CONSIDERATIONS REGARDING THE ASSESSMENT OF THE WORKING STATUS OF A BAC COMPRESSOR

Alisa Filofteia OPREA[1], Nicolae POPA[1], Constantin ONESCU[1]
[1]University of Pitesti, Romania,

Article history:
Received: 10.06.2013; Accepted: 20.09.2013.

Abstract: *One of the very important factors to increase productivity and decrease fabrication costs is represented by the improvement of the equipment's reliability and, by default, the decrease of maintenance costs. A safe way to increase the reliability is to decrease the vibrations level. This paper presents a case study, in which the registered vibrations at a compressor are an alarm signal for the equipment and this supposes maintenance works for the vibrations' decrease.*

Keywords: compressor, vibration, maintenance, spectrum

INTRODUCTION

The analysis of the equipment's behavior during operation and the way in which they can crash leads to the conclusion that, for over 70% of the equipments, it can't be statistically established a good working interval. That's why the preventative maintenance, which implies fixed intervals for revisions and repairs, leads to major additional costs, affecting the indirect costs through the increase of the equipment's or technological line's stopping time.

The preventative maintenance method can still be applied for some equipment, where the maintenance costs don't represent the major factor to optimize, but they have to work safety. Statistically, the method must be applied for 2-5% of the existing system within equipments. That is the reason since 80's, a new series of concepts regarding the optimization of maintenance related costs were elaborated, materialized in two new maintenance methods: predictive and proactive maintenance.

The predictive maintenance method starts from the premise that equipment's status can be monitored by specific tools during its working, so in every moment it can be traced down a developing flaw. The plans for repairs must be done in such a way that the flaw wouldn't develop. This method has one inconvenient: not all the flaws are predictable, which means that there are flaws that can appear suddenly, with no obvious reason.

Opposed to the other methods, the proactive method looks to eliminate the causes that lead to the appearance of the flaws. By partially or totally eliminating these causes, the interval between two repairs can grow a lot. The proactive maintenance is not just a theoretical concept; it is a way of action in order to highly increase the installations' global reliability.

CASE STUDY

For the implementation of a proactive maintenance system, two essential conditions are required:

- The existence of a data base with information about the equipment behavior;

- The periodically analysis of the causes that lead to the equipment default, in order to eliminate

these causes before they create the necessary conditions for the flaws.

The analyzed equipment is a BAC air compressor.
The monitoring of the dynamic equipment's working status was done by measuring the vibrations on the bearings' cage in the points mentioned in figure 1, with a vibrations analyzer using an accelerometer with a 100 mV/g sensibility.

WIDE BAND MEASURING VALUES

The values presented in the following tables represent the amplitude of the vibrating velocity in mm/s, RMS on the frequency interval 110Hz-1500 Hz.

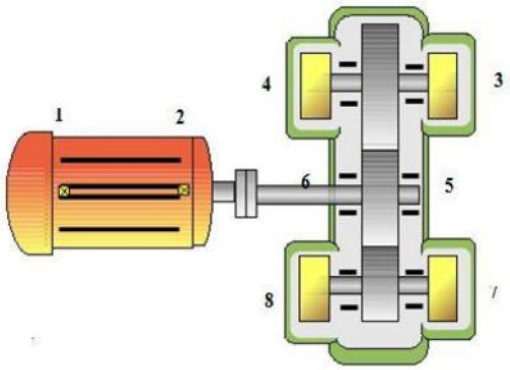


Figure 1. Vibration measuring points on compressor.

