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DIAGNOSTICS OF THE STATE OF BEARINGS KNOTS A NONCOLLAPSIBLE METHOD

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Summary. This paper presents problems of the diagnostics of bearings a noncollapsible method.

Key words. Diagnostic, bearing knot, noncollapsible method, technical state, vibroacoustic, friction.

INTRODUCTION

Frictionless bearing sinews the revolved parts of mechanisms and machines. He has the limited term of service, that, in same queue, influences on a capacity and longevity of mechanism. Breakage of frictionless bearing entails the abrupt ends of equipment, failures in work, high cost of repair.

The decision of problem of diagnostics of the state of bearings a noncollapsible method will help to decide the task of prognostication of death of bearing knot and timely conducting of repair.

It is presently suggested to examine all of period of service of bearings as five stages [1] (fig. 1). We consider that on the first stage, general technical state of the new bearing – «ideal».

On the first stage the set bearing works without the display of some defects. There is earning extra the money of bearing on the second stage. On the third stage appears and begins to develop some defect, there are shock vibroimpulses, growings on a size. On the fourth stage shock impulses in bearing arrive at on the energy practically a maximal value. On the fifth stage the area of development of defect is so great, that bearing begins to "lose" the basic setting - to provide the rotation of billows with a minimum friction, stage of expectation of failure [1, 5, 6, 7, 9].

The analysis of vibroacoustic of information allows operatively to find out a developing disrepair, estimate the degree of its meaningfulness and undertake measures to prevention of unplanned stop of production process. Practically all of the known vibroacoustic methods of control are based on the analysis of either signal or his frequency descriptions. In most cases the vibration of bearing is registered a vibration sensor, set on the corps of bearing which besides additionally collects signals from other mechanical sources of vibration. During work of bearing in composition a mechanism there is a signal with the large level of noise, therefore his sound description is distributed in in relation to to the wide bar of frequencies, which noise and low-frequency effects is laid on on.

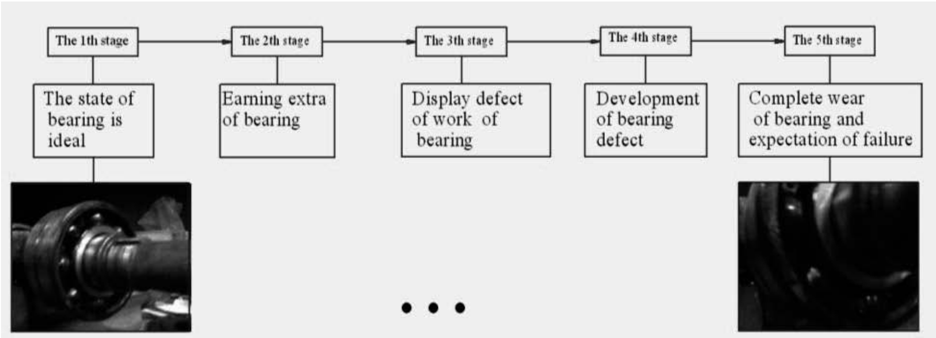

Fig. 1. Flow-chart of the stages of work of bearing

Lately actively the methods of control of bearings develop rolling, based on an analysis and comparison of narrow-band making spectrums. At the same time in works of Yavlenskogo k.N., Yavlenskogo a.K. [3, 9, 10] is shown possibility of application of continuous veivlet transformation for the analysis of vibration signals of frictionless bearing.

The analysis of literary data [2, 3, 11, 12] showed that vibrodiagnosticians expected most authenticity and most effect from introduction of diagnostics of frictionless bearing on the spectrums of vibroacoustic signals. A spectrum is distributing of power of initial temporal signal in a frequency area. It was before considered that appearance of the obviously expressed narrow peaks on a spectrum in the area of characteristic frequencies of one or another element of frictionless bearing, having not only large amplitude but also substantial power, it is necessary to expect only in that case, when a defect will develop to such degree, that his power will be commensurability with power of the expressly diagnosed peaks on a spectrum. In other words, a defect will be visible on a spectrum only then, when he will be developed enough [1].

