COST CONTROLLING IN TERMS OF METALLURGICAL PRODUCTION

Iveta VOZÁKOVÁ a, Kamila JANOVSKÁ a, Šárka VILAMOVÁ a

a the Department of Economics and Management in Metallurgy, FMMI, VŠB-TU Ostrava, Ostrava – Poruba, Czech Republic, iveta.vozakova@vsb.cz; kamila.janovska@vsb.cz; sarka.vilamova@vsb.cz

Abstract

According to the forecasts of top consulting firms the world economy will be significantly influenced by the growth of world population in the coming years (It is estimated to increase to 9 billion people in 2050). From the view of metallurgical companies it means a serious challenge as for accessability of high-quality mineral resources, because their market prices will keep growing too.

Assuming such a development metallurgical companies should as soon as possible realize the need for effective cost management. In the future, the ability to optimize cost upon knowledge of business processes will be crucial for steel companies to stay competitive. Without the detailed knowledge of the company cost, it means the cost of individual processes as well as the total cost of the final products, no steel company will be able to define and implement right decisions to ensure its business growth, sufficient income and cash flow for its operation.

For the purpose of making the right decision under the specific technological, geographical and social conditions of the particular metallurgical company it is necessary to consider the decision possible impact on the cost area in the relevant operation of the company, but also on the total cost of the company final product. The article points out the need for detailed knowledge of cost and cost structure in metallurgical companies as the crucial factor in the process of steel production optimization.

Keywords: Cost controlling, metallurgical company, the optimization process of metallurgical production.

1. INTRODUCTION

The basic presumption for the effective cost management is the ability to identify the efficiency and finality of their spending. The effort to achieve the efficiency and finality is represented in practice by the effort to identify the costs in relationships with certain industry performance (products, activities) - thus constructing a calculation. The fact that the calculation shows in mutual dependence the kind and value of an expressed unit performance, makes it the most important tool of economic management [1]. Metallurgical production has very complicated issues of performance evaluation in connection with the preparation of calculations. This can be described as a fabrication by stages. The stage production is characterized by the unexceptional gain of new qualities of the raw material or the material in a technologically closed section. The production on each stage must be able to work separately. The finished product of each stage, except the last one, is the starting semi-product for a variety of products which need other stages of production. A specific metallurgical production is a chain of manufacturing processes from the production of pig iron to the finished product, when a linking of manufacturing plants occurs (stages), which gradually transfer their manufactured production. This is called a semi product (with the exception of the last operation).

In terms of stage production, there is often used a successive and continuous calculation. Successive calculation is the calculation where the consumption of the semi-finished products, produced in earlier stages of the production, shows in the calculation of successive stages the semi products of its own production, with a complex item. In the continuous calculation the value of the semi product consumption from the previous stage is replaced by the values of cost items, with which was the semi product valued. Approaches which would enhance the explanatory power of gradual and continuous calculation for metallurgical production are searching. Therefore, the aim of this paper is to describe and evaluate an option which has the potential to increase the explanatory power of these calculations and the method of differential analysis.
2. **CALCULATION**

Using calculations in the managerial leading is very versatile. Calculations in all of its forms of use either as costing final performance, semi products, or as activities and operations, are the informative tools with the widest field of use [3]:

- They are used as a basis for deciding on the optimal composition of the products with sales capacity and on their implementation (fabricate or purchase);
- In the form of transfer prices they allow to show the relationships between related systems and with a valuation method influence the conduct of employees of these systems in order to act in accordance with the corporate goals;
- They can be used as an administrative tool of the economy especially in the direct costs or other variable costs of the operation;
- They are a widely used tool for evaluating the variant pricing considerations;
- They are used as an important basis for processing the estimates of costs, incomes and profits;
- They are also used as a tool for evaluating the state and changes on the unfinished products, semi-finished products, finished products, etc.

In practice, each company determines their own calculation formula, in which the names of the items may represent specific types of costs occurring in the given manufacturing process. The way of sorting the cost items, the details of their subdivision, their relation to the calculation of prices and other valued variables and the structure of subtotals, shows changeable considering the users and the decision-making assignment, for whose solution the calculation has to work.

3. **CALCULATION ON METAL PRODUCTION**

Assigning the costs of the calculation is a basic problem solved in the calculation process, not only in metal production. This problem is solved as the technical papers [4].