Table 1. Wide band measurements

Point	Direction	Values	U.M.	Date/time
P1	A	2.17	mm/s	06/04/2010-10:31:38
P1	H	4.86	mm/s	06/04/2010-10:32:02
P1	V	1.31	mm/s	06/04/2010-10:32:23
P2	A	4.83	mm/s	06/04/2010-10:33:23
P2	H	4.51	mm/s	06/04/2010-10:33:47
P2	V	2.45	mm/s	06/04/2010-10:34:11
P3	A	1.76	mm/s	06/04/2010-10:37:13
P3	H	1.23	mm/s	06/04/2010-10:37:38
P3	V	1.99	mm/s	06/04/2010-10:38:03
P4	A	1.60	mm/s	06/04/2010-10:35:48
P4	H	0.63	mm/s	06/04/2010-10:36:09
P4	V	1.71	mm/s	06/04/2010-10:36:36
P5	A	3.14	mm/s	06/04/2010-10:39:21
P5	H	1.63	mm/s	06/04/2010-10:39:44
P5	V	2.21	mm/s	06/04/2010-10:40:11
P6	A	3.22	mm/s	06/04/2010-10:45:31
P6	H	1.70	mm/s	06/04/2010-10:45:56
P6	V	2.28	mm/s	06/04/2010-10:46:19
P7	A	2.64	mm/s	06/04/2010-10:41:16
P7	H	1.21	mm/s	06/04/2010-10:41:38
P7	V	1.76	mm/s	06/04/2010-10:42:04
P8	A	3.34	mm/s	06/04/2010-10:43:33
P8	H	0.70	mm/s	06/04/2010-10:43:57
P8	V	1.76	mm/s	06/04/2010-10:44:21

WIDE BAND VALUES INTERPRETATION

In order to appreciate the severity of the measured vibrations, it was used ISO 10816/3 – 1998 as reference. According to this standard, the analyzed equipment, having the nominal capacity of 4,1 MW, may come under group 1 "Large machines with nominal capacity over 300 kW; electrical machines with the distance between the shaft axis and the sustaining plan H - 315 mm". In the absence of some stipulation from the machine manufacturer, the following limits of the vibrations in the evaluation area may be considered:

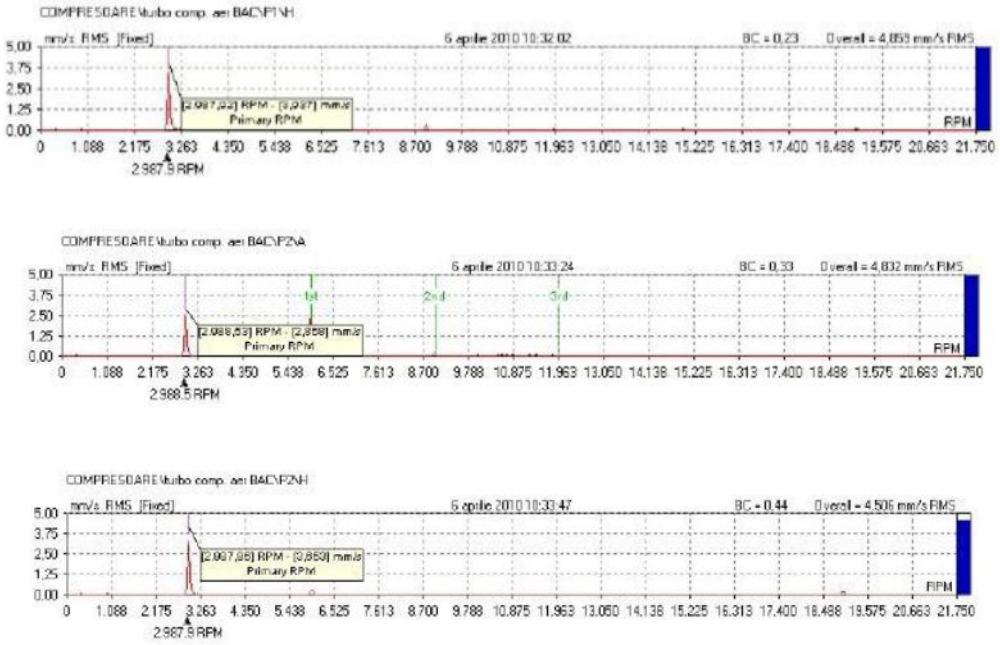
Evaluation area	Limits
A/B	2.3
B/C	4.5
C/D	7.1

Comparing the registered values with the limits estimated in the standard, we can notice that on the electric engine, in point 1 vertical direction and point 2 axial appear values from the beginning of evaluation zone C. The machines with vibrations in area C, are normally considered to be unsatisfying for continuous working on long term. In generally, they can operate for a limited period of time in this status, until a possibility for repair actions shows up.

The vibrations measured in points P 2 -V, P2 - H, P 5 -A, P 6 - A, P 7- A, P 8-A come under evaluation area B. According to the standard, the vibration values are considered acceptable for continuous working on long term.
The rest of the measured values are in the normal limits range for the analyzed equipment.

