

Variance Analysis: Material, Labour, Overhead and Sales Variances!

The function of standards in cost accounting is to reveal variances between standard costs which are allowed and actual costs which have been recorded. The Chartered Institute of Management Accountants (UK) defines variances as the difference between a standard cost and the comparable actual cost incurred during a period. Variance analysis can be defined as the process of computing the amount of, and isolating the cause of variances between actual costs and standard costs. Variance analysis involves two phases:

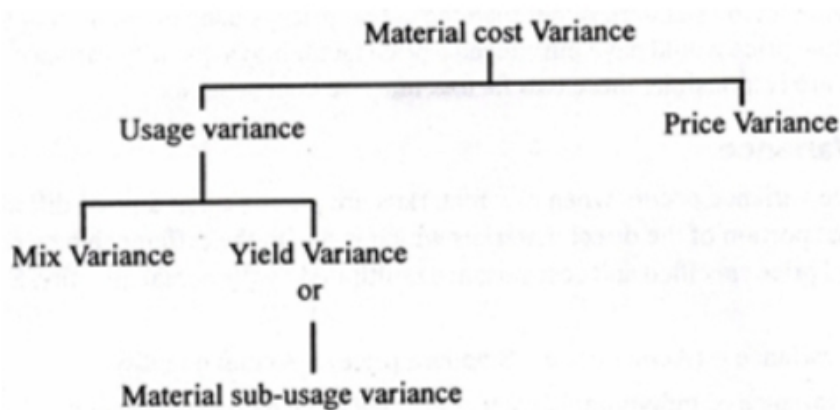
(1) Computation of individual variances, and

(2) Determination of Cause (s) of each variance.

We now turn to explain below the computation of material, labour and factory overhead variances:

I. Material Variance:

The following variances constitute materials variances:



Material Cost Variance:

Material cost variance is the difference between the actual cost of direct material used and standard cost of direct materials specified for the output achieved. This variance results from differences between quantities consumed and quantities of materials allowed for production and from differences between prices paid and prices predetermined.

This can be computed by using the following formula:

$$\text{Material cost variance} = (\text{AQ} \times \text{AP}) - (\text{SQ} \times \text{SP})$$

Where AQ = Actual quantity

ADVERTISEMENTS:

AP = Actual price

SQ = Standard quantity for the actual output

SP = Standard price

Material Usage Variance:

The material quantity or usage variance results when actual quantities of raw materials used in production differ from standard quantities that should have been used to produce the output achieved. It is that portion of the direct materials cost variance which is due to the difference between the actual quantity used and standard quantity specified.

As a formula, this variance is shown as:

Materials quantity variance =
(Actual Quantity – Standard
Quantity) x Standard Price

A material usage variance is favourable when the total actual quantity of direct materials used is less than the total standard quantity allowed for the actual output.

Example:

Compute the materials usage variance from the following information:

Standard material cost per
unit Materials issued

Material A — 2 pieces @ Rs.
10=20 (Material A 2,050 pieces)

Material B — 3 pieces @ Rs. 20
=60 (Material B 2,980 pieces)

Total = 80

Units completed 1,000

Solution:

Material usage variance =
(Actual Quantity – Standard
Quantity) x Standard Price

Material A = (2,050 – 2,000) x
Rs. 10 = Rs. 500 (unfavourable)

Material B = (2980 – 3000) x Rs.
20 = Rs. 400 (favourable)

Total = Rs. 100 (unfavourable)

It should be noted that the standard rather than the actual price is used in computing the usage variance. Use of an actual price would have introduced a price factor into a quantity variance. Because different departments are responsible, these two factors must be kept separate.

The materials usage or quantity variance can be separated into mix variance and yield variance.

For certain products and processing operations, material mix is an important operating variable, specific grades of materials and quantity are determined before production begins. A mix variance will result when materials are not actually placed into production in the same ratio as the standard formula. For instance, if a product is produced by adding 100 kg of raw material A and 200 kg of raw material B, the standard material mix ratio is 1: 2.

