CALCULATION OF METAL ADDITIVES COSTS IN THE AUTOMOTIVE INDUSTRY

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Abstract

The Article is dedicated to the calculation of metal parts (additives) costs in the automotive industry. The selected methods applied in practice have been critically assessed. The focus was the evaluation of usefulness of the selected methods of material cost calculation in the context of their impact on cost object and income object accounting of an automotive enterprise.

Keywords: metal additives costs, automotive industry, cost calculation

1. INTRODUCTION

Currently, it is a company's environment, rather than its internal production potential, that is increasingly perceived as the basic factor determining permanent fundaments of enterprise development. The environment influences a company's financial standing by generating beneficial conditions (chances, opportunities) for its operation and development. However, it may also pose certain threats to an enterprise. The importance of environmental impact on enterprises' results makes it necessary to constantly monitor environmental changes and analyze their impact on companies' results (cf. [1], [5]).

The need to constantly monitor environmental changes is particularly important for the metal industry, which delivers components and finished products to virtually all industry branches, including automotive, air transport, transport and machinery. The automotive industry is one of the fastest growing branches of this sector in Poland. Its development depends on the market environment, particularly on the prices of metals on the global market. Thus, in this case the change monitoring refers mainly to the prices of metals, i.e. metal parts of produced goods which are included in their sales price. This requires the use of advanced cost accounting methods (cf. [6], [7]).

The purpose of this article is to present the concepts for calculating costs of own products in the automotive industry. It focuses on illustrating the manner of evaluating purchasing components, which include metal additives (e.g. copper) in the variable cost account system. Additionally, the usability of selected calculation methods has been described in the context of their impact on the cost drivers account and result drivers account in the automotive industry.

2. GENERAL CONCEPT OF COST ACCOUNTING

Cost accounting and allocation takes place in financial and managerial accounting, however primary costs (consumption of external resources) are accounted for simultaneously in financial and managerial accounting, and secondary costs - only in managerial accounting. Direct costs are accounted for directly in cost accounting objects, and overhead (general) costs - sequentially, i.e. first in cost types and cost centers and then in cost object and/or income objects. **Fig. 1** illustrates the stages of cost allocation in an enterprise. By nature, direct costs may be directly "transferred" to the cost object accounting. Sometimes, they are allocated to cost centers in a purely informative manner or as a basis for overhead costs accounting (e.g. costs of raw materials as a basis for determining the surcharge of overhead purchasing costs). Overhead costs (e.g. overhead costs of purchasing, manufacturing and selling) are always allocated in relation to cost centers. They are recorded in cost centers and allocated as part of internal activity - unless auxiliary cost centers were differentiated. Then,

with reference to each cost center, the cost rates are determined (i.e. allocation rates and surcharge rates, cf. [2] [3]).