SPECTRAL ANALYSIS

On the diagram amplitude/frequency is mentioned as predominant frequency of vibrations the drive speed of the electric engine (approximately 49.8 Hz), as can be observed in the figure 2 for the points 1H, 2A, 3V, 4V, 5A, 6A, 7A, 8A.



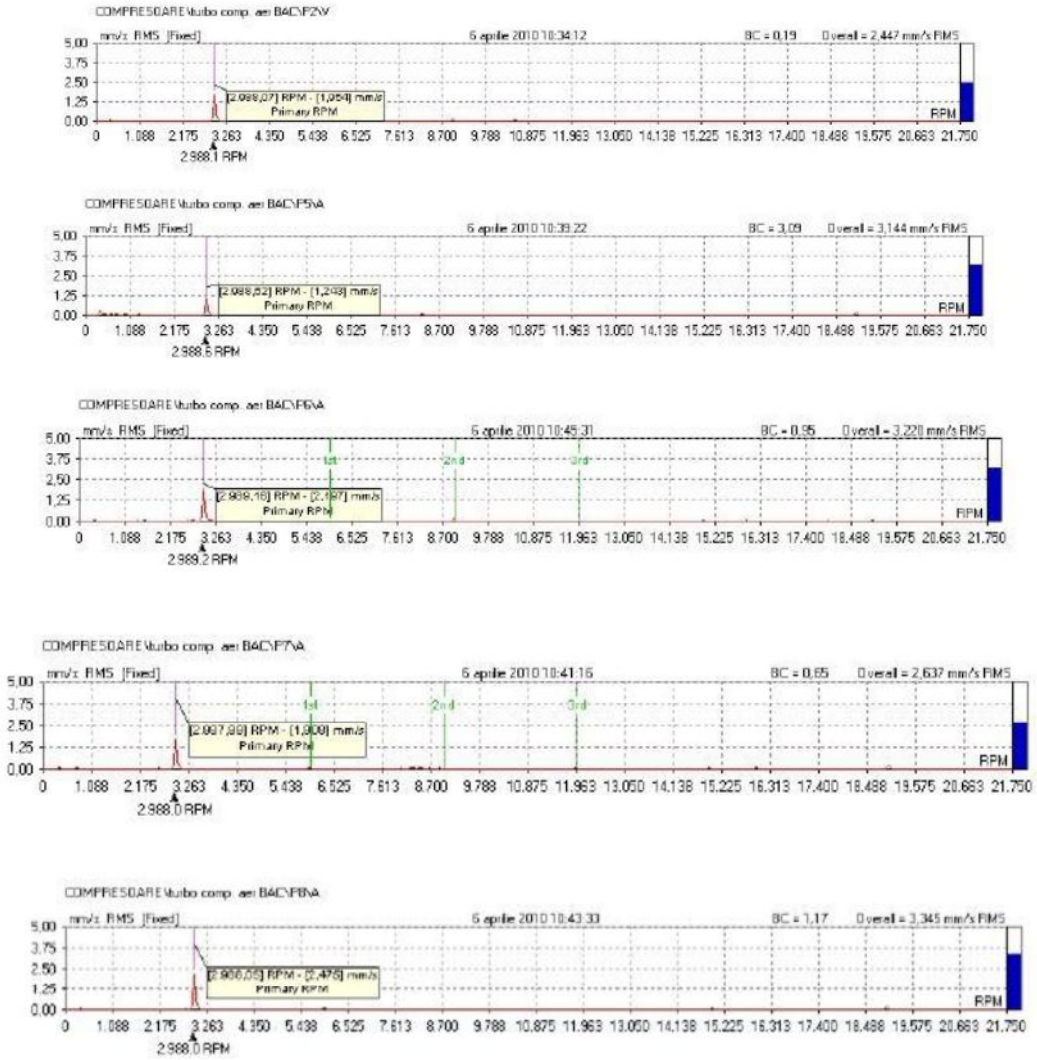


Figure 2. Frequency analysis.

The diagrams amplitude/frequency for the measuring points of the compressor show the vibration occurrence on the drive speed of the electric engine.
Taking into consideration all presented above, we present as cause for the measured vibrations the inadequate transmission of the torque to the compressor. It can be determined by the inadequate working of the coupler (blocking due to possible positioning errors) or by aligning errors.

CONCLUSION

The alignment of engine-compressor axis will be verified. The alignment procedure should contain the verification of the soft foot, as well as thermal compensations according to the technical recommendations of the producer.

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