Actual raw materials used must be in this 1: 2 ratio, otherwise a materials mix variance will be found.

Material mix variance is usually found in industries, such as textiles, rubber and

such as textiles, rubber and chemicals, etc. A mix variance may arise because of attempts to achieve cost savings, effective resources utilisation and when the needed raw materials quantities may not be available at the required time.

Materials mix variance is that portion of the materials quantity variance which is due to the difference between the actual composition of a mixture and the standard mixture.

It can be computed by using the following formula:

Material mix variance =
(Standard cost of actual quantity of the actual mixture
– Standard cost of actual quantity of the standard mixture)

Materials mix variance =
(Actual mix – Revised
standard mix of actual input)
x Standard price

**Revised standard mix or
proportion is calculated as
follows:**

Standard mix of a particular
material/Total standard
quantity x Actual input

Example:

A product is made from two
raw materials, material A and
material B. One unit of
finished product requires 10
kg of material.

**The following is standard
mix:**

Material A –	20%	–	2 kg @ ₹ 20	=	₹ 40
Material B –	80%	–	8 kg @ ₹ 10	=	₹ 80
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	100%	–	10 kg @ ₹ 12	=	₹ 120

During a period one unit of product was produced at the following costs:

Material A –	8 kg @ ₹ 20	=	₹ 160
Material B –	4 kg @ ₹ 12.5	=	₹ 50
	<u>12 kg @ ₹ 17.5</u>	=	<u>₹ 210</u>

Compute the materials mix variance.

Solution:

Material mix variance =
(Actual proportion – Revised standard proportion of actual input) x Standard price.

Revised standard proportion =

$$\frac{\text{Standard proportion of a particular mix}}{\text{Total standard quantity}} \times \text{Actual input}$$

Revised standard proportion:

$$\text{Material A} = 2/10 \times 12 = 2.40 \text{ kg.}$$

$$\text{Material B} = 8/10 \times 12 = 9.60 \text{ kg.}$$

Materials mix variance:

$$\begin{aligned} \text{Material A} &= (8 \text{ kg} - 2.40 \text{ kg}) \times 20 \\ &= 5.60 \times 20 = ₹ 112.0 \text{ (unfavourable)} \end{aligned}$$

$$\begin{aligned} \text{Material B} &= (4 \text{ kg} - 9.60) \times 1.00 \\ &= 5.60 \times 10 = ₹ 56 \text{ (favourable)} \end{aligned}$$

$$\text{Total mix variance} = ₹ 56 \text{ (unfavourable)}$$

(b) Materials Yield Variance:

Materials yield variance explains the remaining portion of the total materials quantity variance. It is that portion of materials usage variance which is due to the difference between the actual yield obtained and standard yield specified (in terms of actual inputs). In other words, yield variance occurs when the output of the final product does not correspond with the output that could have been obtained by using the actual inputs. In some industries like sugar, chemicals, steel, etc. actual yield may differ from expected yield based on actual input resulting into yield variance.

The total of materials mix variance and materials yield variance equals materials quantity or usage variance. When there is no materials

mix variance, the materials yield variance equals the total materials quantity variance. Accordingly, mix and yield variances explain distinct parts of the total materials usage variance and are additive.

The formula for computing yield variance is as follows:

Yield Variance = (Actual yield – Standard Yield specified) x Standard cost per unit

Example:

Standard input = 100 kg,
standard yield = 90 kg,
standard cost per kg of output
= Rs 200

Actual input 200 kg, actual yield 182 kg. Compute the yield variance.

Solution:

Standard yield for the actual input = $\frac{90}{100} \times 200 = 180$ kg

Yield variance = (Actual yield – Standard yield for the actual input) × Standard cost per unit (per kg)
= $182 - 180 \times ₹ 200$
= $2 \times 200 = ₹ 400$ (favourable)

The above yield variance can be computed by using another formula also, e.g.,

Yield Variance = (Actual Loss – Standard Loss on Actual Input) × Standard Cost per unit
= $(18 \text{ kg} - 20 \text{ kg}) \times ₹ 200$
= ₹ 400 (favourable)

In this example, there is no mix variance and therefore, the materials usage variance will be equal to the materials yield variance.

