APPLICATION OF METHODS TO COVER THE COSTS OF THE MANUFACTURING AS AN IMPORTANT FACTOR IN INCREASING THE COMPETITIVENESS OF FIRMS

Kartunov S. K., Doctor-Ingineer, Professor
TU — Gabrovo, BG-5300 Gabrovo, H. Dimitar Str. 4, Department MU
skartunov@abv.bg

The costscover in manufacturing is an important factor for increasing the competitiveness of firms. The target parameters in a manufacturing company are turnover, reduce costs and profits from the activity. The turnover ask how many products the company is able to sell on the market. Depending on the evolution of costs it can contribute to better financial results or lead to a loss. The smaller are the cost, the better at the same turnover is the profits from productive activity. It is best to manage profits. In calculating the account to cover the outcome of proceedings shall be calculated as the difference between revenue and production costs. Therefore, the profit can affect costs and turnover, with its characteristics price and quantity.

The Management profit includes splitting its more precisely for each direction of the company, respectively workers. The Account to cover offers two methods:

- dividing the fixed and variable costs;
- introducing lines of reporting and responsibility.

In the first method the separation of the fixed and variable costs shows which costs change with the business. Dimension to this benefit, for example quantity produced or sold products or executed hours. If are known fixed and variable costs can be made up to cover them, and it is:

$$P = O — C_{пр.} \quad (1)$$

where O — the turnover, currencies; $C_{пр.}$ — variable costs, currencies; P — cover the costs, currencies.

Thus analyze to what extent individual products contribute to cover the fixed costs in the company.

In the second method (Profit-Center) analyze and reduce the costs of directions. The company is divided in steps of directions, for each of estimating the costs and their impact on the end result, and so one — Profit Center is one strand of reporting and responsibility.

The calculation to cover of the costs only makes sense, when the person or the respective field has its own turnover. Moreover, should take into account costs since its implementation. In more complex situations may be performed relatively computation cost recovery in arbitrary units.

The analysis of the costs of the proceedings is a matter considered by many authors, but here is done in terms of competitiveness of firms. The calculation of relative unit costs and coverage distinguishes them dependent and independent operating expenses as the difference between individual and total costs depend only on the selected batch. The Methods are two: a direct calculation costs recovery (Direct Costing) and calculating a relative unit costs and the costs cover [1, 2, 5, 6]. The first is suitable for large companies, the second — for sole proprietors and small businesses.

With Break-Even-analysis or analysis of the threshold of profit confirms what quantities of the product must be sold to cover the total costs and achieve profit, here seen in Example 2. If more products contribute to cover fixed costs using the method of operational analysis.

Study of parameters on various occasions in engineering manufacturing

Example 1. In manufacturing company incurred fixed costs $C_{п.}$= 300 000 Million currencies, variable costs. $C_{пром.}$ = 280 currencies * batch size (production program, lot) and is achieved revenue Pr = 900 currencies * batch size [1, 3].

To make an account to cover costs C.

Decision:

Should define the target function (profit), that is:

$$P = Pr — C; P \rightarrow 0 \quad (2)$$

Its decision is at Pr = C. The batch of production is indicated by x.

$$\begin{aligned} 900x &= 300000+280x \\ 620x &= 300000 \\ x &= 484 \end{aligned} \quad (3)$$

In production batch of more than 484 units the Company will work to gain (profits). The solution is shown graphically in Figure 1. The rights of fixed costs shows, that they are independent of the quantity sold. The Variable costs accounted respectively produce and sell quantity.The total costs is obtained as the sum of fixed and variable ones. They are compared with the curve of revenue and where is the intersection of the curve of revenue and total expenditure lies the threshold gain.

