

Compilation of vibrodiagnostic indicators of industrial equipment for the implementation of Predictive Maintenance systems
Paweł Fic

Silesian University of Technology, Department of Automatic Control, Electronics and Computer Science,
Department of Automation and Robotics
Supervisor: Prof. Adam Czornik, D.Sc.

Abstract: The paper will include a discussion and comparison of the values of vibrodiagnostic indicators for various industrial equipment. Vibrodiagnostic indicators will be contrasted with indicators derived from temperature, current and voltage measurements of equipment supply. The business benefit provided by Predictive Maintenance class systems will be discussed using an example from a real implementation.

The data analyzed comes from industrial implementations and from tests on a test bench set up for the doctorate. Much of the measurement apparatus is manufactured by the company where the implementation doctorate, within which the described research is conducted, is being carried out. The apparatus will not be discussed in any detail, but only an overview will be given.

The business motivation with an example calculation will be presented based on the implementation of an industrial Predictive Maintenance system. Implementation difficulties will also be indicated. In terms of algorithmic and hardware.

Industrial equipment has been studied. These include electric motors, low and high power, multi-stage centrifugal pumps, multi-piston pumps, fans and servo drive. The analysis of data from multistage centrifugal pumps was carried out on a relatively large statistical sample. Namely, several dozen units. The indicators developed for industrial equipment were compared with analogous indicators for equipment closer to everyday life such as washing machines and internal combustion engines. The motivation for conducting research in an environment other than strictly industrial will be adequately motivated and summarized.

Methods assuming time series analysis will be compared. In particular, Fourier analysis and statistical analysis set in the context of the measurement apparatus being developed for the doctorate. The possibility of fusing vibration measurements with measurements of other types will also be briefly presented.

The last part of the paper will be suggestions for further research. The possibilities of applying artificial intelligence will be indicated. In particular, neural networks.

Data and examples from industrial implementations will be anonymized.

Literature:

Kowalski, Cz. 2013, Diagnostics of drive systems with induction motor with the use of artificial intelligence methods, Oficyna Wydawnicza Politechniki Wrocławskiej.

Zhu Y., Guo, L. 2017, Sequential preventive maintenance interval determination based on Monte Carlo method for deteriorating systems, Second International Conference on Reliability Systems Engineering

Mishra, K., Manjhi S. K. 2018, Failure Prediction Model for Predictive Maintenance, IEEE International Conference on Cloud Computing in Emerging Markets (CCEM).

Mustgofa, AA., Asfani, D. A., Negara, I. M. Y., Fahmi, D., Priatama, N. 2016, Vibration analysis for the classification of damage motor PT Petrokimia Gresik using fast fourier transform and neural network, International Seminar on Intelligent Technology and Its Applications (ISITIA), pp. 381-386