Traditionally, for this assignment it has been used the classification of costs as direct and indirect. The classification of costs into direct and indirect is currently stepping back in some cases into the background. An even bigger importance gets the cost segmentation within the calculation into unit and administrative, variable and fixed. A necessary feature of the direct costs doesn’t have to be their proportional character, which is typical on unit costs. Much of the direct costs integrate some elements of the fixed costs. In terms of considering changes in volume and range is therefore desirable to follow the direct unit costs and the direct administrative costs separately. Indirect costs incur in association with the implementation of a wider range of performances. Generally, only a minority called variable overhead is affected by the level of utilization of the capacity. Particularly, considering the solution of decision problems on the existing capacity, this variable overhead should be calculated separately from the fixed overhead, which can be an irrelevant cost for this type of task [3].

Therefore, the detailed cost structure is critical for the effective management of a company aimed to optimize the consumption of raw materials. With the purpose of a simple variable cost structure that can effectively be used for obtaining the calculations, it is necessary to have a very detailed chart of accounts (the level of the chart’s detail has a higher demand for its maintenance and adjustment of methodology). For an effective tracking of the variable costs is essential to ensure appropriate and consistent information through the administrative accounting system.

In the managerial accounting system, the production cycle of a metallurgical plant is divided by its stages of manufacture, from which then is possible to prepare and analyze respectively the progressive calculations. The number of stages directly depends on the type of business. From this perspective, primarily there are two basic types of business [5]:
• mini iron-mill (equipment for the direct reduction of iron DRI, steel plant - electric arc furnace including ladle metallurgy, equipment for a continuous casting of steel called continuous casting, rolling route)
• company with an integrated metallurgical production (coking, agglomeration, blast furnaces, steel plants - converters including ladle metallurgy, continuous casting, rolling route, the finishing line)

Within the mini iron-mill there can be identified and for the necessary calculations defined four stages of production. Within the companies with an integrated metallurgical production there can be identified and for the necessary calculations defined seven stages of production.

The structure of successive calculation is determined by the number of partial cost items and the number and detail of the defined totals of items constituting the calculation formula, and then by the type of expression of these cost items. For the necessary compilation of successive calculations the cost items of the calculating formula are commonly divided into the following groups[5]:

- Variable manufacturing costs
- Fixed manufacturing costs
- Legal and marketing expenses

The cost items of the variable manufacturing costs are presented in both quantitative and qualitative terms, and they change its value depending on the volume of production of that stage. The structure of the variable production cost items on metallurgical companies may be as follows [5]:

- Gross input (metallic part and additives)
- By-products (e.g., flakes, scrap, slag, etc.)
- Net Input (specific consumption of this item is in the practice known as a trial balance)
- Technological fuel (e.g. natural gas, blast furnace gas, blast furnace coke, anthracite, etc.)
- Energy
- Other supplies (e.g., refractory materials, etc.)

The sum of the variable and fixed production costs presents the production costs of a given stage of production, which then enter as a variable cost item in the subsequent stages of the production. Adding the
legal and marketing expenses to the sum of cost items, we obtain the total of the production costs, i.e. the full cost of the corresponding level of production.

The stage of production is determined by the volume of the consumed materials and services necessary to produce a particular throughput volume for a given stage of production in a given period of time. The throughput volume in a period of time represents the amount of outputs of a certain stage, which may be a product or a service. Tracking the costs of a specific sub-product, which are divided according to quality, category of other characters is often not possible due to the arrangement of a company’s financial management system, which does not allow a cost tracking with a better detail on the product. However, this reduction of the successive calculations, reduces the labor intensity of the preparation, facilitating the maintenance of that system and therefore it is satisfactory for the purposes of the calculations and to make the required analysis.

The process of comparing costs and the subsequent cost optimization is one of the main goals of the majority of the metal companies. The comparison of the individual cost items is made by successive calculations, which is time consuming. The output of the successive calculations is also a large amount of information that is difficult to consolidate on the final product. The subsequent interpretation and presentation of results requires sufficient time and the corresponding expertise of each auditor.

Here you can observe room for continuous calculations. A continuous calculation passes through each stage of production and accumulates external inputs and their specific consumption on the final (determined) phase. The result of the continuous calculation is a list of all the external inputs from each successive calculation, including its specific consumption, prices and specific costs per unit of production of the final stage. The continuous calculation is based on the replacement of the cost items of the consumption of the semi-products (the output of the previous stage of production) with a detailed cost structure of the preceding stage.

