

THE ISSUE OF OVERHEAD COSTS ALLOCATION ACCORDING TO LABOUR INPUTS IN TARGET COSTING OF METALLURGICAL PRODUCTION

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Abstract

This article is focused on the issue of overhead costs allocation used for target costing. The first phase is allocation of overhead costs of secondary (supporting) cost centers to the primary (production) cost centers. In the second phase, the overhead costs of the primary cost centers are allocated to products or activities. The commonly used allocation key includes the standards of labor input in the production process. The analysis in this article highlights the inappropriateness of using this allocation key in the calculations used in price negotiations.

Keywords: contribution margin, product costs, overhead costs, proportional costs, fixed costs, target costing

1. INTRODUCTION

In the current terminology dealing with costing calculations, it is necessary to distinguish between the product costs or prime costs [1], which are of variable nature, and the overhead costs [1], which can be either variable (e.g. technological energy or fixed (depreciations)). It is because the costing calculations per unit of production use different calculation algorithm for each of these types of costs.

The calculation of the product costs in metallurgical production is based on production formulas, providing the specific consumptions of the individual products. The formulas are sometimes referred to as BOMs (Bills of Material). The evaluation of specific consumption makes it easy to calculate the costs of consumption of this material per unit of production, for example, per ton, both the product of its specific consumption and the price.

The calculation of overhead costs per unit of production is much more demanding, since these costs do not arise primarily for specific products. The character of overhead costs is based on the fact that they are common to several types of products. Sometimes, overhead costs are referred to as common costs.

Overheads, arising at higher organizational levels of the company than the workplaces, are considered to be specific groups of fixed overhead costs. They are most commonly referred to as production, procurement, sales and administrative expenses.

The overhead costs of workplaces, which are directly involved in the production, are the closest to the actual product costing. A large part of these overhead costs is based on the depreciations of technological equipment of the workplace in question, and a smaller part on its organizational and operational provisions. The amount of these costs cannot be significantly affected. However, there are also induced overhead costs at workplaces, related, for example, to maintenance and repairs of technological equipment, which can be controlled, for example, by ensuring appropriate inputs (Gross Charge) [2]. More workplaces form a cost (accounting) center, where overhead costs, which are mostly based on the organizational and operational provision of the individual workplaces, arise. The sum of these overhead costs is then referred to as operating overhead costs of these centers. The higher unit, in terms of the organization, is a plant, where overhead costs, again, arise mainly due to organizational and operational provision of production or non-production centers of the plant. The summary of these common overhead costs is called operating overhead costs of the plant. More plants form a company, which is another level where overhead costs arise as well, this time within the scope of company management joint centers, where the sum of these costs is referred to as administrative overhead costs.

The allocation system of operating overhead costs of the plant consists of two phases. The scope of the first phase is the allocation of operating overhead costs of the plant to production centers. The second allocation phase deals with the allocation of overhead costs (operating overhead costs) of production centers into costing units, which may be both products and activities.

2. METHODS DATA

The allocation of operating overhead costs of the plant to production centers is very often performed within the ratio of consumption of production (labor and machinery) time - method Activity-based Costing [3]. This means that the center producing more labor-intensive products has to bear higher operating overhead costs of the company. If we consider operating overhead costs as fixed cost, the allocation according to labor input can be defined as an allocation based on the principle of causality. The product with higher labor input remains in the production process longer, which is a variable that influences just the amount of fixed costs. A similar method, i.e. allocation according to the total amount of required (consumed) machinery and working time, is also used in the allocation of administrative overhead costs to plants and, subsequently, to the centers as well. The allocation of administrative overhead costs to plants sometimes takes advantage of the so-called principle of bearing capacity, where the centers with lower costs ratio receive higher share of the administrative overhead costs and vice versa.

The allocation of operating overhead costs of the individual production centers per unit of production of those products that go through these centers is often performed using an allocation key in the form of labor input of the individual products. Labor input is the specific consumption of labor or machine time per unit of production. In case the operating overhead cost is a fixed cost, then this allocation is based on the principle of causality. The calculation of the operating overhead cost value per unit of production of a concrete product is then based on the product of the values of these labor inputs and operating overhead cost costing rates in CZK per unit of labor or machine time.

The calculation of the value of operating overhead costs per unit of production of a concrete product (costing unit):

Operating overhead costs in CZK/unit of production_{KJ} = labor input_{KJ} in minutes x costing rate in CZK/min.

KJ - costing unit, i.e., the calculated product

The labor input is defined for the individual products as the consumption of time (e.g., in minutes) per unit of their production (e.g. ton).

Operating overhead cost costing rate of the given center, using labor input as the reference value, is the average value of this overhead cost per unit of time of labor or machine performance of the center.

2.1. Definition of the labor input values (specific consumption of work time)

The values of labor or machine input of the individual products are mostly included in the standard setting base of each production center. These time standards are constantly compared with the actual state and they are evaluated. The evaluation of the labor inputs also includes the planning and monitoring of downtime, i.e., the time when the production or work process is interrupted for any reason. Given these facts, the labor input values determined and evaluated in this way can be regarded as realistic.

2.2. Definition of the value of operating overhead costs costing rate

Costing rate of operating overhead costs represents an average value of operating overhead costs of a concrete center per unit of labor input, i.e., for example per minute of work or machine performance of the workplace in question.

