

оброблювального середовища контейнера вібраційної машини, вплив оброблюваних деталей, які вводяться шляхом збільшення маси контейнера на величину маси середовища, зменшеної на коефіцієнт зависання робочого середовища), моделювати можливі нестационарні – резонансні режими, які можуть зустрічатись під час роботи вібраційної машини.

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MEASUREMENT VIBRATIONS

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Introduction. Vibrations are an expression of mechanical parts of machines, reacting on internal and external forces of a system. Vibrations are always annoying aspect of running of mechanical plant. Majority of failures developing in rotary machines show itself by excessive vibrations. Therefore is able to use vibration signals as indicators of mechanical condition of machines. Every mechanical failure or defect generates specifically vibrations. To identify causation of failure and to select proper steps for its improvement it is necessary to identify type of vibration. Vibration diagnostic is set of measuring and of evaluating methods permitting objective determination of machine condition. Differences between determinations of failures and analyzes of developing of failure's causes are considerable. Early identification of failure is main premise for planning of improvement interventions, rise of reliability and minimalization of failure rate.

Total vibrations – overall. When vibration signal is analyzed, two components are important: amplitude and frequency. Amplitude is magnitude of vibration signal and it is related with severity. The bigger amplitude, the higher vibrations and higher of severity are. Frequency indicates failure ratio of certain time duration. Types of failures can be appreciated according frequency of vibrations. If we find frequency at which vibrations develops, causes of its generation are more clearly. Total vibrations present total vibrational energy measured in certain frequency rate. Measuring of total vibrations and comparing of its value with a standard leads to acquisition of information about condition of machine. Vibrations are considered to most significant operating parameter according that low-frequency conditions can be appreciated, as for example: imbalance, unalignment, mechanical bearing clearance, resonance of construction, not enough rigid foundation, bent shaft, undue wear of bearing or breaking of rotor blade.

Frequency range of measuring depends on used measuring equipment. Significant condition for comparison of two values is to realize measuring of both values in same frequency range.

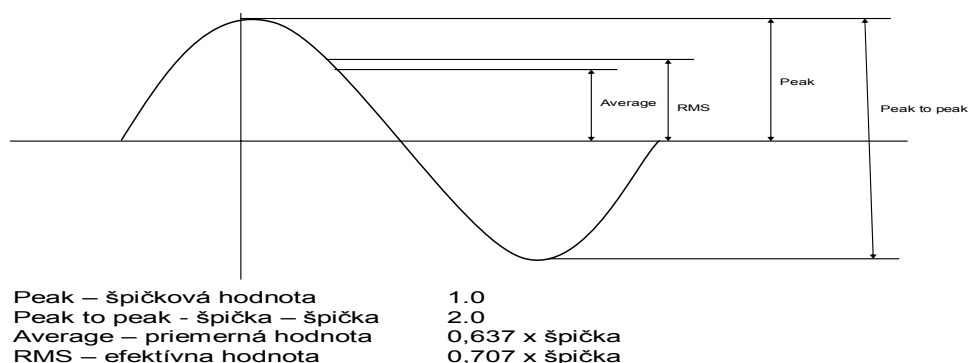


Fig. 1 Expression of amplitude signal value by measuring with total vibration method

The most proper and the most reliable method for appreciation of vibration is to compare the measuring with a previous measuring. This procedure allows following trend of developing of vibration values in certain intervals. Analyze is then written to trend graph. A trend graph is a linear graph showing dependence of vibration values to time.

For comparison of initial values is suitable to use ISO standard defining conditions for classification of machines. After data logging, comparison step follows. In this step values of further measuring are compared with values of antecedent measuring. The reason for usage of this method is that each machine is produced with certain differences, each machine is dissimilar installed, set and each machine works in dissimilar conditions and each machine has different maintenance.

Multiparametric monitoring. The princip of a multiparametric access to running monitoring of machine is in usage of several measuring methods at the same time allowing best detection and diagnostic of machine failure. The multiparametric access permits early uncovering of a specific breakdown of machines used to be invisible for normal monitoring method. At the same time multiparametric access permits more ways how to measure deviations from normal behavior of signal. Multiparametric monitoring seems to be very effective by monitoring of conditions of bearings. If defect develops on external raceway with bearing rollers then each bearing roller passing this place impact to the defect what cause weak repeating vibrational signal. Its amplitude is so small that by usage of total vibration method it is losing in spectrum of vibrations actuated by running speed or by oscillation of construction. For detection of the failures is the most proper choice usage of multiparametric monitoring.

