System of Predictive Maintenance

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Abstract: The paper presents theoretical concepts for the system of predictive maintenance system. Also are presented the advantages and disadvantages of applying the system.

Keywords: predictive, maintenance, management

1. INTRODUCTION

The main purpose of the maintenance systems is to maintain in operation the machines, the tools and the equipment and they are based on the logical organization of the works according to several criteria. [1]:

- depending on the resources;
- depending on the use of the means for automatic data processing;
- depending on the cost reduction for maintenance, repairs and storage;
- depending on the necessity of eliminating the accidental stoppage by preventing some damages, mistuning, permanent wear, etc.

The adopted systems must actually involve the workers who use this equipment to maintain and repair the machines they work with, in order to appreciate the maintenance work, to be aware - from a technical and functional point of view – of the equipment they use, in order to operate it at the allowed parameters and in order to pay more attention to the daily works of maintenance and surveying the behavior during the operation.

In order to achieve these objectives, several maintenance systems [3] are used at national and world level. (Figure 1)

2. SYSTEM OF PREDICTIVE MAINTENANCE

The system of predictive maintenance is a system from the category of modern systems that are based on the use of new technologies which help to diagnose the technical system so that predictions should be made referring to state of wear of the system, the expected operational time until the next breakdown, to the components that will be replaced, etc. [2]:

Fig. 1. Maintenance systems

The choice of a particular maintenance system is made depending on the actual conditions that the respective company has and depending on the advantages and disadvantages that each system has. It is important to mention that applying a maintenance system does not exclude other systems. This means that several maintenance systems are applied in a company for the same machines.

Fig. 2. Predictive Maintenance Systems

The main specific operation in the system of predictive maintenance is that of monitoring the machines, the tools and the equipment irrespective of age and physical condition.
or permanent, in order to control the operation, to avoid failures, to analyze the systems and, in the end, to draw up a diagnosis of the system. In its turn, the diagnosis will help to draw up the maintenance strategy, to establish the deadlines, to establish the places of intervention and the size of the intervention. The aims of the monitoring can be structured as follows (fig. 1.30)

2.1. Fault detection using method of monitoring

Fault detection and localization of fault of machines and equipment using continuous monitoring method is essentially based on the existence of a number of sensors and transducers to monitor parameters that describe the system.

Each of these sensors or transducers compares the received signal with a threshold signal (upper or lower) for parameter monitored. All overruns are reported to a human operator or are sent to a block decision.

The advantage of the method is that of the permanent control over the system. The main disadvantage consists in the great number of sensors and transducers, a number which increases exponentially with the linear increase of the parameters monitored.

The method of fault detection and localization using the method of periodical monitoring is based on the existence of multiple possibilities of mounting some portable transducers and sensors within the system. The transducers and the sensors are connected to recording equipment, which is also portable, or by means of data acquisition plates to portable computers, with which data can be stored in short time.

Processing data thus obtained can follow, mainly, two ways:

- Comparing the new entries to already existing data in order to establish the variation trend of the parameters monitored. In case the values of the parameter monitored are maintained relatively constant, one can consider that the system has a normal operation. Intense degradation of the values of the parameter monitored indicates the occurrence of great wear and the imminence of an intervention;
- Comparing new entries with the standard values for the parameter monitored. Exiting the range of normally considered values is automatically
followed by entrance in the repair system. The advantage of the method consists in the possibility of using the sensors and transducers for several systems. Also, another advantage is the fact that the number of sensors and transducers can be large.

![Logical diagram for application of monitoring](image)

*Fig. 3. Logical diagram for application of monitoring*

The disadvantage of the method consists in the fact that, in case of an error regarding the intervals at which the monitoring is done, the danger exists that the system will deteriorate although the sampled signals have not indicated this.

After choosing the monitoring method (permanent or periodical), one usually proceeds to the choice of parameters to be monitored. The most frequently chosen ones are:

- vibrations;
- temperature;
- pressure;
- lubricants condition;

![Detection and localization of flaws using the method of periodical monitoring](image)

*Fig. 4. Detection and localization of flaws using the method of periodical monitoring*
For example it shows the model of diagnosis using the monitoring of the lubricant. Besides the role they have, lubricants, the real “blood” of the systems, can give complete information about their status. The diagnosis of the systems using lubricants is done based on figure 5.

Fig. 5. Diagnostic of the systems using the method of monitoring the lubricants

3. CONCLUSIONS

Predictive maintenance system is a modern maintenance system which fits in type LEAN systems. The system present a lot of advantages. Of these can be enumerate:

- elimination of accidental faults of machines and equipments;
- moving the maintenance intervention before the predicted time of failure.

The main disadvantage of the system is the price relatively high and the necessity of well-trained operators.

REFERENCES


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