

THE ASSESSMENT OF DECISION-MAKING IN COST MANAGEMENT OF THE ANCILLARY ACTIVITY OF PRODUCTION

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ABSTRACT

In the following research paper, the problem of an auxiliary activity costs has been undertaken, indicating the impact of the costs on the decisions associated with optimization of maintenance in the cement industry companies in Poland. The problem of the optimization and efficiency of the ancillary processes of production is not new but important and up-to-date due to the conditions for modern production processes in the cement industry companies. The whole of the presented considerations have been divided into three basic parts. The first part of the paper emphasizes the essence of the ancillary processes in the production activity of the company. The considerations presented in the second part are characterized by the costs as a criterion for the assessment of the ancillary processes of production. The subsequent third part of the paper is the answer to the research question. The aim of the paper is to learn and assess the process of decision-making in the field of cost management of the ancillary activity of production. In order to respond to the research question there have been presented the results of the empirical research based on the case study. The conclusions from the research indicate that the proper cost management of the ancillary activity of production determines the efficiency of decision-making in the company of the cement industry in Poland. The research methods applied in order to accomplish the objective are literature studies, case study, descriptive analysis as well as trend analysis.

KEYWORDS

decision-making, cost management, cement industry companies.

Introduction

Decision-making in the field of future directions of business development requires the ability of managers to assess the current situation using some useful instruments allowing to respond rapidly [1–3]. Therefore, the rapidity of the response to changes in the environment is determined by the rate of the decisions taken by managers [4–6]. This means that managers must “create new characteristics, behavior and attitudes, which will constitute an adequate response to globally transforming reality” [7], which

means that the efficiency of the decisions taken influences the adaptability of enterprises.

An important role, against the background of the production activity of enterprises, is played by the ancillary processes of production. The task of the ancillary processes of production is to maintain high performance of the machine park during cyclic operation of technical objects and to ensure their fault-free functioning. The ancillary processes of production are the area of cost reduction. Searching for the ways of rational maintenance management, classified as ancillary processes of production, at the lowest

costs and simultaneously the highest possible efficiency, has become an important area of decision-making of managers of modern enterprises.

The key research question is the following: “are the costs of the ancillary activity of production the stimulus creating or hindering decision-making processes in the surveyed company?”. As a consequence of this question, the objective of the paper has been to learn and assess the process of decision-making in the field of cost management of the ancillary activity of production. The research object is the company of the cement industry. The empirical research has been conducted in the area of maintenance of the process line. The research methods applied to accomplish the objective are: literature studies, case study, descriptive analysis and trend analysis of costs in the maintenance process of the surveyed company.

Identification of the ancillary processes in the production activity of the company

The ancillary processes of production in the company are to restore the usability of fixed assets which, under the influence of operation, lose their initial value in use. This is manifested both in the operation of the company and the decisions of the managerial staff [6, 8, 9]. In the opinion of R. Kaplan and D. Norton, the processes taking place in the organization must enable the activity operation, in such a way, the value which attract and keep the target market segment customers is created and ensure the shareholders' expectations regarding the financial results of the organization [10]. M. Hammer and J. Champy define the process as a sequence of activities carried out inside the enterprise in the sphere of production, services or trade, performed in order to provide the customer with a specific service or product [11]. Therefore, in some cases, in the research paper, the concept of activity or production in relation to auxiliary applications are used.

The concept of the operation of technical objects is defined as “a set of intended organizational, technical and economic activities of people with a technical object and the mutual relations between them from the moment of adoption of the object for the intended use until its liquidation” [12]. Therefore, under the influence of the operation and after the calculated time, fixed assets lose not only their economic value but also the initial value in use. According to R. Borowiecki, decision-making in the area of the ancillary processes of production must take into account “the right view on machine management, which is provided by the results of the analysis of the

use of machinery and equipment in extensive terms, taking into account their working time, as well as in intensive terms, concerning their technical parameters [13]. This means that the research cycle in the area of the operation of technical objects begins with defining the level of the activity of machines and equipment in the production activity of the company and ends with the assessment of these processes.

