Chapter

19

Standard Costing

Learning Objectives

After reading this chapter, you should be able to:

1. explain historical costing and its limitations;
2. define standard costs and its differences with estimated cost, standard costing and its advantages and limitations;
3. understand different types of standards and explain how tight should standards be;
4. describe developing or setting standards; revision of standards;
5. explain the procedure of computing material cost variances, labour cost variances, overhead cost variances and sales variances;
6. discuss disposition of variance, managerial uses of variances, and
7. understand different types of control ratios.

Control of cost is one of the most important objectives of cost accounting and cannot be achieved without some standard against which actual can be compared. This chapter introduces the concepts and basic procedures of standard costing and also explains the techniques used in standard cost variance analysis. However, before discussing standard costing it will be appropriate to evaluate briefly historical cost accounting and its limitations.

HISTORICAL COSTING AND ITS LIMITATIONS

Historical cost systems are principally associated with recording of historical, or as they are commonly called, actual cost. Historical costing is the ascertainment of costs after they have been incurred. Historical costs have the following limitations:

1. Historical costs are collected after they have been incurred and therefore are ineffective in cost control. The costs have been incurred, they cannot be undone and no steps can be taken to correct inefficiencies.
2. Historical costs are not helpful in cost reduction since they contain no standards or goals towards which employees can work.

3. Historical costs do not provide reliable guides to management in the tasks of budgeting, planning, and decision-making because they reflect a situation in a previous period. But the enterprise, in fact, may be working under conditions different from those prevailing during that previous period.

DEFINITION OF STANDARD COST, STANDARD COSTING

A standard cost is a planned cost for a unit of product or service rendered. Standard costs represent excellent target costs that should be obtained. The Institute of Cost and Management Accountants (UK) defines standard cost as "a predetermined cost which is calculated from management's standards of efficient operation and the relevant necessary expenditure. It may be used as a basis for price fixing and for cost control through variance analysis." Standard cost expresses what costs should be under attainable good performance.

Standard costing is the setting of predetermined cost estimates in order to provide a basis for comparison with actual costs. The Institute of Cost and Management Accountants (UK) defines standard costing as "the preparation and use of standard costs, their comparison with actual costs, and the analysis of variances to their causes and points of incidence."

STANDARD COSTS AND ESTIMATED COSTS

The term "standard costs" should not be confused with "estimated costs". Standard cost and estimated costs differ in the following respects:

First, estimated costs are frequently less accurately determined. Estimated costs are developed from projections using averages of past data regarding performance. Standard costs are predetermined realistically and much more scientifically through the use of time and motion studies, engineering estimates and specifications, selected measures of plant capacity, cost behaviour patterns.

Second, estimated costs are not helpful to management in accomplishing managerial functions as they are not scientifically predetermined costs. But standard costs involve more sophistication, operation analysis and evaluation and comprehensive review of internal and external factors and provide reliable measures for product costing, product pricing, planning, coordination and cost control purposes.

Third, estimated cost emphasises on actual cost with which it is compared at the end of the accounting period. If the estimated costs are found higher or lower than actual costs they are revised for use in the next accounting period. In standard costing, the emphasis is on standard costs, that is, what costs of material, labour and overhead should be incurred if the factory is to be operated as a highly efficient unit with each manager, foreman, worker, plant and machine functioning as an efficient part of the production process. Under standard costing, actual costs are ascertained only to facilitate their comparison with standard costs.

ADVANTAGES OF STANDARD COSTING

Among the many advantages generally attributed to standard costing, the most important may be listed as follows:

1. *Managerial planning* Planning is a process of using all resources in such a manner that maximises business profits. Standard costs are more convenient than actual costs for budget preparation because the standard costs at different production levels and for different product-mixes are readily built up into total costs as called for by the budget. On the other hand, using actual costs requires a great deal of analysis and adjustment when extensive changes in product volume or product-mixes take place.
2. *Coordination* The establishment of standards coordinates all functions—manufacturing, marketing engineering, research, and accounting towards the achievement of a common goal. Setting standards involves defining and communicating targets so that they can work towards the attainment of the goal.
3. *Cost control* Cost control and cost reduction are probably the most important aims of any costing system; and standard costing gives due recognition to this fact. Cost control has the objective of production of the required quality at the lowest cost attainable under existing conditions. Standards enable management to make periodic comparison of actual costs with standard costs in order to measure performance and to take action to maintain control over costs.
4. *Economical means of costing and record-keeping* The use of standard costs can reduce clerical labour and expense by avoiding the detailed record-keeping which is necessary when actual costs alone are used.
5. *Formulating price and production policies* Standard costs as compared to actual costs can be used for estimating selling prices. When standard unit costs are available, expected costs and sales prices can be computed on the basis of standard costs. Standards already established can easily be modified to reflect current conditions and changes in material prices or labour rates and the price of the product can be determined on a realistic basis.

   Actual costs, on the other hand, may reflect excessive usage of material, abnormal labour times or an inequitable charge for overhead. Actual overhead cost per unit at any given time may be so influenced by temporary fluctuations in production levels as to make actual cost entirely unusable for pricing.
6. Standards as incentives to employees If standards are reasonable and attainable they act as incentives to employees to improve their performances and to maintain the quality of the product. Standards motivate workers, supervisors and foremen to work more efficiently in the accomplishment of their respective standards.

DIFFERENT TYPES OF STANDARDS

The two principal considerations affecting the classification of standards are: (i) attainability of standards, that is, the ease with which it is possible to achieve the standards, and (ii) frequency with which the standards are revised. On the basis of these two factors, it is possible to classify standards as ideal, normal, basic, current or expected actual standards.

Ideal, Perfect, Maximum Efficiency or Theoretic Standards

Ideal standards (costs) are the standards which can be attained under the most favourable conditions possible. The level of performance under ideal standards would be achieved through the best possible combination of factors—the most favourable prices for materials and labour, highest output with best equipment and layout, and maximum efficiency in the utilisation of the

production resources—in other words, maximum output at minimum cost. Such standards reflect only goals or targets without any hope of performance being currently achieved. These standards are extremely tight and do not provide for waste and inefficiency in any form; no material is wasted; no units are spoiled; there are no idle hours; operators work at predetermined speed; the available capacity is fully utilised.

Normal Standards

Normal standards are the average standards which (it is anticipated) can be attained during a future period of time, preferably long enough to cover one business cycle. These standards are not revised until the cycle has run its full course. This generally results in an incorrect valuation of inventories and consequent errors in the profit disclosed, as the inventories are understated in periods of high prices, and over-stated when prices are low. Normal standards are mainly used as a device to solve the problem of absorbing fixed overhead rather than in connection with material cost and wages. Since these standards do not reflect the goals to be attained, they are not often used.

Basic Standards

The Institute of Cost and Management Accountants (UK) defines a basic standard as the standard which is established for use unaltered for an indefinite period which may be a long period of time. Basic standards are seldom revised or updated to reflect current operating costs and price level changes.

Currently Attainable or Expected Actual Standards

Current standards are standards which are established for use over a short period of time, and are related to current conditions. They represent current costs to be expected from efficient operations. Currently attainable standards are formulated after making allowance for the cost of normal spoilage, cost of idle time due to machine breakdowns, and the cost of other events which are unavoidable in normal efficient operations. They take the place of actual cost and are recorded in account books and financial statements. Any deviation from these standards reflect inefficiencies in the production activities, unless the variances have occurred due to uncontrollable factors. These standards are most accurate and very useful to management in product costing, inventory valuations; estimates, analyses, performance evaluation, planning, employee motivation, and for managerial decision making and external financial reporting.

HOW TIGHT SHOULD STANDARDS BE

It can be rightly said that a single standard may not be suitable for all purposes. For the purposes of cost control, tight standards need to be established. The attainable (good) performance standards are useful for purposes of inventory valuation, product costing and income determination.

High Standards

A high standard helps in cost reduction and motivating employees to try to reach the targets established. High standards represent the best possible performance and, if achieved, raise the levels

of performance and efficiency as compared to poor or loose standards. High standards being unattainable in practice may not be good for the employees. Employees may not seriously accept them because they know that they are unattainable and impossible to achieve. High standards are also not realistic and therefore cannot be used in product costing, inventory valuation, financial statement, planning, and capital investment decisions.

Low (Loose) Standards

A standard which is low or loose can be attained by poor performance. However, it defeats the purpose of standard costing and fails to disclose inefficiencies. Such standards do not help management in cost control as they are not accurate measures to compare actual results.

In conclusion, it can be said that accountants generally seem to favour currently attainable standards which are most appropriate for performance appraisal, accounting purposes, cost control and decision-making. Such standards produce good performance, promote employee motivation and include unavoidable elements, such as spoilage, lost time, capacity not utilised in setting standards.

DEVELOPING OR SETTING STANDARD

All factors related with standards-setting should be considered in the establishment of standards. Whatever method is used, standards must be established for a definite period of time so that they can be effective in performance evaluation, control and analysis of costs. Standards are usually set for a six- or twelve-month period. Sometimes a longer period is used but rarely a shorter period. Standards are developed for:

1. Materials.
2. Labour, and
3. Overhead.

Materials Standards

Two standards must be developed for materials:

1. Materials quantity (usage) standard
2. Materials price standard

Labour Standards

As in the case of direct materials, labour standards are also established for both cost and quantity (efficiency). For standard cost purposes, direct labour is treated separately from indirect labour, which is included in the factory overhead. Two standards are usually developed for labour costs:

1. Labour usage (or efficiency) standard
2. Labour cost (or rate) standard

Factory overhead cost standards

Setting Overhead Standards

Setting standard overhead cost requires the determination of: (1) standard capacity and (2) standard overhead costs for this capacity. The standard overhead costs can be computed using

normal capacity. The normal or expected actual capacity aims at a production level according to an existing set of conditions. This capacity does not require complete utilisation of all available facilities but is based on the efficient utilisation of resources and operations.

After standard capacity is determined, overhead—variable and fixed—to be incurred at that capacity is prepared. The standard overhead rate is found by dividing the standard or budgeted overhead at standard capacity by the volume selected to represent standard capacity. Volume may be measured in units of product, standard productive hour (labour or machine) or some standard cost, such as direct labour.

$$\text{Standard overhead rate} = \frac{\text{Standard overhead}}{\text{Standard production}}$$

REVISION OF STANDARDS

Standard costs require continuous review and, at times, frequent change. Changing prices, technological advances, new personnel, new machinery, changing quality of materials and new labour negotiations, all influence standards and make them obsolete resulting in unrealistic budgets, poor cost control, and unreasonable unit cost for inventory valuation and income determination.

A company should establish a programme to revise standards whenever required so that standards can be set at a currently attainable level. Labour rate standards should be revised for any change in labour rates; material quantity standards for any change in type, quality of material or method of production. If a new machine is purchased to replace an old machine, labour time standards and material quantity standards should be updated. In addition to these obvious revisions, in every business firm there should be a system for revising standards for adequacy and suitability at least once a year. A periodic review of standards is desirable to accomplish the objectives of standard costing.

VARIANCE ANALYSIS

The function of standards in cost accounting is to indicate variances between standard costs which are allowed and actual costs which have been recorded. The Institute of Cost and Management Accountants (UK) defines variance 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 the cause(s) of each variance

First, we concentrate on the computation of material, labour and factory overhead variances. Analysis of causes, reporting variances to managers, and accounting disposition of variances conclude the study of standard costing in this chapter.

MATERIALS VARIANCE

Variances as given in Fig. 19.1, constitute materials variances:

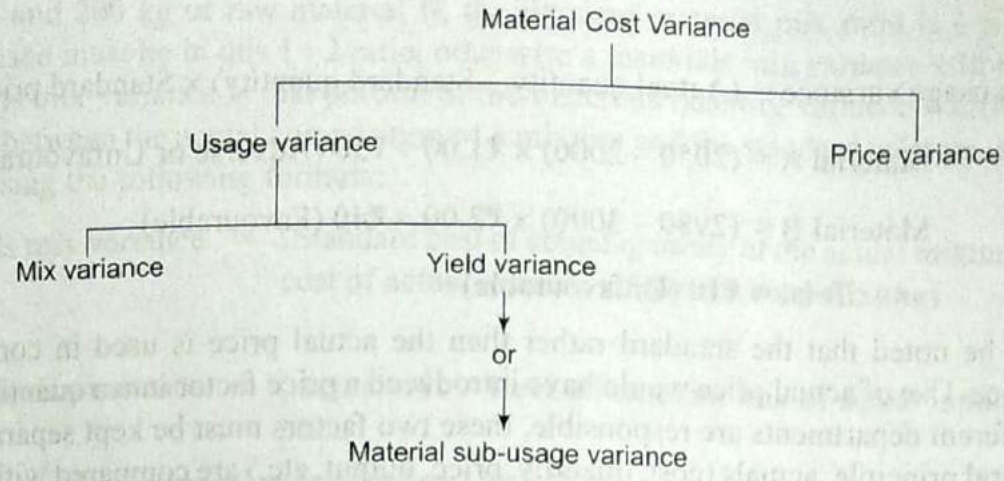


Fig. 19.1 Types of materials variances

Material Cost Variance

Material cost variance is the difference between the actual cost of direct materials 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.

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

where AQ = Actual quantity
AP = Actual price
SQ = Standard quantity for the actual output
SP = Standard price

Materials 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) × 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 @ ₹1.00	= 2.00	Material A 2050 pieces
Material B 3 pieces @ ₹2.00	= 6.00	Material B 2980 pieces.
	₹ 8.00	
Units completed 1000		

Solution

Materials usage variance = (Actual quantity – Standard quantity) × Standard price

Material A = (2050 – 2000) × ₹1.00 = ₹50 (Adverse or Unfavourable)

Material B = (2980 – 3000) × ₹2.00 = ₹40 (Favourable)

Total = ₹10 (Unfavourable)

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

As a general principle, actuals (cost, quantity, price, output, etc.) are compared with respective standard data to compute variances. Therefore, any formula to calculate, mathematically, any variance would be as follows:

(Actual–Standard)

However, one may use variance formula as Standard–Actual as it does not influence in any way the variance figure calculated by using the formula 'Actual–Standard'.

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) × Actual quantity

Materals price variance is unfavourable when the actual price paid exceeds the predetermined standard price. It is advisable that materials price variance should be calculated at the time of materials purchase rather than when materials are used. Purchase of matrials 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.

Example

Assuming in above example that material *A* was purchased at the rate of ₹1.00 and material *B* was purchased at the rate of ₹2.10 the material price vriance will be as follows:

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

Material *A* = (1.00 – 1.00) × 2,050 = Zero

Material *B* = (2.10 – 2.00) × 2,980 = ₹298 (Unfavourable)

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

Materials Mix Variance

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

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.

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:

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

or

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

Revised standard proportion is calculated as follows:

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

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 @	₹2.00	=	₹4.00
Material B	80%–	8 kg @	₹1.00	=	₹8.00
	100%–	10 kg	₹1.20		₹12.00

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

Material A	8 kg @	₹2.00	=	₹16.00
Material B	4 kg @	₹1.25	=	₹15.00
	12 kg	₹1.75		₹21.00

Compute the materials mix variance.

Solution

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

Revised standard proportion:

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

Revised standard proportion:

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

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

Materials mix variance:

Material A = (8 kg – 2.40 kg) × 2.00

= 5.60 × 2.00 = ₹11.20 (Unfavourable)

Material B = (4 kg – 9.60) × 1.00

= 5.60 × 1.00 = ₹5.60 (Favourable)

Total mix variance = ₹5.60 (Unfavourable)

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.

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.

The formula for computing yield variance is as follows:

Yield variance = (Actual yield – Standard yield specified) × Standard cost per unit

or

Yield variance = (Actual loss – Standard loss on actual input) × Standard cost per unit

Example

Standard input = 100 kg, standard yield = 90 kg, standard cost per kg of output = ₹20. 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.

= (182 – 180) × ₹20

= 2 × 20 = 40 (Favourable)

The above yield variance can be computed by using another formula also, for example,

Yield variance = (Actual loss – Standard loss on actual input) × Standard cost per unit

= (18 kg – 20 kg) × ₹20

= ₹40 (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) × Standard cost per unit of input

Important Note

Variances, generally, can be computed by using two approaches namely by comparing the actuals with standards or comparing standard with actuals as displayed below.

Actual — Standard

or

Standard — Actual

A survey of relevant literature, books and publications on cost and management accounting in India and abroad reveals that both the above approaches have been recognised by the authors. In this text, both the methods have been followed in calculating variances to avoid any confusion among the students and readers. The use of only one of the above two approaches may create some doubt among the students.

Example 19.1

Following details relating to product X during the month of April, 2009 are available:

Standard cost per unit of *X*:		
Materials	:	50 kg @ ₹4 0/kg
Actual production	:	100 units
Actual material cost	:	₹42/kg
Material price variance	:	₹9,800 (Adverse)
Material usage variance	:	₹4,000 (Favourable)

Calculate the actual quantity of material used during the month of April, 2009.

(CA May, 2009)

Solution

		₹
Standard cost of materials for actual output [(100 units × 50 kg) × ₹40 per kg]	=	2,00,000
Material usage variance		4,000 (F)
		1, 96, 000
Material price variance		9,800 (A)
Actual cost of materials used		2,05,800

Actual material cost = ₹42 per kg.

$$\therefore \text{ Actual quantity of materials used during the month} = \frac{₹2,05,800}{42} = 4,900 \text{ kg}$$

Alternative solution

Material price variance = ₹9800 (A)
Actual price per kg. = ₹42
Actual quantity of material used = ₹9800/(42 – 40) = 4900 kg

Example 19.2

UV Ltd. presents the following information for November, 2008:
Budgeted production of product P = 200 units.
Standard consumption of raw materials = 2 kg. per unit of P.
Standard price of material A = ₹6 per kg.
Actually, 250 units of P were produced and material A was purchased at ₹8 per kg and consumed at 1.8 kg per unit of P. Calculate the material cost variances.

(CA. November, 2008)

Solution

Actual production of P = 250 units
Standard quantity of A for actual production = 2×250 = 500 kg. (SQ)
Actual quantity of A for actual production = 1.8×250 = 450 kg. (AQ)
Standard price/kg. of A = ₹6 (SP)
Actual price/kg. of A = ₹8 (AP)

(1) Total Material Cost Variance = (Standard Price × Standard Quantity) – (Actual Price × Actual Quantity)
$= (6 \times 500) - (8 \times 450)$
$= 3{,}000 - 3{,}600 = 600(A)$

(2) Material price variance = (Standard price – Actual price) × Actual quantity
$= (6 - 8) \times 450 = 900\ (A)$

(3) Material usage variance = (Standard quantity – Actual quantity) × Standard price
$= (500 - 450) \times 6 = 300(F)$

Example 19.3

Standard material cost for manufacturing 1,000 units of output is 400 kg of material at ₹2.50 per kg. When 2,000 units are produced it is found that actual cost is 825 kg of material at ₹2.70 per kg. Calculate material cost variance, material price variance and material usage variance.

