

## **IMPLEMENTATION OF NEW ANALYZERS**

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### **ABSTRACT**

*Vibration measurement and analysis have acquired special significance, because they provide a large amount of quality information with a low capital investment.*

*The chose of minimal combination of vibrodiagnostics format witch are going to give an optimal opportunity of detection dynamical problems is made, with complete affection of use end simplicity in using.*

*The final results of measurements and research, shown in the section seven, confirmed that the program structure of new analyzer quickly and practically identifies the cause of dynamic problem that occurred in machines in real conditions of exploitation.*

*During evaluation application software of new analyzer, we can conclude it is in class leading world products, but simpler and more reliable in comparing with all commercial analyzer.*

**Keywords:** rotation machines, dynamics problem in machines, vibrodiagnostics, development new analyzers vibration

### **1. INTRODUCTION**

Vibration measurement and analysis have acquired special significance, because they provide a large amount of quality information with a low capital investment. Existing vibrodiagnostics methods witch are development on existing analyzers vibration of leading word companies, are researched end quality. Which method to choose in an individual case is determined not only by the construction of the machines to be investigated, but is mainly dependent on the expenditure commitment and the depth to which machine diagnosis will be utilized.

The function of set aim in this particular case is the selection of optimal set of formats of vibrodiagnostics that provide the maximal possibility of detection, selection and verification of dynamic problem, considering economic rationality and simplicity for use.

Beside the researches that were performed, the literature of leading world companies from this field of work is used. Here are some of them: Bruel & Kjeaar, Vibro; SCHENCK; Bently Nevada; SKF; SPM etc.

Programs structure of now analyzers including optimal set of vibrodiagnostics formats[3].

Computers platforms of now analyzers chosen is SB-X255, this is based standard PC/104+.

This is platforms including PCMCIA controller and slots [11].

Sensor of vibration in chosen is SKF industrial accelerometer CMCP1100. For measurement faze angle and rotation sped chosen is optical sensors ROS-5P (by Monarch Instrument), measurement range 1- 250,000 RPM.

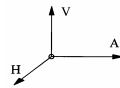
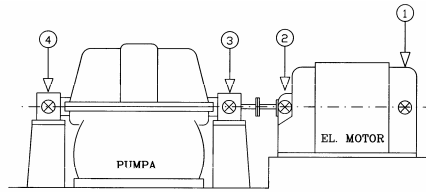
### **2. MEASUREMENT RESULTS OF NOW ANALYZERS**

This is presented practically identifies the cause of dynamic problem that occurred in machines in real conditions of exploitation.

#### **2.1. Diagnosis of EP**

1. Thermal Power Plant Gacko,
2. Plant: pump

3. Data and time: 15.02.2007



Picture 1. Show plant pump

### 3. THE RESULTS

#### - Overall of vibrations

Table 1. Overall of vibrations in pump bearings

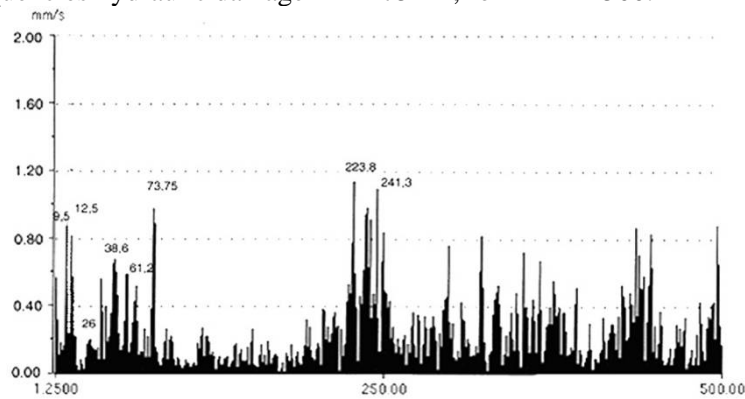
Bearings	Horizontal	Vertical	Axial
	$\sum v_{RMS}$ [mm/s]	$\sum v_{RMS}$ [mm/s]	$\sum v_{RMS}$ [mm/s]
1	1,6	1,2	1,8
2	1,2	1,1	1,3
3	1,9	2,1	1,5
4	3,2	3,1	1,2

Evolution from in ISO 10816 standard: permissible.

#### - Spectral analysis

Let's show spectral plot horizontal vibration in 4-th bearings.

Damage characteristic frequency for SKF6318: BPFO= 38,6 Hz, BPFI=61,2 Hz; BSF=26,1 Hz; FTF=4,75 Hz, frequencies hydraulic damage BPF=75 Hz, for RPM=1500.



Picture 2. Spectrum plot horizontal vibration for 4 bearings

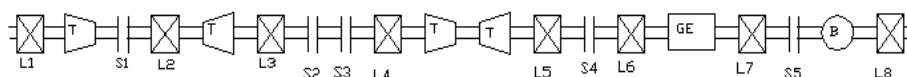
This is spectrum plot which shows detection of damage in rolling-element 4-th bearings.

#### - HFD values

HFD values is 9,2 g. This is high values.