The importance of the properly operating maintenance system in the production company is great, which is supported by the following quotation: “in the analysis of fixed assets management, an important place is occupied by the analysis of the use of machines and equipment participating directly in manufacturing processes. Their technical efficiency, activation level as well as the level of use affect mainly the production and financial results of the company” [13]. The most important benefits resulting from the effective operation of technical objects can be a noticeable reduction in manufacturing costs, associated with lower costs of repairs resulting from failures, unscheduled downtime of production lines, also arising from failures, and elimination of delays in delivery of finished products to customers. Moreover, failure-free operation of the machine park allows for the implementation of the assumed production plans and schedules, contributes to reduction in the demand for maintenance services and results in the efficiency of machines and equipment.

Summing up, it should be stated that the ancillary processes in the production activity consist in the efficient operation of technical objects while ensuring their failure-free operation due to which they play the priority role against the background of the activity of the company. The maintenance of the machine park is an area whose costs have become the focus of interest of the managers of the most rapidly developing companies, looking for opportunities to reduce costs. Searching for the ways of rational maintenance management at the lowest costs and simultaneously the highest possible efficiency has become the challenge for maintenance engineers and managers.

Costs as a criterion of the assessment of the ancillary processes

The ancillary processes of production in the production company are one of many factors generating costs which may have significant impact on development of the asset and financial situation of enterprises [14]. C. Drury states that costs can be divided into three categories: costs for decision-making, costs for valuation purposes and costs for control purposes.

es [15]. According to A. Jarugowa, the concept of costs is associated with the specific object, activity or its effect, e.g. a manufactured product or a provided service [16]. M. Dobija believes that costs refer to sacrificing one value for the benefit of obtaining another one [17]. Taking into account the above categories, it can be assumed that the objective of the measurement of costs is validation of products and provided services as well as decision-making, planning and control of the business activity.

An important area generating costs is repairs. In the subject literature, repairs are classified by the way of planning, organizing, implementation and control while identifying: major scheduled repairs, post-inspection overhauls, periodic overhauls, standard repairs, preventive repairs, emergency repairs [18]. Repairs are cost generating, however they influence an improvement in the efficiency of maintenance management and contribute to an increase in the total performance of manufacturing systems.

The main reason for costs in the area of efficiency of machines and equipment is their failures which, while preventing proper operation, bring about unplanned downtime. Unplanned downtime of technical objects results in generating additional costs. It happens that the failures of objects only constrain their operation while simultaneously impeding efficiency. The problem is to detect the failure or malfunction bringing about reduced efficiency. Consequently, an unnoticed operation of the machine with reduced efficiency may lead, among others, to: idling, slower pace of work, a break in operation or finally breakdown. For the maximum operation of equipment and in order to avoid unplanned downtime it is very important to implement all possible measures to minimize the risk of failure. For this purpose one should aim at reduction in accelerated processes of wear and tear of components, monitor the basic parameters of the working conditions on an ongoing basis and maintain high quality of maintenance. In addition, one should strive to eliminate the existing weak links, to draw conclusions from each failure for the future reference and have repairs carried out in such a way that their effect is long-lasting and not just momentary. The guidelines on bearing the costs of the repair are presented in the literature review that is why their interpretation is omitted [5].

Costs incurred on maintaining the machine park of production companies are reflected in the benefits achieved from the high level of quality, which is presented in Fig. 1. The figure illustrates the moment in which costs incurred on maintenance of machines and equipment begin to decrease. The figure indicates that as there is an increase in costs incurred

on the activities maintaining technical objects lower expenses are incurred on their repairs. However, the frequency of maintenance is also important in here. The more often the equipment is maintained the higher decrease there is in the costs of its repairs. Therefore, it is reasonable to carry out regular maintenance, which contributes to reduction in general costs incurred on repairs and maintenance.