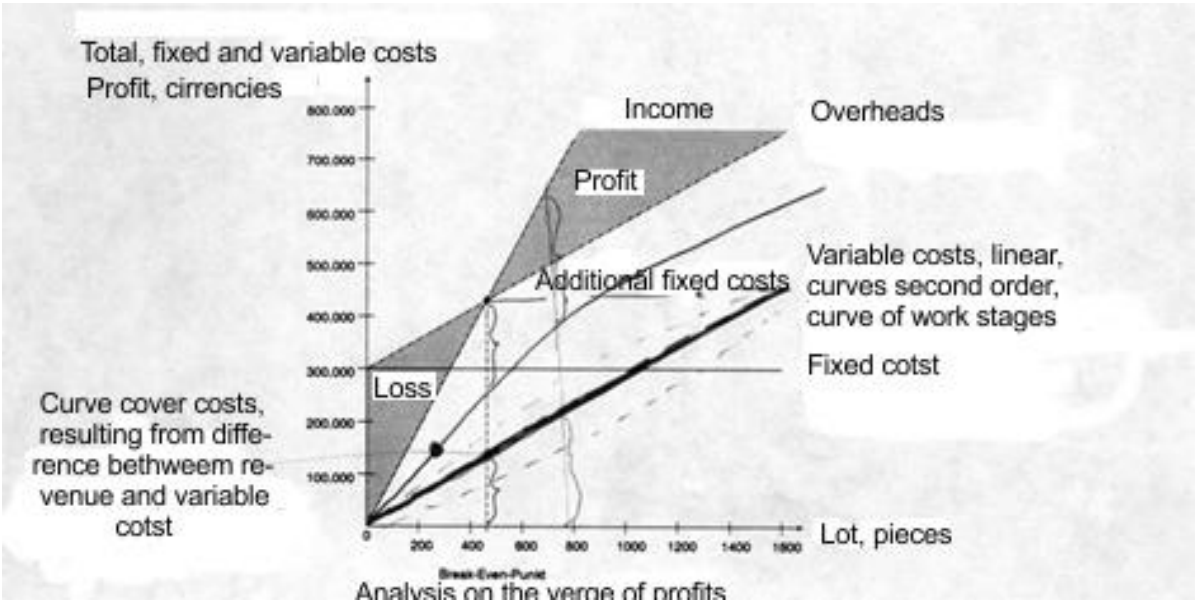


Fig. 1. Graphical analysis of the costs cover

Example 2. Company should decide to purchase machine A or B. The cost analysis shows fixed costs per year per machine A and B respectively 20000 currencies for A and 40000 currencies for machine B;Proportionate costs per unit of output or 5currencies/unit for Machine A and 2currencies/unit for MachineB.

a) To find a lot of what production program machine B works more profitable than machine A?

b) How costs will be saved if implemented machine B to machine A and annual program 20000 units/Yr.?

Decision: a) The condition of equality of cost putting together the equation:

$$20\,000 + 5x = 40\,000 + 2x$$
$$3x = 20\,000 \qquad (4)$$
$$x = 6667 \text{ units}$$

In a batch size of more than 6667 units Machine B will work more profitable.

b) The Expenses C_A on machine A will be:

$C_A = 20\,000 + 5*20\,000 = 120\,000$ currencies

The Expenses $C_Б$ on machine B will be:

$C_Б = 40\,000 + 2*20\,000 = 80\,000$ currencies

With the introduction of machine B will save 40 000 currencies expenditure.

Example 3 (Reverse task)

A proposed production of 10 000 units the Logistics manager determined on a cost-function C_O = 40 000 currencies + 4x. The price per unit of output should be 10 currencies.

A) Where lies the threshold of profit?

B) What is the profit for the planned batch size total and per unit of production?

C) How are the costs per unit of output for the planned batch size?

D) How are the costs per unit of output at the intersection?

E) At what batch size the profit is 20% of turnover?

Solution: A) Of equality of income and expenditure follows:

$$40\,000 + 4x = 100\,000$$
$$x = 15\,000 \qquad (5)$$

B) P = ?

P = 100 000 — 40 000 — 40 000 = 20 000 currencies

P_{un} = 20 000/10 000 = 2 currencies/unit

C) C_o = 40 000 + 4*15 000 = 100 000 currencies

The cost of Unit production for the planned batch size are 10 currencies.

D). In formula (1) is drawn up the system:

$$P = O — C_{пр.}$$
$$0{,}2\ O = O — C_{пр.} \qquad (6)$$

The decision of the system is:

$$0{,}2x*10 = x*10 — 40\,000 — 4x \qquad (7)$$

$$x = 10\ 000$$

In batch size 10 000 units the Profit is 20% of turnover.

Example 4

Company produces a variety of special tools in terms of mass production with batch size M of 250000 units/Yr. The Net selling price is 5,28 currencies/unit. The dependent batch costs $C_{пар.}$ = 2,32 currencies/unit, and the spending time dependent are $C_в$ = 532 800 currencies/Yr. [1, 4].

To calculate: a) Critical batch size $M_{кр.}$ and the critical level of employment;

b) If the employment rate is 100%, the cost dependent on the batch size (lot) for years; The revenue Пр and total costs C per year; The cover of costs ПР and the profit for the year $П_{год.}$; The percent profit on revenue and the expenditure of the manufactured unit;

c) Analogously — all parameters at the level of occupancy of 80%, 90% and 100%;

d) At what batch size per year the cost per unit output: $C_{е. пр.}$ are 4, 54 currencies/unit and percentage profit (gain) was 10%;

e) To plotted costs and revenue, depending on the lot and the employment rate.

Answer: a) $Z.M_{кр.} = C_в + C_{пар.}M_{кр.}$ (8)

$M_{кр.} = C_в/Z$ — $C_{пар.}$ = 532 800/(5,28 — 2,32) = 180 000 units/Yr.

$C_{з\ кр.} / M_{кр.} = 100/M$ (9)

$C_{з\ кр.}$ = 180 000.100/250000 = 72 %

b) $C_{пар.} = M.C_{е. пр.}$ (10)

$C_{пар.}$ = 2,32.250 000 = 580 000 currencies/Yr.

$P = O$ — $C_{пр.}$ (11)

$C_{об.} = C_в + C_{пар.}$ = 532 800 + 580 000 = 1 112 800 currencies/Yr.

