы масла

Замена масла необходима ☐ да ☐ нет

Fig. 6. The imprint of drops of engine oil on the test paper with columns for entering the control records.

Evaluation tables drawn up only for petrol and diesel engines and cannot be used to assess the quality biomotorai oil, and in the case of the use of biofuels (especially biodiesel).

Before the introduction of reducing agents in lubricants, you must also check the condition of the seals of the restored unit.

The main condition for long and reliable operation of the units is in good condition sealing devices (gaskets) and of different protective covers. Significant loss of oil (leak) can lead to the removal of components of the reductant and decrease the expected results of exposure.

The second stage. Purification systems of machines for forestry work. To clean the lubrication, fuel and cooling systems, special cleaners, replace air, fuel and oil filters, and then refilled with fresh motor oil to the lower level (dipstick – gauge), leaving part of the oil preparation of the composition with a reducing agent and subsequent topping up and replace antifreeze if necessary. Not recommended for cleaning of engine oil system of machinery for forestry work flushing oils, as this leads to reduce the quality then fill the engine oil.

The third stage. Preparation and processing of the engine. Operation of non-recovery of internal combustion engines most advantageously carried out at stations of technical service of machines for forestry work, where experts monitor the process of treatment with

complete diagnosis of the engine and ensure the correct use of the device. However, in view of sufficient simplicity, the treatment process can be carried out both on the motor company, and in an ordinary garage (for Parking) and even on the road.

Before the introduction of the devices should have a temperature not below 20 °C for complete removal from the packaging and ease of administration.

Strictly forbidden them heated on an open fire, stove, etc. for these purposes, they can be soaked in a warm place, under running hot water or air. Immediately before administration vial (tube, bottle, canister) with the additive or additives should be thoroughly shaken for 2...3 minutes.

The resulting composition is a lubricant (oil) and the device mix thoroughly for 3...4 minutes and then introduce to the engine or prepared in advance the necessary amount of engine oil. The operation for the introduction of Teflon preparations should be on a cold engine to minimize the possibility of premature polymerization of during pouring. After the injection, start the engine and to carry out a test run or leave it in working condition at least 30 minutes.

Conclusions. Processed machine for forestry work it is necessary to exploit to achieve higher technical and economic indicators as the best results from treatment are achieved, the operating time of 1500 moto-hours. Moreover, during long-term storage components of the reducing agent can delaminate deposited in the wrong place, the formed coating to be corroded etc So if intensive use of machines for forestry work in the winter is not planned, it is better to postpone the recovery of CIP in the spring. You should not increase the manufacturer's recommended dosage of devices administered, which can lead to the opposite result.

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ТЕХНОЛОГІЯ ВІДНОВЛЕННЯ ПРАЦЕЗДАТНОСТІ СИЛОВОЇ УСТАНОВКИ МАШИН ДЛЯ ЛІСОТЕХНІЧНИХ РОБІТ

Л. Л. Тітова, І. Л. Роговський

Анотація. Способи проведення технологічних операцій безрозбірного сервісу можуть бути різними, вони залежать як від механізмів дії препаратів, так і від їх агрегатної форми. Наприклад, оливорозчинні препарати, такі як металоплакуючі присадки і кондиціонери, в основному вводяться в приготовані до заправки або вже заправлені в машину для лісотехнічних робіт паливно-мастильні матеріали. Порошкові препарати (реметалізанти, геомодифікатори) можуть вводитися безпосередньо в зону

тертя (свічкові отвори, підшипники кочення і т.д.). У разі застосування полімервмісних препаратів іноді використовують метод спеціальної обробки – введення аерозолів в паливно-повітряні суміші.

Найбільш прогресивна це система безрозбірного сервісу в залежності від технічного стану машин для лісотехнічних робіт, при якій необхідність того або іншого впливу оцінюється на підставі результатів технічної діагностики. У цьому випадку можна вибирати або профілактичні препарати, більш м'якої дії, або препарати, що забезпечують більш інтенсивний вплив на тертьові з'єднання і агрегати машин для лісотехнічних робіт.