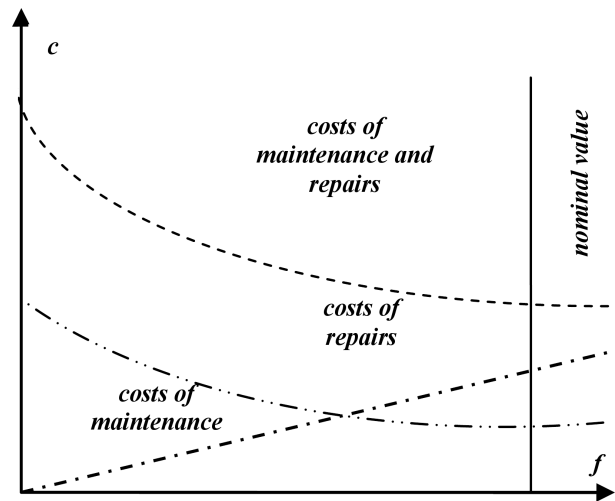


Fig. 1. The impact of maintenance costs on reduction in repair costs: f – frequency of maintenance, c – costs [19].

Effective maintenance contributes to an increase in the total efficiency of manufacturing systems. Among the most common major activities generating costs in the area of efficiency of technical objects the following deserve a special attention: unplanned downtime, retooling and setting, scheduled downtime, decline in pace of work, production errors and errors at startup [19].

Summing up, it should be stated that the maintenance of the high-level efficiency of technical objects generates operating costs for businesses which are the target for elimination in the management of the operation of production machines and equipment. Not all reasons of the discussed costs are possible to eliminate, however striving for the smallest possible number of failures and maintaining the proper cycle of maintenance and repairs brings about the results in the form of an increase in the efficiency of the machine park.

The analysis and assessment of the costs of the ancillary processes of production – case study

The operation of the maintenance processes in the cement industry companies is a complex process

due to a large amount of organizational and financial elements appearing in it. The empirical part of the paper has been developed on the basis of the case study carried out in the cement industry company in Poland. The conduct of the research process using case study allows to present an accurate and in-depth image of the analyzed phenomena and relations. There must be remembered though the limited (probabilistic) possibility of scientific cognition using the case study method. The constraints of case study are: small representativeness of the results, intuitiveness and subjectivity of judgements, high time consumption and high costs of the conducted research [11, 20–22].

In order to respond to the research question, which is: “Are the costs of the ancillary activity of production the stimulus creating or hindering decision-making processes in the surveyed company?”, there has been conducted the empirical research. The objective of the paper has been to learn and assess the process of decision-making in the field of cost management of the ancillary activity of production. The research area is the costs generated by general overhauls and emergency repairs. The research period is the years of 2005–2015. The selection of costs of repairs and failures as the subject of the research has been determined by the horizontal approach to economic categories. Cost information has impact on optimizing decisions.

In the cement industry companies the objective is to minimize the occurrence of failures bringing about production downtime since they generate high costs, which is the subject of interest of the present paper. Maintenance in the surveyed enterprises is implemented through the actions: preventive, predictive, resolving failures and ensuring the reliability of machines and equipment of the process line.

General overhauls refer to major repairs of the machine park carried out in the analyzed company once a year. The level of costs of works carried out during general overhaul of the process line in the total maintenance budget of the process line of the α company is presented in Fig. 1. The conducted research indicates that in years 2005–2008 there was a decrease in the share of costs incurred on general overhaul of the process line in the general structure of maintenance costs. In years 2009–2015 the share of costs incurred on general overhaul of the process line grew steadily in the total maintenance budget of the α company reaching in 2015 the highest level in the whole research period.

While analyzing the costs of breakdowns in the general structure of maintenance costs in the α company (Fig. 2) it can be noticed that in years 2005–

2008 the share of costs incurred on elimination of the consequences of breakdowns increased in the structure of the machine park maintenance costs. In years 2009–2015 there was a decrease in the level of costs incurred on elimination of the consequences of breakdowns reaching in 2015 the lowest level in the whole research period (Fig. 3).

