ASPECTS OF OPTIMIZING MAINTENANCE PROCESSES

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Abstract
In the strong competitive environment of the market the demand on the efficiency of production and thus also on reliability of production machinery and equipment increases. Machine reliability can be achieved by advisable maintenance. The article examines the optimization of the maintenance process to reduce maintenance costs and hence the total cost.

Key words
Maintenance, optimizing, effectiveness, machinery, costs

Introduction

The main objective of maintenance in a company is to ensure the reliability of production machinery and equipment and maintain their desired state. The importance of maintenance grows with the increased technical level of production, automation and with rise in integrated manufacturing processes. To maintain competitiveness on the market, it is crucial to reduce production costs, which include maintenance costs. This can be achieved by appropriate planning and management of the maintenance process.

Optimizing the effectiveness of maintenance

Maintenance costs create a substantial part of the production costs, their level of management, organization and implementation has a significant impact on the quality, price and delivery date of the product. Optimization of the maintenance process is an important internal resource for increasing the efficiency of a company, thereby improving their market position. Feasibility of these objectives can be achieved through planning, management, monitoring and improving organizational methods including economic aspects. In this case we are talking about "Management with intelligent maintenance", which allows workers to clearly identify individual components, technologies, systems and measures needed to perform the necessary maintenance at the right time with minimal cost. It follows that the focus on care of machinery and equipment should be aimed at preventive inspections and repairs. One of the criteria for maintenance optimization can be regarded as the amount of costs to ensure trouble-free operation (Fig.1). However, if we examine the causes of high maintenance costs, it is necessary to identify the factors affecting the amount of the total cost of maintenance and to define them as criteria.

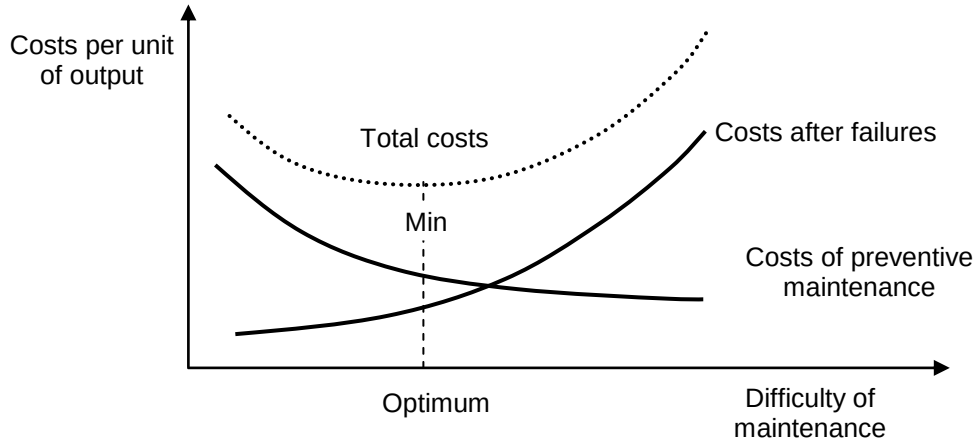

Fig. 1 Graphical expression of optimized maintenance

The graph shows that higher investments in preventive maintenance lower the maintenance cost after a failure.
Standardization of repair procedures contributes to the overall optimization of maintenance, which ensures compliance with regulations, awareness of workers and efficient practice in difficult situations.

The process of maintenance and optimization aspects

Manufacturing companies are changing their strategies of behavior on the market to withstand the dynamic growth of economic, socio-political and technological complexity. The management of the production and use of production processes, machines and systems are increasing pressures on costs and maintainability due to the emerging foreign competition, including the introduction of new regulations, new materials, technologies, services and communications. Therefore it is necessary to find new methods and techniques to promote the coordinated development of machine production and the maintenance / restoration. The primary objective in determining the optimal course during the maintenance process is to minimize the total cost of maintenance work and costs related with their implementation (reduction of production capacity) [5]. In shaping the cost function to perform maintenance the following factors play a key role in particular (Fig. 2):

