

# Cost Planning

## 1. Basics of cost planning

Starting point is a profound analysis of all costs that are permitted for a specific product. These costs are called standard costs, and they are the basis for cost finding in the planning process.

The result may be:

$C_{fp} := 30000$  Fixed standard cost

$cv_p := 5$  Variable standard cost per unit

The range of planned output be:

$x := 0..12000$

In cost planning cost functions are generally assumed to be linear. Thus the function of planned costs is

$$(1) \quad C_p(x) := C_{fp} + cv_p \cdot x$$

If the planned output is  $x_p := 10000$  this function yields

$$C_p(x_p) = 80000$$

Planned costs and planned output are used to determine planned cost per unit. If cost planning is based on full costs the result is

$$(2) \quad c_p := \frac{C_p(x_p)}{x_p} \quad \text{Standard cost per unit in cost planning based on full costs}$$

$$c_p = 8$$

If cost planning is based on variable costs, however, only total variable costs are divided by the quantity of planned output. Thus standard cost per unit is identical to variable standard cost per unit:

$$cv_p = 5 \quad \text{Standard cost per unit in cost planning based on variable costs}$$

These costs per unit are allocated to the goods actually produced during the planning period. In full costing the amount of total costs allocated to the number of goods produced is

$$(3) \quad ALC_{full}(x) := c_p \cdot x$$

and in variable costing

$$(4) \quad ALC_{var}(x) := cv_p \cdot x$$

At the end of the planning period total actual costs have to be ascertained. For example, these actual costs be

$$C_a := 75000$$

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Actual costs are compared with planned costs, and the deviations are analyzed. The method of analysis depends on the method of cost planning applied.

### 2. Fixed budget cost planning

Fixed budget cost planning is applied if there is no deviation between the planned quantity of goods  $x_p$  and the quantity of goods actually produced ( $x_a$ ), in short if

$$x_a := x_p$$

$$x_a = 10000$$

Due to the fact that actual quantity is identical with planned quantity the problem of proportionalizing fixed costs cannot arise. So it is not necessary to assign only variable costs to products as is done to avoid the problem of proportionalized fixed costs. For this reason fixed budget cost planning is applied on a full costing basis.

Thus, after the quantity  $x_a$  has been produced, total costs allocated to products are

$$ALC_{full}(x_a) = 80000$$

which sum is identical to the planned costs  $C_p(x_p) = 80000$ .

This is not by coincidence, for according to (3)  $ALC_{full}(x_a) = c_p \cdot x_a$ , and according to (2)  $C_p(x_p) = c_p \cdot x_p$ . Since here is  $x_a = x_p$ , the right sides of both equations are identical and so are the planned costs and the costs allocated to products.

In order to determine whether the forecast came true it is enough to compare actual costs with planned costs. The difference between both is called the gross variance 1:

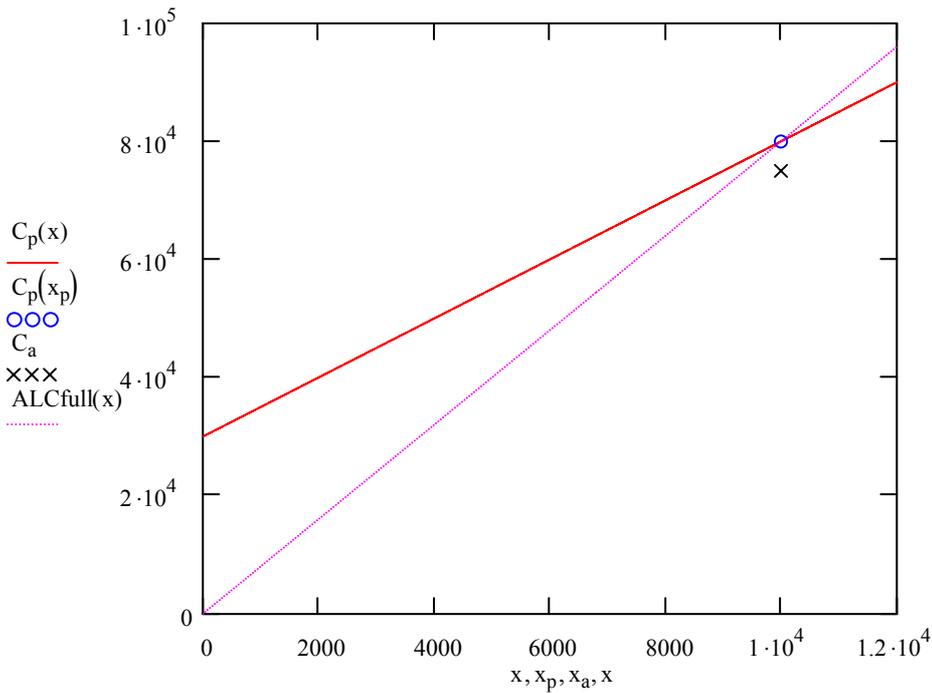
$$(5) \quad GV_1 := C_a - C_p(x_p)$$

$$GV_1 = -5000$$

If  $GV_1$  is negative, actual costs are less than planned costs, and vice versa if  $GV_1$  is positive.

This may be illustrated as follows:

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If however the actual quantity of goods produced possibly differs from the quantity planned, the picture will change. This problem is dealt with in flexible budget cost accounting.

### 3. Flexible budget cost accounting

#### 3.1 Flexible budget cost accounting on a full cost basis

The actual quantity be

$$x_a := 6000$$

Now the difference between actual costs and planned costs must be judged differently, because cost planning was based on planned output and not on actual output. If actual output had been the base of cost planning, another amount of costs would have been planned.

The question is: What would the planned costs have been if planning had been based on  $x_a$  and not on  $x_p$ ?

This question is answered by the attainable standard cost:

$$(6) \quad ATC := C_p(x_a)$$

$$ATC = 60000$$

The function of planned costs will yield attainable standard cost if the actual quantity of goods produced is inserted. These costs would have been adequate for the actual quantity. Thus attainable standard costs are the right scale for judging actual costs.

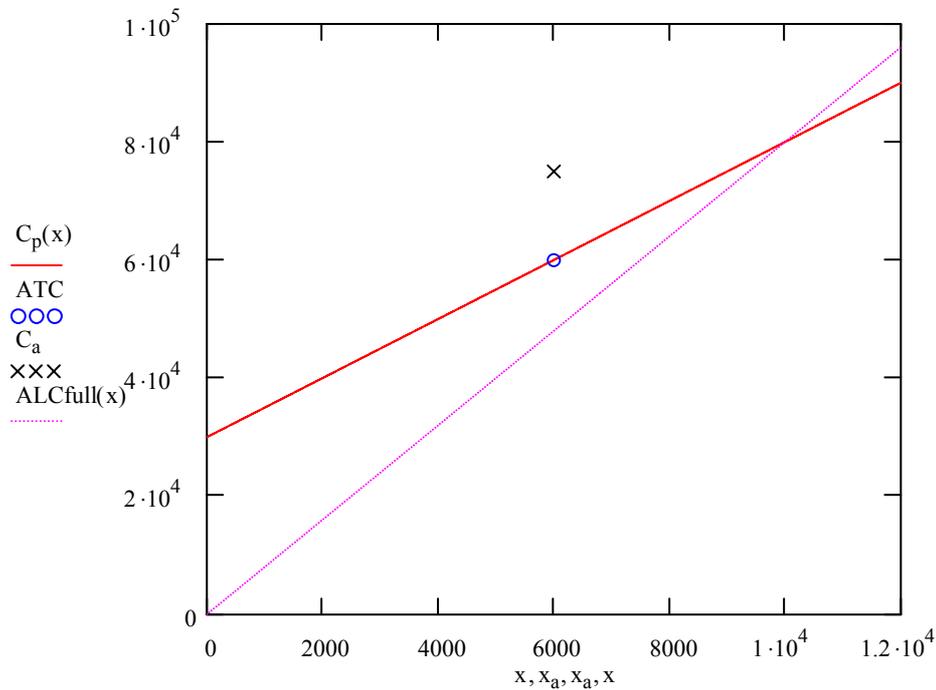
The difference between actual cost and attainable standard cost is called the usage variance:

$$(7) \quad UV := C_a - ATC$$

$$UV = 15000$$

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If actual costs exceed attainable standard costs the usage variance is positive. In this case investigations are necessary why this happened. A negative usage variance is a reason to be pleased, but it should be a cause for thinking over cost planning.



Anyway, the originally planned costs are no longer of interest; what counts are only the planned costs adapted to actual output, the attainable standard costs.

These costs are the right scale for costs allocated to products. With the quantity  $x_a$  the allocated costs are

$$ALC_{full}(x_a) = 48000$$

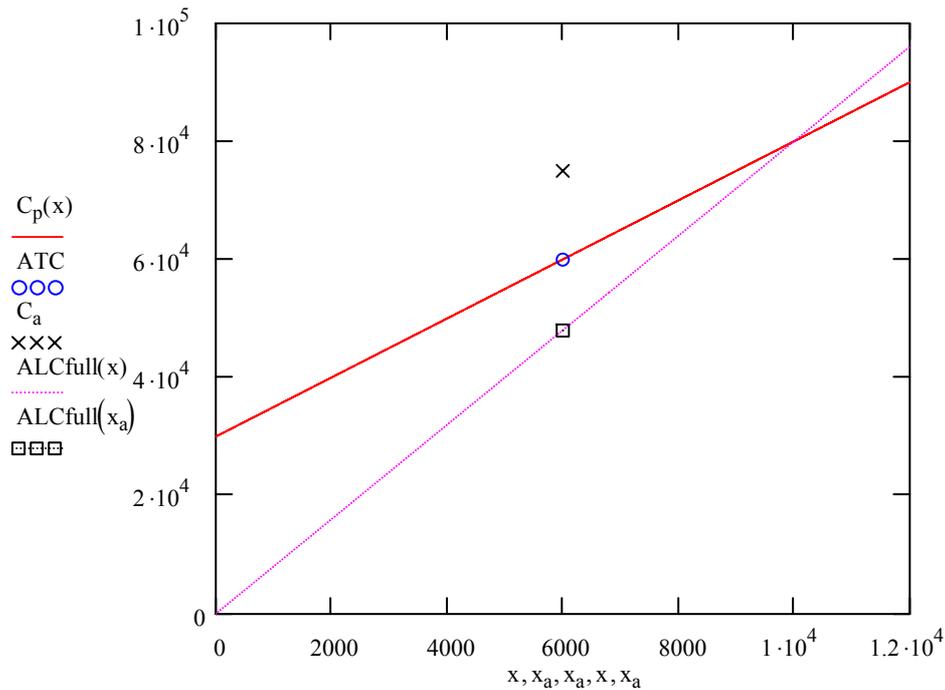
At least these costs should have been allocated to products. The difference between attainable standard costs and allocated costs is called the volume variance:

$$(8) \quad VV := ATC - ALC_{full}(x_a)$$

$$VV = 12000$$

Both the volume variance and the usage variance are plotted at the actual quantity of goods produced, because for both the actual quantity is the independent variable:

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The sum of usage variance and volume variance is called gross variance 2 (contrary to gross variance 1):

$$(9) \quad GV_2 := UV + VV$$

$$GV_2 = 27000$$

Substituting equations (7) and (8) into equation (9) yields

$$GV_2 := C_a - ATC + ATC - ALC_{full}(x_a)$$

$$(10) \quad GV_2 := C_a - ALC_{full}(x_a)$$

$$GV_2 = 27000$$

If gross variance 2 is interpreted as the difference between actual costs and allocated costs a positive variance shows which part of actual costs could not be charged to products. If gross variance 2 is negative this shows to which extent more costs were allocated than actually arose.