(B.Com. (Hons.), Delhi University 2008)

Solution

(i) Material cost variance = (Standard cost – Actual cost)
$= (800 \times 2.50) - (825 \times 2.70)$
$= 2{,}000 - 2{,}227.50 =$ **₹227.50 (A)**

(ii) Material price variance = (Standard price – Actual price) × Actual quantity
$= (2.50 - 2.70) \times 825 =$ **₹165 (A)**

(iii) Material usage variance = (Standard quantity – Actual quantity) × Standard price
$= (800 - 825) \times 2.50 =$ **₹62.50 (A)**

Example 19.4

Modern Tiles Ltd. makes plastic tiles of standard size of 6" × 6" × 1/8". From the information given ahead you are required to calculate:

(i) Total material cost variance;
(ii) Material price variance;
(iii) Material usage variance;
(iv) Material mix variance; and
(v) Material yield variance.

A standard mix of the compound required to produce an output of 20,000 sq. ft. of tiles of 1/8" thickness is as follows:

Direct material	*Quantity*	*Price per kg.*
	kg	₹
A	600	9.00
B	400	6.50
C	500	4.00

For the month of March 2008, actual production of plastic tiles was 6,20,000 units. The actual data for direct material consumed was as under:

Direct material	*Quantity consumed*	*Price per kg.*
	kg	₹
A	5,000	8.50
B	2,900	6.00
C	4,400	4.50

(B.Com. (Hons.), Delhi University, 2009)

Solution

Working Notes:

1. One mix of 20,000 sq. ft of titles would produce $= \frac{20{,}000 \times 12 \times 12}{6 \times 6} = 80{,}000$ tiles

2. To produce 6,20,000 tiles, Standard quantity required $= \frac{6{,}20{,}000}{80{,}000} \times 1500 = 11{,}625$ kg.

3. Total standard quantity is apportioned in the ratio of Standard quantity of Direct material *i.e.* 6 : 4 : 5

$$SQ\ (A) = 11{,}625 \times \frac{6}{15} = 4650 \text{ kg.}$$

$$SQ\ (B) = 11{,}625 \times \frac{4}{15} = 3100 \text{ kg.}$$

$$SQ\ (C) = 11{,}625 \times \frac{5}{15} = 3875 \text{ kg.}$$

4. Revised standard quantity
Total actual quantity = 5000 + 2900 + 4400 = 12,300 kg.

RSQ = Total actual quantity × Standard proportion

$$RSQ\ (A) = 12,300 \times \frac{6}{15} = 4920 \text{ kg.}$$

$$RSQ\ (B) = 12,300 \times \frac{5}{15} = 3280 \text{ kg.}$$

$$RSQ\ (C) = 12,300 \times \frac{5}{15} = 4100 \text{ kg.}$$

5. Total standard cost

$$= [600 \times 9] + [400 \times 6.50] + [500 \times 4] = ₹10,000$$

$$RSQ\ (B) = 12,300 \times \frac{4}{15} = 3280 \text{ kg.}$$

6. Standard cost per unit of standard output

$$= \frac{\text{Total standard cost}}{\text{Total standard output}} = \frac{10,000}{80,000} = 0.125$$

or $$\frac{77,500}{6,20,000} = 0.125$$

7. Standard yield for actual input

$$= \frac{80,000}{1500} \times 12,300 = 6,56,000 \text{ tiles}$$

Basic Calculation Table

Direct material	*Standard*			*Actual*		
	Quantity (kg.)	*Rate (₹)*	*Amount (₹)*	*Quantity (kg.)*	*Rate (kg.)*	*Amount (₹)*
A	4,650	9.00	41,850	5,000	8.50	42,500
B	3,100	6.50	20,150	2,900	6.00	17,400
C	3,875	4.00	15,500	4,400	4.50	19,800
Total	11,625		77,500	12,300		79,700

Computation of Variances:

(i) Total Material Cost Variance:

= Standard cost for Actual output – Actual cost

= 77,500 – 79,700 = **₹2200 (A)**

(ii) Material Price Variance:

= Actual quantity (Standard price – Actual price)

= AQ (SP – AP)

A = 5,000(9.0 – 8.50) = ₹2,500 (F)

B = 2,900(6.50 – 6.00) = ₹1,450 (F)

C = 4,400(4.00 – 4.50) = ₹2,200 (A)

₹1,750 (F)

(iii) Material Usage Variance:
= Standard price (Standard quantity – Actual quantity)
= SP (SQ – AQ)

A	= 9.00 (4,650 – 5,000)	= ₹3,150 (A)
B	= 6.50 (3,100 – 2,900)	= ₹1,300 (F)
C	= 4.00 (3,875 – 4,400)	= ₹2,100 (A)
		₹3,950 (A)

(iv) Material Mix Variance:
= Standard price (Revised standard quantity – Actual quantity)
= SP(RSQ – AQ)

A	= 9.00(4,920 – 5,000)	= ₹ 720 (A)
B	= 6.50(3,280 – 2,900)	= ₹2,470 (F)
C	= 4.00(4,100 – 4,400)	= ₹1,200 (A)
		₹ **550 (F)**

(v) Material Yield Variance:
= Standard cost per unit of output (Actual yield – Standard yield for actual input)
= 0.125(6,20,000 – 6,56,000)
= 0.125 × 36,000 = **₹4,500 (A)**

Example 19.5

The standard material cost for 100 kg of chemical D is made up of:
Chemical A—30 kg @ ₹4 per kg
Chemical B—40 kg @ ₹5 per kg
Chemical C—80 kg @ ₹6 per kg
In a batch, 500 kg of chemical D were produced from a mix of
Chemical A — 140 kg @ cost of ₹588
Chemical B — 220 kg @ cost of ₹1056
Chemical C — 440 kg @ cost of ₹2860
How do the yield, mix and the price factor contribute to the variance in the actual per 100 kg of chemical D over the standard cost. *(B.Com. (Hons.), Delhi, 2012)*

Solution

	Standard for 100 kg.			*Actual for 100 kg.*		
	Quantity (kg.)	*Rate (₹)*	*Amount (₹)*	*Quantity (kg.)*	*Rate (₹)*	*Amount (₹)*
A	30	4	120	28	4.20	117.60
B	40	5	200	44	4.80	211.20
C	80	6	480	88	6.50	572.00
	150		800	160		900.80

1. Material Cost Variance = SC – AC
= 800 – 900.80
= **₹100.80 (A)**

2. Material Price Variance = (SP – AP) × AQ

A = (4 – 4.20) × 28 = ₹ 5.60 (A)

B = (5 – 4.80) × 44 = ₹ 8.80 (F)

C = (6 – 6.50) × 88 = ₹44.00 (A)

Total = **₹40.80 (A)**

3. Material Usage Variance = (SQ – AQ) × SP

A = (30 – 28) × 4 = ₹ 8 (F)

B = (40 – 44) × 5 = ₹20 (A)

C = (80 – 88) × 6 = ₹48 (A)

Total = **₹60 (A)**

4. Material Mix Variance = (RSQ – AQ) × SP

$$A = \left[\left(\frac{160}{150} \times 30\right) - 28\right] \times 4 = ₹16.00\ (F)$$

$$B = \left[\left(\frac{160}{150} \times 40\right) - 44\right] \times 5 = ₹\ 6.67\ (A)$$

$$C = \left[\left(\frac{160}{150} \times 80\right) - 88\right] \times 6 = ₹16.00\ (A)$$

Total = **₹6.67 (A)**

5. Material Yield Variance

(Actual Yield – Standard Yield) × Standard Output Price

$$= \left[\left(100 - \frac{160}{150} \times 100\right)\right] \times 8 = \left(100 - \frac{320}{3}\right) \times 8 = \textbf{₹53.33 (A)}$$

Example 19.6

Finolex Co. uses a standard cost system and manufactures product Z. Standard cost per 1000 kg of output is as under:

Material	*Quantity (in kg)*	*Price (in ₹)*
A	800	2.50
B	200	4.00
C	200	1.00

In March 2007, the company produced 2,00,000 kg of output. Actual consumption was:

Material:

A — 1,57,000 kg @ ₹2.40

B — 38,000 kg @ ₹4.20

C — 36,000kg @ ₹1.10

Calculate material variances. *(B.Com.(Hons), Delhi ,2007)*

Solution

Standards Material Cost of 2,00,000 kg of output

		Standard Quantity (kg)	*Standard Price (₹)*	*SQ × SP (₹)*
A	800 × 200 =	1,60,000	2.50	4,00,000
B	200 × 200 =	40,000	4.00	1,60,000
C	200 × 200 =	40,000	1.00	40,000
		2,40,000		6,00,000

Actual Material Cost of 2,00,000 kg of output

	AQ (kg)	*AP (₹)*	*AQ × AP (₹)*
A	1,57,000	2.40	3,76,800
B	38,000	4.20	1,59,600
C	36,000	1.10	39,600
	2,31,000		5,76,000

(i) Material cost variance = (SQ × SP) – (AQ × AP) = 6,00,000 – 5,76,000 = ₹24,000 (F)

(ii) Material price variance = AQ(SP – AP)

A	=	1,57,000 (2.50 – 2.40)	=	15,700 (F)
B	=	38,000 (4.00 – 4.20)	=	7,600 (A)
C	=	36,000 (1.00 – 1.10)	=	3,600 (A)
MPV	=			₹4,500 (F)

(iii) Material usage variance = SP(SQ – AQ)

A	=	2.50 (1,60,000 – 1,57,000)	=	7,500 (F)
B	=	4.00 (40,000 – 38,000)	=	8,000 (F)
C	=	1.00 (40,000 – 36,000)	=	4,000 (F)
MUV	=			₹19,500 (F)

MCV = MPV + MUV = 4,500 (F) + 19,500 (F) = ₹24,000 (F)

(iv) Material mix variance

MMV = SP (AQ in std. prop – AQ)

A	=	2.50 (1,54,000 – 1,57,000)	=	7,500 (A)
B	=	4.00 (38,500 – 38,000)	=	2,000 (F)
C	=	1.00 (38,500 – 36,000)	=	2,500 (F)
				₹3,000 (A)

(v) Material yield variance $= \frac{SQ \times SQP}{Output} \times$ (Expected output from AQ – Actual output)

$$= \frac{6,00,000}{2,00,000} \times \left(\frac{2,00,000}{2,40,000} \times 2,31,000 \right) - 2,00,000$$

$$= 3\ (1,92,500 - 2,00,000) = ₹22,500\ (F)$$

MUV = MMV + MYV = 3,000 (A) + 22,500 (F) = ₹19,500 (F)

AQ in Std. Proportion = A = 2,31,000 × 16/24 = 1,54,000;

B = 2,31,000 × 4/24 = 38,500; C = 2,31,000 × 4/24 = 38500

Example 19.7

From the following data, calculate the following variances:

(i) Material cost variance;
(ii) Material price variance;
(iii) Material quantity variance;
(iv) Material mix variance;
(v) Material yield variance.

Material	*Standard*		*Actual*	
	Qty.	*Unit Price*	*Qty.*	*Unit Price*
A	60%	₹20	88	₹30
B	40%	₹10	132	₹10

Standard loss: 10%
Actual output: 180 units

(B.Com.(Hons), Delhi 2003, 2005)

Solution

Comparative Statement of Costs

Article	*Standard*			*Actual*		
	Qty.	*Price ₹*	*Cost ₹*	*Qty.*	*Price ₹*	*Cost.₹*
A	120	20	2,400	88	30	2,640
B	80	10	800	132	10	1,320
	200		3,200	220		3,960
Less: Std. Loss	20			40		–
	180		3,200	180		3,960

Material cost variance = Std. cost – Actual cost

= 3,200 – 3,960 = ₹760 (A)

Material quantity variance = (SQ – AQ) SP

A = (120 – 88) 20 = 640 (F)

B = (80 – 132) 10 = 520 (A)

₹120 (F)

Material price variance $= (SP - AP) \times AQ$

A = (20 – 30) 88 = 880 (A)

B = (10 – 10) 132 = Nil

₹880 A

Material mix variance $A = \left(\frac{120}{200} \times 220 - 88\right) 20 = 880$ (F)

$B = \left(\frac{80}{200} \times 220 - 132\right) 10 = 440$ A

₹440 (F)

Material yield variance $= \left(\frac{180}{200} \times 220 - 180\right) \frac{3200}{180}$

$= (198 - 180) \frac{3200}{180}$

= ₹320 (A)

Working Notes

(i) *Standard quantity of materials A and B*

Standard quantity = 60 + 40 = 100

Less: Standard loss 10

Standard output 90

When standard output is 90, quantity of material *A* is 60

When output is 180, material *A* quantity will be $\frac{180 \times 60}{90} = 120$

Similarly quantity of material *B* will be $\frac{180 \times 40}{90} = 80$

(ii) *Standard output for the actual input*

Actual input = 88 + 132 = 220

When standard input is 100, standard output is 90

When actual input is 220, standard output will be $\frac{220 \times 90}{100} = 198$

(iii) *Revised standard quantity for actual input*

Material $A = \frac{120}{200} \times 220$

Material $B = \frac{80}{200} \times 220$

Example 19.8

Pragati Company manufactures a product P by mixing three raw materials. For every 100 kg of output 125 kg of raw material input are used. In April 1997, there was an output of 5600 kg. of product P. The standard and actual particulars of April, 1997 are as follows:

Raw Material	Standard		Actual	
	Mix	Price per kg	Mix	Price per kg
I	50%	₹40	60%	₹42
II	30%	₹20	20%	₹16
III	20%	₹10	20%	₹12

Calculate all material variances. The actual quantity of material used was 7000 kg.

(B. Com. (Hons.) Delhi 1997)

Solution

Raw Material	Standard for output of 5600 kg.			Actual for output of 5600 kg		
	Qty kg.	Rate ₹	Amt. ₹	Qty kg.	Rate ₹	Amt. ₹
I	3500	40	1,40,000	4200	42	1,76,400
II	2100	20	42,000	1400	16	22,400
III	1400	10	14,000	1400	12	16,800
Total	7000*		1,96,000	7000		2,15,600

$$*\frac{5,600}{100} \times 125$$

DMCV = Std. cost for actual output – Actual cost

= 1,96,000 – 2,15,600 = ₹19,600 (A)

DMPV = Actual qty. × (SR – AR)

I = 4,200 × (40 – 42) = 8,400 (A)

II = 1,400 × (20 – 16) = 5,600 (F)

III = 1,400 × (10 – 12) = 2,800 (A)

5,600 (A)

DMUV = SR × (Std. qty. for actual output – Actual qty.)

I = 40 × (3,500 – 4,200) = 28,000 (A)

II = 20 × (2,100 – 1,400) = 14,000 (F)

III = 10 × (1,400 – 1,400) = Nil

14,000 (A)

DMMV = SR × (SRQ – AQ)

Since total Std. Mix and Actual Mix are the same, the RSQ will be the same as Std. qty.

I = 40 × (3,500 – 4,200) = 28,000 (A)

II = 20 × (2,100 – 1,400) = 14,000 (F)

III = 10 × (1,400 – 1,400) = 0

14,000 (A)

The Direct material yield variance will be *Nil.*

Example 19.9

A company is manufacturing a chemical product making use of 4 different types of raw materials as follows:

Raw material	*Share of total input (%)*	*Cost of raw materials (₹/kg)*
A	40	50
B	30	80
C	20	90
D	10	100

There is an inevitable normal loss of 10% during the processing.

For April 2007, the management furnished the following information:

Raw material consumed	*Quantity consumed (kg.)*	*Cost of material (₹/kg)*
A	42000	48
B	31000	80
C	18000	92
D	9000	110

Output obtained for the month was 92000 kg.

Calculate:

(a) Material cost variance,
(b) Material price variance,
(c) Material mix variance,
(d) Material yield variance,
(e) Material usage variance.

(ICWA, Inter, Stage 1, June 2007)

Solution

Standard cost of the finished product is worked out as follows:

Input	*Quantity (kg)*	*Standard Price/kg (₹)*	*Standard Cost (₹)*
A	40	50	2,000
B	30	80	2,400
C	20	90	1,800
D	10	100	1,000
	100	7,200	7,200
Processing loss	10	–	–
Output	90		7,200
Standard cost per unit (7200 ÷ 90)			₹80

Computation of variances:

(a) *Material cost variance* = Standard cost of actual finished output – Actual cost of output

$$= 92000 \times 80 - \begin{bmatrix} A = 42000 \times 48 = 20,16,000 \\ B = 31000 \times 80 = 24,80,000 \\ C = 18000 \times 92 = 16,56,000 \\ D = 9000 \times 110 = 9,90,000 \end{bmatrix}$$

71,42,000

$$= 73,60,000 - 71,42,000 = ₹2,18,000 \text{ (F)}$$

(b) *Material price variance* = (Standard price – Actual price) Actual quantity consumed

A = (50 – 48) 42,000	=	₹84,000 (F)
B = (80 – 80) 31,000	=	–
C = (90 – 92) 18,000	=	₹36,000 (A)
D = (100 – 110) 9,000	=	₹90,000 (A)
		₹42,000 (A)

(c) *Material mix variance* = (Actual input in standard proportion – Actual input) × Standard price

A = (40,000 – 42,000) ₹50 = ₹	1,00,000 (A)
B = (30,000 – 31,000) ₹80 = ₹	80,000 (A)
C = (20,000 – 18,000) ₹90 = ₹	1,80,000 (F)
D = (10,000 – 9,000) ₹100 = ₹	1,00,000 (F)
	₹ 1,00,000 (F)

(d) *Material yield variance* = (Standard yield of actual input – Actual yield) × Standard rate of finished product

$$= (1,00,000 \times 90 - 92,000) \times ₹80$$
$$= ₹1,60,000 \text{ (F)}$$

(e) *Material usage variance* = Standard cost of actual finished output – Stand cost (input) of actual input.

$$₹\ 73,60,000 - \begin{bmatrix} A = 42000 \times 50 = 20,00,000 \\ B = 31000 \times 80 = 24,80,000 \\ C = 18000 \times 90 = 16,20,000 \\ D = 9000 \times 100 = 9,00,000 \end{bmatrix}$$

71,00,000

$$= 73,60,000 - 71,00,000$$
$$= ₹2,60,000 \text{ (F)}$$

(i) Check: Material usage variance = (Mix variance + Yield variance)

= (1,00,000 (F) + 1,60,000 (F)) = ₹2,60,000 (F)

(ii) Material cost variance = Material price variance + Material usage variance

2,18,000 (F) = 42,000 (A) + 2,60,000 (F)

Example 19.10

In a manufacturing process the following standards apply:

Standard prices : Raw material A ₹10 per kg., B ₹50 per kg.

Standard mix : 75% A and 25% B (by weight)

Standard output (weight of product as a percentage of weight of raw material) – 90%

In a particular period actual costs, usages and output were as follows:

4400 kg of A costing ₹46,500

1600 kg of B costing ₹78,500

Output 5670 kg of product.