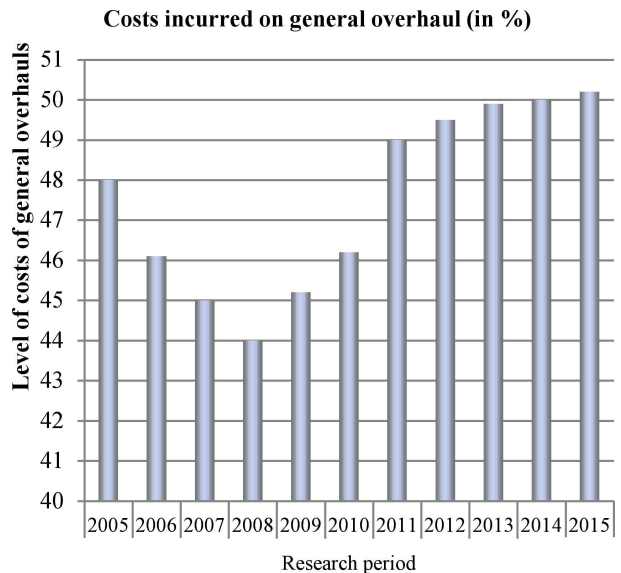


Fig. 2. The level of costs of general overhaul in the α company (Source: own calculations).

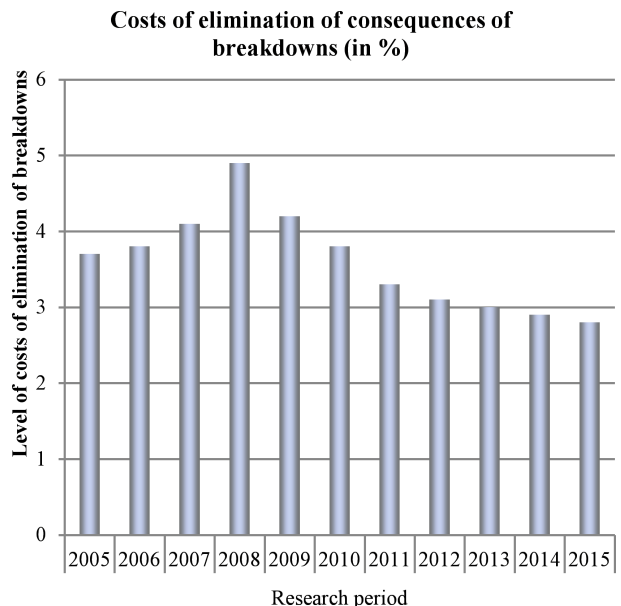


Fig. 3. Costs of works carried out in the emergency situation in the α company (Source: own calculations).

In order to elaborate the research, the Pearson correlation coefficient was used. Based on correlation studies in the α enterprise, a very strong positive correlation between the effectiveness indicator

of preventive actions is noticed and the return on assets. This means that along with the increase of the efficiency of asset management, the coefficient of effectiveness of preventive measures increases. Maintaining of a high level machines reliability and devices in the α enterprise encourages an increase in the use of assets and the generation of a higher rate of return on assets. Hence the increase in the reliability of machines and devices in the α enterprise follows simultaneously with an increase in profitability. In order to confirm the results of the studies calculated with the Pearson's linear correlation coefficient, the criteria for assessing the quality of the model were determined using the determination coefficient R^2 , which describes this part of the dependent variability resulting from its dependence on the included variables (Fig. 4). The studied correlation is statistically significant (at the level of $\alpha = 0.05$).