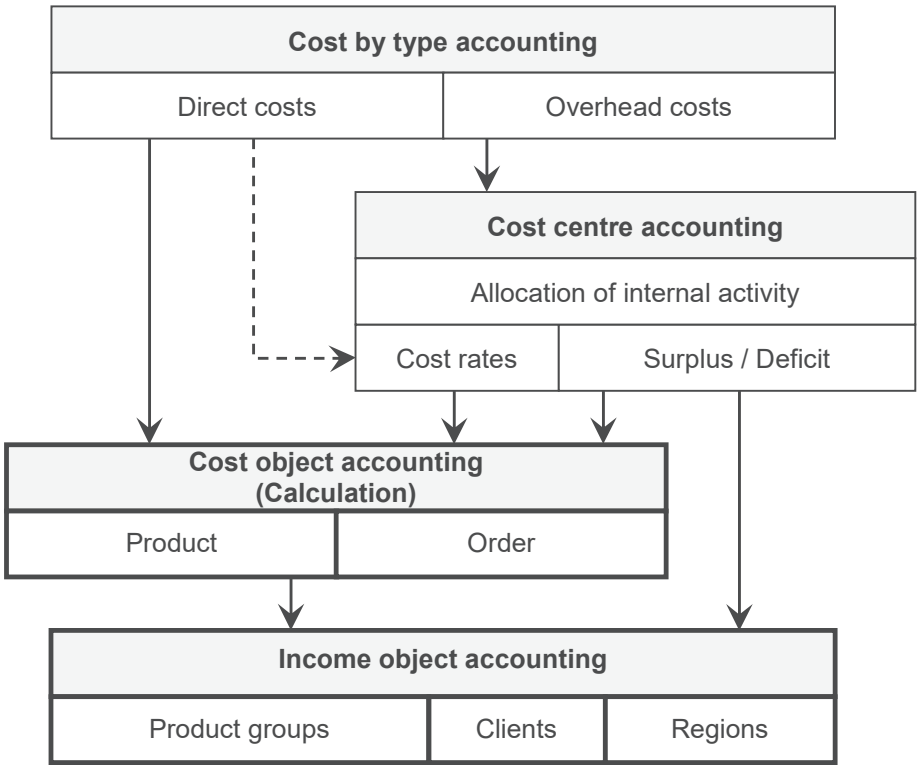

Fig. 1 Stages of cost accounting, cf. [3] [8]

Calculation rates are prices of performances delivered by one cost center for another cost center or cost object. In the first instance, this applies to internal activity - and in the second - costs of direct pay and machine hours of manufacturing orders. The rates are used to allocate overhead costs to one unit of a given cost object, for example product or order. Besides that, overall overhead costs of the period are recognized in the income objects and compared with the products/services of this period. If in a given period, too many or too few overhead costs were allocated, the resultant cost surplus or deficit is recognized in income object accounting. Income object accounting, besides the result achieved in a given reporting period, also gives information about its sources, provided that a proper division into objects was made (cf. [8]). Income objects may be e.g. groups of articles, clients, regions, etc. (cf. [3] [4]).

The second part of the article focuses on illustrating the concept of using the account in question in the metal industry. Starting from a classical (traditional) solution, the authors present the concept of using a variable cost account system for metal parts included in the components of finished products.

3. COST CALCULATION - AN EXAMPLE OF THE TRADITIONAL APPROACH

The example illustrates cost accounting in current and normal cost accounting including: cost types, cost centers and cost and income objects based on [3]. Within four main cost centers were recognized: Purchasing, Processing, Assembly and Sales corresponding to typical functional areas of an enterprise. Cost objects and income are the same products P1 and P2. Product P2 contains metal components.

3.1 Cost center accounting

Table 1 illustrates the cost center analysis sheet containing overhead costs, surcharge rates, normal costs allocation (to cost objects) and surplus and deficit by cost center. Cost center allocation means allocation of normal costs to objects and determination of surplus or deficit for individual cost centers.

Table 1 Cost center analysis sheet

(in k €)	*Purchasing*	*Processing*	*Assembly*	*Sales*	*Total*
Total primary costs (actual)	450	200	170	180	1,000
Cost allocation to objects (normal)	-270	-161	-141	-252	-825
Cost Surplus/Deficit	**180**	**39**	**29**	**-72**	**175**

Overhead costs totaling € 1,000k are divided into cost centers in the following amounts: € 450k; 200k; 170k; and 180k. The costs of the main cost centers were allocated to cost objects based on normal surcharge rates for cost centers in the following amounts, respectively: € 270k; 161k; 141k and 252k, which caused a deficit for cost centers in the following amounts, respectively: € 180k; 39k; 29k and -72k. This shows deficit in Sales cost centers and surplus in other cost centers. Total surplus is € 175k and is to bring normal values of profit/loss on sales determined based on normal costs to the actual values.

3.2 Cost object and income accounting

Cost object accounting being the calculation of prime costs is illustrated by **Table 2**. The table shows cost item analysis as a breakdown of costs that make up prime cost of calculation objects. Direct costs are made up of raw materials and labor costs. Overhead costs are allocated through surcharge rates. As reference values determining overhead cost surcharges, the following were assumed for cost centers: raw materials, labor cost and cost of products sold. For example, overhead costs surcharge for P1 is € 150 (= 20% x 748)k, and for P2 it is € 120 (= 20% x 602)k, which makes up the total surcharge for purchasing cost of € 270k.