The above formula uses output or loss as the basis of computing the yield variance. Yield variance can also be computed on the basis of input factors only. The fact is that loss in inputs equals loss in output. A lower yield simply means that a higher quantity of inputs have been used and the anticipated or standard output (based on actual inputs) has not been achieved.

Yield, in such a case, is known as sub-usage variance (or revised usage variance) which can be computed by using the following formula:

Sub-usage or revised usage variance = (Revised Standard Proportion of Actual Input – Standard quantity) x Standard Cost per unit of input

Example:

Standard material and standard price for manufacturing one unit of a product is given below:

	Standard material	Standard price
Material A	5 kg	@ ₹ 40
Material B	3 kg	@ ₹ 60

The actual production of the product is 400 units.

The actual material A 2,500 kg @ ₹ 39

B 1,000 kg @ ₹ 62.5

Calculate the materials sub-usage variance.

Solution:

Revised standard proportion of actual input:

Material A = $5/8 \times 3,500 = 2,187.5$ kg

Material B = $3/8 \times 3,500 = 1,312.5$ kg

Material sub-usage variance:

(Revised standard proportion of actual input – Standard quantity) × SP

Material A = $(2,187.5 - 2,000) \times 40$

= $187.5 \times 40 = ₹ 7,500$ (unfavourable)

Material B = $(1,312.5 - 1,200) \times 60$

= $112.5 \times 60 = ₹ 6,750$ (unfavourable)

Total materials sub-usage variance = ₹ 14,250 (unfavourable)

Or

$$(3,500 - 3,200) \times \frac{₹ 1,52,000}{3,200}$$

$$= 300 \times \frac{1,52,000}{3,200} = ₹ 14,250 \text{ (unfavourable)}$$

Materials yield variance always equal sub-usage variance. The difference lies only in terms of calculation. The former considers the output or loss in output and the latter considers standard inputs and actual input used for the actual output. Mix and yield variance both provide

useful information for production control, performance evaluation and review of operating efficiency.

Materials Price Variance:

A materials price variance occurs when raw materials are purchased at a price different from standard price. It is that portion of the direct materials which is due to the difference between actual price paid and standard price specified and cost variance multiplied by the actual quantity. Expressed as a formula,

Materials price variance =
(Actual price – Standard price)
x Actual quantity

Materials price variance is unfavourable when the actual price paid exceeds the predetermined standard price. It is advisable that materials price variance should be calculated for

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Materials price variance is unfavourable when the actual price paid exceeds the predetermined standard price. It is advisable that materials price variance should be calculated for materials purchased rather than materials used. Purchase of materials is an earlier event than the use of materials.

Therefore, a variance based on quantity purchased is basically an earlier report than a variance based on quantity actually used. This is quite beneficial from the viewpoint of performance measurement and corrective action. An early report will help the management in measuring the performance so that poor performance can be corrected or good performance can be expanded at an early date.

Recognizing material price variances at the time of purchase lets the firm carry all units of the same materials at one price—the standard cost of the material, even if the firm did not purchase all units of the materials at the same price. Using one price for the same materials facilities management control and simplifies accounting work.

If a direct materials price variance is not recorded until the materials are issued to production, the direct materials are carried on the books at their actual purchase prices. Deviations of actual purchase prices from the standard price may not be known until the direct materials are issued to production.

Example:

Assuming in Example 1 that material A was purchased at the rate of Rs 10 and material B was purchased at the rate of Rs 21, the material price variance will be as follows:

Materials price variance =
(Actual Price – Standard Price)
x Actual Quantity

Material A = $(10 - 10) \times 2,050 =$
Zero

Material B = $(21 - 20) \times 2,980 =$
2980 (un-favourable)

Total material price variance
= Rs 2980 (un-favourable)

The total of materials usage variance and price variance is equal to materials cost variance.