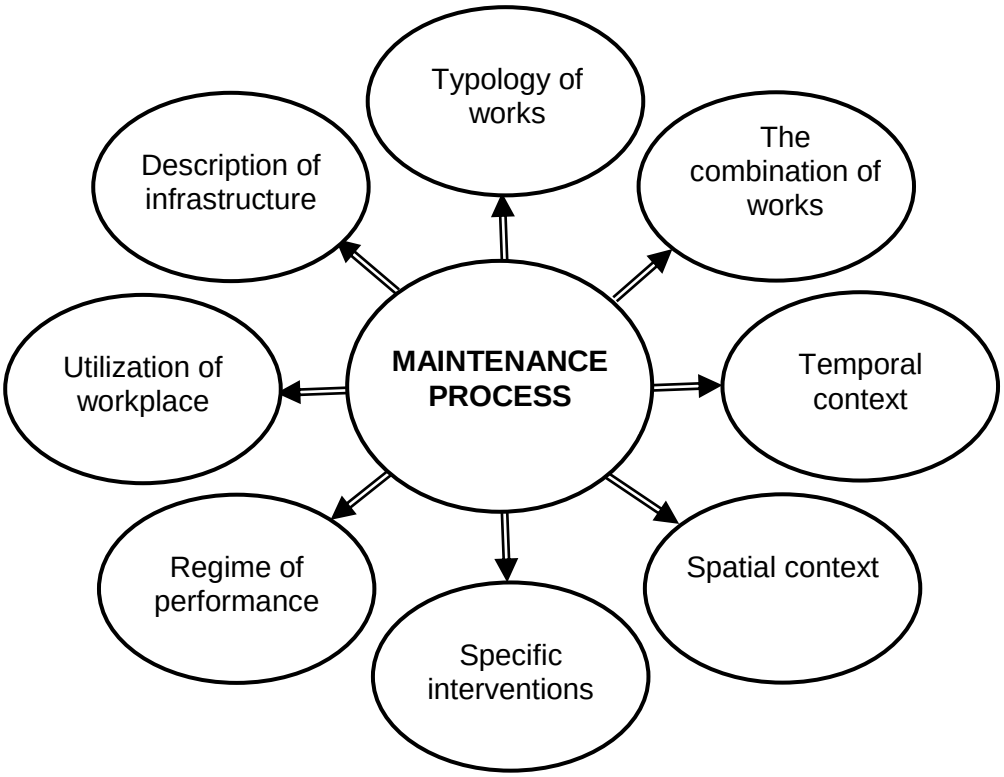

Fig. 2 Factors affecting the maintenance process

1. Infrastructure description. Maintenance process is normally done by homogeneous sections. Homogeneous sections may represent a CNC machine or workstation (production modules and cells). As criteria can be used for example type of components, design / technology features, quality and reliability, etc. Decomposition to relatively small homogeneous segments is just a way to describe the wide-spectral infrastructure and assess the need for maintenance.

2. Typology of works (interference) of maintenance. Characteristic for manufacturing operations is the process of maintenance of machines using a lot of technologies, and most of them developing their own technologies, based on experience by their own (used) production technology and cooperation with the suppliers of machinery. Therefore, it is difficult to exhaustively define the general working typology (basic, superior) for maintenance and recovery, so that they would be unique to each production operation.

3. The combination of works (interference) of maintenance. Maintenance of machine subsystems (control / sensors, motorics / mechanical basis, machine features) can not be considered as possible individual combinations of work (activities) on these subsystems because it dramatically affects the costs. Therefore, the maintenance process simulation is calculated with all subsystems at the same time. In this case, the computational cost and budgetary control are performed for the combination of work. Another reason for grouping interventions is superior operation costs. The superior operation must always be performed in the same range, regardless of the extent of the service action.

4. Temporal contexts of works. These are controlled in parts, for example when we renew motorics it simulates the process of controlling the condition of management and sensorics. If any of these subsystems reaches the threshold (standby / age / occupancy), the model considers the maintenance / restoration as well. In this case there can not be a situation where control is restored one year and motorics (drives) a year later, because the threshold values are in conflict.

5. Spatial contexts of works. In contrast to temporal the spatial context of work activities are different, for example if we planned maintenance activities on two adjacent or nearly adjacent homogeneous sections (same machine), it will be two separate actions (unless the rule for merging and division of work according to the maximum extent is not applied) which create the model. It is evident that spatial disproportions (placement) plus combinations of adjacent departments have an impact on costs, it is difficult to assess their impact. The technologies used and local conditions have a much more dramatic effect to the scope and cost of work activities (especially in recovery), as they usually have poor adaptability and they are more time consuming.

6. Specific interventions. They mostly affect our costs for the organization and maintenance management technology used for specific interventions such as cost of equipment, cost of specialists and other work force, costs of maintenance interval, … organizational units of maintenance and operation and arrangement of the manufacturing companies also play a key role in the cost.

7. Regime of performance of maintenance. It is an ambition that the manufacturing process was the least affected by the performance of maintenance, or was realized during full operation. If it is not possible to realize in the place to be faulty machines relegated away from the production plant (implemented technological / material flow). Measures to perform maintenance outside the production plant need time, depending on the speed of assembly / dismantling works, transfer to the maintenance center, which implies a special (additional) costs, depending on the distance that separates the production facility from the maintenance (renovation). The worst of it is "slim" operation - do not have a renovation workshop, which

means a greater loss of time, decrease the time available for production, thereby increasing the costs involved.

8. Utilization of workplace / machines at the production plant and the way the major cost item. The conclusion of the excavation workplaces leads to severe consequences for the economy of operation. Possibility to manage and maintain manufacturing facility with temporarily limited maintenance coverage is low, and is also a lack of quality of service. In these workplaces must be maintenance intervals (inspection) machinery and equipment the smallest or we must organize replacement production, which increases the cost of running these situations. In contrast to this is a thin production facilities, which allow greater maintenance intervals and offer the opportunity to reduce overall operating costs.

Conclusion

The contribution is focused on complex understanding of the maintenance process and its optimal solution. More closely deals with issues allowing to find a balance between the claims (which means less to worry about property / low cost) and quality / value (which is an extension of property / production capacity) of structure of manufacturing company. These issues play a key role in deciding the strategy of investment capacities. Based on this scenario of strategies of investment capacities can proceed to simulate direction of manufacturing facility and in "the actual production system" assess and define the necessary costs/functions of maintenance (number of maintenance activities related to moral and physical wear and tear).

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Notes

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