A condition of the application of costing rates of any operating overhead costs, and hence the operating overhead costs in product costing of a concrete center, is that the level of these costing rates must correspond to the total actual value of the given type of operating overhead cost in the concrete center.

3. EXPERIMENTAL PART

The condition saying that the used costing rates of operating overhead costs must match the total value of operating overhead costs of the given centre can be provided by a calculation, as a **share of the total value of operating overhead costs of the workplace and the sum of products of the values of labour inputs and the detailed forms of production volumes for the individual products.**

$$kS_{VR} = \frac{\sum VR}{pr_1q_1 + pr_2q_2 + \dots + pr_kq_k} = \frac{\sum VR}{\sum_{i=1}^k pr_iq_i} \quad (1)$$

kS_{VR} - Costing rate of the operating overhead cost (in CZK/minute or hour)

$\sum VR$ - Total amount of operating overhead costs per workplace that is to be allocated to products (in CZK)

pr_i - Labor input of the i -th product (in min/unit of production)

q_i - Production volume of the i -th product (in units of production)

An example of the allocation of operating overhead costs of XY center to products (costing unit) in the rate of labor input is presented in **Table 1**.

Table 1 An example of the allocation of operating overhead costs of a center into costing units in proportion to the labor inputs of the individual products

Costing unit	Production volume in tons	Labor input in min/ton	Total production time in minutes	Costing rate in CZK / min	Allocated operating overhead costs to products in CZK
Product A	3 500	15.60	54 600.00	26.81943968	1 464 341.41
Product B	200	35.62	7 124.00	26.81943968	191 061.69
Product C	16 300	13.68	222 984.00	26.81943968	5 980 305.94
Product D	15 520	15.68	243 353.60	26.81943968	6 526 607.20
Product E	360	42.30	15 228.00	26.81943968	408 406.43
Product F	590	15.10	8 909.00	26.81943968	238 934.39
Product G	4 560	25.16	114 729.60	26.81943968	3 076 983.59
Product H	12 600	51.62	650 412.00	26.81943968	17 443 685.40
Product I	350	12.60	4 410.00	26.81943968	118 273.73
Product J	990	28.30	28 017.00	26.81943968	751 400.24
TOTAL	54 970		1 349 767.20		36 200 000.00
					Control sum
Operat. over. costs of XY centre in CZK					36 200 000.00
Costing rate = 36 200 000 CZK: 1 349 767.20 minutes = 26.81943968 CZK/min.					

Allocation of fixed overhead costs, for example, in the form of overhead costs according to the labour input makes economic sense, especially in cases where own capacity is fully used. In opposite situation, this method may not be correct. This method makes products with high labor input more expensive and often, due to the market price, also less cost-effective. This fact can lead to wrong considerations to exclude such products from the production program at the time when the capacity is not fully used.

The target costing calculations [4] can be based on the planned or actual costing rates of operating overhead costs that were calculated under the following conditions:

- Depreciations of tangible assets, representing part of the operating overhead costs, match the actual value of their acquisition and the real time of their use. This means that production and machinery equipment with zero depreciation, or with depreciation that does not correspond to the current price of their acquisition and the real time of their use, are not used.
- Work and production capacities are fully used or are used at least at the level that is usual in real competitive environment.

In case the depreciations of used tangible assets included in operating overhead costs do not correspond to the real cost of acquisition and the real time of use, it is necessary to increase the operating overhead costs by the absolute value of the difference between the used depreciation amount and the amount of the so-called costing depreciations, which correspond to the real cost of acquisition and the real time of use of the tangible assets.

In the event that the labor and machine capacities are not fully used or are not used in the usual scale, it is necessary to increase the volume of production, which is used in the costing rate calculation of operating overhead costs, to the level of usual capacity utilization in real market environment. At the same time, it is also necessary to consider increasing the value of operating overhead costs for the individual workplaces, in case this overhead costs include part of variable costs or in case it is necessary to consider increasing some of the fixed costs (e.g., when adding a production shift), as a result of previous increase of production volume.

4. RECOMMENDATIONS

The use of labor input as the reference value in the calculations of costing rates of operating overhead costs, which are dominated by fixed costs, is mathematically and logically justified only in cases of full use of the technical level of own capacities, which is possible only in continuous production mode, including Saturdays and Sundays.

The use of labor input for the allocation of operating overhead costs, even in situation when own capacities are not fully used, makes it look like products with a high labor input are unprofitable and their production curtails the net income, which is often false. In case of fully unutilized own capacities, the sales of each product that has a positive contribution margin (difference between the selling price and the proportional costs per production unit) improves the net income, although the full costs calculation resulted in a loss. The question is only what minimum contribution margin is to be used when selling the products and to what territories, so that the company does not compete with itself as a result of this price.

CONCLUSION

In case the scale of usual use of manufacturers' own capacities in the given market sector does not achieve their full technical use, it often leads to a situation when the market price of products does not fully reflect the different amounts of labor input spent in their production. However, if a manufacturing company finding itself in such a situation uses costing calculations for the purpose of price negotiations, which allocates a substantial part of its fixed overhead costs according to the amount of labor input, the products of this company with high labor input appear to be unprofitable, when compared with the market prices. It often leads to the "vicious"

circle situation, which can be characterized by a formula: "We do not have orders, because we have high prices. We have high prices, because we have high calculated costs. We have high costs, because we do not have orders" [5].

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