Table 2 Cost object analysis sheet

	(in k €)	*Surcharge*	*Product P1*	*Product P2*	*Total*
	Raw materials		748	602	1 350
+	Overhead costs of Purchasing	20%	150	120	270
+	Labor cost of Processing		92	43	134
+	Overhead costs of Processing	120%	110	51	161
+	Labor cost of Assembly		26	21	47
+	Overhead costs of Assembly	300%	77	64	141
=	**Costs of goods**		**1,202**	**902**	**2,104**
+	Overhead selling costs	12%	144	108	252
=	**Prime costs (normal)**		**1,346**	**1,010**	**2,356**

Cost item analysis in addition illustrates changes in value of product stock and activated own work. The cost of goods is a base for determining the surcharge of overhead selling cost, which for product P1 is € 144k (= 12% x 1,202)k. Direct costs are valued at current values and overhead costs - at normal values (as a product of normal surcharge rates and reference values). Taking normal values for overhead cost accounting means determination of prime costs based on normal costs [4].

Overhead costs surcharges of main cost centers of € 270k; 161k; 141k and 252k, respectively, 'debit' cost objects (cf. **Table 2**) and also - in the same amounts 'credit' cost centers (cf. **Table 1**), which is reflected in the

cost center analysis sheet - item 'Cost allocation to objects (normal.)'. The credits and debits form value flows between the cost center and cost object accounting. Successive flows take place in cost object accounting.

Unlike cost object accounting, where cost allocation is reflected by manufacturing value flows, income object accounting includes sales revenue and costs. Result data is presented in the so-called income object analysis (IOA) sheets being a sales revenue and costs account within income objects. **Table 3** demonstrates IOA for income objects - also the products P1 and P2 - patterned after a profit and loss account in the multi-step format in a simplified version. Sales revenue and cost account helps calculate profit on sales by normal value totaling € 770k. The amount is divided into products: € 744k and € 26k.

Table 3 Income object analysis sheet

	(in k €)	*Product P1*	*Product P2*	*Total*
	Sales revenue	2 090	1 036	3 126
-	Prime costs (normal)	1 346	1 010	2 356
=	**Profit/loss on sales (normal)**	**744**	**26**	**770**
+	Surplus of overhead costs			
-	Deficit of overhead costs	100	75	175
=	**Profit/loss on sales (actual)**	**644**	**-49**	**595**

Bringing sales results to the current (actual) values requires recognition of surplus and deficit of overhead costs determined in cost center accounting in the amount of € 175k. In the contemplated example, this caused a decrease in profit on sales from € 770k to € 595k. In this approach, it resulted in particular to obtain a negative result for the product P2 in the amount of € -49k, which because of the relatively large share of their costs absorbed a large share of deficit of overhead costs in the amount of € 75k.

Indicated a large share of the costs for product P2 was caused on the one hand by the amount of the cost of materials containing metallic additives, on the other hand - to the large surcharge of overhead costs based precisely on the cost of materials. Such an approach may result in the reduction of the adequacy of the settlement overheads calculated on products and consequently to inappropriate decisions.

4. COST CALCULATION - AN NEW APPROACH

Considering the above presented limitations of the traditional approach proposed new - consisting in extracting the metal additives with the cost of materials. The resulting two components - the base and the metal additives - will be billed separately. Overhead costs of purchasing will be settled only in relation to the base component.

4.1 Cost center accounting

Table 4 illustrates the cost center analysis sheet, based on the previously shown example, with the new approach. Overhead costs totaling € 1,000k are divided into cost centers in the same way that is in the amounts: € 450k; 200k; 170k; and 180k. The costs of the main cost centers were allocated to cost objects based on normal surcharge rates. In the case of the Purchasing cost center settlement was only based only on part of the base material - without metal additives. These costs were allocated in the following amounts, respectively € 214; 161k; 141k and 246k, which caused a deficit for cost centers in the following amounts, respectively: € 236k; 39k; 29k and -66k.

The difference with the previously shown example relates primarily to overhead cost allocation of Purchasing cost center. The increase of overhead cost of Sales is only a consequence of increasing the cost of goods, which also consists of surcharge of Purchasing costs. Total surplus is € 238k and is to bring normal values of profit/loss on sales determined based on normal costs to the actual values.

