IMPLEMENTATION OF MULTI STAGE COSTING AND THEIR OTHER USE IN THE FOUNDRY

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Abstract

The paper deals with the practical application of the multi stage costing in the foundry. The emphasis in the practical part of the paper is on the calculation method, the definition of basic links and procedures. Multi-stage costing often to help to uncover the costs, that impossible cover by traditional calculation methods therefore it is currently applied in many Foundry. Bases of this calculation method are the budgets of individual workplaces and centers. Due to the versatility of this calculation method, other possible approaches and the use of multi stage costing are suggested. The goal of this paper is to show different possibilities of application this method.

Keywords: Calculation method, optimum capacity, cost, opportunity cost, cost drivers

1. INTRODUCTION

The calculation, in general meaning, is one of several effective cost management tools in an enterprise. Without exaggeration, it is a principle which used by every person in life. This is much important for a correctly functioning business that strives to achieve strategic goals, be it maximizing profits, expanding the portfolio, improving product quality, new acquisitions, or other key steps.

This cost management tool is becoming increasingly important, especially in the current very turbulent economic environment, characterized by shorter product and service life cycles, shorter supply cycles and, above all, considerable fluctuations in capacity utilization [1]. Every enterprise and all their processes are a "living organism" that is constantly evolving and changing, in the same way his management tools. That's why the enterprise's calculations go through development and try to pinpoint as much as possible causality, uncover deficiencies, unused capacities, wastage costs, and find how effective being used costs in the enterprise.

At present, the most up-to-date the most modern methods of calculation such as Activity Based Budgeting or Activity Based Costing and others are increasingly highlighted. Nevertheless, more traditional methods of calculation, such as Variable Costing, are still being used in some industries. One of the ways of using the above method will be discussed later in this article.

2. MULTI STAGE OF VARIABLE COSTING

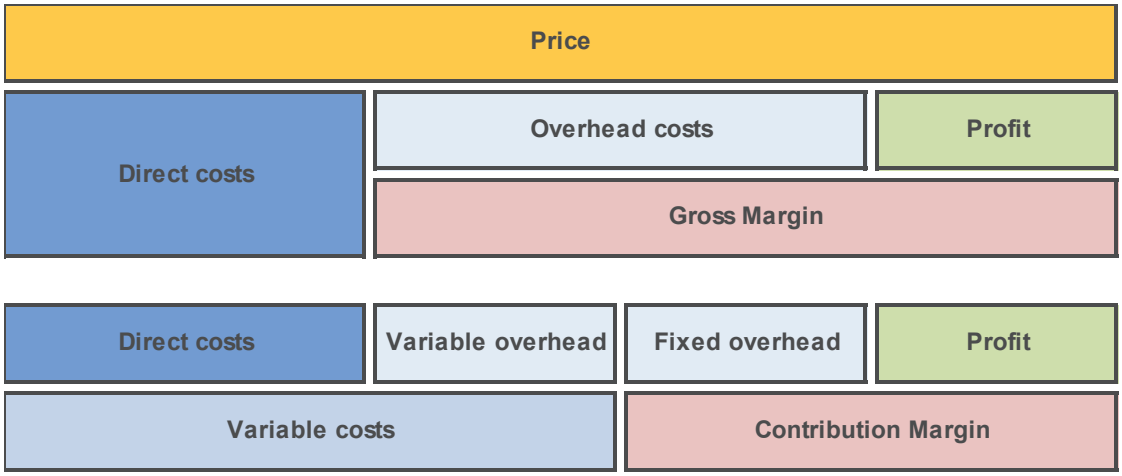
Multi-stage calculations in different forms are based on a standard Variable Costing. Sometimes Variable Costing are referred to as a Calculation of Contribution Margin. Basis of this calculation is to assign variable costs to individual products, services, or processes. All fixed costs are considered to the cost of the period and de facto are not related to output and must be paid out of the total margin. When using Variable Costing in different grades, by type and consumption of fixed costs, we can better define their effective use and maximizing profit. The primary prerequisite for implementation this calculation to any variation is the separate tracking of variable and fixed costs and the use of a tool that would allow the management of free capacities and maximize profits [2].

