

INFLUENCE OF ABATEMENT OF THE MECHANICAL JOINTS ON THE ROTATING MACHINES

ВЛИЯНИЕ ОТПУСКА МЕХАНИЧЕСКИХ СОЕДИНЕНИЙ НА РАБОТУ ВРАЩАЮЩИХСЯ МАШИН

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Abstract/Rezюме: This work emphasizes the insufficient tightening or abatement of the mechanical joints which appear during the functioning of the mechanical equipment as a result of a late technical revision. The manifestation of this fault of exploitation, similar to a lack of balance presents specific particularities, emphasized through the analysis of the received signal in the domain of time, respectively frequency.

KEYWORDS: SPECTRAL ANALYSIS, AMPLITUDE, LACK OF BALANCE, ROTATION FREQUENCY.

1. Introduction

In the case of the dynamic equilibration of the rotors (the rotation axis rigorously coincides with one of the main inertia axis), in their bearings does not appear any perturbative action. In practice this thing is very difficult to achieve and during the exploitation of the rotating machines, because of some incidents lacks of balance appear which determine the malfunctioning or even the removal of the building block.

In the case of the unbalanced rotors, during every period of rotation of the rotor the manifestation of the lack of balance is produced in the same position, respectively at the same value of the disequilibrium angle [1]. Analyzing the signal in the time domain we observe this is a harmonious signal but in the frequency spectrum the disequilibrium appears in both rotation bearings 1x, and the amplitude is proportional to the value of the disequilibrium. In case of the dynamic disequilibrium the vibrations appear in both bearings, at both sides of the rotor, they are radial and of counter direction, they have a sine signal in the time domain and of 1x frequency. Measuring the phases of the radial vibrations in the two bearings we observe that they have altered phases by 180° [4]. For the equilibration of this kind of axle a dynamic equilibration is needed. Usually the dynamic equilibration of the rotors is made in one or more axial planes, dependent on the forms of the rotor [2].

2. Experimental plant

The determinations regarding the diagnosis through vibrations of the insufficient tightening or accidental abatement of the mechanical joints were made on a rotor which equips a beater mill MCF7. The bearings of the beater mill were equipped with a vibration pickoff KD35, with the purpose of taking over the vibrations of the rotor as a result of the disequilibrium to which this is constrained during exploitation. The signals supplied by these pickoffs, calibrated and taken over through an acquisition interface DAS1600 installed on a computer were taken over and stored into files [5]. The correspondence between the measured size and the supplied voltage was made through the calibration and standardization of pickoffs. The watching of the received signal is made with acquisition software conceived to ensure the possibility of graphical representation in time of the signal on the oscilloscope.

3. Experimental determinations

The emphasizing of the technical state of the beater mill MCF7 was made with an unequipped rotor, the mill running idle. The signal obtained in the time domain was sine (fig. 1). In the frequency spectrum the rotation frequency is emphasized, 1x, at 49.6 Hz. In

fig. 3 we present the signal in the time domain, respectively in fig. 4 the spectrum in the radial frequency domain measured by the case of the bearing of the beater mill, to which one has untightened two screws used for fixing the mill.

4. Conclusions

The presence of a high amplitude line in the frequency spectrum to a rotation frequency of the mill equal to 49.6 Hz leaves us the impression of an unbalance of the rotor, disequilibrium able to fix through an equilibration.

Watching the frequency spectrum attentively we observe the appearance of spectral lines (peaks) to fractionate values of the rotation frequency. The frequency is generated by the ununiform movement of the rotor at every rotation. Going on with the abatement of the screws and analyzing the signal in the time domain (fig. 5), respectively the spectrum in the frequency domain (fig. 6), we observe the appearance in the frequency spectrum of a peak to a frequency equal to $\frac{1}{2}$ of the frequency of rotation, determined by an additional angular movement at every second rotation which appeared because of the continuous abatement of the screws. We observe the same thing to the signal in the time domain, where at every second rotation the intensity of the signal is higher than at the rotation before.

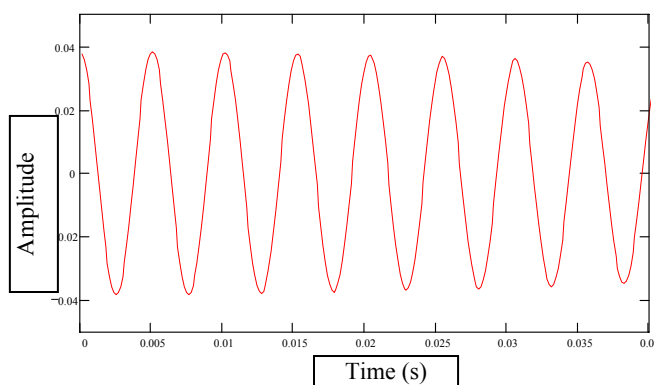


Fig. 1 Signal in time domain.

