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RESEARCH AND ANALYSIS OD THE DEFECTS OF OPERATIONAL THE ROLLING BEARINGS BASED ON THE USE OF LUBRICANTS

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Summary. *With the use of the developed laboratory setting, the researches of noise diagnostic characteristicsof the rolling bearings with the useof lubricants by the Peak-factormethod have been conducted and with thecomparison of the charts of the defects development of the rollingbearingsin their elaboration. The conducted research gives the opportunity to analyzethe effectiveness of the lubricant usage in the rolling bearings.*

Key words: *bearing, defect, testmethod, lubrication, material.*

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Problem setting. Bearing is common and at the same time the most vulnerable element of design, which determines the reliability and durability of the mechanism or node in general. For example, analysis of data about the refusal of the vehicle rear hub of *VAZ 2101*showed that usually the refusal of the node is due to bearing damage*108306,* that had beeninstalled there. The damage characteristic of the bearings is that it takes place without significant displays outside, and that in case of failure, entails a node failure, loss of time and high financial costs for repairs.

In the analysis of defects of rolling bearings quite effective method of diagnosis is noise diagnostic method of nondestructive testing. It allows: to detect assembly defects;todetect both external and internal defects; to identify and assess the level of defects in exploitation; to assess according to the acoustic parameters the effectiveness of a lubricant for the rolling bearings.

Solving of the problem of bearings diagnosing will solve the task of forecasting the term of uptime and eliminate serious breakdowns, and to draw the conclusions about the effective use of a lubricant.

Analysis of the known research results. A lot of scientists deal with the questions of determining the cause of destruction of rolling bearings. Recently the use of devices and appliances of non-destructive methods of control of rolling bearings has become popular [1-4].

Data analysis of the literature showed that the problem of non-destructive testing of bearings is of great practical importance for road transport, as this diagnostic method eliminates the necessity for disassembly and assembly of the nodes that rolling bearing have, and thus increases the lifetime of the node and reduces the cost of repairs, and allows to make recommendations on the use of lubricants in rolling bearings.

The aim of the paper is to develop a method and an information system for monitoring the state of bearings according to the in noise vibration parameters based on static criteria by means of charts comparison of noise diagnostic indicators using different lubricants.

Formulation of the problem. To conduct the research on laboratory facility for diagnosing of the rolling bearings by noise diagnostic method using software GoldWawe and Spectrogram. To get dependence on the wear and tear of the rolling bearings depending on the use of lubricants and the graphic display of wear and tear on the software spectrograms.

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Research conduction. Theresearch experiment on vibroacoustic indicators of the bearing is made in several stages. The first stage was conducted as follows: the bearing 306 smeared with the lubricant №158, and installed in the frame; the frame with the bearing installed on the shaft and attached to the electric motor; connected sensor noise and launched the appropriate software on the computer; switched on the setting and recorded audio file, for further processing, switched off the setting, held its partial disassembly to replace the bearing with another lubricant. Another start of installation is conducted with the bearings with the lubricants LITOL-24 and TSYATYM-201 and there is a record of audio files;

Figure 1. Laboratorysettingof noise diagnosticcontrol

The second phase of the experiment is conducted as follows: bearing with the lubricant LITOL-24 was put in the frame, the setting was assembled; the setting was switched on, after that it had worked for 100 hours; in the end of the first cycle of the developments the audio file was recorded, for further treatment; the setting was switched off, the bearing with another lubricant was replaced and the actions of the second stage were repeated. Several cycles of the files record of the bearings developments were conducted, then using the software GoldWave and Spectrogram 16 the analysis of these files was done.

Results of the research. After the experiment, using appropriate software, an analysis of the recorded files on the computer was conducted. The received data (spectrogram, charts and indicators of noise) allow us to see clearly and analyze the state of wear of the bearing and the development of a defect in it, and the impact of lubricant on the behavior of vibroacoustic indicators.

Analysis of audio files, where different lubricants were used, by means of GoldWave program made it possible to see the change in behavior of vibroacoustic indicators of new bearing in the extreme state of wear and tear.