In practice, we often encounter a so-called multi-stage variation of Variable Costing. It is in cases, where fixed costs groups are causally related to different organizational parts. We assign fixed costs in several layers based on certain relationships to the objects, such as enterprises departments.

2.1. Practical procedure for implementation a multi stage of Variable Costing

The Variable Costing eliminates the negative impact of the full fixed cost allocation and considers them to be the costs related to the operation of the entire enterprise. Primary differentiation of variable and fixed costs is even further in this calculation and can also distinguish overheads, as can be seen from the illustration the **Table 1** [3].

Table 1 Comparison of traditional calculation with Variable Costing



The basic process of multi stage of Variable Costing have the three basic stages [2]:

- In the first stage, all costs directly entering the engagement or performance process are placed. In practice, it is often direct cost of production as a direct material, machine energy usage, direct wages and other costs that are related to a defined process.
- In the second stage, the costs of specialized service activities are closely related to the first stage processes. These can be machine maintenance and repair, product preparation, quality control, etc.
- In the last-third stage - the costs of general servicing activities are included. In the vast majority cases, these costs are used by all departments of the enterprise - administrative overhead, IT services, management activities, etc.

Because Variable Costing do not use fixed costs as an inseparable whole, we are able to assign part of the fixed costs to the specific segment according to certain relationships. In practice, each enterprise generates a series of layers, de facto a few Contributions Margin, according to their needs and the practical use of this information.

The following practical part of the contribution will define the stratification of part of the costs of the unnamed foundry and will present the way of calculating these costs for main processes. In addition, will be the advantages and disadvantages of this type of calculation for the foundry briefly analyzed.

3. CREATION OF MULTI STAGE CALCULATION IN A FOUNDRY

For the practical processing of the model example of a multi stage of Variable Costing, these input data of the individual foundries workplace are used. The sample data was selected for easier presentation of the procedure. It is a steel foundry that in Pouring shop uses electric arc furnaces and electric induction furnaces at the melting plant. Furan blends are consumed in the Molding as a direct material. The Molding uses manual

and machine processing, and this part of the operation also includes Core-shop. The Pattern shop is not part of the workshop and the models are outsourced. **Table 2** below shows that different workplaces consume different volumes of individual types of variable and fixed costs and also in a different ratio. For example, the workplace the Pouring shop have consumptions the largest volume of direct material. High costs values are too the energy consumption and the depreciation of assets of this workplace. By contrast, depreciation in the Molding has higher value than energy consumption. There is due to the technologies and machines that are equipped with this workplace. The data in the **Table 2** are given in thousands CZK per calendar month.

Table 2 Consumption costs of foundry (in thous. CZK)

Cots	Foundry shop				Cleaning shop						Production process in total		TOTAL costs
	Molding		Pouring shop		Cleaning		Heat Treatment		Machining				
	F	V	F	V	F	V	F	V	F	V	F	V	
Direct material		2,000		3,000		800		100		100		6,000	6,000
Direct wages	1,200	100	800	90	1,500	500	600	60	1,000	100	5,100	850	5,950
Direct energy	100	800	1,000	2,000	300	500	700	1,000	300	1,000	2,400	5,300	7,700
Operation material	100	300	500	300	100	200	300	1,000	300	200	1,300	2,000	3,300
Repairs, maintenance	50	100	100	500	50	100	100	1,000	50	50	350	1,750	2,100
Depreciation	100	1,200	100	2,000	300	500	300	1,000	300	500	1,100	5,200	6,300
Total costs	**1,550**	**4,500**	**2,500**	**7,890**	**2,250**	**2,600**	**2,000**	**4,160**	**1,950**	**1,950**	**10,250**	**21,100**	**31,350**

The **Table 3** shows the sales volume for the same period as the costs in the **Table 2**, figures are in thousands CZK. The range of products has been differentiated according to the weight of individual castings into 3 basic groups. With this resolution we will continue to count in creating layers of the calculation.