В окремих випадках необхідність у застосуванні ремонтно-відновлювальних препаратів зумовлена низкою інших причин (примусових), наприклад, участю в нештатних випробуваннях (хімічний тюнінг).

Ключові слова: відновлення, машина, препарат, спосіб, система, технологія

ТЕХНОЛОГИЯ ВОССТАНОВЛЕНИЕ РАБОТОСПОСОБНОСТИ СИЛОВОЙ УСТАНОВКИ МАШИН ДЛЯ ЛЕСОТЕХНИЧЕСКИХ РАБОТ

Л. Л. Титова, И. Л. Rogovskiy

Аннотация. Способы проведения технологических операций безразборного сервиса могут быть различными, они зависят как от механизмов действия препаратов, так и от их агрегатной формы. Например, маслорастворимые препараты, такие как металлоплакирующие присадки и кондиционеры, в основном вводятся в приготовленные к заправке или уже заправленные в машину для лесотехнических работ топливно-смазочные материалы. Порошковые препараты (реметаллизанты, геомодификаторы) могут вводиться непосредственно в зону трения (свечные отверстия, подшипники качения и т. д.). В случае применения полимерсодержащих препаратов иногда используют метод специальной обработки – введение аэрозолей в топливно-воздушные смеси.

Наиболее прогрессивна система безразборного сервиса в зависимости от технического состояния машин для лесотехнических работ, при которой необходимость того или иного воздействия оценивается на основании результатов технической диагностики. В этом случае можно выбирать либо профилактические препараты, более мягкого действия, либо препараты, обеспечивающие более интенсивное воздействие на трущиеся соединения и агрегаты машин для лесотехнических работ.

В отдельных случаях необходимость в применении ремонтно-восстановительных препаратов обусловлена и рядом других причин (принудительных), например, участием в нештатных испытаниях (химический тюнинг).

Ключевые слова: *восстановление, машина, препарат, способ, система, технология*

УДК 631.31:64

АНАЛІЗ СИСТЕМ І СТРАТЕГІЙ ТЕХНІЧНОГО ОБСЛУГОВУВАННЯ ЗЕРНОЗБИРАЛЬНИХ КОМБАЙНІВ ТА ЇХ СКЛАДОВИХ ЧАСТИН

Д. Ю. Калініченко, здобувач*

І. Л. Роговський, кандидат технічних наук

e-mail: irogovskii@gmail.com

Анотація. *Ефективність використання зернозбиральних комбайнів безпосередньо залежить від способів і методів підтримання їх у стані технічної справності на необхідному рівні, чого на практиці сприяють різні форми організації систем технічного обслуговування. Існуючі на даний момент форми і методи організації ТО зернозбиральних комбайнів в Україні і за кордоном можна звести до трьох основних стратегій. Будь-який механізм зернозбиральних комбайнів складається з великого числа допусків, починаючи від моменту проектування і конструювання (проектно-конструкторські допуски), виробництва (виробничо-технологічні) і закінчуючи допусками при експлуатації (експлуатаційні), а також під час ТО, які виконуються різними по кваліфікації фахівцями. Так як на практиці не може існувати абсолютно однакових процесів експлуатації, то не існує і двох абсолютно однакових механізмів їх реалізації. До найбільш значущих чинників, який впливає на експлуатаційні характеристики зернозбиральних комбайнів є умови виготовлення, умови зберігання, умови транспортування, умови експлуатації, технічне оснащення і кваліфікація обслуговуючих працівників, номенклатура і якість вироблених обслуговуючих впливів.*

Ключові слова: *аналіз, система, стратегія, технічне обслуговування, зернозбиральний комбайн*

***Науковий керівник – кандидат технічних наук І. Л. Роговський**

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