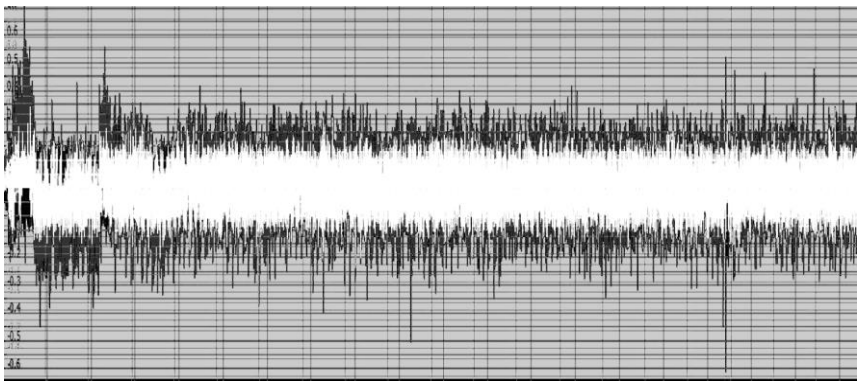

Figure 2. Chart of noise diagnostic indicators using lubricant № 158

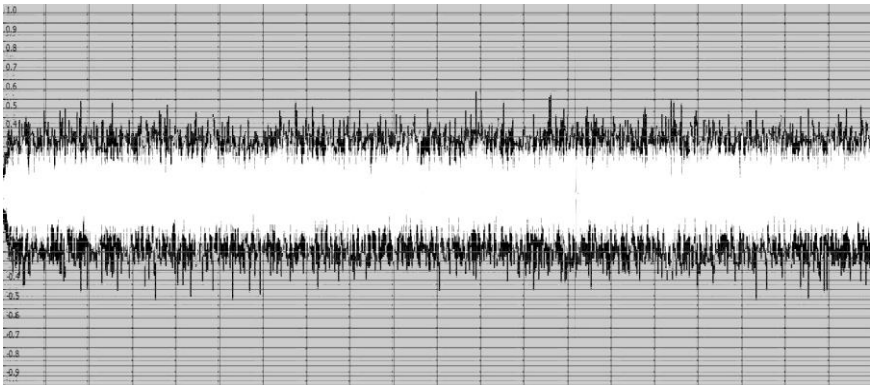

Figure 3. Chart of noisediagnostic indicators using the lubricant LITOL-24

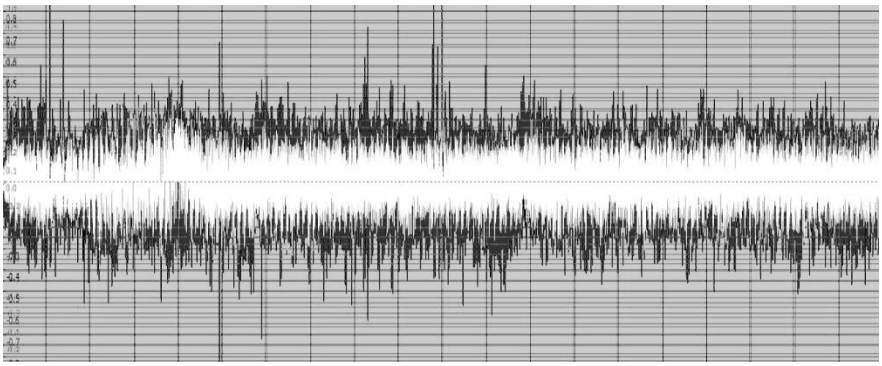

Figure 4. Chart of noisediagnostic indicators using the lubricant TSYATYM-201

Dataofthechartsallowustoseeclearlythedevelopmentofthedefectandoverallstatepictureof theresearchedbearinganddependenceofthestateonthelubricant. White color onthecharts-howstheinitialstate of the researched bearing, andblack color shows the limitingcondition.

Table 1 shows data on the noise value range, which have been recorded during each cycle of the experiment on different lubricants.

Table № 1

The results of the noise measuring

Worktime, hours.		100	200	300	400	500	600	800	1000
Dimension of the sound waves, decibels	*№158*	*46*	*46*	*47*	*49*	*55*	*60*	*69*	*71*
	LITOL-24	44	45	48	54	60	68	74	75
	TSYATYM-201	41	48	55	62	71	75	78	80

Based on the data in Table 1 the graph was prepared (Figure 5) which can analyze the noise range depending on developments.

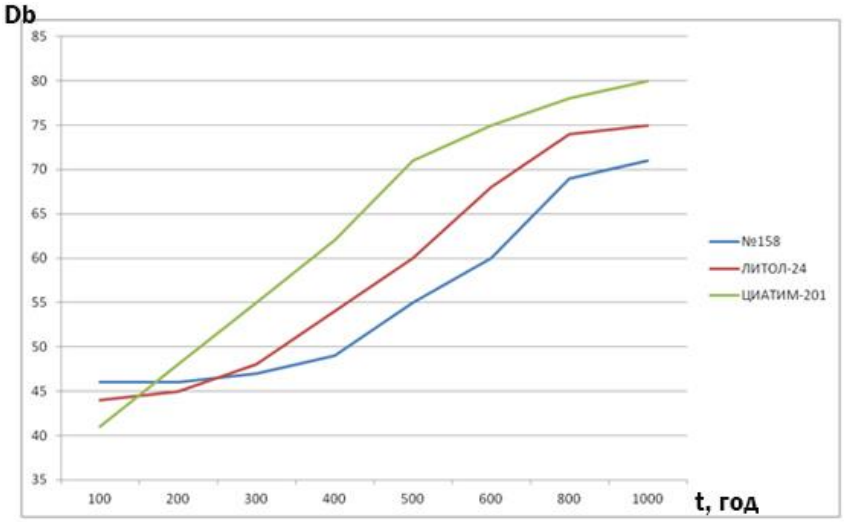

Figure 5. Chart noise of the lubricants

Conclusions. Based on the experiment and due to the analysis of the data, we can draw the following conclusion, that the method of non-destructive diagnostic monitoring of the rolling bearings using different lubricants which we applied gives us the opportunity to get the most accurate data about specific defects of rolling bearings their wear and tear and to prevent the destruction of the entire node in general.

We do not get the data about the kind of defect destruction, but we can only control the overall situation, which is a drawback of this method.

The noise diagnostic method that has been considered gives us the opportunity to make the recommendations on the use of certain types of lubricants in rolling bearings.

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ДОСЛІДЖЕННЯ ТА АНАЛІЗ ЕКСПЛУАТАЦІЙНИХ ДЕФЕКТІВ ПІДШИПНИКІВ КОЧЕННЯ ЗАЛЕЖНО ВІД ЗАСТОСУВАННЯ МАСТИЛЬНИХ МАТЕРІАЛІВ

Дмитро Шматко; Едуард Скорняков; Володимир Авер'янов; Андрій Коровкін

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Резюме. *З застосуванням розробленої лабораторної установки проведено дослідження шумодіагностичних характеристик підшипників кочення з застосуванням мастильних матеріалів методом Пік-чинника та співставленням діаграм розвитку дефектів підшипників кочення по їх напрацюванню. Проведене дослідження дає можливість проаналізувати ефективність застосування мастильних матеріалів у підшипниках кочення.*

Ключові слова*: підшипник, дефект, випробування, метод, мастило, матеріал.*

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