$Pr = Z.M$ = 5, 28.250 000 = 1 320 000 currencies/Yr. (12)

$PR = Pr$ — $C_{пар.}$ = 1 320 000-580 000 = 740 000 currencies/Yr. (13)

$P_{год.} = PR$ — $C_в$ = 740 000 — 532 800 = 207 200 currencies/Yr. (14)

$P_{\%} = P*100/Pr$ = 207 200.100/1 320 000 = 15,7% (15)

$C_{е.пр.} = C/M$ = 1 112 800/250 000 = 4, 45 currencies/unit (16)

c) The calculated parameters are given in Table 1.

Table 1

Results obtained

$C_{з\ кр.}$	M	$C_{пар.}$	Pr	PR	P	P	$C_{е. пр.}$	C
%	Units/Yr.	C-s/Yr.	C-s/Yr.	C-s/Yr.	C-s/Yr.	%	C-s/unit	C-s/Yr.
72	180 000	417 600	950 400	532 800	0	0	5,28	950 400
80	200 000	464 000	1 056 000	592 000	59 200	5,61	4,98	996 800
90	225 000	522 000	1 188 000	666 000	133 200	11,21	4,68	1 054 800
100	250 000	580 000	1 320 000	740 000	207 200	15,70	4,45	1 112 800

d) Drawn to the system:

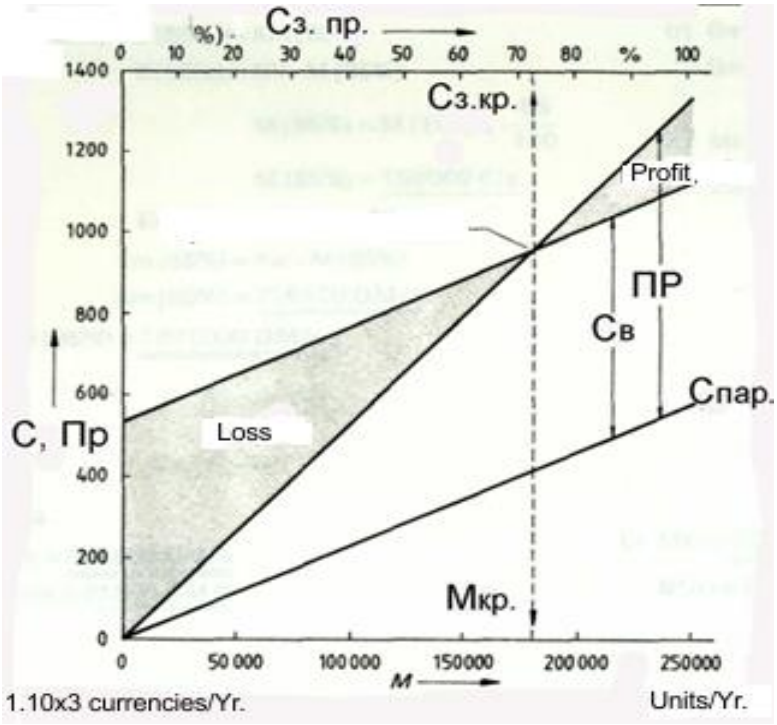
$C = M.C_{е. пр.}$ (17)

$C = C_в + C_{пар.}*M$

$M = C_в/(C_{е. пр.}-C_{пар.})$ = 532 800/(4,54-2,32) = 240 000 Units/Yr. (18)

$M = C_в/Z(1-P_{\%}/100)-C_{пар.}$ = 532 800/5,28(1-10/100)-2,32 = 219 079 Units/Yr (19)

e) The graphical representation of costs and revenue, depending on the lot and the employment rate is shown in Figure 2.



M — Critical batch size (lot)

Fig. 2. Graphical representation of costs and revenues

Conclusion. Referred to are methods for calculating and analyzing bills cover the cost of various engineering procedures, such as are presented and specific examples for different input data, but here is done in terms of competitiveness of firms. In [1] shows the methods and other examples of optimization of production program, comparing and selecting processes, means of production and workforce in Technological preparation of production.

References:

1. Къртунов С., Д. Димова, Логистика, трето допълнено издание, Габрово, УИ „В. Априлов”, 2008, ISBN978-954-683-377-8 (in Bulgarian).
2. Riebel P., Dekungsbeitragsrechnung und Unternehmensführung, Band 1, Opladen, 1972 (in German).
3. Individuell in Lernen, Training, Information, Software, Rottenburg am Neckar, Iltis GmbH, 1993 (in German).
4. Gummersbach A., M. Berg, P. Bülles.., Arbeitsvorbereitung. Betriebswirtschaftslehre, Würzburg, Universitätsdrukerei, 1985 (in German).
5. Gerasymchuk V.H. Marketing support for the withdrawal of industrial products to international markets // Implementation of business processes of marketing cooperation: monograph / for the general ed. prof. L.M. Taranyuk. Sumi: SNAU, 2018. S. 9-23. ISBN 978-966-97774-4-7.
6. Economics and Organization of Production: Textbook / Ed. V.H. Gerasymchuk, A.E. Rosenplenther. Kiev: Knowledge, 2007. 678 p.