The budgeted output for the period was 7200 kg.

Compute the material cost variances. *(ICWA, Stage 2, June 2005)*

Solution

Standard yield from 6000 kg (4400 kg + 1600 kg) of input is

		₹
Material A (75%) 4500 kg @ ₹10	=	45,000
Material B (25%) 1500 kg @ ₹50	=	75,000
6000 kg		1,20,000

Less:

Normal loss @ 10% 600 kg

Std. Output 5400 kg

Std. cost of actual output of 5670 kg $= \frac{1,20,000}{5400} \times 5670$

= ₹1,26,000

Actual cost of actual output of 5670 kg

4400 kg × ₹10.568	=	46,500
1600 kg × ₹49.063	=	78,500
6000 kg		1,25,000

Less actual loss 330 kg

Actual output 5670 kg

(i) Material cost variance = 1,26,000 – 1,25,000 = ₹1000 (F)

(ii) Material price variance:

A (10 – 10.568) × 4400	= 2,499.20 (A)
B (50 – 49.063) × 1600	= 1,499.20 (F)
	1,000.00 (A)

(iii) Material usage variance:

		₹
A	$\left(\frac{4500}{5400} \times 5670 - 4400\right) \times 10$	= 3250 (F)
B	$\left(\frac{1500}{5400} \times 5670 - 1600\right) \times 50$	= 1250 (A)
		2000 (F)

(iv) Material mix variance:

A (4500 – 4400) × 10	= 1000 (F)
B (1500 – 1600) × 50	= 5000 (A)
	4000 (A)

(v) Yield variance = (5400 – 5670) × $\frac{1200000}{5400}$ = 6000 (F)

Example 19.11

A factory manufactures a chemical product with three ingredient chemicals A, B and C as per standard data given below:

Chemical	*Percentage of total input*	*Standard Cost per kg. (₹)*
A	50%	40
B	30%	60
C	20%	95

There is a process loss of 5% during the course of manufacture.
The management gives the following details for a certain week:

Chemical consumed	*Quantity purchased and issued*	*Actual cost (₹)*
A	5200 kg.	2,34,000
B	3600 kg.	2,19,600
C	1700 kg.	1,58,100

Output of finished product: 10200 kg.
Calculate all the relevant variances. *(ICWA, Inter, Stage 1, Dec. 2005)*

Solution

Standard Cost of a Chemical Product

Chemical	*Percentage of input*	*Quantity (kg)*	*Standard cost per kg (₹)*	*Total cost* ₹
A	50%	0.50	40	20
B	30%	0.30	60	18
C	20%	0.20	95	19
Total input		1.00		57
Less: Loss on processing (5%)		0.05		57
Output		0.95		

Standard cost of a chemical product = $\frac{₹57}{0.95}$ = ₹60

Computation of variances:

(1) *Total Material Cost Variances:*

Standard cost of actual production (output) – Actual material cost for production

= 10200 × ₹60 – ₹(234000 + 219600 + 158100)

= ₹612000 – ₹611700 = ₹300 (FAV).

(2) *Material Price Variance:*

(Std. price – Actual price) × Actual qty. consumed.

A: [40 – (234000 / 5200)] × 5200	₹ 26,000 (A)
B: [60 – (219600 / 3600)] × 3600	₹ 3,600 (A)
C: [95 – (158100 / 1700)] × 1700	₹ 3,400 (F)
	₹ 26,200 (A)

(3) *Material Mix Variance:*

= (Actual input in std. proportion – Actual input) × Std. cost of input/kg.

A: (0.50 × 10500 – 5200) × ₹40	₹ 2,000 (F)
B: (0.30 × 10500 – 3600) × ₹60	₹ 27,000 (A)
C: (0.20 × 10500 – 1700) × ₹95	₹ 38,000 (F)
	₹ 13,000 (F)

(4) *Yield Variance*

(Std. yield from actual input – Actual output) × Std. cost of finished product

= (10,500 × 0.95 – 10,200) × ₹60 = ₹13,500 (F)

(5) *Usage Variance:*

Std. cost (output) of Actual output – Std cost of actual qty consumed.

$= 10,200 \times ₹60 - \begin{bmatrix} 5,200 \times ₹40 \\ 3,600 \times ₹60 \\ 1,700 \times ₹95 \end{bmatrix}$ = ₹6,12,000 – ₹5,85,500

= ₹26,500 (F)

Usage variance: Mix variance + Yield variance

= ₹13,000 (FAV) + ₹13,500 (FAV) = ₹26,500 (F)

Total Material Cost Variance:

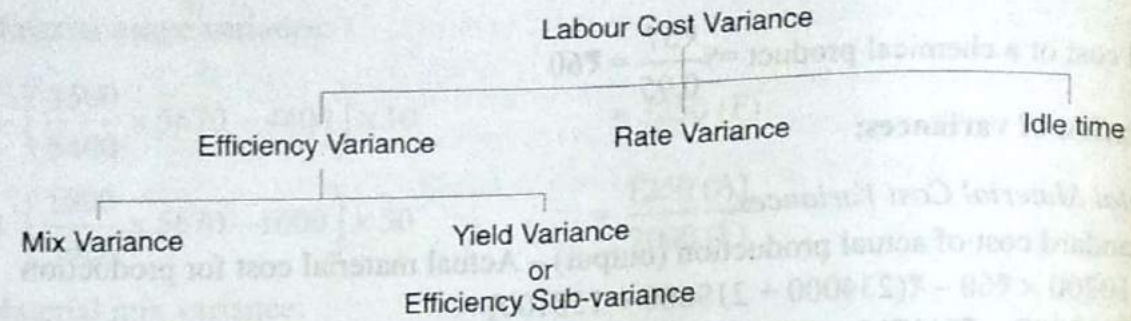
Material price variance + Material usage variance

= ₹26,200 (ADV) + ₹26,500 (F)

= ₹300 (F)

LABOUR VARIANCES

Direct labour variances arise when actual labour costs are different from standard labour costs. Labour variances constitute the following:



Labour Cost Variance

Labour cost variance denotes the difference between the actual direct wages paid and the standard direct wages specified for the output achieved. This variance is calculated by using the following formula:

Labour cost variance = (AH × AR – SH × SR)

where AH = Actual hours
AR = Actual rate
SH = Standard hours
SR = Standard rate

Labour Efficiency Variance

The calculation of labour efficiency or usage variance follows the same pattern as the computation of materials usage variance. If actual direct labour hours required to complete a job differ from the number of standard hours specified, a labour efficiency variance results; it is the difference between actual hours expended and standard labour hours specified multiplied by the standard labour rate per hour. The formula is:

Labour efficiency variance = (Actual hours – Standard hours for the actual output) × Std. rate per hour.

It may be noted that the standard labour hour rate and not the actual rate is used in computing labour efficiency variance. If quantity variances are calculated, changes in prices/rates are excluded, and when price variances are calculated, standard quantities are ignored.

Labour Rate Variance

Labour rate variance is computed in the same manner as materials price variance. When actual direct labour hour rates differ from standard rates, the result is a labour rate variance. It is that portion of the direct wages variance which is due to the difference between the actual rate paid and standard rate of pay specified. The formula for its calculation is:

Labour rate variance = (Actual rate – Standard rate) × Actual hours

Favourable rate variance arise whenever actual rates are less than standard rates; unfavourable variances occur when actual rates exceed standard rates.

Labour Mix Variance

Labour mix variance is computed in the same manner as materials mix variance. Manufacturing or completing a job requires different types or grades of workers and production will be completed

if labour is mixed according to standard proportions. Standard labour mix may not be adhered to under some circumstances and substitution will have to be made. There may be changes in the wage rates of some workers; there may be a need to use more skilled or expensive types of labour, for example, employment of men instead of women; sometimes workers and operators maybe absent. These lead to the emergence of a labour mix variance which is calculated by using the following formula:

Labour mix variance = (Actual labour mix – Revised standard labour mix in terms of actual total hours) × Standard rate per hour

To take an example, suppose the following were the standard labour cost data per unit in a factory:

Class	*Proportion*			*Cost*
	%			₹
A	50	3 hours @	₹4.00	12
B	50	3 hours @	₹2.00	6
	100	6 hours	₹3.00	18

In a period, many class *B* workers were absent and it was necessary to substitute class *B* workers. Since the class *A* workers were less experienced with the job, more labour hours were used. The recorded costs of a unit were:

Class	*Proportions*		*Cost*	
	%		₹	
A	75	6 hours @	₹4.00	24.00
B	25	2 hours @	₹2.00	4.00
	100	8 hours	₹3.50	28.00

Labour mix variance will be calculated as follows:

Labour mix variance = (Actual proportion – Revised standard proportion of actual total hours) × Standard rate per hour

Revised standard proportion:

$$\text{Class } A = \frac{3}{6} \times 8 = 4 \text{ hours}$$

$$\text{Class } B = \frac{3}{6} \times 8 = 4 \text{ hours}$$

Applying the formula:

Class $A = (6 - 4) \times ₹4 = 8$ (Unfavourable)

Class $B = (2 - 4) \times ₹2 = 4$ (Favourable)

Total labour mix variance = ₹4 (Unfavourable)

Labour Yield Variance

The final product cost contains not only material cost but also labour cost. Therefore, higher or lower output than the standard output should take into account labour yield variance also. A lower

output simply means that final output does not correspond with the production units that should have been produced from the hours expended on the inputs. It can be computed by applying the following formula:

Labour yield variance = (Actual output – Standard output based on actual hours) × Average standard labour rate per unit of output

or

Labour yield variance = (Actual loss – Standard loss on actual hours) × Average standard labour rate per unit of output

Labour yield variance is also known as labour efficiency sub-variance which is computed in terms of inputs, i.e. standard labour hours and revised labour hours mix (in terms of actual hours). Labour efficiency sub-variance is computed by using the following formula:

Labour efficiency sub-variance = (Revised standard mix – Standard mix) × Standard labour rate

Substitution Variance This type of variance arises in the case of labour, due to the substitution of labour, that is when one grade of labour is substituted by another. This variance in fact represents the difference between the actual hours at standard rate of standard worker and the actual hours at standard rate of actual worker.

The formula for computation is:

Substitution variance = (Standard hours × Standard rate for standard worker) – (Standard hours × Standard rate of actual worker)

Idle Time Variance

Idle time variance occurs when workers are not able to do the work due to some reason during the hours for which they are paid. Idle time can be divided according to causes responsible for creating idle time, for example, idle time due to breakdown, lack of materials or power failures. Idle time variance will be equivalent to the standard labour cost of the hours during which no work has been done, but for which workers have been paid for unproductive time. Suppose, in a factory 2000 workers were idle because of a power failure. As a result of this a loss of production of 4000 units of product A and 8000 units of product B occurred. Each employee was paid his normal wage (a rate of ₹20 per hour). A single standard hour is needed to manufacture four units of product A and eight units of product B. Idle time variance will be computed in the following manner:

Standard hours lost:

$$\text{Product } A = \frac{4000}{4} = 1000 \text{ hr}$$

$$\text{Product } B = \frac{8000}{8} = 1000 \text{ hr}$$

$$\text{Total hours lost} = 2000 \text{ hr}$$

Idle time variance (power failure)

2000 hours @ ₹20 per hour = ₹40,000 (Adverse)

Example 19.12

Calculate labour variances from the following information:

Actual hours	5,800
Actual direct wages	₹1,800
Standard rate per hour	₹ 0.35
Standard hours	6,000

(B.Com., (Hons), Delhi, 2007)

Solution

Actual Rate (AR)	=	$\frac{₹1,800}{5800}$	= ₹0.3103448	
Total standard wage	=	6000×0.35 =	₹2,100	
Labour cost variances	=	Std. wage – Actual wage =	2100 – 1800 =	₹300 (F)
Labour rate variance	=	AH (SR – AR) =	5800 (0.35 – 0.3103448) =	₹230 (F)
Labour efficiency variance	=	SR (SH – AH) =	0.35 (6000 – 5800) =	₹70 (F)
Labour cost variance	=	LRV + LEV =	230(F) + 70(F) =	₹300 (F)

Example 19.13

The standard labour cost for producing 200 metres of cloth was predetermined as 30 skilled labour hours @ ₹15 per hour and 30 unskilled labour hours @ ₹10 per hour. 300 metres of cloth was produced with the help of 30 skilled labour hours paid @ ₹17 per hour and 30 unskilled labour hours paid @ ₹12 per hour.

Calculate:

(i) Labour mix variance and
(ii) Labour yield variance.

(B.Com., (Hons), Delhi, 2005)

Solution

Labour Mix Variance:

$$A = \left(\frac{30}{75} \times 60 - 30\right) 15 = 90 \text{ (A)}$$

$$B = \left(\frac{45}{75} \times 60 - 30\right) 10 = 60 \text{ (F)}$$

₹30 (A)

Labour Yield Variance

$$A = \left(\frac{300}{75} \times 60 - 300\right) \frac{900}{300} = ₹180 \text{ (F)}$$

Example 19.14

The following standard and actual data in respect of Chemical *X* is made available to you from the records of Naulakha Chemicals Ltd.

Standard Data:		*Total*
Materials:	₹	₹
450 kg of material *A* @ ₹20 per kg	9,000	
360 kg of material *B* @ ₹10 per kg	3,600	12,600
810		
Labour: @ per hour	₹	
2400 skilled hours ₹2		4,800
1200 unskilled hours ₹1		1,200
90 kg Normal loss	–	
720 kg		18,600
Actual Data:		Total
Materials:	₹	₹
450 kg of material *A* @ ₹19 per kg	8,550	
360 kg of material *B* @ ₹11 per kg	3,960	12,510
810		
Labour: @ per hour		
2,400 skilled hours ₹2.25		5,400
1,200 unskilled hours ₹1.25		1,500
50 kg Actual loss		19,410
760		

You are required to compute:

(a) Material cost variance;
(b) Material price variance;
(c) Material yield variance;
(d) Labour cost variance;
(e) Labour rate variance;
(f) Labour yield variance.

(B.Com.(Hons), Delhi 2002)

Solution

(a) Material Cost Variance:

$$(RSQ \times SP) - (AQ \times AP)$$

RSQ of Material *A* $= \frac{760}{720} \times 450 = 475$ kg

RSQ of Material *B* $= \frac{760}{720} \times 360 = 380$ kg

Material *A* $= (475 \times 20) - (450 \times 19)$

Material *B* $= 9,500 - 8,550 = 950$ (F)

$= (380 \times 10) - (360 \times 11)$

$= 3,800 - 3,960 = 160$ (A)

Total 790 (F)

(b) Material Price Variance:

(SP – AP) AQ

	₹
Material A = (20 – 19) × 450 kg.	450 (F)
Material B = (10 – 11) × 360 kg.	360 (A)
Total	90 (F)

(c) Material Yield Variance:

Std. price (Std. loss – Actual loss)

$₹\frac{12,600}{720}$ (90 kg – 50 kg)

$= \frac{12,600}{720} \times 40 = ₹700$ (F)

(d) Labour Cost Variance:

(SH × SR) – (AH × AR)

Skilled (2,400 × 2) – (2,400 × 2.25)

4.800 – 5.400 = ₹600 (A)

Unskilled = (1,200 × 1) – (1,200 × 1.25)

1,200 – 1,500 = ₹300 (A)

Total 900 (A)

(e) Rate Variance:

(SR – AR) AH

Skilled (₹2 – ₹2.25) × 2,400 = ₹600 (A)

Unskilled (₹1 – ₹1.25) × 1,200 = ₹300 (A)

Total 900 (A)

(f) Labour Yield Variance – NIL

Example 19.15

In a factory 100 workers are employed and standard average wage rate is ₹50 per hour. Standard working hours per week are 40 and the standard performance is 10 units per hour. During a week, wages paid for 50 workers are at the rate of ₹50 per hour, 10 workers at ₹70 per hour and 40 workers at ₹40 per hour. Actual output was 380 units. The factory did not work for 5 hours due to breakdown of machinery. Calculate labour variances.

(B.Com. (Hons), Delhi University, 2011)

Solution

Standard cost = 100 workers × ₹50 × 40 hours = ₹2,00,000

Standard cost of actual output = $₹2,00,000 \times \frac{380}{400}$ = ₹1,90,000

Actual cost of 50 workers = 50 × ₹50 × 40 hours = ₹1,00,000
Actual cost of 10 workers = 10 × ₹70 × 40 hours = ₹ 28,000
Actual cost of 40 workers = 40 × ₹40 × 40 hours = ₹ 64,000
Total actual cost = ₹1,92,000

1. Labour Cost Variance = Standard cost of actual output – Actual cost
= ₹1,90,000 – ₹1,92,000 = ₹2,000 (A)
2. Labour Rate Variance = This variance is calculated in three parts as follows:
(Standard rate – Actual rate) × Actual hours
(i) (₹50 – ₹50) × 50 workers × 40 hours = Nil
(ii) (₹50 – ₹70) × 10 workers × 40 hours = ₹ 8,000 (A)
(iii) (₹50 – ₹40) × 40 workers × 40 hours = ₹16,000 (F)
Total labour rate variance = ₹ 8,000 (F)
3. Labour Efficiency Variance = (SH – AH) × Standard Rate

$$= \frac{380 \text{ units}}{10 \text{ units}} \times 100 \text{ workers} - [(40 \text{ hrs} - 50 \text{ hrs}) \times 100 \text{ workers}] \times ₹50$$

= (3,800 – 3,500) × ₹50 = ₹15,000 (F)
4. Idle Time Variance = Idle hours × Standard rate
= 5 hrs. × 100 workers × ₹50 = ₹25,000 (A)

Example 19.16

The standard labour employment and the actual labour engaged in a week for a job are as under:

	Skilled workers	*Semi-skilled workers*	*Unskilled workers*
Standard no. of workers in the gang	32	12	6
Actual no. of workers employed	28	18	4
Standard wage rate per hour (₹)	3	2	1
Actual wage rate per hour (₹)	4	3	2

During the 40 hours working week, the gang produced 1,800 standard labour hours of work. Calculate:

(a) Labour cost variance;
(b) Labour rate variance;
(c) Labour efficiency variance;
(d) Labour mix variance
(e) Labour yield variance.

(B.Com. (Hons), Delhi University, 2011)

Solution

	Standard			*Actual*		
	Hours	*Rate*	*Amount*	*Hours*	*Rate*	*Amount*
Skilled	1,280	3	3,840	1,120	4	4,480
Semi-skilled	480	2	960	720	3	2,160
Unskilled	240	1	240	160	2	320
	2,000		5,040	2,000		6,960

Labour Cost Variance = SC – AC

$$= \left(\frac{5,040}{2,000} \times 1,800\right) - 6,960 = \textbf{₹2,424 (A)}$$

Labour Rate Variance = (SR – AR) × AH

Skilled	(3 – 4) × 1,120 =	1,120 (A)
Semi-skilled	(2 – 3) × 720 =	720 (A)
Unskilled	(1 – 2) × 160 =	160 (A)
	=	**₹2,000 (A)**

Labour Efficiency Variance = (ST* – AT) × SR

Skilled	(1,152 – 1,120) × 3 =	96 (F)
Semi-skilled	(432 – 720) × 2 =	576 (A)
Unskilled	(216 – 160) × 1 =	56 (F)
	=	**424 (A)**

Labour Mix Variance = (RST – AT) × SR

Skilled	(1,280 – 1,120) × 3 =	480 (F)
Semi-skilled	(480 – 720) × 2 =	480 (A)
Unskilled	(240 – 160) × 1 =	80 (F)
	=	**80 (F)**

Labour Revised Efficiency Variance = (ST* – RST) × SR

Skilled	(1,152 – 1,280) × 3 =	384 (A)
Semi-skilled	(432 – 480) × 2 =	96 (A)
Unskilled	(216 – 240) × 1 =	24 (A)
	=	**504 (A)**

Verification:

Labour Cost Variance	= Labour Rate Variance	+ Labour Efficiency Variance
2,424 (A)	= 2,000 (A)	+ 424 (A)
Labour Efficiency Variance	= Labour Mix Variance	+ Labour Revised Efficiency Variance
424 (A)	= 80 (F)	+ 504 (A)

Example 19.17

The following standards have been set to manufacture a product by a company:

	₹
Direct Material:	
2 units of '*A*' @ ₹4 per unit	8.00
3 units of '*B*' @ ₹3 per unit	9.00
15 units of '*C*' @ ₹1 per unit	15.00
Direct Labour:	
3 lab. Hrs. @ ₹8 per lab. hr.	24.00
Total standard prime cost	56.00

The company had manufactured and sold 6,000 units of the product during the year. Direct material costs incurred were as follows:

12,500 units of '*A*' @ ₹4.40 per unit
18,000 units of '*B*' @ ₹2.80 per unit
88,500 units of '*C*' @ ₹1.20 per unit

The company worked for 17,500 direct labour hours during the year. For 2,500 of these labour hours, the company paid @ ₹12 per labour hr., while for the remaining labour hrs. it paid at the standard rate. You are required to calculate:

(i) Material price, Usage, Mixture and Yield variances;
(ii) Labour rate and Efficiency variances. *(B. Com (Hons), Delhi University, 2010)*

Solution

	Standard for 6,000 units			*Actual*		
	Qty.	*Rate (₹)*	*Amt (₹)*	*Qty.*	*Rate (₹)*	*Amt (₹)*
A	12,000	4	48,000	12,500	4.40	55,000
B	18,000	3	54,000	18,000	2.80	50,400
C	90,000	1	90,000	88,500	1.20	1,06,200
Total	1,20,000		1,92,000	1,19,000		2,11,600

(i) 1. Material Price Variance = (SP – AP) × AQ

A = (4 – 4.40) × 12,500 = ₹ 5,000 (A)
B = (3 – 2.80) × 18,000 = ₹ 3,600 (F)
C = (1 – 1.20) × 88,500 = ₹17,700 (A)
MPV = ₹19,100 (A)

2. Material Usage Variance = (SQ – AQ) × SP

A = (12,000 – 12,500) × 4 = ₹2,000 (A)
B = (18,000 – 18,000) × 3 = ₹ Nil
C = (90,000 – 88,500) × 1 = ₹1,500 (F)
MUV = ₹ 500 (A)

3. Material Mix Variance = (RSQ – AQ) × SP

$$A = \left(1{,}19{,}000 \times \frac{12{,}000}{1{,}20{,}000} - 12{,}500\right) \times 4 = ₹2{,}400\ (A)$$

$$B = \left(1{,}19{,}000 \times \frac{18{,}000}{1{,}20{,}000} - 18{,}000\right) \times 3 = ₹450\ (A)$$

$$C = \left(1{,}19{,}000 \times \frac{90{,}000}{1{,}20{,}000} - 88{,}500\right) \times 1 = ₹750\ (F)$$

MMV = ₹2,100 (A)

4. Material Yield Variance = (Actual yield – St. yield) × SP

$$\textbf{MYV} = (6{,}000 - 5{,}950^{*}) \times \frac{₹1{,}92{,}000}{6000 \text{ units}} = ₹1{,}600\ (F)$$

$$^{*}\text{St.yield} = 6{,}000 \text{ units} \times \frac{1{,}19{,}000}{1{,}20{,}000} = 5{,}950 \text{ units}$$

(ii) Labour Variance:

Standard labour cost = 18,000 hrs. × ₹8 = ₹1,44,000

Actual cost = (2,500 × ₹12) + (15,000 × ₹8) = ₹1,50,000

Labour Rate Variance = (SR – AR) × AH

= (8 – 12) × 2,500 + (8 – 8) × 1,500 = ₹10,000 (A)

Labour Efficiency Variance = (SH – AH) × SR

= (18,000 – 17,500) × 8 = ₹4,000 (F)

Example 19.18

Standard hours for producing two products *A* and *B* are 15 hours and 20 hours per unit respectively. Both products require identical type of labour and the standard wage rate is ₹5 per hour. In a year 10,000 units of *A* and 15,000 units of *B* were produced. The total labour hours actually worked were 4,50,500 and actual wage bill came to ₹23,00,000. This included 12,000 hours paid for at ₹7 per hour and 9,400 hours paid for @ ₹7.50 per hour, the balance having been paid at ₹5 per hour.

You are required to compute labour cost variance, labour rate variance and labour efficiency variance. *(B.Com. (Hons.), Delhi University, 2008)*

Solution

Standard Cost =	10,000 units × 15 hours × ₹5	=	₹ 7,50,000
	+ 15,000 units × 20 hours × ₹5	=	₹15,00,000
	Total	=	₹22,50,000

Labour Cost Variance = Standard cost – Actual cost

= 22,50,000 – 23,00,000 = **₹50,000 (A)**

Labour Rate Variance = (Standard rate – Actual rate) × Actual hours

= (5 – 7) × 12,000 + (5 – 7.50) × 9,400 + (5 – 5) × 4,29,100

= 24,000 (A) + 23,500 (A) + Nil = **₹47,500 (A)**

Labour Efficiency Variance = (Standard hours – Actual hours) × Standard rate

= (4,50,000 – 4,50,500) × 5 = **₹2,500 (A)**

Example 19.19

Standard labour cost of producing 40 units of a product is 30 hours work by skilled workers at a standard rate of ₹60 per hour and 90 hours work by unskilled workers at the standard rate of ₹20 per hour. 40 units of the product were produced for which skilled workers were paid for 20 hours at ₹55 per hour and unskilled workers were paid for 130 hours at ₹24 per hour. Due to a machine break-down both skilled and unskilled workers lost 9 hours each. They were paid even for this time.

Calculate

(i) Labour cost variance;
(ii) Labour rate variance;
(iii) Labour efficiency variance unadjusted;
(iv) Labour mix variance;
(v) Labour yield variance;
(vi) Idle time variance.

(B.Com. (Hons), Delhi University, 2007)

Solution

Standard Cost for 40 units

	Hours	*Rate* ₹	*Amount* ₹
Skilled	30	60	1,800
Unskilled	90	20	1,800
	120		3,600

Actual Cost

	Hours	*Rate* ₹	*Amount* ₹
Skilled	20	55	1,100
Unskilled	130	24	3,120
	150		4,220

(i) Labour Cost Variance = Standard cost – Actual cost
= 3,600 – 4,220 = **₹620 (A)**

(ii) Labour Rate Variance = (Standard rate – Actual rate) × Actual hrs.
Skilled = (60 – 55) × 20 = ₹100 (F)
Unskilled = (20 – 24) × 130 = ₹520 (A)
Total **420 (A)**

(iii) Labour Efficiency Variance = (Standard hrs. – Actual hrs.) × Standard rate
Skilled = (30 – 20) × 60 = ₹600 (F)
Unskilled = (90 – 130) × 20 = ₹800 (A)
Total **200 (A)**

(iv) For calculating Labour Mix Variance and Labour Yield Variance, idle hours are excluded from actual hours *i.e.*
Skilled = 20 hrs. – 9 hrs = 11 hrs.
Unskilled = 130 hrs. – 9 hrs. = 121 hrs
Total **132 hrs.**

Revised Standard Hours (RSH) are calculated as follows:
Skilled = 132 × 30/120 = 33
Unskilled = 132 × 90/120 = 99
Total **132**

Labour Mix Variance = (RSH – Actual hrs,) × Standard rate
Skilled = (33 – 11) × 60 = ₹1,320 (F)
Unskilled = (99 – 121) × 20 = ₹ 440 (A)
Total ₹ **880 (F)**

(v) Labour Yield Variance = (Actual Yield – Standard Yield) × Standard output rate

$$= \left(40 \text{ units} - 132 \times \frac{40}{120} \text{ units}\right) \times \frac{3600\ (₹)}{40 \text{ units}}$$

= (40 – 44) × 90 = **₹360 (A)**

(vi) Idle Time Variance = Idle hrs. × Standard rate

Skilled	= 9 × 60	= ₹540 (A)
Unskilled	= 9 × 20	= ₹180 (A)
	Total	₹720 (A)

Example 19.20

The following information is available from the cost records of Vatika & Co. for the month of August, 2009:

Material purchased 24,000 kg ₹1,05,600
Material consumed 22,800 kg
Actual wages paid for 5,940 hours ₹29,700
Unit produced 2160 units.
Standard rates and prices are:
Direct material rate is ₹4.00 per unit
Direct labour rate is ₹4.00 per hour
Standard input is 10 kg. for one unit
Standard requirement is 2.5 hours per unit.
Calculate all material and labour variances for the month of August, 2009.

(C.A. November, 2009)

Solution

Material Variances:

(i) Material Cost Variance
= (SQ × SP) – (AQ × AP)
= (2,160 × 4 × 10) – (22,800 × 4.40)
= ₹86,400 – ₹1,00,320 = 13,920 (A)

(ii) Material Price Variance
= AQ (SP – AP)
= 22,800 Kg (4 – 4.40) = 9,120 (A)

(iii) Material Usage Variance
= SP (SQ – AQ)
= 4 (21,600 – 22,800) = 4,800 (A)

Verification :-

MCV = MPV + MUV
13,920 (A) = 9,120 (A) + 4,800 (A)

Labour Variances:

(i) Labour Cost Variance
= (SH × SR) – (AH × AR)
= (2,160 × 2.50 × 4) – (29,700)
= 21,600 – 29,700 = 8,100 A

(ii) Labour Rate Variance
= AH (SR – AR)
= 5,940 (4 – 5) = 5,940 (A)

(iii) Labour Efficiency Variance
= SR (SH – AH)
= 4 (5,400 – 5,940) = 2,160 (A)

Verification:-

LCV = LRV + LEV
8,100 (A) = 5,940 (A) + 2,160 (A)
SH = 2,160 Units × 2.50 Hours = 5,400 Hrs.

Example 19.21

A building can be constructed by engaging a gang of workers as per details given below, for 100 working days of eight hours each.

Standard data:

	Skilled	*Semi-skilled*	*Unskilled*
No. of workers in the gang	6	8	6
Standard rate of wages/hr	₹25	₹20	₹16

Actual completion of the work however took 104 days of eight hours each. This includes 16 hours of stoppages due to heavy rains. The actual number of workers engaged and the actual rates paid are given below:

	Skilled	*Semi-skilled*	*Unskilled*
Number engaged	8	6	6
Actual rate/hr.	₹30	₹24	₹16

Calculate the following variances:
(a) Labour cost variances
(b) Labour rate variance
(c) Labour efficiency variance
(d) Labour mix variance
(e) Idle time variance

(ICWA, Inter, Stage 1, Dec. 2006)

(i) Standard labour cost:

			Days hrs.		
Skilled workers	=	6 Nos. @ ₹25 for	100 × 8	=	₹1,20,000
Semi-skilled workers	=	8 Nos. @ ₹20 for	100 × 8	=	₹ 1,28,000
Unskilled workers	=	6 Nos. @ ₹16 for	100 × 8	=	₹ 76,800
					₹3,24,800

Standard gang time = 800 hours.
Standard gang rate/hr. = ₹3,24,800 ÷ 800 = ₹406/hr.

(ii) Actual labour cost:

		No.		Days		hr.day		Rate	=	₹
Skilled workers	=	8	×	104	×	8	×	₹30	=	₹1,99,680
Semi-skilled workers	=	6	×	104	×	8	×	₹24	=	₹1,19,808
Unskilled workers	=	6	×	104	×	8	×	₹16	=	₹ 79,872
										₹3,99,360

(iii) Standard labour cost for actual hours of actual gang:

			Days hrs.		
Skilled workers	=	8 Nos. @ ₹25 for	104 × 8	=	₹ 1,66,400
Semi-skilled workers	=	6 Nos. @ ₹20 for	104 × 8	=	₹ 99,840
Unskilled workers	=	6 Nos. @ ₹16 for	104 × 8	=	₹ 79,872
					₹ 3,46,112

(iv) Standard labour cost for actual hours of standard gang:

			Days hrs.		
Skilled workers	=	6 Nos. @ ₹25 for	104 × 8	=	₹1,24,800
Semi-skilled workers	=	8 Nos. @ ₹20 for	104 × 8	=	₹1,33,120
Unskilled workers	=	6 Nos. @ ₹16 for	104 × 8	=	₹ 79,872
					₹3,37,792

(v) Standard labour cost for actual hours utilised for completion of the work.

$(104 \times 8 - 16) \times ₹406 = ₹3,31,296$

Calculation of Variances:

(a) *Labour Cost Variance:*
(Actual labour cost – Std cost of actual hours utilised for completion of the work):
(3,99,360 – 3,31,296) = ₹68,064 (Adv.)

(b) *Labour Rate Variance:*
(Actual labour cost – Std labour cost for actual hours of actual gang):
(3,99,360 – 3,46,112) = ₹53,248 (Adv.)

(c) *Labour Efficiency Variance:* (Std labour cost of actual hrs – Std. labour cost of actual hrs. utilised for completion of the work):
= (3,46,112 – 3,31,269) = ₹14,816 (Adv.)

(d) *Labour Mix Variance:* (Std labour cost of actual hours – Std labour cost of actual hrs in Std mix)
= (3,46,112 – 3,37,792) = ₹8,320 (Adv.)

(e) *Idle time Variance* = Idle time × Std rate = 16 × 406 = ₹6,496 (Adv)
Alternatively: Labour cost variance: (Labour rate variance + Labour efficiency variance)

= [53,248 (A) + 14,816 (A)]
= ₹68,064 (Adv.)

Labour Efficiency Variance = (Labour mix Var. + Idle Time Var.)
= [8,320 (A) + 6,496 (A)]
= ₹14,816 (Adv.)

Example 19.22

The following cost data are available for the year 2005:

	Budgeted		*Actual*
Fixed overhead	96,000	(yearly)	8,500 (monthly)
Working days	300	(yearly)	–
Production (units)	24,000	(yearly)	2,100 (monthly)
Working hours in a day	8		–
Idle time (hrs.)	–		4

Find out idle time variance. *(ICWA, Stage 2, Dec. 2006)*

Solution

Let FO_2 stand for Budgeted fixed overhead for one month = ₹96,000/12 = ₹8,000
Let FO_3 stand for Standard fixed overhead for hours available during the period at standard rate.

$$= \frac{\text{Fixed overhead for one month}}{\text{Budgeted hours} \times \text{Hours available in a month}}$$

$$= \frac{₹8,000}{\frac{\text{Budgeted hours available in a year}}{12}} \times \text{Hours available in a year}$$

$$= \frac{₹8,000}{\frac{300 \text{ days} \times 8 \text{ hours}}{12}} \text{ (Budgeted hrs. for a month – Idle hrs)}$$

$$= \frac{₹8,000}{200 \text{ hrs}} (200 \text{ hrs} - 4) = \frac{₹8,000}{200} 196 \text{ or } ₹7,840$$

Idle Time Variance = $FO_2 - FO_3$
= ₹8,000 – ₹7,840 = ₹160 (A)

OVERHEAD VARIANCES

The analysis of factory overhead variances is more complex than variance analysis for direct materials and direct labour. Generally, overhead variances constitute the following variances:

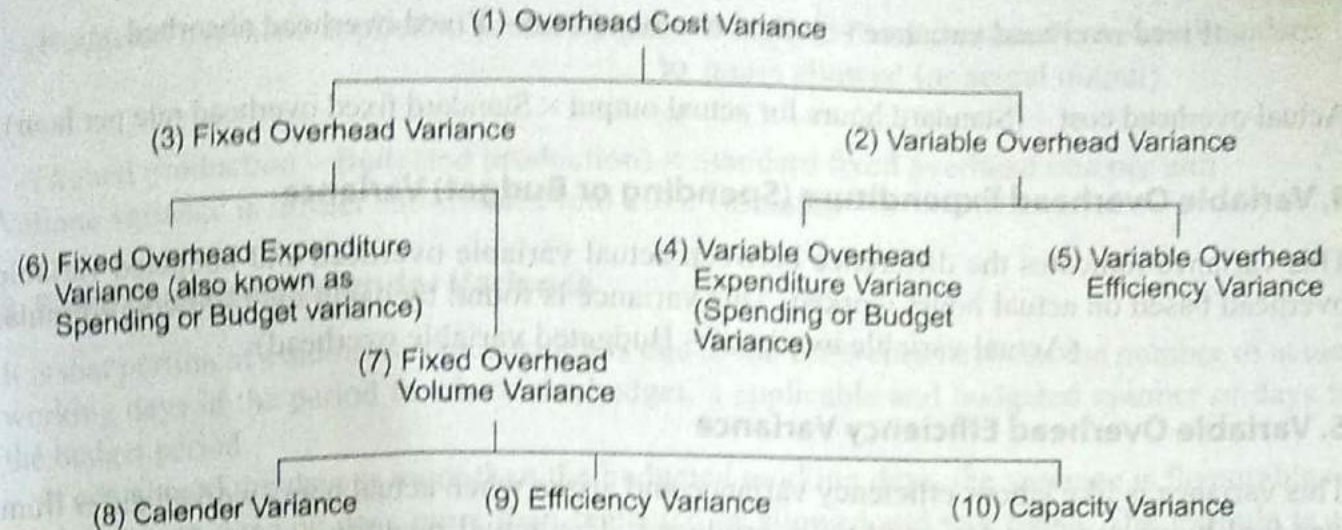


Fig. 19.2 Types of overhead cost variances

1. Total Overhead Cost Variance

This overall overhead variance is the difference between the actual overhead cost incurred and the standard cost of overhead for the output achieved. This can be computed by applying the following formula:

(Actual overhead incurred – Standard hours for the actual output × Standard overhead rate per hour)

or

Actual overhead incurred – (Actual output × Standard overhead rate per unit)

To illustrate the overall overhead variance, assume that the actual overhead for a department amounts to ₹10,00,000 for the month of January, 2002 and standard (or allowed) hours for work performed total 4500 hours, while actual hours used are 5000. If overhead rate is ₹200 per hour, the overall overhead variance will be the following:

Actual department overhead	₹10,00,000
Overhead charged to production (4500 hr × ₹200)	₹ 9,00,000
Overall or net overhead variance (Unfavourable)	₹1,00,000

2. Variable Overhead Variance

It is the difference between actual variable overhead cost and standard variable overhead allowed for the actual output achieved. The formula for computing this variance is as follows:

Actual overhead cost – (Actual output × Variable overhead rate per unit)

or

Actual overhead cost – (Standard hours for actual output × Standard variable overhead rate per hour)

3. Fixed Overhead Variance

This variance indicates the difference between the actual fixed overhead cost and standard fixed overhead cost allowed for the actual output. This variance is found by using the following formula.

Fixed overhead variance = Actual overhead cost – Fixed overhead absorbed

or

Actual overhead cost – (Standard hours for actual output × Standard fixed overhead rate per hour).

4. Variable Overhead Expenditure (Spending or Budget) Variance

This variance indicates the difference between actual variable overhead and budgeted variable overhead based on actual hours worked. This variance is found by using the following formula:

(Actual variable overhead – Budgeted variable overhead)

5. Variable Overhead Efficiency Variance

This variance is like labour efficiency variance and arises when actual hours worked differ from standard hours required for good units produced. The actual quantity produced and standard quantity fixed might be different because of higher or lower efficiency of workers employed in the manufacturing of goods. This variance is found by using the following formula:

(Actual hours – Standard hours for actual output) × Standard variable overhead rate per hour

6. Fixed Overhead Expenditure (Spending or Budget) Variance

This variance indicates the difference between actual fixed overhead and budgeted fixed overhead. The formula for computing this variance is as follows:

(Actual fixed overhead – Budgeted fixed overhead)

If actual fixed overhead costs are greater than budgeted fixed costs, an unfavourable variance results because actual costs exceed the budget. Actual overhead costs seldom equal budgeted costs because property tax rates may change, insurance premiums may increase or equipment charges may affect depreciation rates. As an illustration, assume that a company completed 36000 units (equal to 18000 standard productive hours) in 18500 hours at the recorded fixed cost of ₹75,100. The standard fixed cost rate per hour is ₹4. Therefore,

Expenditure variance = (Actual overhead costs – Budgeted overhead costs)

That is = (75,100 – 18,500 × 4)

= (75,100 – 74,000)

= ₹1,100 (unfavourable)

The expenditure or budget variance provides management with information which helps in controlling costs. The budget variance is usually prepared on a departmental basis and the factors that cause the budget variance are, therefore, controllable by departmental managers.

7. Fixed Overhead Volume Variance

Volume variance relates to only fixed overhead. This variance arises due to the difference between the standard fixed overhead cost allowed (absorbed) for the actual output and the budgeted fixed overhead based on standard hours allowed for actual output achieved during the period. The variance shows the over-or under-absorption of fixed overheads during a particular period. If the actual output is more than the standard output, there is over-absorption and variance is favourable. If actual output is less than the standard output, the volume variance is unfavourable. The formula for computing this variance is as follows:

(Budgeted overhead applied to actual output – Budgeted fixed overhead based on standard hours allowed for actual output)

or

(Actual production – Budgeted production) × Standard fixed overhead rate per unit

Volume variance is further sub-divided into three variances.

8. Fixed Overhead Calendar Variance

It is that portion of volume variance which is due to the difference between the number of actual working days in the period to which the budget is applicable and budgeted number of days in the budget period.

If actual working days is more than the budgeted working days, the variance is favourable as work has been done on days more than budgeted or allowed and vice versa. The formula is as follows:

(No. of actual working days – No. of budgeted working days) × Standard fixed overhead rate per day

Calendar variance can be computed based on hours or output. Then the formulae are:

Hours Basis:

Calendar variance = (Revised budget capacity hours – Budgeted hours) × Standard fixed overhead rate per hour

If revised budgeted capacity hours are more than the budgeted hours, the variance will be favourable. In the reverse situation, the variance will be unfavourable.

Output Basis

Calendar variance = (Revised budgeted quantity in terms of actual number of days worked – Budgeted quantity) × Standard fixed overhead rate per unit

If revised budgeted quantity is more than the budgeted quantity the variance is favourable; if revised budgeted quantity is less, the variance will be unfavourable.

9. Fixed Overhead Efficiency Variance

It is that portion of volume variance which arises when actual hours of production used for actual output differ from the standard hours specified for that output. If actual hours worked are less than the standard hours, the variance is favourable and when actual hours are more than the standard hours, the variance is unfavourable. The formula is:

Fixed overhead efficiency variance = (Actual hours – Standard hours for actual production) × Standard fixed overhead rate per hour

or

Fixed overhead efficiency variance = (Actual production – Standard production as per actual time available) × Standard fixed overhead rate per unit

10. Fixed Overhead Capacity Variance

It is that part of fixed overhead volume variance which is due to the difference between the actual capacity (in hours) worked during a given period and the budgeted capacity (expressed in hours). The formula is:

Capacity variance = (Actual capacity hours – Budgeted capacity hours)
× Standard fixed overhead rate per hour

This variance represents idle time also. If actual capacity hours are more than the budgeted capacity hours, the variance is favourable and if actual capacity hours are less than the budgeted capacity hours, the variance will be unfavourable.

In case actual number of days and budgeted number of days are also given, then budgeted capacity hours will be calculated in terms of actual number of days and it will be known as revised budgeted capacity hours, that is, budgeted hours for actual days worked. In this situation, the formula for calculating capacity variance will be as follows:

Capacity variance = (Actual capacity hours – Revised budgeted capacity hours)
× Standard fixed overhead rate per hour

In the above formula, the variance will be favourable if actual capacity hours are more than the revised budgeted hours. However, if actual capacity hours are lesser than the revised budgeted hours, the variance will be adverse as lesser hours means that lesser actual hours have been worked taking the actual days utilised into account.

Two-way, Three-way and Four-way Variance Analysis

The above overhead variances are also classified as Two-way, Three-way and Four-way variance. The different variances under these categories are listed below. The formulae for computing these variances are similar to as explained in the preceding section.

A. Two-way Variance Analysis

1. Controllable variance (Budget variance)
2. Volume variance (Uncontrollable variance)

B. Three-way Variance Analysis

1. Expenditure variance (Spending variance)
2. Capacity variance
3. Efficiency variance

C. Four-way Variance Analysis

1. Expenditure variance (Spending variance)
2. Variable overhead efficiency variance
3. Fixed overhead efficiency variance
4. Capacity variance

Example 19.23

From the following data, calculate fixed overhead variances:

Hours, when working at normal capacity	2,000
Fixed overhead hourly rate	₹2
Hours allowed for actual production	1,600
Actual details: Hours	1,550
Overheads	₹3,750

(B.Com. (Hons), Delhi University, 2011)

Solution

(1) Overhead Cost Variance
= Absorbed overheads – Actual overheads
= (1,600 hours × ₹2) – ₹3,750 = ₹550(A)

(2) Overhead Budget Variance
= Budgeted overheads – Actual overheads
= (2000 hours × ₹2) – ₹3,750 = ₹250(F)

(3) Overhead Volume Variance
= Absorbed overheads – Budgeted overheads
= (1600 hours × ₹2) – (2000 hours × ₹2) = ₹800(A)

(4) Overhead Efficiency Variance
= Absorbed overheads – Standard overheads
= (1600 hours × ₹2) – (1550 hours × ₹2) = ₹100(F)

(5) Overhead Capacity Variance
= Standard overheads – Budgeted overheads
= (1550 hours × ₹2) – (2000 hours × ₹2) = ₹900(A)

Example 19.24

A company has a normal capacity of 120 machines working 8 hours per day for 25 days in a month. The fixed overheads are budgeted at ₹1,44,000 per month. The standard time required to manufacture one unit of product is 4 hours.

In November 2009, the company worked for 24 days utilizing 840 machine hours per day and produced 5,305 units of output. The actual fixed overheads were ₹1,42,000.

You are required to calculate:

(i) Total Fixed Overhead Cost Variance;
(ii) Fixed Overheads Budget/Expenditure Variance;
(iii) Fixed Overheads Volume Variance;
(iv) Fixed Overheads Capacity Variance;
(v) Fixed Overheads Efficiency Variance; and
(vi) Fixed Overheads Calendar Variance. *(B.Com. (Hons), Delhi University, 2005, 2010)*

Solution

$$\text{Budgeted overhead rate} = \frac{₹1,44,000}{120 \text{ machines } 8 \text{ hours } 25 \text{ days}} = ₹6 \text{ per unit}$$

(i) Total Fixed Overheads Cost Variance
= Absorbed overheads – Actual overheads
= [5305 units × 4 hrs. × ₹6] – ₹1,42,000
= ₹1,27,320 – ₹1,42,000 = **₹14,680 (A)**

(ii) Fixed Overheads Budget/Expenditure Variance
= Budgeted overheads – Actual overheads
= ₹1,44,000 – ₹1,42,000
= **₹2,000 (F)**

(iii) Fixed Overheads Volume Variance

= Absorbed overheads – Budgeted overheads
= (5305 units × 4 hrs. × ₹6) – ₹1,44,000
= ₹1,27,320 – ₹1,44,000 = **₹16,680 (A)**

(iv) Fixed Overheads Capacity Variance

= Standard overheads – Revised budgeted overheads

$$= (₹20,160 \times ₹6) - \left(1,44,000 \times \frac{24 \text{ days}}{25 \text{ days}}\right)$$

= ₹1,20,960 – ₹1,38,240 = **₹17,280 (A)**

(v) Fixed Overheads Efficiency Variance

= Absorbed overheads – Standard overheads
= (5,305 units × 4 hrs. × ₹6) – (₹20,160 × ₹6)
= ₹1,27,320 – ₹1,20,960 = **₹6,360 (F)**

(*vi*) Fixed Overheads Calendar Variance

= (Actual days – Standard days) × St. rate per day

$$= (24 - 25) \times \frac{₹1,44,000}{25 \text{ days}} = ₹5,760 \text{ (A)}$$

Verification:

Total F.O. cost variance = Budget variance + Volume variance
₹14,680 (A) = ₹2,000 (F) + ₹16,680 (A)
Volume variance = Capacity variance + Efficiency variance + Calendar variance
₹16,680 (A) = ₹17,280 (A) + ₹6,360 (F) + ₹5,760 (A)

Example 19.25

From the following data calculate overhead variances:

Fixed overhead	₹10,200
Variable overhead	₹14,250

Normal capacity 10,000 standard hours
Budgeted rate —Fixed overhead ₹1 per hour
—Variable overhead ₹1.70 per hour
Actual level —8,000 standard hours.

Required: Variable overhead cost variance and fixed overhead cost, budget and volume variances.

(B.Com. (Hons.), Delhi University, 2008)

Solution

Variable Overhead Cost Variance = Absorbed overhead – Actual overhead
= (8,000 hrs. × ₹1.70) – 14,250
= 13,600 – 14,250 = **₹650 (A)**

Fixed Overhead Cost Variance = Absorbed overhead – Actual overhead
= (8,000 hrs. × ₹1) – 10,200 = **₹2,200 (A)**

Expenditure Variance = Budgeted overhead – Actual overhead
= (10,000 × ₹1) – 10,200 = **₹200 (A)**

Volume Variance = Absorbed overhead – Budgeted overhead
= (8,000 × ₹1) – 10,000 = **₹2,000 (A)**

Example 19.26

A company using standard costing system has the following information for the budget period:
Budgeted variable overheads = ₹8,00,000
Budgeted fixed overheads = ₹5,00,000
Overheads are recovered on the basis of standard machine hours. The company had budgeted for 100,000 machine hours for the year.
During the budge period the company used 1,10,000 machine hours while it should have used 95,000 machine hours for actual output.
Actual variable overheads ₹8,00,000
Actual fixed overheads ₹4,70,000
Calculate the following variances:

(i) Variable Overhead Cost Variance;
(ii) Variable Overhead Spending Variance;
(iii) Variable Overhead Efficiency Variance;
(iv) Fixed Overhead Cost Variance;
(v) Fixed Overhead Expenditure Variance;
(vi) Fixed Overhead Volume Variance;
(vii) Fixed Overhead Efficiency Variance;
(viii) Fixed Overhead Capacity Variance.

(B.Com.(Hons), Delhi, 2007)

Solution

$$\text{Budgeted fixed overheads per standard hour} = \frac{\text{Budgeted Fixed Overheads}}{\text{Budgeted Std. Hours}} = \frac{₹5,00,000}{100,000} = ₹5$$

$$\text{Budgeted variable overheads per standard hour} = \frac{\text{Budgeted Variable Overheads}}{\text{Budgeted Std. Hours}}$$

$$= \frac{₹8,00,000}{1,00,000} = ₹8$$

$$\text{(i) Variable overhead cost variance} = \text{Budgeted Variable overheard for actual output} - \text{Actual variable overheads for actual output}$$

= (Budgeted variable overheads per standard hour × Actual output in Std. hrs) – Actual variable overheads
= (8 × 95,000) – ₹8,00,000 = ₹7,60,000 – ₹8,00,000 = ₹40,000 (A)

(ii) Variable overhead spending variance = Budgeted variable overheads – Actual variable overheads
= ₹8,00,000 – ₹8,00,000 = Nil

$$\text{(iii) Variable overheads efficiency variance} = \text{Budgeted variable overheads per standard hour} \left(\text{Budgeted output in standard hours} - \text{Actual output in standard hours} \right)$$

= 8(1,00,000 – 95,000) = ₹40,000 (A)

Variable over head cost variance = ₹40,000 (A) = (Variable overheads spanding variance − Variable overhead efficiency variance)

= Nil + ₹40,000 (A) = ₹40,000 (A)

(iv) Fixed overheads cost variance = Budgeted fixed overheads for actual output − Actual fixed overheads for actual output

= (Budgeted fixed overheads per standard hour × Actual output in standard hours) – Actual fixed overheads

= ₹5 × 95,000 – ₹4,70,000 = ₹4,75,000 – ₹4,70,000 = ₹5,000 (F)

(v) Fixed overheads expenditure variance = Budgeted fixed overheads – Actual fixed overhead

= ₹5,00,000 – ₹4,70,000 = ₹30,000 (F)

(vi) Fixed overheads volume variance = Budgeted fixed overheads per standard hour (Budgeted output in standard hours − Actual output in standard hours)

= 5(1,00,000 – 95,000) = ₹25,000 (A)

Fixed overhead variance = ₹5,000 (F) = Fixed overheads expenditure variance + Fixed overheads volume variance

= ₹30,000 (F) + ₹25,000 (A) = ₹5,000 (F)

(vii) Fixed overheads efficiency variance = Budgeted fixed overheads per standard hour (Budgeted hours for actual output − Actual hours worked for actual output)

= ₹5 (95,000 – 1,10,000) = ₹75,000 (A)

(viii) Fixed overheads capacity variance = Budgeted fixed overheads per standard hour (Budgeted Hours – Actual hours woked)

= ₹5 (1,00,000 – 1,10,000) = ₹50,000 (F)

Fixed overhead volume var. = ₹25,000 (A) = Fixed overhead efficiency variance + Fixed overhead capacity variance

= ₹75,000 (A) + ₹50,000 (F) = ₹25,000 (A).

Example 19.27

Details of fixed overheads, production hours and production for a period are:

Budgeted hours	10000 hours
Standard fixed overheads per hour	₹10
Standard hours per unit of output	5 hours
Actual production	1920 units
Actual fixed overheads	₹94,000

Calculate:

(i) Fixed overhead cost variance;
(ii) Fixed overhead expenditure variance; and
(iii) Fixed overhead volume variance.

(B.Com.(Hons), Delhi, 2005)

Solution

FOCV = Std. F/O for actual output – Actual F/O for actual output

= 1920 × 50 – 94000 = 2000 (F)

FO. expenditure variance = Budgeted exp. – Actual exp

= 1,00,000 – 94000 = 6000 (F)

$$\text{Fixed overhead volume variance} = \left(\begin{matrix}\text{Budgeted}\\ \text{overhead}\end{matrix} - \begin{matrix}\text{Actual}\\ \text{overhead}\end{matrix}\right) \times \text{Budgeted rate}$$

= (2000 – 1920) 50 = 4,000 (A)

Workings:

$$\text{Budgeted output} = \frac{\text{Budgeted hours}}{\text{Budgeted rate}} = \frac{10000}{5} = 2000 \text{ units}$$

Budgeted expenditure = Budgeted hours × Std. F/O per hour.

= 10000 × ₹10 = ₹1,00,000

Budgeted rate per unit of output.

$$₹ = \frac{1,00,000}{2000} = ₹50 \text{ per unit}$$

Example 19.28

The following information is available from the cost records of a company for December, 2003:

	₹
Materials purchased 20000 pieces	88,000
Materials consumed 19000 pieces	
Actual wages paid for 4950 hours	24,750
Fixed factory overheads budgeted	40,000
Fixed factory overheads incurred	44,000

Units produced – 1800

Standard rates and prices are:

Direct material rate – ₹4 per piece.

Standard output – 10 pieces per unit

Direct labour rate – ₹4 per hour

Standard hours required to produce a unit – 2.5 hours

Overheads – ₹8 per labour hour

Compute the following variances:

(a) Material price and usage;
(b) Labour rate and efficiency;
(c) Fixed overheads expenditure variance;
(d) Fixed overheads volume variance.

(B.Com.(Hons), Delhi 2004)

Solution

Standard Cost Card (per unit)

Element of Cost	*Quantity of Hour*	*Rate* ₹	*Standard Cost*
Direct material	10 Pieces	4	40
Direct labour	2.5 Hours	4	10
Overheads	2.5 Hours	8	20
Total Standard Cost			70

Calculation of Variance

(*a*) *Material Price Variance:*

= Actual usage (St. price – Actual price)

= 19000 pieces (₹4 – ₹4.40) = ₹7,600 Adverse

$$\text{(Actual price} = \frac{₹88,000}{20000} = ₹4.40\text{)}$$

Material Usage Variance

= St. price (St. usage – Actual usage)

= ₹4 (18000 pieces – 19000 pieces) = ₹4,000 (Adverse)

(St. usage = For 1800 units @ 10 pieces = 18000 pieces.

(*b*) *Labour Rate and Efficiency Variance:*

Labour rate variance = Actual time (St. rate – Actual rate)

= 4950 hrs. (₹4 – ₹5) = ₹4,950 (Adverse)

$$\text{Actual rate} = \frac{\text{Actual labour cost}}{\text{Actual time}} = ₹5$$

Labour Efficiency Variance:

St. rate (St. time – Actual time)

= ₹4 (4500 hours – 4950 hours) = ₹1800 (Adverse)

(*c*) *Fixed Overhead Expenditure Variance:*

Budgeted overheads – Actual overheads

₹40,000 – ₹44,000 = ₹4,000 (Adverse)

(*d*) *Fixed Overhead Volume Variance:*

= St. fixed overhead rate per unit

(Actual output – Budgeted output)

= 2.5 hrs. × ₹8 (1800 units – 2000 units)

= ₹4,000 (Adverse)

$$\text{Budgeted output} = \frac{\text{Budgeted overheads}}{\text{St. overhead per unit}}$$

$$= \frac{₹40,000}{₹20} = 2000 \text{ units.}$$

Example 19.29

From the following data, calculate:

(1) Fixed overhead expenditure variance;
(2) Fixed overhead volume variance;
(3) Fixed overhead cost variance.

	Budgeted	*Actual*
Fixed overheads for July	₹10,000	₹10,200
Units of production in July	5,000	5,200
Standard time for one unit	4 hours	–
Actual hours worked		20,100 hrs

(B.Com.(Hons), Delhi, 2002)

Solution

(1) *Fixed Overhead Expenditure Variance:*
Budgeted overhead – Actual overhead
₹10,000 – ₹10,200 = ₹200 (A)

(2) *Fixed Overhead Volume Variance:*
(i) Where Std. rate per unit is given,
(Actual production – Budgeted production) × Std. rate per unit,

$$\text{Standard fixed overhead rate per unit} = \frac{10000}{5000} = ₹2$$

(5,200 – 5,000) × ₹2 = 400 (F)

(ii) When Std. rate per hour is given,
(Std. hours for actual production – Budgeted hours) × Std. rate per hour

$$\text{Standard fixed overhead rate per hour} = \frac{₹2}{4 \text{ Hours}} = ₹0.50$$

(5,200 × 4 – 5,000 × 4) × ₹0.50
(20,800 – 20,000) × ₹0.50
800 × ₹0.50 = 400 (F)

(3) *Fixed Overhead Cost Variance:*
(St. overhead cost of actual output – Actual overhead costs)
(5,200 × ₹2) – 10,200
₹10,400 – 10,200 = ₹200 (F)

Example 19.30

Kolkata Furniture manufactures modular tables, chairs and office desks. The standard labour times required per unit of table, chair and desk are 4 hours, 2 hours and 8 hours respectively. The budgeted production per week is 140 standard hours and budgeted fixed overheads per week is ₹70,000.

During a particular week the firm achieved the following output:

Tables	8 Nos.
Chairs	8 Nos.
Desks	9 Nos.

The actual fixed production overhead amounted to ₹75,000.

(ICWA, Inter, Stage I, Dec. 2003)

Calculate:

(i) Fixed overhead variance
(ii) Expenditure variance
(iii) Volume variance

Solution

Standard FOH rate per hour = ₹70,000 ÷ 140 hrs. = ₹500
Standard hours of actual production: 120 hours

Tables = 8 × 4 = 32 hours
Chairs = 8 × 2 = 16 hours
Desks = 9 × 8 = 72 hours

Actual fixed production overhead: ₹75,000

(i) Fixed Production OH: Total variance:
(Standard FOH of actual production – Actual FOH)
= ₹(120 × 500) – ₹75,000 = ₹60,000 – ₹75,000 = ₹15,000 (Adv.)

(ii) Fixed Production OH: Expenditure variance:
(Budgeted FOH – Actual FOH) = ₹70,000 – ₹75,000 = ₹5,000 (Adv.)

(iii) Fixed Production OH: Volume variance:
(Budgeted FOH – Std. FOH of actual production)
= ₹70,000 – ₹120 × 500 = ₹70,000 – ₹60,000 = ₹10,000 (Adv.)

	₹	₹
Reconciliation		
Standard FOH of actual production: (120 × 500)		60,000
Add: Adverse variances –		
Expenditure variance	5,000	
Volume variance	10,000	15,000
Actual fixed overhead		75,000

Example 19.31

The following information was obtained from the records of a manufacturing unit using Standard Costing System:

	Standard	*Actual*
Production	4000 units	3800 units
Working days	20	21
Fixed overhead (₹)	40,000	39,000
Variable overhead (₹)	12,000	12,000

You are required to calculate the following overhead variances:

(a) Variable overhead variance

(b) Fixed overhead variance
  (i) Expenditure variance
  (ii) Volume variance
  (iii) Efficiency variance
  (iv) Calendar variance

(c) Also prepare a reconciliation statement for the standard fixed expenses worked out at standard fixed overhead rate and the actual fixed overhead. *(CA Inter, ICWA Inter)*

Solution

Basic calculations	*Budgeted data*	*Actual data*
Variable overhead (₹)	12,000	12,000
Fixed overhead (₹)	40,000	39,000
Production (units)	4,000	3,800
Working (days)	21	20

$$\text{Standard variable overhead rate per unit} = \frac{12,000}{4000 \text{ units}} = ₹3$$

$$\text{Standard production per day} = \frac{4000 \text{ units}}{20 \text{ days}} = 200 \text{ units}$$

Standard fixed overhead per day = 200 × ₹10 = ₹2,000

(a) Variable overhead cost variance = Actual variable overhead – Recovered variable overhead
= 12,000 – 3,800 × 3
= 12,000 – 11,400 = ₹600 (A)

(b) Fixed overhead variance = (Actual fixed overheads – Recovered fixed overheads)
= 39,000 – 3,800 × 10
= 39,000 – 38,000 = ₹1,000 (A)

(i) Fixed overhead expenditure variance = Actual overheads – Budgeted overheads
= 39,000 – 40,000 = ₹1,000 (F)

(ii) Fixed overhead volume variance = Recovered overheads – Budgeted overheads
= 38,000 – 40,000 = ₹2,000 (A)

(iii) Fixed overhead efficiency variance = Standard fixed overhead rate per day × (Actual time – Standard time for actual output)
= 2,000 × (21 – 3,800/200)
= 2000 (21 – 19) = 4,000 (A)

(iv) Fixed overhead calendar variance = Standard fixed overhead rate per day × (Actual days – Budgeted days)
= 2,000 × (21 – 20)
= ₹2,000 (F)

or

Standard fixed overhead rate per day × Extra days/Deficit worked
= 2,000 × 1 = 2,000 (F)

(c) Reconciliation statement

Standard fixed overheads 3800 × 100		₹38,000
Less: Fixed overhead expenditure variance	1,000 (F)	
Less: Fixed overhead calendar variance	2,000 (F)	3,000 (F)
		35,000
Add: Fixed overhead efficiency variance (A)		4,000
Actual Fixed Overheads		39,000

Example 19.32

The following data is given:

	Budget	*Actuals*
Production (in units)	400	360
Man-hours to produce above	8000	7000
Variable overheads (₹)	10,000	9,150

The standard time to produce one unit of the product is 20 hours.
Calculate variable overhead variances and give necessary journal entries to record the transactions.
(CA Inter, Nov. 1997, B. Com. (Hons), Delhi 2000)

Solution

Basic Calculations

1. Standard Variable Overhead per unit:
   ₹10,000/400 units = ₹25 per unit
2. Standard Variable Overhead per hour:
   ₹10,000/8,000 hrs. = ₹1.25 per hour
3. Recovered Variable Overhead:
   = Actual output × Standard variable overhead per hour
   = 360 units × ₹25 = ₹9,000
4. Budgeted variable overhead (based on actual hours worked):
   = Actual hours worked × Standard variable overhead per hour
   = 7,000 hrs. × ₹1.25 = ₹8,750
5. Standard hours for actual output:
   = Actual output × Standard hours per unit
   = 360 units × 20 hours = 7,200 hours

Computation of Variances:

(i) *Variable Overhead Cost Variance:*
= Recovered variable overhead – Actual variable overheads
= ₹9,000 – ₹9,150 = ₹150 (A)

(ii) *Variable Overhead Budget or Expenditure Variance:*
= Budgeted variable overheads – Actual variable overheads
= ₹8,750 – ₹9,150 = ₹400 (A)

(iii) *Variable Overhead Efficiency Variance:*
= Standard variable overhead per hour (Standard hours for actual output – Actual hours)
= Recovered variable overheads – Budgeted variable overheads
= ₹9,000 – ₹8,750
= ₹250 (F)

Verification

Variable Overhead Cost Variance	= Variable overhead budgets variance + Variable overhead efficiency variance
₹150 (A)	= ₹400 (A) + ₹250 (F)

Journal Entries

			Dr. ₹	*Cr.* ₹
1.	Variable Overheads Control A/c	Dr.	8,750	
	Variable Overheads Expenditure Variance A/c	Dr.	400	
	To Bank/Creditors			9,150
2.	Work-in-progress Control A/c	Dr.	9,000	
	To Variable Overheads Control A/c			8,750
	To Variable Overheads Efficiency Variance A/c			250

SALES VARIANCES

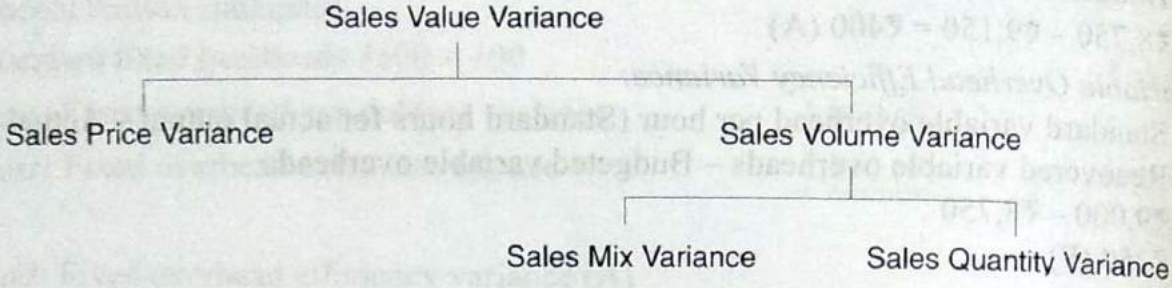
Sales variance is the difference between the actual value of sales achieved in a given period and budgeted value of sales. There are many reasons for the difference in actual sales and budgeted sales such as selling price, sales volume, sales mix. Sales variances can be calculated by using any one of the following two methods.

A. *Sales variance based on turnover*
B. *Sales variances based on margin (i.e. contribution margin or profit)*

The first approach, that is sales variance based on turnover, accounts for difference in actual sales and budgeted sales. The sales variances using margin approach accounts for differences in actual profit and budgeted profit. In the margin method it is assumed that cost of production is constant, that is no difference is assumed between actual cost of production and standard cost of production. The reason for this assumption is that cost variances are calculated separately to analyse the difference between actual cost and standard cost of production. Therefore, cost side of the sales variance is assumed constant under the margin method. Sales variances computed under these two methods show different amounts of variance.

The different sales variances under these two approaches and their formulae are given below:

(A) Sales Variances Based on Turnover



(i) *Sales Value Variance* Also known as sales variance, this variance shows the difference between actual sales value and budgeted sales value. The formula is

Sales value variance = (Actual value of sales – Budgeted value of sales)

Actual sales = Actual quantity sold × Actual selling price

Budgeted sales = Standard quantity × Standard selling price

or

Sales value variance = (Actual quantity × Actual selling price) – (Standard quantity × Standard selling price)

If actual sales are more than the budgeted sales, there is favourable variance and if actual sales less than the budgeted sales, unfavourable variance arises.

(ii) *Sales Price Variances* This variance is due to the difference between actual selling price and standard or budgeted selling price. The formula is:

Sales price variance = (Actual selling price – Budgeted selling price) × Actual quantity

If actual selling price is less than the budgeted selling price, variance is unfavourable and if actual selling price is more than the budgeted selling price, there will be favourable sales price variance.

(iii) *Sales Volume Variance* Sales volume variance arises when the actual quantity sold is different from the budgeted quantity. If actual sales quantity exceeds the budgeted sales quantity, there is a favourable sales volume variance and if actual quantity sold is less than the budgeted quantity, the variance is unfavourable. The formula is:

Sales volume variance = (Actual quantity – Budgeted quantity) × Budgeted selling price

Sales volume variance is divided into two variances:

(a) Sales mix variance (b) Sales quantity variance.

(a) *Sales Mix Variance* Sales mix variance is one part of overall sales volume variance. This variance shows the difference between actual mix of goods sold and budgeted mix of goods sold. The formula is:

Sales Mix variance = (Actual mix of quantity sold – Actual quantity in standard proportion) × Standard selling price

Sales mix variance = (Budgeted price per unit of actual mix – Budgeted price per unit of budgeted mix) × Total actual quantity

If actual mix of sales are more than the actual mix sales in standard or budgeted proportion, the variance is favourable and if actual mix sales are less than the standard mix (of actual sales), the variance is unfavourable. Similarly, if budgeted price per unit of actual mix is more than the budgeted price per unit of budgeted mix, favourable variance will arise. In the reverse situation, variance will be unfavourable.

(b) *Sales Quantity Variance* This variance is also a part of overall volume variance. This variance shows the difference between total actual sales quantity and total budgeted sales quantity. If total actual quantity is more than the total budgeted quantity, variance will be favourable and if total actual quantity less than the total budgeted quantity, there will be unfavourable sales quantity variance. The formula is

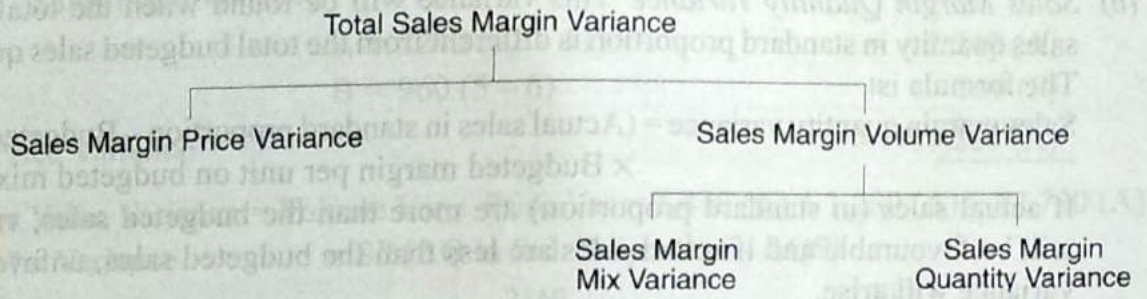
Sales quantity variance = (Total actual quantity – Total budgeted quantity) × Budgeted price per unit of budgeted mix

The total of sales mix variance and sales quantity variance will be equal to sales volume variance.

(B) Sales Variance based on Margin (that is Contribution Margin or Profit)

As stated earlier, the sales variances using margin approach show the difference in actual profit and budgeted profit only, whereas sales variances based on turnover show the difference between total actual sales and total budgeted sales.

The following sales variances are calculated if margin or profit is the basis of calculation:



(i) *Total Sales Margin Variance*—This variance indicates the aggregate or total variance under the margin method. This variance shows the difference between actual profit and budgeted profit. The formula is:

Total sales margin variance = Actual profit – Budgeted profit

If actual profit is more than the budgeted profit, variance will be favourable and if actual profit less than the budgeted profit, unfavourable variance will arise.

(ii) *Sales Margin Price Variance*—This variance is one part of total sales margin variance and arises due to the difference between actual margin per unit and budgeted margin per unit. It is significant to note that, assuming cost of production being constant, the difference in the actual margin and budgeted margin will only because of the difference between actual selling price and budgeted selling price. The formula for calculating sales margin price variance is:

Sales margin price variance = (Actual margin per unit – Budgeted margin per unit) × Actual quantity

If actual margin per unit is more than the budgeted margin per unit, favourable variance will be found and if actual margin less than the budgeted margin, variance will be unfavourable.

(iii) *Sales Margin Volume Variance*—This variance shows the difference between actual sales units and budgeted sales unit. The formula is:

Sales margin volume variance = (Actual quantity – Budgeted quantity) × Budgeted margin per unit

If actual sales units are more than budgeted sales units, variance will be favourable and if actual sales units less than the budgeted sales unit, unfavourable variance will arise.

Sales margin volume variance can be calculated using another formula which is:

Sales margin volume variance = (Standard profit on actual quantity of sales – Budgeted profit)

If standard profit exceeds budgeted profit, variance will be favourable and if standard profit is less than the budgeted profit, unfavourable variance will emerge.

Sales margin volume variance consists of (a) sales margin mix variance and (b) sales margin quantity variance.

(a) *Sales Margin Mix Variance* This variance shows the difference between actual mix of goods sold and budgeted (standard) mix of goods sold. The formula is

Sales margin mix variance = (Actual sales mix – Standard proportion of actual sales mix) × Budgeted margin per unit

If budgeted margin per unit on actual sales mix is more than the budgeted margin per unit on budgeted mix, variance will be favourable. In the reverse situation, unfavourable variance will arise.

(b) *Sales Margin Quantity Variance* This variance will be found when the total actual sales quantity in standard proportion is different from the total budgeted sales quantity. The formula is:

Sales margin quantity variance = (Actual sales in standard proportion – Budgeted sales) × Budgeted margin per unit on budgeted mix

If actual sales (in standard proportion) are more than the budgeted sales, variance will be favourable and if actual sales are less than the budgeted sales, unfavourable variance will arise.

Example 19.33

Greenfield Co. provides the following data for the month of March 2007:

Budget:

Product	*Budgeted sales (in units)*	*Budgeted selling price per unit* (₹)
A	2160	12
B	1440	5

Actual:

Product	*Budgeted sales (in units)*	*Budgeted selling price per unit* (₹)
A	2240	11
B	960	6

You are required to compute:

(i) Sales value variance
(ii) Sales volume variance
(iii) Sales price variance
(iv) Mix variance

(B.Com. (Hons), Delhi, 2007)

Solution

	Budgeted Sales				Actual Sales		
	BQ (units)	*BP (₹)*	*BQ × BP*		*AQ (units)*	*AP (₹)*	*AQ × AP*
A	2160	12	25,920	A	2240	11	24,640
B	1440	5	7,200	B	960	6	5,760
	3600		₹33,120		3200		₹30,400

Sales Value Variance = (BQ × BP) – (AQ × AP) = 33,120 – 30,400 = ₹2,720 (A)

Sales Volume Variance = BP(BQ – AQ)

A = 12 (2,160 – 2,240) = 960 (F)

B = 5 (1440 – 960) = 2,400 (A)

Sales Volume Variance ₹1,440 (A)

Sales Price Variance = AQ (BP – AP)

A = 2240 (12 – 11) = 2,240 (A)

B = 960 (5 – 6) = 960 (F)

Sales Price Variance = ₹1,280 (A)

Sales Value Variance = Volume Var + Price Var = 1,440 (A) + 1,280 (A) = ₹2,720 (A)

Sales Mix Variance = SP (AQ in Std. Proportion – AQS)

AQ in Std. Prop = A $3200 \times \frac{2160}{3000} = 1920$; B $3200 \times \frac{1440}{3600} = 1280$

Sales Mix Variance = BP (AQS in Std. Prop – AQ)

A = 12 (1920 – 2240) = 3840 (F)

B = 5 (1280 – 960) = 1600 (A)

Sales Mix Variance ₹2,240 (F)

Example 19.34

H Ltd. furnishes the following information relating to budgeting sales and actual sales for the month of March, 2008:

	Product	*Sales quantity units*	*Sale price per unit* ₹
Budget Sales:			
	A	1,200	15
	B	800	20
	C	2,000	40
Actual Sales:			
	A	880	18
	B	880	20
	C	2,640	38

You are required to calculate:

(i) Sales price variance;
(ii) Sales volume variance;
(iii) Sales mix variance, and
(iv) Total sales value variance.

Assume products to be homogeneous. *(B.Com. (Hons), Delhi University, 2009)*

Solution

Table of Basic Calculations

Product	*Standard*			*Actual*		
	Quantity (Units)	*Rate (₹)*	*Amount (₹)*	*Quantity (Units)*	*Rate (₹)*	*Amount (₹)*
A	1200	15	18,000	880	18	15,840
B	800	20	16,000	880	20	17,600
C	2000	40	80,000	2,640	38	1,00,320
Total	**4000**		**1,14,000**	**4,400**		**1,33,760**

Calculation of Standard Sales

Product	*Actual Quantity (Units)*	*Budgeted Price (₹)*	*Standard Sales (₹)*
A	880	15	13,200
B	880	20	17,600
C	2,640	40	1,05,600
	4,400		**1,36,400**

Calculation of Revised Standard Quantity (RSQ)

RSQ = Total Actual Quantity × Standard Proportion

$$\text{RSQ (A)} = 4{,}400 \times \frac{1200}{4000} = 1{,}320$$

$$\text{RSQ (B)} = 4{,}400 \times \frac{800}{4000} = 880$$

$$\text{RSQ (C)} = 4{,}400 \times \frac{2000}{4000} = 2{,}200$$

Computation of Variances

(i) **Sales Price Variance**

= Actual Quantity (Actual price – Budgeted price)

= AQ (AP – BP)

A = 880 (18 – 15) = ₹ 2640 (F)

B = 880 (20 – 20) = ₹ NIL

C = 2,640 (38 – 40) = ₹5,280 (A)

Total Sales Price Variance = **₹2,640 (A)**

Alternatively: Sales Price Variance

= Actual sales – Standard sales
= ₹1,33,760 – ₹1,36,400
= **₹2,640 (A)**

(ii) **Sales Volume Variance**

= Budgeted Price (Actual quantity – Budgeted quantity)
= BP (AQ – BQ)

A = 15(880 – 1,200)	= ₹4,800 (A)
B = 20(880 – 800)	= ₹1,600 (F)
C = 40(2,640 – 2,000)	= ₹25,600 (F)
Total Sales Volume Variance	= **₹22,400 (F)**

Alternatively: Sales Volume Variance = Standard sales – Budgeted sales
= ₹1,36,400 – ₹1,14,000
= **₹22,400 (F)**

(iii) **Sales Mix Variance**

= Budgeted Price (Actual quantity – Revised standard quantity)
= BP(AQ – RSQ)

A = 15(880 – 1,320)	= ₹6,600 (A)
B = 20(880 – 880)	= ₹ NIL
C = 40(2,640 – 2,200)	= ₹17,600 (F)
Total Sales Mix Variance	= **₹11,000 (F)**

(iv) **Total Sales Value Variance**

= Actual sales – Budgeted sales
= ₹1,33,760 – ₹1,14,000 = **₹19,760 (F)**

Example 19.35

From the following information about sales, calculate:

(i) Total sales variance;
(ii) Sales price variance;
(iii) Sales volume variance;
(iv) Sales mix variance;
(v) Sales quantity variance.

	Standard		Actual	
	Units	Rate ₹	Units	Rate ₹
Product A	5,000	5	6,000	6
B	4,000	6	5,000	5
C	3,000	7	4,000	8

(B.Com. (Hons), Delhi University, 2008)

Solution

(i) **Total Sales Variance** = Actual sales – Standard sales

A	$(6,000 \times 6) - (5,000 \times 5)$	= ₹11,000 (F)
B	$(5,000 \times 5) - (4,000 \times 6)$	= ₹ 1,000 (F)
C	$(4,000 \times 8) - (3,000 \times 7)$	= ₹11,000 (F)
	Total	**₹23,000 (F)**

(ii) **Sales Price Variance** = (Actual price – Standard price) × Actual quantity

A	$(6 - 5) \times 6,000$	= ₹6,000 (F)
B	$(5 - 6) \times 5,000$	= ₹5,000 (A)
C	$(8 - 7) \times 4,000$	= ₹4,000 (F)
	Total	**₹5,000 (F)**

(iii) **Sales Volume Variance** = (Actual quantity – Standard quantity) × Standard price

A	= $(6,000 - 5,000) \times 5$	= ₹5,000 (F)
B	= $(5,000 - 4,000) \times 6$	= ₹6,000 (F)
C	= $(4,000 - 3,000) \times 7$	= ₹7,000 (F)
	Total	**₹18,000 (F)**

(iv) **Sales Mix Variance** = (Actual quantity – Revised standard quantity) × Standard price

A	= $(6,000 - 6,250) \times 5$	= ₹1,250 (A)
B	= $(5,000 - 5,000) \times 6$	= ₹ Nil
C	= $(4,000 - 3,750) \times 7$	= ₹1,750 (F)
	Total	**₹500 (F)**

RSQ (Revised Standard Quantity) is calculated as follows:

$$\text{RSQ} = \frac{\text{Standard Quantity}}{\text{Total Standard Quantity}} \times \text{Total Actual Quantity}$$

$$A = \frac{5,000}{12,000} \times 15,000 = 6,250 \text{ units}$$

$$B = \frac{4,000}{12,000} \times 15,000 = 5,000 \text{ units}$$

$$C = \frac{3,000}{12,000} \times 15,000 = 3,750 \text{ units}$$

(v) **Sales Quantity Variance** = (Revised standard quantity – Standard quantity) × Standard price

A =	$(6,250 - 5,000) \times 5$	= ₹6,250 (F)
B =	$(5,000 - 4,000) \times 6$	= ₹6,000 (F)
C =	$(3,750 - 3,000) \times 7$	= ₹5,250 (F)
	Total	**₹17,500 (F)**

Example 19.36

Compute the sales variances (total, price and volume) from the following figures:

Product	*Budgeted quantity*	*Budgeted price per unit (₹)*	*Actual quantity*	*Actual price per unit (₹)*
P	4000	25	4800	30
Q	3000	50	2800	45
R	2000	75	2400	70
S	1000	100	800	105

(C.A., November, 2010)

Solution

Working:

Product	*Budgeted price (₹)*	*Actual price (₹)*	*Budgeted qty.*	*Actual qty.*	*Budgeted sales (₹)*	*Standard Sales (Actual sales at budgeted price ₹)*	*Actual sales (₹)*
	a	*b*	*c*	*d*	$e = a \times c$	$f = a \times d$	$g = b \times d$
P	25	30	4,000	4,800	1,00,000	1,20,000	1,44,000
Q	50	45	3,000	2,800	1,50,000	1,40,000	1,26,000
R	75	70	2,000	2,400	1,50,000	1,80,000	1,68,000
S	100	105	1,000	800	1,00,000	80,000	84,000
					5,00,000	5,20,000	5,22,000

Calculation of variances:

Sale Price Variance = Actual Quantity (Actual price – Budgeted price)
= Actual sales – Standard sales
= 5,22,000 – 5,20,000 = ₹2,000 (Favourable)

Sales Volume Variance = Budgeted Price (Actual quantity – Budgeted quantity)
= Standard Sales (Actual sale at standard price) – Budgeted sales
= 5,20,000 – 5,00,000 = ₹20,000 (Favourable)

Total Sales Variance = Actual sales – Budgeted sales
= 5,22,000 – 5,00,000 = ₹22,000 (Favourable)

Verification: Total Sales Variance (₹20,000/- Favourable) = Sales Price Variance (₹2,000/- Favourable) + Sales Volume Variance (₹20,000 Favourable)

Example 19.37

The summarised budget and actual working results of GEMCO LTD. for the year 2005–06 are given below:

Details	Budget Products			Actual Products		
	A	B	C	A	B	C
	₹	₹	₹	₹	₹	₹
Selling price per unit	12	16	25	13	16	27
Cost per unit	9	11	20	10	12	21
Sales (units)	40,000	32,000	24,000	42,000	40,000	22,000

Analyse the results and calculate the following:

(i) Budgeted profit, actual profit and variance in profit.

(ii) Analysis of the variance in profit in the following:

(1) Price variance

(2) Cost variance

(3) Sales margin volume variance

(4) Sales margin mix variance

(5) Sales margin quantity variance *(ICWA, Inter, Stage 1, June 2006)*

Solution

GEMCO Ltd.

(i) *Budgeted Profit*

	₹
(40,000 × 3 + 32,000 × 5 + 24,000 × 5)	4,00,000
Actual Profit	
(42,000 × 3 + 40,000 × 4 + 22,000 × 6)	4,18,000
Variance in Profit:	18,000 (FAV)

(ii) *Analysis of Variance in Profit:*

(a) Cost Variance = (Standard cost – Actual cost) × Actual no. of units

	₹	
A: (9 – 10) × 42,000	= 42,000 (Adv)	
B: (11 – 12) × 40,000	= 40,000 (Adv)	
C: (20 – 21) × 22,000	= 22,000 (Adv)	
		₹1,04,000 (Adv)

(b) Price Variance = (Std price – Actual price) × Actual no. of units

	₹	
A: (12 – 13) × 42,000	= 42,000 (Fav)	
B: (16 – 16) × 40,000	= 0	
C: (25 – 27) × 22,000	= 44,000 (Fav)	
		₹86,000 (Fav)

(c) Sales Margin Volume Variance:

= (Budgeted vol. – Actual vol) × Standard profit

A: (40,000 – 42,000) × 3	= 6,000 (Fav)	
B: (32,000 – 40,000) × 5	= 40,000 (Fav)	
C: (24,000 – 22,000) × 5	= 10,000 (Adv)	
		₹36,000 (Fav)

Reconciliation:

Variance in profit = Cost variance + Price variance + Volume variance
= 1,04,000 (Adv) + 86,000 (Fav) + 36,000 (Fav)
= ₹18,000 (Fav)

(d) Sales Margin Mix Variance:

(Revised standard qty – Actual qty.) × Standard profit

	₹	
A: (40/96 × 1,04,000 – 42,000) × 3	= 4,000 (Adv)	
B: (32/96 × 1,04,000 – 40,000) × 5	= 26,667 (Fav)	
C: (24/96 × 1,04,000 – 22,000) × 5	= 20,000 (Adv)	₹2,667 (Fav)

(e) Sales Margin Quantity Variance

	₹	
A: (40/96 × 1,04,000 – 40,000) × 3	= 10,000 (Fav)	
B: (32/96 × 1,04,000 – 32,000) × 5	= 13,333 (Fav)	
C: (24/96 × 1,04,000 – 24,000) × 5	= 10,000 (Fav)	₹33,333 (Fav)

Reconciliation:

		₹
Sales margin mix variance	:	2,667 (Fav)
Sales margin qty. variance	:	33,333 (Fav)
Sales margin volume variance	:	36,000 (Fav)

Example 19.38

The budgeted and the actual sales for a period in respect of three products are given below:

Budgeted Figures

Product	*Quantity*	*Price* ₹	*Value* ₹
A	1,000	5	5,000
B	750	10	7,500
C	500	15	7,500
	2,250		20,000

Actuals

Product	*Quantity*	*Price* ₹	*Value* ₹
A	1,200	6	7,200
B	700	9	6,300
C	600	14	8,400
	2,500		21,900

Calculate Sales Variances. *(CA Inter, Nov. 1998)*

Solution

Basic Calculations

Products	Budgeted Qty.	Budgeted Price	Budgeted Value	Actual Qty.	Actual Price	Actual Value	Standard Sales (Actual qty. × Budgeted price)
		₹	₹		₹	₹	
A	1,000	5	5,000	1,200	6	7,200	6,000
B	750	10	7,500	700	9	6,300	7,000
C	500	15	7,500	600	14	8,400	9,000
	2,250		20,000	2,500		21,900	22,000

Computation of Sales Variances

1. *Sales Value Variance* = Budgeted sales – Actual sales
   = ₹20,000 – 21,900
   = ₹1,900 (F)

2. *Sales Price Variance* = Actual Quantity × (Std. price – Actual price)
   A = 1,200 × (5 – 6) = ₹1,200 (F)
   B = 700 × (10 – 9) = ₹ 700 (A)
   C = 600 × (15 – 14) = ₹ 600 (A)
   ₹ 100 (A)

3. *Sales Volume Variance* = Std. Selling Price × (Budgeted qty. – Actual qty.)
   A = 5 × (1,000 – 1,200) = ₹1,000 (F)
   B = 10 × (750 – 700) = ₹ 500 (A)
   C = 15 × (500 – 600) = ₹1,500 (F)
   ₹2,000 (F)

4. *Sales Mix Variance* = Std. Price × (Revised Std. Qty. – Actual Qty.)

$$A = 5 \times \left(\frac{2,500}{2250} \times 1000 - 1,200\right)$$

$$= 5 \times \left(\frac{10}{9} \times 1,000 - 1,200\right) = ₹444 \text{ (F)}$$

$$B = 10 \times \left(\frac{2,500}{2250} \times 750 - 700\right)$$

$$= 10 \times \left(\frac{7,500}{9} - 700\right) = ₹1,333 \text{ (A)}$$

$$C = 15 \times \left(\frac{2,500}{2250}\right) \times 500 - 600$$

$$= 15 \times \left(\frac{5,000}{9} - 600\right) = ₹667 \text{ (F)}$$

222 (A)

5. *Sales Qty. Variance* = Std. Rate × (Budgeted qty. – Revised std. qty.)

$$A = 5 \times \left(1{,}000 - \frac{10{,}000}{9}\right) = ₹556 \text{ (F)}$$

$$B = 10 \times \left(750 - \frac{7{,}500}{9}\right) = ₹833 \text{ (F)}$$

$$C = 15 \times \left(500 - \frac{5{,}000}{9}\right) = ₹833 \text{ (F)}$$

₹2,222 (F)

Revision Variance

When a budget is revised, but where, as a matter of policy the change is not incorporated in the standard cost rate, a variance will arise termed as a Revision variance. Revision variance is the difference between the basic standard cost and the revised standard cost.

DISPOSITION OF VARIANCE

Variance may be disposed of in either of the following ways:

1. Inventories and the cost of goods sold may be adjusted to reflect the actual costs.
2. Variances may be transferred to the profit and loss account.

Under the first method, all variances are allocated between the inventory accounts and cost of goods sold account. This method, in fact, converts the accounts balances from standard costs to actual historical costs.

The following arguments are given in support of this method:

1. Only actual costs should be recorded in the cost of goods sold account and inventory accounts. The supporters of this method do not favour standard costs as true costs or costs suitable for use in the profit and loss account but as merely guides in factory management.
2. Variances from the standard are costs and not losses and therefore should be reflected in the inventory valuations and cost of goods sold.
3. If the variances are large, standard costs do not represent the actual costs and therefore are not good measures to determine the costs of goods sold and inventory.

Under the second method, the variances are considered as profit or loss items in the period in which they occurred. The work-in-process, finished goods inventory, and cost of goods sold are stated at standard costs. Unfavourable cost variances are deducted from the gross profit at standard costs. Favourable cost variances are added to the gross profit calculated at standard cost. The treatment of the cost variances under this method is shown on the income statement given below.

ABC Company
Income Statement for the Year Ending December 31, 2012

	₹	₹
Sales revenue		5,00,000
Cost of sales (standard)	3,00,000	

(Contd.)

	₹	₹
Selling and administrative expenses (standard)	1,50,000	4,50,000
Net Income (standard)		50,000
Deduct unfavourable variance from net income:		
Material price	200	
Material usage	800	
Labour efficiency	900	
Overhead:		
Volume	2,000	
Budget	1,100	5,000
Net income (actual)		45,000

The second method has the following arguments in its favour:

1. Standard costs help in the preparation of statements at the early date; actual cost delays the determination of inventory costs and cost of goods sold.
2. Standard costs avoid the inclusion of costs due to wastage, losses, inefficiencies, excessive overheads from low production volume. Standard cost represent normal costs and therefore inventory figures are conservative and acceptable for income determination and other purposes.
3. In a multi-product company, it may be difficult to determine accurately how much variance should be distributed to each product.
4. In taking corrective action managers may find it more useful when variance are depicted in the profit and loss account. Managerial attention is usually hampered when variances are combined with cost of goods manufactured.

It is difficult to suggest which method should be followed in accounting for variances. If the variances are large and significant, the first method, that is. distribution of variances to the respective accounts appears to be appropriate for financial reporting, tax and job and contract pricing purposes. The second method may be preferable when the variances are insignificant. Thus, the treatment of variances depends on many factors such as (i) size of variance, (ii) accuracy of standard costs, (iii) cause of variances such as incorrect standard costs, (iv) timing of variances, for example, caused by seasonal fluctuation, (v) type of variance–material, labour, and overhead.

MANAGERIAL USES OF VARIANCES

Determination of variances is only the first step in the process of standard cost variance analysis. Mere computation of material, labour and overhead variances is useless for cost control and performance evaluation. The final objective of variance analysis is to determine the person(s) responsible for each variance and to pinpoint the cause(s) for incurrence of these variances. That is, before management can take effective action for improving control over costs, it needs to know not only the amount of variances, but also where the variances originated, who was responsible for them, and what caused them to arise.

Analysis of Variances by Responsibilities

Variances must be identified with the manager responsible for the costs incurred who should be held responsible for that cost. The cost factors which are directly controllable by operating supervision must be separated from those costs factors from which executive management is responsible.

Specific titles of individuals who are responsible for each type of variance differ among business enterprises. Generally speaking, the following personnel are held accountable for variances noted against them:

Responsibility for Cost Variances

Variance	*Personnel Responsible*
(i) Materials price variance	Purchasing agent or purchasing manager.
(ii) Materials quantity variance	Plant superintendent, departmental supervisors, machine operators, quality control department and material handlers.
(iii) Labour rate standard	Personnel (employment) department manager, departmental supervisor and plant superintendent.
(iv) Labour efficiency variance	Plant superintendent, departmental supervisors, production scheduling department, quality control department, material handlers and machine operators.
(v) Overhead expenditure variance	Variable portion is the responsibility of the individual foreman or supervisor, they are expected to keep actual expenses within the budget. Fixed portion is the responsibility of top management.
(vi) Overhead efficiency variance	Same personnel who are responsible for labour efficiency variance.
(vii) Overhead volume variance	Top management and production schedulers.

Analysis of Variances by Causes

Reasons for the variance should be determined and plans for necessary corrective action made either by discussing possible causes with the supervisors or by examining underlying data and records. The analysis of variances by causes is therefore an important aspect of the use of standard costs to attain effective cost control. For any standard cost variance, there are many possible causes. The following list is not all inclusive but does indicate causes responsible for variances.

Possible Causes of Standard Cost Variances

Materials Price Variance

1. Recent changes in purchase price of materials.
2. Failure to purchase anticipated quantities when standards were established resulting in higher prices owing to non-availability of quantity purchase discounts.
3. Not taking cash discounts anticipated at the time of setting standards resulting in higher prices.

4. Substituting raw material differing from original materials specifications.
5. Freight cost changes and changes in purchasing and storekeeping costs if these are debited to the materials cost.

Materials Quantity Variance

1. Poor materials handling.
2. Inferior workmanship by machine operator.
3. Faulty equipment.
4. Cheaper, defective raw material causing excessive scrap.
5. Inferior quantity control inspection.
6. Pilferage.
7. Wastage due to inefficient production method.

Labour Rate Variance

1. Recent labour rate changes within industry.
2. Employing a man of a grade different from the one laid down in the standard.
3. Labour strike leading to utilisation of unskilled help.
4. Labour layoff causing skilled labour to be retained at higher rates, so as to prevent resignations and job switching.
5. Employee sickness and vacation time.
6. Paying a higher overtime allowance than provided for in the standard.

Labour Efficiency Variance

1. Machine breakdown, use of defective machinery and equipment.
2. Inferior raw materials.
3. Poor supervision.
4. Lack of timely material handling.
5. Poor employee performance.
6. Inefficient production scheduling—delays in routing work, materials, tools and instructions.
7. Inferior engineering specifications.
8. New inexperienced employees.
9. Insufficient training of workers.
10. Poor working conditions—inadequate or excessive heating, lighting, ventilation, etc.

Overhead Volume Variance

(Factors causing either idle time or overtime of plant and facilities)

1. Failure to utilise normal capacity.
2. Lack of sales order.
3. Too much idle capacity.
4. Inefficient or efficient utilisation of existing capacity.
5. Machine breakdown.
6. Defective materials.
7. Labour troubles.
8. Power failures.

OVERHEAD EFFICIENCY VARIANCE

These included all causes which are listed under labour efficiency variance.

Analysis of Variances by Products

Since management usually wants current true costs when decisions are to be made with respect to pricing and related questions, variances are often analysed by products in order to arrive at current product costs. Companies producing non-standard goods according to customer's specifications may also help analyse variances by job orders. The analysis of variances by causes is useful in deciding whether or not cost variances should be allocated to products in arriving at product costs for pricing. Standard product costs should be reviewed periodically and revised when it is found that the standard product costs in use are no longer useful for the purpose.

Variance Reports to Management

Variance reports basically aim to inform managers responsible for the operation when actual performance differs from the standards. To be effective, the report must be timely, accurate and clearly understood by the recipients.

Control of production and costs is a matter of timing; the effectiveness of the control is often in direct proportion to the speed with which variances are reported. Timely reporting often requires daily and weekly reporting of performance information. Therefore, it is important to focus managerial attention on off-standard conditions immediately following each shift, day or week, rather than to accumulate and summarise variances from standards each month. A month, and generally even a week, is too long a period for many off-standard conditions to remain unchecked and uncorrected, because the time interval may prevent positive identification of employees who are responsible for the unsatisfactory work.

Variance analysis reports are primarily control reports. In developing and reporting the variances, it should be remembered that the variance data must (i) deal with relevant distinctions, (ii) be understandable, (iii) measure with reasonable accuracy what they are supposed to measure, (iv) be presented and explained concisely, (v) be timely, and (vi) provide the amount of details needed by different persons at each level of management.

LIMITATIONS OF STANDARD COSTING

Standard costs are not without their shortcomings. The first limitation is regarding the predetermined nature of standard costs. The accuracy of standard costs is limited by the knowledge and skill of the people who created them and they contain the prejudices of their makers. Such badly conceived standard costs do not enjoy the confidence of the users of the system.

Secondly, it is difficult to select a type of standard (ideal, currently attainable, normal, etc.) which can help in cost control and achieve other managerial purposes. If standards are too low, they defeat the objective of standard costing and bring the operating efficiency down. If they are too high, they can create ill-will and encourage employees to beat the system by fair means or foul.

Thirdly, a good programme of standard costing requires that both management and operating personnel should have full confidence in it and standards should be fair and workable. Educating

employees is necessary in this regard. However, lack of acceptability, education and communication is a major difficulty in operating a standard costing system.

In spite of the above limitations, standard costing has developed into an extraordinary and very useful tool and has contributed much in providing different kinds of cost data for so many different purposes.

CONTROL RATIOS

Control ratios are useful to management to know whether the deviations of actuals from budgeted results are favourable or unfavourable. These control ratios are expressed in percentage. The ratio is taken as favourable if it is 100% or more. In case it is less than 100%, the ratio is considered as unfavourable.

Control ratios are as follows:

1. *Activity Ratio* Activity ratio is used to measure the level of activity achieved over a period. It is obtained when the number of standard hours equivalent to the output produced are expressed at a percentage of the budgeted hours

$$\text{Activity ratio} = \frac{\text{Standard hrs for actual production}}{\text{Budgeted hours}} \times 100$$

2. *Capacity Ratio* This ratio points out to what extent budgeted hours have been utilised. This ratio shows the relationship between actual working hours and budgeted working hours.
3. *Efficiency Ratio* Efficiency ratio shows the degree of efficiency achieved in production. It is derived when the standard hours equivalent to the output produced, are expressed as a percentage of the actual hours spent in producing the output.

$$\text{Efficiency ratio} = \frac{\text{Standard hrs for actual production}}{\text{Actual hours worked}} \times 100$$

Example 19.39

Based on the data given below show the calculation of:

(i) Efficiency ratio;
(ii) Production volume ratio;
(iii) Idle capacity ratio.

Data	*Standard Hour of Output*	*Hours of Actual Operations*
Theoretical capacity	100	100
Theoretical capacity less Unavoidable loss time	95	95
Planned activity for period	81	90
Actual activity for period	68	85

(ICWA, Stage 2, June 2005, Dec. 2006)

Solution

(i) Efficiency ratio: $\frac{\text{Output Expressed in standard hour}}{\text{Actual Hours Spent}} \times 100$

$= \frac{68}{85} \times 100 \text{ or } 80\%$

(ii) Production volume ratio: $\frac{\text{Actual Output in standard hour}}{\text{Budgeted output in standard hours}} \times 100$

$= \frac{68}{81} \times 100 \text{ or } 84\%$

(iii) Idle capacity ratio: $\frac{\text{Practical capacity in standard hour} - \text{Budgeted Capacity}}{\text{Practical capacity in standard hours}} \times 100$

$= \frac{95-81}{95} \times 100 \text{ or } 14.7\%$

Example 19.40

In a day of 8 hours, a direct worker is expected to produce 12 units of product *P* or 16 units of product *Q* or 10 units of product *R*. The budgeted production of a month is 225 units of *P*, 180 units of *Q* and 300 units of *R*. During the month of November 2002, 450 direct labour hours were worked and the actual production was 240 units of *P*, 400 units of *Q* and 250 units of *R*.

Calculate the efficiency and capacity ratios. *(ICWA Final, Dec, 1999)*

Solution

Standard Time

P	8/12	=	0.6667 per unit
Q	8/16	=	0.5 per unit
R	8/10	=	0.8 per unit

Budgeted hours:		*(Hours)*
P	225 units × 0.6667	150
Q	180 units × 0.5	90
R	300 units × 0.8	240
		480

Standard hours produced:		*(Hours)*
P	240 × 0.667	160
Q	400 × 0.50	200
R	250 × 0.8	200
		560
Actual hours:		450

Capacity utilisation ratio	450/480 ×100	= 93.75%
Efficiency ratio	560/450 × 100	= 124.44%

Example 19.41

Calculate from the following figures:

(i) Efficiency ratio
(ii) Activity ratio and
(iii) Capacity ratio

Budgeted production	880 units
Standard hours per unit	10
Actual production	750 units
Actual working hours	6,000

(CA Inter, May 1999; B. Com (Hons), Delhi 2010)

Solution

(i) Efficiency ratio $= \dfrac{\text{Standard hours for actual production}}{\text{Actual hours worked}} \times 100$

$= \dfrac{750 \text{ units} \times 10 \text{ hours}}{6{,}000} \times 100 = 125\%$

(ii) Activity ratio $= \dfrac{\text{Standard hours for actual production}}{\text{Budgeted hours}} \times 100$

$= \dfrac{750 \text{ units} \times 10 \text{ hours}}{880 \text{ units} \times 10 \text{ hours}} \times 100 = 85.23\%$

(iii) Capacity ratio $= \dfrac{\text{Actual hours worked}}{\text{Budgeted hours}} \times 100$

$= \dfrac{6000 \text{ hours}}{880 \text{ units} \times 10 \text{ hours}} \times 100 = 68.18\%$

Example 19.42

In a manufacturing shop product *X* requires 2.5 man-hours and product *Y* requires 6 man-hours. In a month of 25 working days of 8 hours a day, 2000 units of *X* and 1000 units of *Y* were produced. The company employs 50 workers in the shop and the budgeted man-hours are 108,000 for the year. You are required to work out the capacity ratio, activity ratio and efficiency ratio.

Solution

(ICWA, Inter)

Standard man-hours produced:

Product *X*: 2,000 units @	2.5 man-hours	= 5,000 man-hours
Product *Y*: 1,000 units @	6 man-hours	= 6,000 man-hours
	Total	= 11,000 man-hours

Budgeted man-hours per month = 108,000/12 = 9000

Actual man-hours worked = 50 workers × 25 days × 8 hours = 10000 man-hours

Ratios:

$$\text{Activity ratio} = \frac{\text{Standard man-hours produced}}{\text{Budgeted man-hours}} \times 100$$

$$= \frac{10,000}{9,000} \times 100 = 122.22\%$$

$$\text{Efficiency ratio} = \frac{\text{Standard man-hours produced}}{\text{Actual man-hours worked}} \times 100$$

$$= \frac{11,000}{10,000} \times 100 = 111.00\%$$

Example 19.43

A factory produces two products *P* and *Q*. *P* takes 10 hours to produce and *Q* requires 16 hours as per the budget. A month has 25 budgeted days of 8 hours each. During the month 500 units of *P* and 400 units of *Q* were produced. The factory employs 50 workers. They actually worked for 9 hours daily for 24 days. Calculate;

(i) Efficiency ratio;
(ii) Capacity ratio;
(iii) Calender ratio.

(B.Com.(Hons), Delhi, 2007)

Solution

(i) $\text{Efficiency ratio} = \frac{\text{Budgeted Hours for Actual output}}{\text{Actual Hours worked}} \times 100 = \frac{11400}{10800} \times 100 = 105.5\%$

(ii) $\text{Capacity ratio} = \frac{\text{Actual Hours worked}}{\text{Budgeted Hours}} \times 100 = \frac{10800}{10000} \times 100 = 108\%$

(iii) $\text{Calender ratio} = \frac{\text{Actual Days worked in the month}}{\text{Budgeted days in the month}} \times 100 = \frac{24}{25} \times 100 = 96\%$

Activity ratio has not been asked in the question. However, it will be calculated as follows:

$$\text{Activity ratio} = \frac{\text{Budgeted hours for actual output}}{\text{Budgeted Hours}} \times 100 = \frac{11400}{10000} \times 100 = 114\%$$

Example 19.44

Calculate efficiency and activity ratio from the following data:

Capacity ratio	=	75 %
Budgeted output	=	6,000 units
Actual output	=	5,000 units
Standard time per unit	=	4 hours

(C.A., November, 2009)

Solution

$$\text{Capacity ratio} = \frac{\text{Actual Hours}}{\text{Budgeted Hours}} \times 100$$

$$75\% = \frac{\text{AH}}{\text{6000 Units} \times \text{4 hour per unit}}$$

$$.75 = \frac{\text{AH}}{\text{24000 Hours}}$$

$$\text{AH} = 18000 \text{ hours}$$

$$\text{Efficiency ratio} = \frac{\text{Actual Output in term of Standard Hours}}{\text{Actual Working Hours}} \times 100$$

$$= \frac{\text{5000 units} \times \text{4 hours per unit}}{\text{18000 Hours}} \times 100$$

$$= \frac{\text{20000 Hours}}{\text{18000 Hours}} \times 100 = 111.11\%$$

$$\text{Activity ratio} = \frac{\text{Actual Output in term of Standard Hours}}{\text{Budgeted Output in term of Standard Hours}} \times 100$$

$$= \frac{\text{20000 units}}{\text{6000 units} \times \text{4 hour per unit}} \times 100$$

$$= \frac{\text{20000 Units}}{\text{24000 Units}} \times 100 = 83.33\%$$

Example 19.45

Calculate efficiency and capacity ratio from the following figures:

Budgeted production	80 units
Actual production	60 units
Standard time per unit	8 hours
Actual hours worked	500

(November, 2007)

Solution

$$\text{Efficiency ratio} = \frac{\text{Actual output in terms of standard hours}}{\text{Actual hour worked}} \times 100$$

Or $$\frac{480}{500} \times 100 = 96\%$$

$$\text{Capacity ratio} = \frac{\text{Actual hours worked}}{\text{Budgeted hours}} \times 100$$

Or $$\frac{500}{640} \times 100 = 78.12\%$$

Theory Questions

1. Define and explain the concepts of standard cost and standard costing. *(B. Com. (Hons), Delhi, 2000)*
2. Discuss briefly the use of standard costs in the following management activities: cost reductions, operating performance, evaluation, product pricing decisions and providing incentives.
3. Compare and contrast the usefulness of ideal standards, basic standards, and currently attainable standards.
4. "Standard costs are bases for a proper managerial control of manufacturing operation." Define standard cost and explain the above statement. *(B. Com. (Hons), Delhi)*
5. What is standard costing and how would you distinguish it from budgetary control?
6. What are the points of similarity and difference between budgeted and standard costs.
7. "Variance analysis is an integral part of standard cost accounting." Explain this statement.
8. By purchasing low-grade materials, a company reports favourable material price variance, but it consistently experiences unfavourable material quantity variances. What relationship may exist between these conditions? Is the price variances really favourable?
9. What are the shortcomings of historical costs for managerial uses?
10. What is the difference between an estimated cost and a standard cost? *(B. Com. (Hons), Delhi, 2003)*
11. Describe briefly how standard costs are set for (a) material (b) labour.
12. Briefly explain the meaning of each of the following variances: material prices, material usage, labour efficiency, and labour rate.
13. Discuss some of the problems that might be created by standards which are set too high and by standards which are too loose.
14. What are the advantages and limitations of standard costing? *(B. Com. (Hons), Delhi)*
15. Discuss briefly shortcomings of standard cost system. *(B. Com. (Hons), Delhi, 2004)*
16. Explain why overhead variances are generally treated as period costs.
17. Discuss the information which a well-designed cost report should give to management from the point of view of production and control. How should such information be given?
18. What is a "two variance analysis" of factory overheads. Give a brief description. *(B. Com. (Hons), Delhi)*
19. Explain the term 'variance' and distinguish between controllable and uncontrollable variances. *(B. Com. (Hons), Delhi 2000)* *(B. Com. (Hons), Delhi 2001)*
20. Describe briefly the managerial use of variances.
21. Point out the difference between historical costing and standard costing. *(B.Com. (Hons) Delhi, 2003)*
22. Briefly distinguish between the two cost control techniques 'Budgetary Control' and 'Standard Costing'. *(ICWA Inter, Stage 1, Dec 2005)*
23. In analysing variance it is found frequently that an adverse variance from one standard is related directly to a favourable variance from another. Give two examples of such a situation and comment briefly on each. *(ICWA Inter, Stage II, Dec. 2003)*
24. Distinguish between standard costs and budgeted costs. *(B.Com. (Hons), Delhi ,2002)*
25. What is sales value volume variance? *(ICWA Inter, Stage 1, June 2006)*
26. Define variance analysis. What are the ways of disposing cost variances? *(ICWA Inter, Stage 1, June 2005)*
27. What is fixed production overhead variance? Explain how this is calculated and further analysed. *(ICWA Inter, Stage 1, Dec. 2003)*
28. Distinguish between budgetary control and standard costing. *(B.Com. (Hons), Delhi, 2007)*

29. Explain fixed overhead cost variance. *(B.Com. (Hons), Delhi, 2007)*
30. Briefly describe the following control ratios:
    (i) Activity ratio
    (ii) Capacity ratio
    (iii) Efficiency ratio
31. Distinguish between standard costing and budgetary control. *(B.Com. (Hons) Delhi, 2007)*
32. Proper interpretation of variances from standard is very important for the success of standard costing system as a tool for cost control. Mention some important factors that must be born in mind while interpreting variances from standard. *(B.Com. (Hons), Delhi, 2011)*
33. In analysing variance, it is found frequently that an adverse variance from one standard is related directly to a favourable variance from another.
    Give two examples of such a situation and comment briefly on each. *(B.Com. (Hons), Delhi, 2012)*

    Ans: Two examples where adverse variance may be off set by a favourable variance are as under: *(ICWA Stage 2, Dec. 2003)*

    (i) **Direct Materials:** A favourable price variance may arise when material is purchased at cheaper price. But the quality may be poor and this may result in inefficient usage causing an adverse usage variance.

    (ii) **Direct Wages:** Employing workers of higher grade may lead to adverse wage rate variance. But this may be offset by favourable efficiency variance because more skilled workers do the work in less time than allowed.

Self-Evaluation Questions

Choose the correct answer for the following multiple-choice questions.

1. The difference between the standard hours for the actual output and actual hours is
   (a) Labour rate variance.
   (b) Overhead cost variance.
   (c) Labour efficiency variance.
   (d) Overhead volume variance.
2. Cost variance includes all but one of the following
   (a) Direct material variance.
   (b) Direct labour variance.
   (c) Variable overhead variance.
   (d) Sales variance.
3. A standard cost system may be used in
   (a) Either job order costing or process costing.
   (b) Job order costing but not process costing.
   (c) Process costing but not job order costing.
   (d) Neither process costing nor job costing.
4. If actual hours worked exceed the standard hours allowed what type of variance will occur
   (a) Favourable labour usage (efficiency) variance.
   (b) Favourable labour rate variance.
   (c) Unfavourable labour usage (efficiency) variance.
   (d) Unfavourable labour rate variance.
5. An unfavourable materials price variances occurs because of
   (a) Price increases in raw materials.
   (b) Price decreases in raw materials.
   (c) Less than anticipated normal wastage in the manufacturing process.
   (d) More than anticipated normal wastage in the manufacturing process.
6. Which of the following is a purpose of standard costing?
   (a) Determine a break even production level.
   (b) Control costs.