DESCRIPTION OF EXPERIMENT

Authors are conduct experimental research of work of frictionless bearing №310 (basic parameters of bearing GOST 8338-75 resulted in a table. 1).

For the record of sound of work interesting us workings elements the microphone of the directed action (for basis of which the microphone of Philips SBC MD110 was taken), which passed him on the personal computer, was used. Then findings were processed through the program MATLAB and appendix of “Spectrogram” written for it, which allow to make the spectral analysis of record of sound of work of knot.

Table 1. **Basic parameters of bearing № 310**

Denotation of bearing	d	D	B	r	Marbles		Mass, kg	C, H	C0, H	N
					Dw	z				
310	50	110	27	3,0	19,05	8	1,08	61800	36000	6,3

The new bearings, being in the ideal state were set in the probed knot. During all of term of work of this bearing knot the record of his work and treatment of results was systematic made.

The results of treatment of signals on the different stages of work of bearing are shown out as the graphs (fig. 2-9). On an ax X time of record is represented, on an ax Y frequency, and a color is show force of sound in certain moment of time on certain frequency.

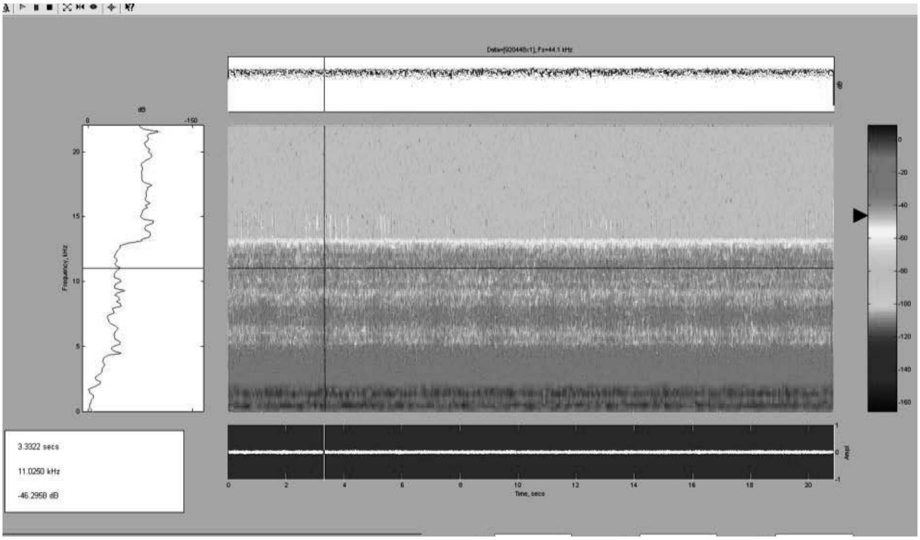

Fig. 2. The 1th stage. Spectral analysis of sound of work of bearing

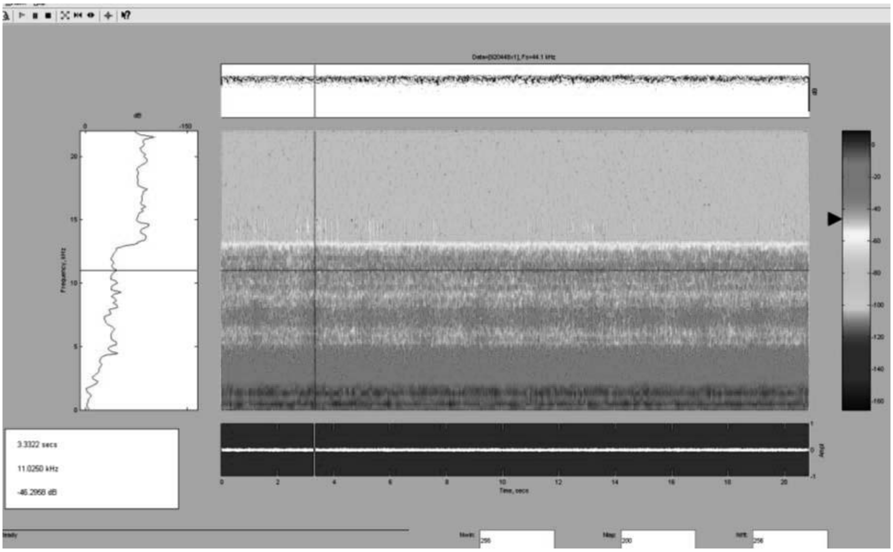

Fig. 3. The 1th stage. Spectral analysis of sound of work of billow

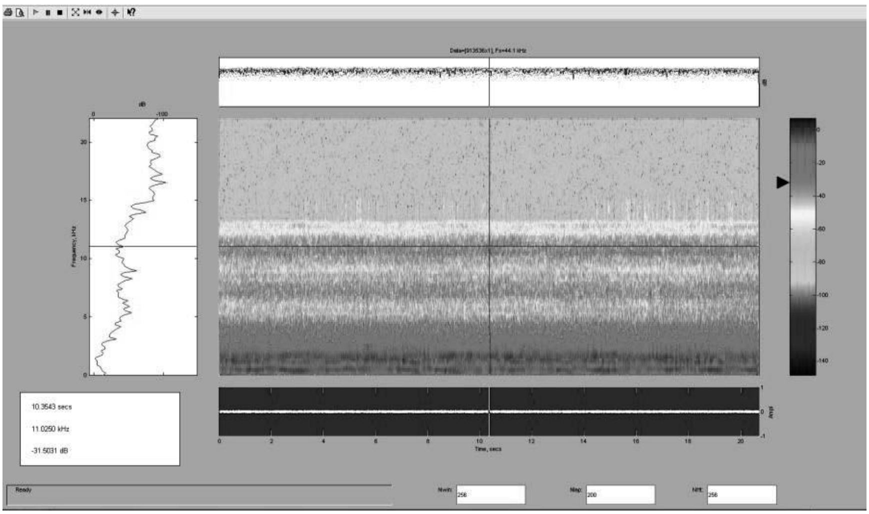

Fig. 4. The 2th stage. Spectral analysis of sound of work of bearing

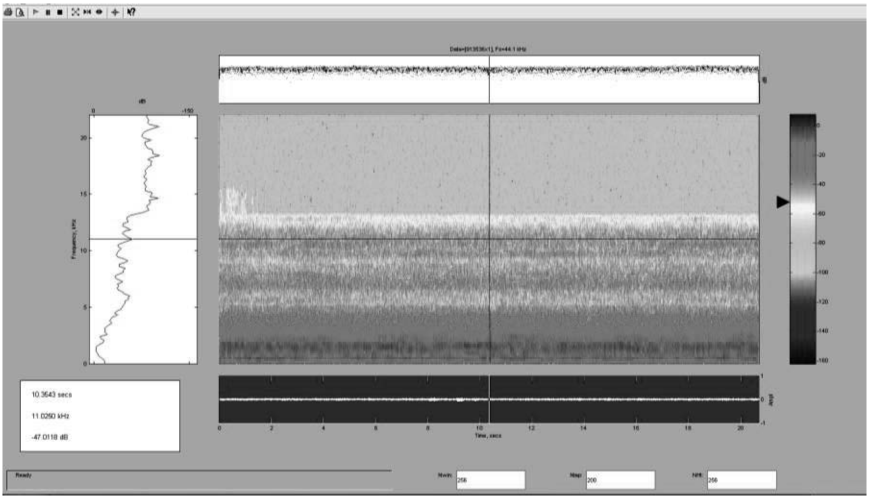

Fig. 5. The 2th stage. Spectral analysis of sound of work of billow

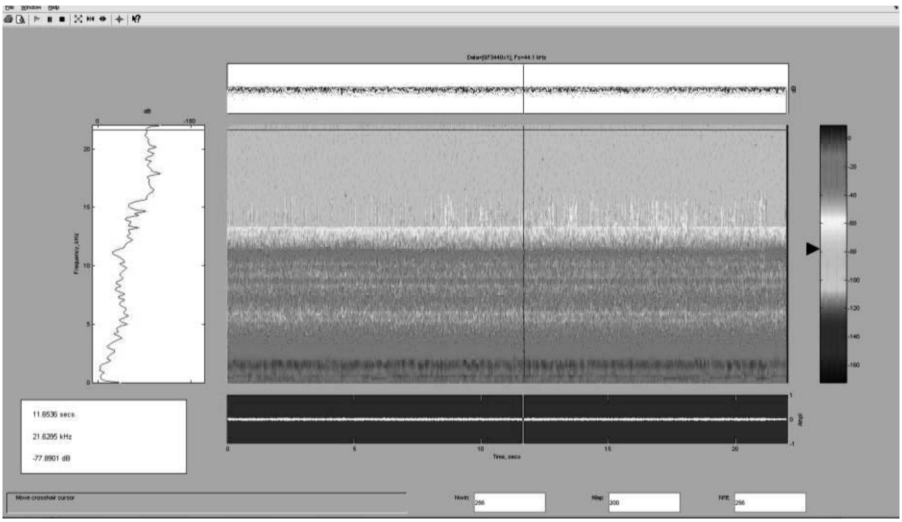

Fig. 6. The 3th stage. Spectral analysis of sound of work of bearing

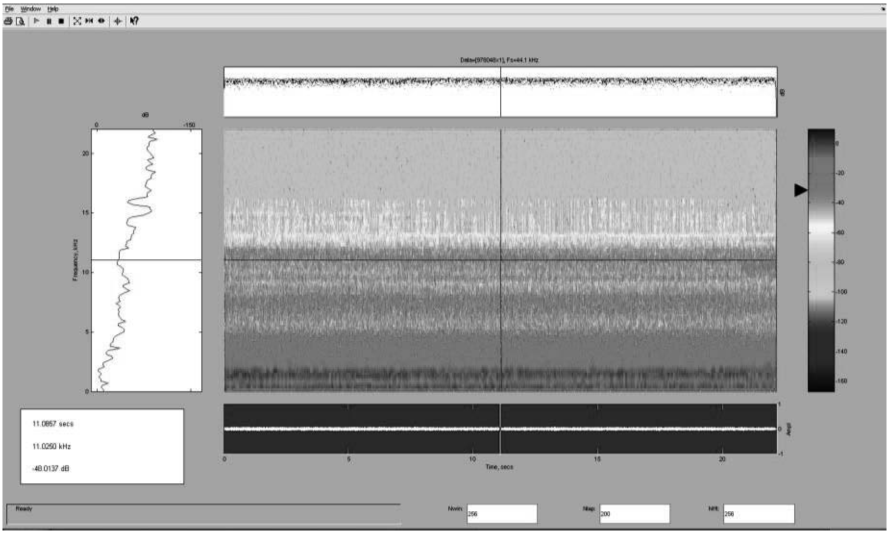

Fig. 7. The 3th stage. Spectral analysis of sound of work of billow

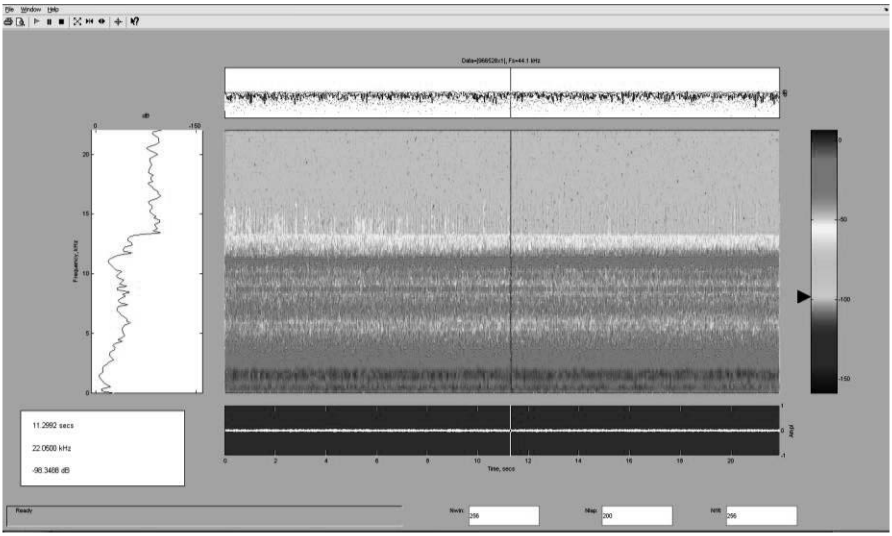