Continuous calculation provides an overview of the consumption of basic raw material inputs, supplemented by individual specific consumption to the final product and also the exact definition of the fixed costs, which can be used to compare the amount of manual labor costs, repairs and maintenance costs and the amount of allocated unit costs of the production of the final product.

The continuous calculation is not often applied on metal companies for their significant calculating complexity. Today's level of computer technologies, in the field of the basic software Microsoft Office Excel, allows you to easily pre-define calculations, and thus shorten the manipulation process from several days to several minutes. With this tool opens new possibilities for the use of continuous calculations to model the future development of the company’s costs in relation to the prices of raw materials and energy, and to compare their own full costs of the final stage of the production with other companies of the corporation.

4. METHOD OF DIFFERENTIAL ANALYSIS

This method can greatly increase the informational value of successive calculations. The successive calculations are generally used in manufacturing processes, where the production levels are technologically and organizationally separated. The production on each stage presents a product that can be used as an intermediate product in the subsequent stages or may be sold. The essence of this calculation is that the costs of each stage of production are accumulated, and all product costs are thus caught up until the last stage. It happens so that the performance of the previous stage forms the material costs of the following stage, to which a given stage adds its processing costs.

The differential method of analysis consists in the calculation of successive calculations for all of the stages of production of the company and the subsequent implementation of the differential analysis of the results. Differential analysis is one of the basic methods of comparing two successive calculations. For this comparison, there are used the following data:
planned and real economical results for various time periods (months, quarters, years),
updated planned results in the form of projections (short-term plans taking into account the current
market situation and in the corporation) and the subsequent real economical results.

Within this comparison, the difference in costs per item cost quantifies and interprets as:
the influence of the production volume
the influence of the consumer prices
the influence of the specific consumption

The differential analysis is processed individually at the particular stages of production so that it best
describes the specifics of a given stage of production. The application of the differential analysis on
successive calculations increases their explanatory capacity. The differential analysis of the successive
calculations provides information of the changes in the cost items of a particular stage including the semi-
products of the own production, but does not accumulates the originated results of the differential analysis of
more stages of production, therefore it does not provides an integrated picture of the impact of the changes
in the important cost elements of a particular stage on the total costs of certain final product. As an example
we have the production of coke, which is consumed in blast furnaces. Changing the particular types of
coking coal is reflected in the quality of the produced coke, which in consequence directly influences the
level of consumption needed to produce the required volume of pig iron in a blast furnace. At the same time,
such change on the parameters of the input material can affect the volume of production of coke gas, which
is used for energy generation or for the billet and slabs heating in rolling mills. From the above example
results that the differential analysis of the particular stages of production, is therefore unable to take into
account the possible positive and negative effects on the subsequent stage of production[5].

5. CONCLUSION

Calculation as one of the basic tools of a managerial accounting, displays the two basic poles of a business
process including the performance qualitatively expressed and its quantitative characteristics. For this reason, it is a
very important tool that allows managers to identify the relationships and behavior of the costs depending on
the size and structure of the performance and determine the costs of corporate performance as such. An
important step in the calculation of the costs is the definition of the subject of calculation, thus the
assignment of costs.

For maintain of competitiveness of steel companies in the future will be absolutely crucial ability to optimize
cost, contingent upon knowledge of business processes. In today's highly competitive environment among
the most important tools that can effectively respond to any change in the external and internal environment
of the organization and support the achievement of desired business aims - optimizing costs, profit
maximization and market value may be included in Operations Management Procedures[6] and
manufacturing process simulation for production process management and control[7].

The presented methods significantly affect the economic thinking at the company’s level and with in a very
significant way contribute to the effective management decisions. An important fact is that there is no
universal right or wrong way to assign the costs to the corresponding performance. Each allocation method
has to respect not only the relation between the cost and its objective, but mainly the decision-making
problem, which will be dealt with on this assignment. Therefore, application of the method of successive
calculations of the comparative analysis, which definitely increases the explanatory power of successive
calculations in metallurgical production is, as stated in the previous text, its pros and cons, and it is very
important to individual decisions, which particular case solve this way.

ACKNOWLEDGEMENT
The work was supported by the specific university research of Ministry of Education, Youth and Sports of the
Czech Republic No. SP2011/27.
LITERATURE