Table 4 Cost center analysis sheet

(in k €)	*Purchasing*	*Processing*	*Assembly*	*Sales*	*Total*
Total primary costs (actual)	450	200	170	180	1,000
Cost allocation to objects (normal)	**-214**	**-161**	**-141**	**-246**	-762
Cost Surplus/Deficit	**236**	**39**	**29**	**-66**	**238**

4.2 Cost object and income accounting

Cost object accounting being the calculation of prime costs with the new approach is illustrated by **Table 5**. The table shows cost item analysis as a breakdown of costs that make up prime cost of calculation objects. Overhead costs surcharges of main cost centers of € 214k; 161k; 141k and 246k, respectively, 'debit' cost objects (cf. **Table 5**) and also - in the same amounts 'credit' cost centers (cf. **Table 4**), which is reflected in the cost center analysis sheet - item 'Cost allocation to objects (normal.)'. The credits and debits form value flows between the cost center and cost object accounting. Successive flows take place in cost object accounting. The difference with the previously shown example relates to cost of raw material - metal additives. The change applies overhead costs for the product P2. Overhead costs purchasing and selling have decreased due to the reduction in the reference of overhead costs allocation. The reference was only a base amount of materials - without the metal additives.

Table 5 Cost object analysis sheet

	(in k €)	*Surcharge*	*Product P1*	*Product P2*	*Total*
	Raw materials (base)		748	320	1 068
+	Raw materials (metal additives)		0	282	282
+	Overhead costs of Purchasing	20%	150	64	214
+	Labour cost of Processing		92	43	134
+	Overhead costs of Processing	120%	110	51	161
+	Labour cost of Assembly		26	21	47
+	Overhead costs of Assembly	300%	77	64	141
=	**Costs of goods**		**1,202**	**845**	**2 048**
+	Overhead selling costs	12%	144	101	246
=	**Prime costs (normal)**		**1,346**	**947**	**2,293**

Table 6 demonstrates income object analysis sheet (IOA) for products P1 and P2. Sales revenue are divided into base and metal additives amounts. Costs are also divided into base and metal additives amounts and especially into direct (raw material and labor costs) and overhead costs. It helps calculate two contribution margins - of the base and the metal additives. Profit/loss on sales by normal value totaling € 833k. The amount is divided into products: € 744k and € 89k.

Bringing sales results to the current (actual) values requires recognition of surplus and deficit of overhead costs determined in cost center accounting in the amount of € 167k divided into product P1 and product P2. In the contemplated example, this caused a decrease in profit on sales from € 744k to € 595k. In this approach, it resulted in particular to obtain a positive result for the product P2 in the amount of € 18k, which because of the relatively small share of their overhead costs. It has been found that the product P2 is still profitable. The reason was the change in overhead costs allocation.

Table 6 Income object analysis sheet

	(in k €)	*Product P1*	*Product P2*	*Total*
	Sales revenue (base)	2 090	670	2 760
-	Raw material (base)	748	320	1 068
=	**Contribution margin (base)**	**1 342**	**350**	**1 692**
+	Sales revenue (metal additives)	0	366	366
-	Raw material (metal additives)	0	282	282
=	**Contribution margin (metal additives)**	**0**	**84**	**84**
-	Labour cost	117	64	182
-	Overhead costs total (normal)	481	281	762
=	**Profit/loss on sales (normal)**	**744**	**89**	**833**
+	Surplus of overhead costs	0	0	0
-	Deficit of overhead costs	167	71	238
=	**Profit/loss on sales (actual)**	**577**	**18**	**595**

CONCLUSIONS

The literature on the subject covers many methods of costs allocation in an enterprise. The presented comparison of two alternative approaches demonstrating the need of a more in-depth analysis of their usefulness in the context of information needs of an entity. A conclusion saying that - even if the application of various cost allocation methods does not impact profit/loss on sales, it may materially impact the valuation of the profit/loss (i.e. contribution margin) for different products especially in the automotive industry - deserves much attention. Further studies will aim at deepening the contemplated analysis of software implementation in the area of cost accounting.

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