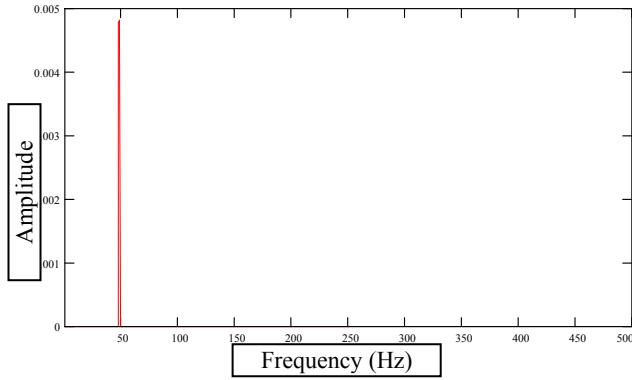


Fig. 2 Frequency spectrum.

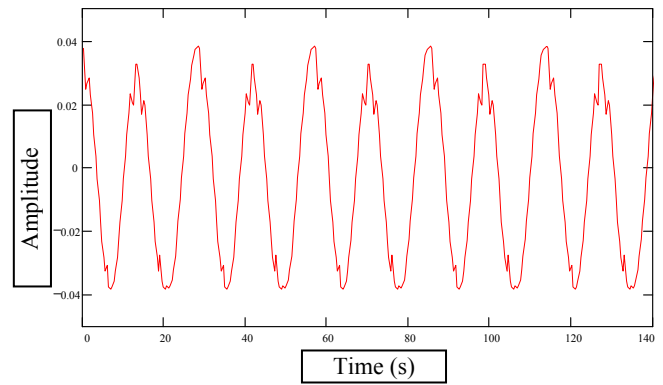


Fig. 5 Signal in time domain.

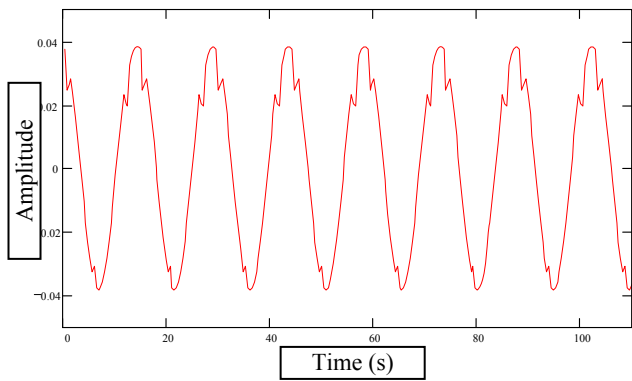


Fig. 3 Signal in time domain.

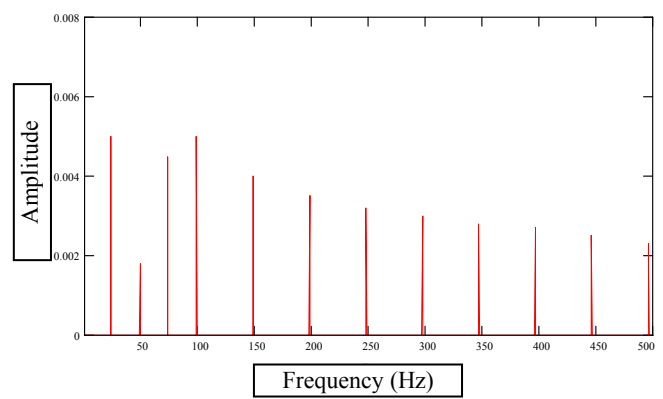


Fig. 6 Frequency spectrum.

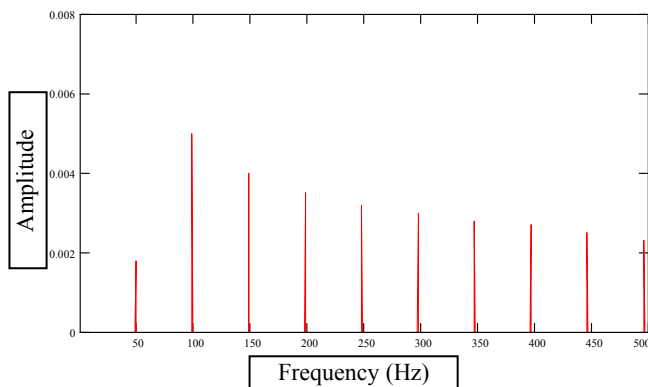


Fig. 4 Frequency spectrum.

5. References

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