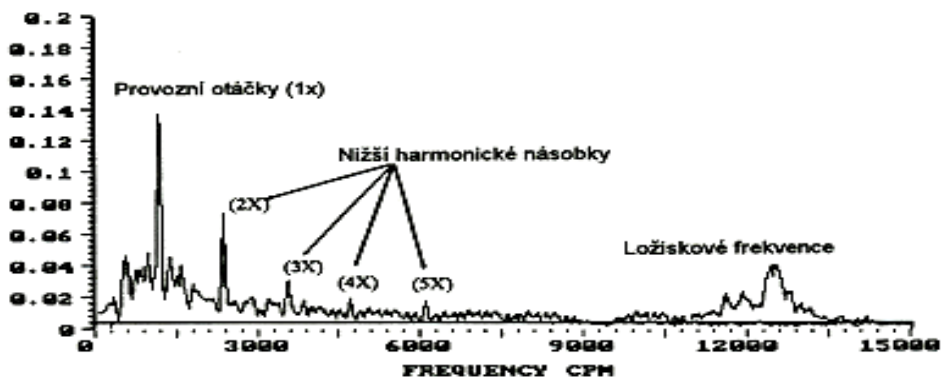


Fig. 2 FFT spectrum

martSCANNER. Apparatus SmartSCANNER is caused by integration of laser device for machine setting and of vibration analyze apparatus to one apparatus.

A SmartSCANNER measures most important parameters informing about changes of technical condition of monitoring apparatus: vibrations and analyzes of vibrations, condition of rolling contact bearings, temperature, running speed and cavitation of pumping unit. Apparatus has built-in sensors for measuring of mentioned parameters. It is possible to connect external sensor to the apparatus. Four LED diodes indicate ISO 10816-3 evaluation levels. Balancing module permits balancing in one or two levels. Balancing module measures process parameters and offers customer-defined tasks with manual entering of retrieved data. At the same time it is electronically recorder, because besides measuring function is able to record information from visual control. It permits to let horizontally or vertically setting of machine by using of common functions. It offers functions and properties caring about user comfort.

Data collection and machine diagnostic:

- In-build sensors: simultaneous measuring of vibrations, of cavitation and of high-frequency shock pulses emitted by rolling contact bearing is able to perform by means of patented accelerator, tilting elastic sensor for measuring of temperatures at intervals – 50 °C to +100 °C, contact less measuring of running speed.
- Software: OMNITREND® PC permits to transfer data about machine setting and monitored machine condition to joint database
- Trend: machine damage following by means of trend curves – directly on display of apparatus or by the medium of software OMNITREND® in case the apparatus is used as data collector.
- Signal analyze: time signals and trajectories detect damage for low-speed machines and gear boxes.
- Machine diagnostic: FFT analyze and envelope analyze provide information for diagnoses of machine, rolling contact bearings and toothing.
- Balancing: allows balancing in one or two balancing levels.
- Electronical recorder: besides measuring function is able to record information from visual control.



Fig. 3 SmartSCANNER – Apparatus 3-in-1

Conclusion. A system of maintenance control is more and more important for decrease of manufacturing costs and for effective usage of machine time. The system of maintenance control together with marketing strategy creates necessary condition of healthy and profitable functioning of a firm. Basic idea of this system is application of system of reciprocal connection of a preventive maintenance and of a

productive maintenance, precisely monitoring trends of machines and creating clear estimation about future functions of parts. The task is to prevent expensive unavailability time at catastrophically breakdown, to prolong operating time of parts, to minimize warehouse stock of replacement parts. Application of the methods in manufacturing system leads not only to reduction of manufacturing costs but also to increase of qualitative characteristic of manufactured parts.

Productivity is rising due to minimalization of unavailability time of manufacturing machines and of apparatuses. Being short we can say that it is thorough diagnostic following of machine condition. If certain wear is found, unavailability time in optimal time and range and following reparation is planed even when machines are still running. At the same time accent is put on breakdown prevention by creating of optimal condition for machine running. The optimal conditions for machine running is created mainly by proper setting and balancing of rotating parts and by proper bearing lubrication. Trend leads to establishment of intelligent parts that permit more accurate and surer reacting on situation of machine in danger.

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