### 2.2. Diagnostics of turbine

1. Thermal Power Plant Gacko
2. Plant: turbine



Picture 3. Show plant turbine

3. Data and time: 23.02.2007 in 18:30

4. The results

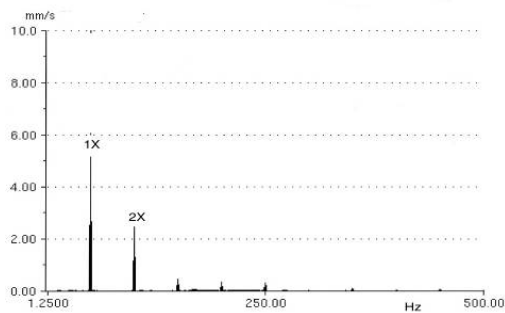
**- Overall of vibrations**

Table 2. Overall of vibrations in pump bearings

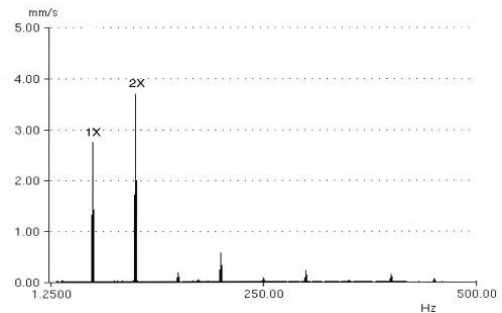
Bearings	HOR	VER	AX
	$\sum v_{RMS}$ [mm/s]	$\sum v_{RMS}$ [mm/s]	$\sum v_{RMS}$ [mm/s]
1	3,4	1,8	1,8
2	2,1	1,8	2,1
3	1,4	3,6	2,2
4	2,0	1,9	2,3
5	3,2	2,7	2,1
6	3,3	4,6	6,5
7	3,8	5,8	9,3
8	6,4	5,2	4,1

Evolution from in ISO 10816 standard: permissible.

**-Spectral analysis**



Picture 4. Spectral plot vertical vibrations in bearings 7

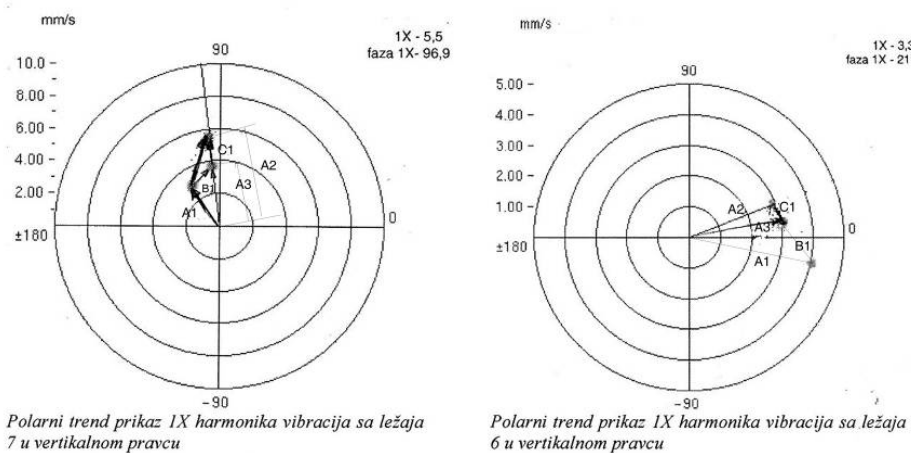


Picture 5. Spectral plot vertical vibrations in bearings 6

From the spectral plot dynamic damages can be identified: unbalance and misalignment.

**- Polar plot**

Let's show Polar plot 1X harmonic vibration in 6-th and 7-th of bearings, various in parameters process.



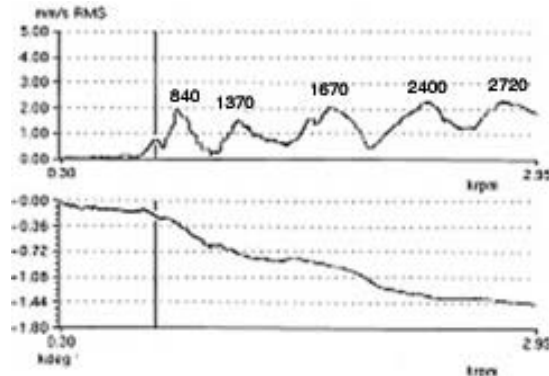
Picture 6. Polar trend plots of 6 and 7 bearings

From the Polar plot we can see change of amplitude and phase 1X harmonics vibrations.

We can see B1- vector thermal unbalance, C1- vector asymmetric magnetic field.

## - Bode plot

Let's show Bode plot 1X harmonics vibration during start-up machines in 1-st bearings.



Picture 7. Bode plot

We can see resonance frequencies turbine: 1- 840; 2- 1370; 3- 1670; 4- 2400; 5- 2720.

## 4. CONCLUSIONS

We came up to the following results this paper:

- The concept of multi-channel analyzer is set. Its program structure contains optimal model of vibrodiagnostics
- The value of application software of a new analyzer is compared with up to date world solutions on the same issue.

The final results of measurements and research, shown in the section seven, confirmed that the program structure of new analyzer quickly and practically identifies the cause of dynamic problem that occurred in machines in real conditions of exploitation.

## 5. REFERENCES

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