Table 3 Sales volume (in thous. CZK)

Sales volume (in thous. CZK)	
small casting (< 100 kg)	8,250
middle casting (> 100 kg < 1.000 kg)	16,500
large casting (> 1.000 kg)	30,250
TOTAL	**55,000**

Differentiation of fixed and variable consumption cost data is essential for further work with them in Variable Costing. It should be taken into consideration, for example, that energy consumption is both variable and fixed. Energy consumption of production lines and machines is a variable costing, and energy consumption in offices or common spaces is a fixed cost. Another parameter for distinguishing layers of stages of calculation is the definition of direct costs. These are costs that are directly attributable to a given performance without any further differentiation. These are the starting points for creating the calculations.

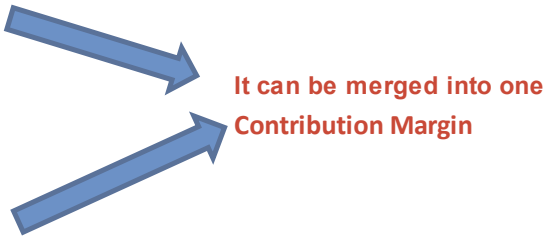
3.1. Multi stage calculation the whole enterprise

Multi stage of Variable Costing can has different uses, most often it is the basis for pricing or calculation costs. This article shows only how to create and use a multi stage of Variable Costing. In the illustrative examples will be presented with a multi stage calculation of the whole enterprise and the costly most demanding the workplace of the foundry - the Pouring shop. Based on the data presented in **Tables 2** and **3**, we will create in first the first stage - the Contribution Margin 1, that we will assign only the direct costs to the total volume of production. So direct material and direct - variable portion of energy consumption. Some enterprises are already working with this level Contribution Margin when monitoring specific key performance metrics. However, overhead variable costs, which in this example are represented by a variable part of wage costs, overhead material, repairs and maintenance and depreciation of specific machines and technologies, may be

assigned to also the first stage. In this article, these variable parts of overhead costs constitute of a separate level of Contribution Margin 2. The next stage is formed the overhead costs of production centers. The last stage is the general fixed costs of other enterprise centers, such as quality control, technology, purchasing and administration. These it forms a separate part because they are not directly related to performance. Processed calculations according to the above criteria are shown in **Table 4**. When making this calculation in a foundry operation, other aspects of this specific activity would have to be taken into consideration, such as defective products, material losses and others.

Table 4 Multi stage calculation of the foundry (in thous. CZK)

SALES VOLUME		**55,000**
Direct material	VARIABLE	6,000
Energy consumption - directly	VARIABLE	5,300
Total variable costs - directly	VARIABLE	***11,300***
CONTRIBUTION MARGIN 1	VARIABLE	**43,700**
Direct wages	VARIABLE	850
Operation material	VARIABLE	2,000
Repairs and Maintenance	VARIABLE	1,750
Depreciation	VARIABLE	5,200
Variable overhead costs - total	VARIABLE	***9,800***
CONTRIBUTION MARGIN 2	FIXED	**33,900**
Direct wages	FIXED	5,100
Energy consumption - fixed	FIXED	2,400
Operation material	FIXED	1,300
Repairs and Maintenance	FIXED	350
Depreciation	FIXED	1,100
Fixed overhead costs - total	FIXED	***10,250***
CONTRIBUTION MARGIN 3	FIXED	**23,650**
General fixed costs	FIXED	17,600
PROFIT		**6,050**



The above-mentioned the multi stage of Variable Costing allows us to track several indicators used in operational cost management. One is gross margin, which is de facto the difference between the price of performance and its direct costs [4]. This indicator shows how many percent of each sales crown represents a contribution to cover fixed costs and profits. It is up to each enterprise at which level or stage of calculation to record direct costs. Another advantage of this enterprise-level calculation is simple, separate tracking of variable and fixed costs over in a short period of time, making it an effective basis for managerial decisions based on existing capacity.