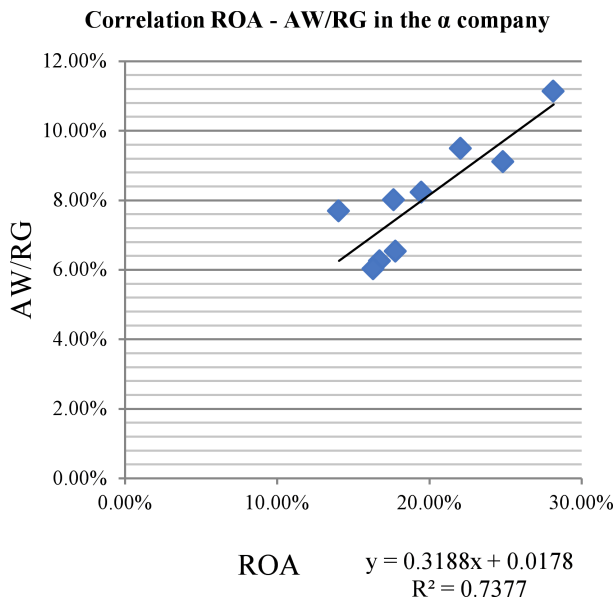


Fig. 4. Coefficient of determination between ROA and the costs of breakdowns in the α company (Source: own calculations).

When analyzing the results of the conducted research, it should be noted that, as a result of the observation of the amount of costs incurred on elimination of the consequences of breakdowns and costs incurred on general overhaul of the process line in the analyzed company, it can be stated that the costs associated with carrying out major repairs are inversely proportional to the costs of failures.

Discussion

The conducted research indicates the relationship between the amount of costs incurred on gener-

al overhaul and the level of costs incurred on elimination of the consequences of breakdown. In the event of reduction in costs incurred on general overhaul there is an increase in the costs of elimination of failure and its consequences. Analogically, in the event when costs incurred on general overhaul increase there is a decrease in the costs of failure.

The amount of costs incurred on general overhaul at the level of more than 50% of the total costs for the maintenance of the surveyed companies per year allows to minimize the costs associated with the occurrence of breakdowns and elimination of their consequences. It follows that the current control of maintenance costs and verification of cost information allows for making right managerial decisions in terms of expenditure for general overhaul of the process line.

Summing up the results of the conducted research it should be concluded that the basic task of maintenance in the surveyed company of the cement industry is to achieve the highest reliability and performance of production equipment, networks and installations and reduction in time spent on removal of malfunction of major machines and equipment of the company. Furthermore, inspections and predictive actions carried out correctly should guarantee the continuity of work of process lines and eliminate the occurrence of emergency situations. Each unplanned downtime of the production line increases operating costs, therefore it is important to select appropriate management tools of the ancillary processes of production so that they enable the quantification and verification of the flow of cost information through its analysis and comparison with the established objectives.

Conclusions

Cost information on the ancillary processes of production of enterprises is one of the basic elements which creates the efficiency of the process of decision-making in the area of production [23, 24]. The objective of the study has been to learn and assess the decision-making process in the field of cost management of the ancillary activity of production. The main contribution of the paper is in-depth understanding of the impact of costs of the ancillary activity on the decisions associated with optimization of maintenance in the surveyed company. In the analysis, two types of costs generated by the maintenance department of technical objects in the surveyed company have been referred to, based on cost information concerning costs incurred on general overhauls and resolving failure. The study supports

the current view that the rapidity and quality of the implementation of solutions in the area of cost management of the ancillary activity of production creates the efficiency of the decision-making process in the cement industry companies in Poland, allowing for taking right decisions.

Summing up the results of the conducted case study, it should be stated that the efficiency of decision-making in the surveyed companies of the cement industry is conditioned by rationality and efficiency of the ancillary processes of production, which include maintenance, since they generate high operating costs. A clear implication from the theoretical and empirical assumptions of the conducted case study is the fact that the decisions in the area of the ancillary processes of production of the cement industry companies should allow to accurately determine the quantity and type of spare parts and materials essential for carrying out the repair before stopping the process line. In the counterpoint, the study draws attention to the fact that following the maintenance procedures, i.e. carrying out regular inspections and general overhauls is to ensure the proper operation of the cement plants with the smallest number of failures, low repair costs and an uninterrupted production process. Some of the considerations have been presented in general terms which, on the one hand has allowed to highlight the complexity of the discussed problem and, on the other, inspires for further research. In order to accomplish the objective of the research there have been used literature studies, case study as well as descriptive analysis and trend analysis. The problem of the efficiency of the ancillary processes of production is not new but still important and up-to-date due to the conditions for modern production processes in the companies of the cement industry.

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