Fig. 8. The 4th stage. Spectral analysis of sound of work of bearing

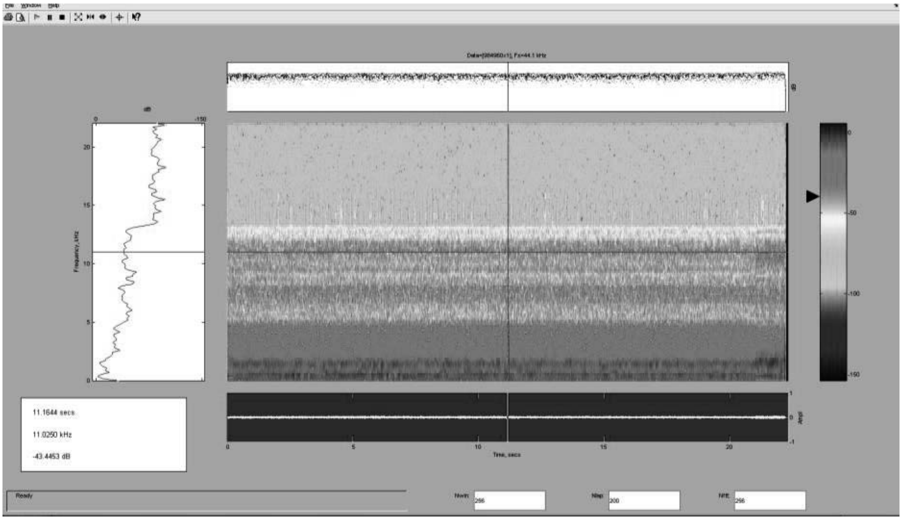

Fig. 9. The 4th stage. Spectral analysis of sound of work of billow

1th stage – a difference between the spectral analysis of sound of work of billow and bearing is not observed.

2th stage – a difference between the spectral analysis of sound of work of bearing and billow shows up as a spectrum of yellow.

3th stage – a difference between the spectral analysis of sound of work of bearing and billow shows up as a spectrum of yellow-red color.

4th stage – a difference between the spectral analysis of sound of work of bearing and billow shows up as a spectrum of red color.

CONCLUSIONS

It was set as a result of analysis of the got data, that spectrum, responsible for the state of bearing № 310, is in a frequency range from 10 to 11,5 kGc. Comparing the results of signals it is possible to assert on the different stages of work of bearing, that with worsening of the state of bearing (development of wear processes, defects) force of sound is increased in the indicated spectrum.

For the probed bearing № 310 under reaching force of sound of 120 dB in a frequency range from 10 to 11,5 kGc it is necessary to make his replacement.

Thus, the use of microphone of the directed action and considered method of the signal processing is given by possibility to conduct monitoring of bearings knots a noncollapsible method. The same chart of monitoring can allow to control any other knots of different machines and mechanisms.

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ДИАГНОСТИКА СОСТОЯНИЯ ПОДШИПНИКОВ НЕРАЗРУШАЮЩИМ МЕТОДОМ

Владимир Витренко, Ирина Кириченко, Михаил Кашура, Александр Кашура

Аннотация. В статье рассматриваются вопросы диагностирования состояния подшипников неразрушающим методом.

Ключевые слова: Диагностика, подшипник, неразрушающий метод, техническое состояние, виброакустика, трение.