The Multi stage of Variable Costing can also be an important management tool in foundry enterprises also in pricing decisions, as mentioned earlier. In situations where the capacity of the business exceeds customer demand, there is a problem of unused fixed costs, which, by using more traditional methods of calculation, could be more expensive cost for the enterprise. If applying the multi stage calculation correctly, the manager is able determine the level at which it is possible to lower the price under the given circumstances to fill capacities or take other operational decisions. In the short term, in some cases, the price may be reduced to the variable cost level because any positive cover contribution is better than unused capacity at this time, which will not contribute to the fixed costs. Another use of this calculation in a foundry enterprise can be the decision making and the determination of an optimal assortment of production. Thanks to this calculation method, it is also possible to analyze the products that the foundry decided to produce for certain strategic

reasons, even though the profitability of their production is at the expense of producing other products. This phenomenon is illustrated in **Table 5**, where it is clear, that small castings defined by its weight of up to 100 kg can consume disproportionately much more direct material and energy than large castings. The Pouring shop section is the most demanding section of the foundry. When creating a multi stage calculation of Variable Costing for this segment, it has been found that small castings have positive values in all the Contributions Margin for a given segment. But the Contribution Margin 3 contribute to general fixed costs and profit only marginally and ultimately negative values.

Table 5 Multi stage of Variable Costing of Pouring shop (in thous. CZK)

POURING SHOP (in thous. CZK)		Small castings (< 100 kg)	Middle castings (> 100 kg < 1 000 kg)	Large castings (> 1 000 kg)	Total sales share
SALES VOLUME		**2,734**	**5,468**	**10,025**	**18,227**
Direct material	VARIABLE	850	900	1,250	3,000
Energy consumption - directly		300	600	1,100	2,000
Total variable costs - directly		***1,150***	***1,500***	***2,350***	***5,000***
CONTRIBUTION MARGIN 1		**1,584**	**3,968**	**7,675**	**13,227**
Direct wages		13	27	50	90
Operation material		165	90	45	300
Repairs and Maintenance		75	150	275	500
Depreciation		300	600	1,100	2,000
Variable overhead costs - total		***553***	***867***	***1,470***	***2,890***
CONTRIBUTION MARGIN 2	FIXED	**1,031**	**3,101**	**6,205**	**10,337**
Direct wages		120	240	440	800
Energy consumption - fixed		150	300	550	1,000
Operation material		75	150	275	500
Repairs and Maintenance		15	30	55	100
Depreciation		15	30	55	100
Fixed overhead costs - total		***375***	***750***	***1,375***	***2,500***
CONTRIBUTION MARGIN 3		**656**	**2,351**	**4,830**	**7,837**
General fixed costs		875	1,750	3,208	5,833
PROFIT		**-219**	**601**	**1,622**	**2,004**

4. CONCLUSION

In conducted study in the foundry has shown that a multi stage of Variable Costing brings a number of positive effects. In particular, it provides high quality information to address a variety of decision-making tasks, allows for quicker orientation in assortment performance, pricing change considerations, etc. This method eliminates inaccurate fixed cost allocation to performance, typical of absorption calculations. Practice in many enterprises shows that it is a good management tool in a short period when of fluctuations in prices and volume of production. It simplifies managers' decision-making on issues of reaction to the incompleteness of production capacities, overcapacity of production capacities, but also when setting a minimum selling price.

Certain pitfalls of a multi stage of Variable Costing stem from the very nature of differentiation between variable and fixed costs. At differently long periods, the costs behave differently and often change. Costs that are

variable over a longer period may have a fixed character in the short period, and vice versa. It is therefore necessary to take into consideration the time aspect when applying this tool.

The deficiency of this calculation method is the fact that it is unable to accurately quantify the cost of a specific output performance or product. It does not provide information about the structure and causes of fixed cost consumption. It depends, however, on what decision-making tasks the manager wants to use this method. Therefore, it is appropriate to use the Multi stage of Variable Costing in parallel with other appropriate calculation procedures.

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