But now, how can the volume variance be interpreted?

Since all possible values of ATC are located on the function of planned costs, a general function of volume variance is given by establishing the difference between equation (1) and equation (3):

$$(11) \quad VV(x) := C_{fp} - (c_p - cv_p) \cdot x$$

The term  $c_p - cv_p$  is nothing but the fixed cost per unit. If these are denominated as  $cf_p$ , we have

$$(12) \quad cf_p := c_p - cv_p$$

Substituting (12) into (11) yields

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$$(13) \text{ VV}(x) := C_{fp} - c_{fp} \cdot x$$

The first term in this equation is the fixed cost which should be covered by cost allocation to products. Fixed costs actually charged to products are subtracted from the targeted fixed costs. A positive difference means that those fixed costs were not attributed to products.

In equation (13)  $C_{fp}$  may be expressed in terms of fixed cost per unit.

These are obtained by dividing total planned fixed cost by planned output:

$$(14) c_{fp} := \frac{C_{fp}}{x_p}$$

from which follows

$$(15) C_{fp} := c_{fp} \cdot x_p$$

Substituting (15) into (13):

$$(16) \text{ VV}(x) := c_{fp} \cdot x_p - c_{fp} \cdot x$$

It can be seen from equation (16) that the volume variance is positive as long  $x < x_p$ . The volume variance is = 0 if  $x = x_p$ . This happens in the point of intersection between  $C_p(x)$  and  $ALC_{full}(x)$ . The volume variance is negative if  $x > x_p$ .

The volume variance is caused by the fact that there is no other way to determine the planned cost per unit in advance than by dividing total planned cost by total output. If now the fixed costs per unit are multiplied by any quantity, the original fixed costs are only obtained by using  $x_p$ . In all other cases the fixed costs calculated will differ from the original fixed costs.

This problem is known from calculating products - it is the problem of proportionalizing fixed costs, the problem which brought up variable costing instead of full costing. And in cost planning the idea is the same: To avoid confusion, never attribute any fixed costs to products. This is the aim of flexible budget cost accounting on a variable cost basis.

### 3.2 Flexible budget cost accounting on a variable cost basis

It is self-understood that also in variable costing fixed costs arise and fixed costs have to be covered. This in fact is checked in cost centre accounting. Actual costs are containing fixed costs, and so do attainable standard costs. Thus the usage variance as the difference between actual costs and attainable standard costs remains unchanged. The usage variance is examined with regard to variable costs and fixed costs.

But no fixed costs are attributed to products. Given this restriction, how can be checked which costs have been allocated to products? In full costing the scale was the attainable standard costs. But these costs contain all fixed costs, whereas now costs attributed to products do not. If costs allocated to products were deducted from attainable standard costs, there would be a systematic difference amounting to planned fixed costs. To avoid this difference, it is assumed that all fixed costs are attributed to products in one sum, not piece by piece. In other words, ATC has to be compared with  $ALC_{var} + C_{fp}$ :

$$(17) \text{ VV}_{var} := ATC - (ALC_{var}(x_a) + C_{fp})$$

Substituting equations (6), (1) and (4) into equation (17), the quantity always being  $x_a$ , yields

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$$VVvar := Cf_p + cv_p \cdot x_a - cv_p \cdot x_a - Cf_p$$

(18)  $VVvar = 0$

In fact, in flexible budget cost accounting on a variable cost basis the volume variance is always 0, there simply is no volume variance.

Nobody should be startled about this, because we know from full costing that the volume variance is that part of the fixed costs which could not be attributed to the actual quantity of goods produced, and here, by definition, all fixed costs are allocated to products. Thus, there cannot be any difference between planned fixed costs and attributed fixed costs.

This is shown in the following diagram:

