

CHAPTER 28

Standard Costing and Variance Analysis

Introduction

The success of a business enterprise depends to a greater extent upon how efficiently and effectively it has controlled its cost. In a broader sense the cost figure may be ascertained and recorded in the form of Historical costing and Predetermined costing. The term Historical costing refers to ascertainment and recording of actual costs incurred after completion of production. .

One of the important objectives of cost accounting is effective cost ascertainment and cost control. Historical Costing is not an effective method of exercising cost control because it is not applied according to a planned course of action. And also it does not provide any yardstick that can be used for evaluating actual performance. Based on the limitations of historical costing it is essential to know before production begins what the cost should be so that exact reasons for failure to achieve the target can be identified and the responsibility be fixed. For such an approach to the identification of reasons to evaluate the performance, suitable measures may be suggested and taken to correct the deficiencies.

MEANING OF STANDARD COST AND STANDARD COSTING

Standard Cost

The word “Standard” means a “Yardstick” or “Bench Mark.” The term “Standard Costs” refers to Pre-determined costs. Brown and Howard define Standard Cost as a Pre-determined Cost which determines what each product or service should cost under given circumstances. This definition states that standard costs represent planned cost of a product.

Standard Cost as defined by the Institute of Cost and Management Accountant, London “is the Pre-determined Cost based on technical estimate for materials, labour and overhead for a selected period of time and for a prescribed set of working conditions.”

Standard Costing

Standard Costing is a concept of accounting for determination of standard for each element of costs. These predetermined costs are compared with actual costs to find out the deviations known as “Variances.” Identification and analysis of causes for such variances and remedial measures should be taken in order to overcome the reasons for Variances.

Chartered Institute of Management Accountants England 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.”

From the above definition, the technique of Standard Costing may be summarized as follows :

- (1) Determination of appropriate standards for each element of cost.
- (2) Ascertainment of information about actuals and use of Standard Costs.
- (3) Comparison of actual costs with Standard Costs, the differences known as Variances.
- (4) Analysis of Variances to find out the causes of Variances.
- (5) Reporting to the responsible authority for taking remedial measures.

Difference between Estimated Costs and Standard Costs

Although, Pre-determination is the essence of both Standard Costing and Estimated Costing, the two differ from each other in the following respects:

<i>Standard Costing</i>	<i>Estimated Costing</i>
(1) It is used on the basis of scientific.	(1) It is used on the basis of statistical facts and figures.
(2) It emphasises “what the cost should be.”	(2) It emphasises “what the cost will be.”
(3) It is used to evaluate actual performance and it serves as an effective tool of cost.	(3) It is used to cost ascertainment for fixing sales price.
(4) It is applied to any industry engaged in mass production.	(4) It is applicable to concern engaged in construction work.
(5) It is a part of accounting system and standard costing variances are recorded in the books of accounts.	(5) It is not a part of accounting system because it is based on statistical facts and figures.

Compare and Contrast between Standard Costing and Budgetary Control :

Relationship : The following are certain basic principles common to both Standard Costing and Budgetary Control :

- (1) Determination of standards for each element of costs in advance.
- (2) For both of them measurement of actual performance is targeted.
- (3) Comparison of actual costs with standard cost to find out deviations.
- (4) Analysis of variances to find out the causes.
- (5) Give the periodic report to take corrective measures.

Differences : Though Standard Costing and Budgetary Controls are aims at the maximum efficiencies and Marginal Cost, yet there are some basic differences between the two from the objectives of using the two costs.

<i>Budgetary Control</i>	<i>Standard Costing</i>
(1) Budgets are projections of financial accounts.	(1) Standard Costing is a projection of cost accounts.
(2) As a statement of both income and expenses it forms part of budgetary control.	(2) Standard costing is not used for the purpose of forecasting.
(3) Budgets are estimated costs. They are "what the cost will be."	(3) Standard Cost are the "Norms" or "what cost should be."
(4) Budget can be operated with standards.	(4) Standard Costing cannot be used without budgets
(5) In budgetary control variances are not revealed through the accounts.	(5) Under standard costing variances are revealed through different accounts.
(6) Budgets are prepared on the basis of historical facts and figures.	(6) Standard cost are planned and prepared on the basis of technical estimates.

Advantages of Standard Costing

The following are the important advantages of standard costing :

- (1) It guides the management to evaluate the production performance.
- (2) It helps the management in fixing standards.
- (3) Standard costing is useful in formulating production planning and price policies.
- (4) It guides as a measuring rod for determination of variances.
- (5) It facilitates eliminating inefficiencies by taking corrective measures.
- (6) It acts as an effective tool of cost control.
- (7) It helps the management in taking important decisions.
- (8) It facilitates the principle of "Management by Exception."
- (9) Effective cost reporting system is possible.

Limitations of Standard Costing

Besides all the benefits derived from this system, it has a number of limitations which are given below :

- (1) Standard costing is expensive and a small concern may not meet the cost.
- (2) Due to lack of technical aspects, it is difficult to establish standards.
- (3) Standard costing cannot be applied in the case of a concern where non-standardised products are produced.
- (4) Fixing of responsibility is difficult. Responsibility cannot be fixed in the case of uncontrollable variances.
- (5) Frequent revision is required while insufficient staff is incapable of operating this system.
- (6) Adverse psychological effects and frequent technological changes will not be suitable for standard costing system.

Determination of Standard Costs

The following preliminary steps must be taken before determination of standard cost :

- (1) Establishment of Cost Centres.

- (2) Classification and Codification of Accounts.
- (3) Types of Standards to be applied.
 - (a) Ideal Standard
 - (b) Basic Standard
 - (c) Current Standard
 - (d) Expected Standard
 - (e) Normal Standard
- (4) Organization for Standard Costing.
- (5) Setting of Standards.

(1) **Establishment of Cost Centres:** It is the first step required before setting of Standards. According to CIMA, London Cost Centre is “a location, person or item of equipment for which costs may be ascertained and used for the purpose of cost control.” Cost centre is necessary for the determination of standard costs for each product and comparison of actual cost with the predetermined standards to ascertain the deviations to take corrective measures.

(2) **Classification and Codification of Accounts:** Classification of Accounts and Codification of different items of expenses and incomes help quick ascertainment and analysis of cost information.

(3) **Types of Standards to be Applied:** Determination of the type of standard to be used is one of the important steps before setting up of standard cost. The different types of standards are given below :

- (a) Ideal Standard
 - (b) Basic Standard
 - (c) Current Standard
 - (d) Expected Standard
 - (e) Normal Standard
- (a) **Ideal Standard:** The term “Ideal Standard” refers to the standard which can be attained under the most favourable conditions possible. In other words, ideal standard is based on high degree of efficiency. It assumes that there is no wastage, no machine breakdown, no power failure, no labour ideal time in the production process. In practice it is difficult to attain this ideal standard.
- (b) **Basic Standard:** This standard is otherwise known as Bogey Standard. Basic Standard which is established for use is unaltered over a long period of time. In other words this standard is fixed in relation to a base year and is not changed in response to changes in material costs, labour costs and other expenses as the case may be. The application of this standard has no practical importance from cost control and cost ascertainment point of view.
- (c) **Current Standard:** The term “Current Standard” refers to “a standard established for use over a short period of time related to current conditions which reflects the performance that should be attained during the period.” These standards are more suitable and realistic for control purposes.

- (d) **Expected Standard:** Expected Standard may be defined as “the standard which may be anticipated to be attained during a future specified budget period.” These standards set targets which can be achieved in a normal situation. As such it is more realistic than the Ideal Standard.
- (e) **Normal Standard:** This standard resents an average standard in past which, it is anticipated, can be attained over a future period of time, preferably long enough to cover one trade cycle. The usefulness of such standards is very limited for the purpose of cost control.

(4) Organization for Standard Costing: The success of the standard costing system depends upon the reliability of standards. Hence the responsibility for setting standard is vested with the Standard Committee. It consists of

- (a) Purchase Manager
- (b) Production Manager
- (c) Personnel Manager
- (d) Time and Motion Study Engineers
- (e) Marketing Manager and Cost Accountant

(5) Setting of Standard: The Standard Committee is responsible for setting standards for each element of costs as given below :

- I. Direct Material
- II. Direct Labour
- III. Overheads
 - (a) Fixed Overheads
 - (b) Variable Overheads

I. Standard for Direct Material Cost

The following are the standard involved in direct materials cost:

- (i) Material Quantity or Usage Standard.
- (ii) Material Price Standard.

(i) Material Usage Standard: Material Usage Standard is prepared on the basis of material specifications and quality of materials required to manufacture a product. While setting of standards proper allowance should be provided for normal losses due to unavoidable occurrence of evaporation, breakage etc.

(ii) Material Price Standard: Material Price Standard is calculated by the Cost Accountant and the Purchase Manager for each type of materials. When this type of standard is used, it is essential to consider the important factors such as market conditions, forecasting relating to the trends of prices, discounts etc.

II. Standard for Direct Labour Cost

The following standards are established:

- (i) Fixation of Standard Labour Time
- (ii) Fixation of Standard Rate

(i) **Fixation of Standard Labour Time:** Labour Standard time is fixed and it depends upon the nature of cost unit, nature of operations performed, Time and Motion Study etc. While determining the standard time normal ideal time is allowed for fatigue and other contingencies.

(ii) **Fixation of Standard Rates:** The standard rate fixed for each job will be determined on the basis of methods of wage payment such as Time Wage System, Piece Wage System, Differential Piece Rate System and Premium Plan etc.

III. Setting Standards for Overheads

The following problems are involved while setting standards for overheads :

- (1) Determination of standard overhead cost
- (2) Estimating the production level of activity to be measured in terms of common base like machine hours, units of production and labour hours.

Setting of overhead standards is divided into fixed overhead, variable overhead and semi-variable overhead. The determination of overhead rate may be calculated as follows :

$$\begin{aligned} \text{(a) Standard Overhead Rate} &= \frac{\text{Standard overhead for the budget period}}{\text{Standard Production for the budget period}} \\ \text{(b) Standard Variable Overhead Rate} &= \frac{\text{Standard overhead for the budget period}}{\text{Standard Production for the budget period}} \end{aligned}$$

Standard Hour: Usually production is expressed in terms of units, dozen, kgs, pound, litres etc. When productions are of different types, all products cannot be expressed in one unit. Under such circumstances, it is essential to have a common unit for all the products. Time factor is common to all the operation. ICMA, London, defines a Standard Time as a "hypothetical unit pre-established to represent the amount of work which should be performed in one hour at standard performance."

Standard Cost Card: After fixing the Standards for direct material, direct labour and overhead cost, they are recorded in a Standard Cost Card. This Standard cost is presented for each unit cost of a product. The total Standard Cost of manufacturing a product can be obtained by aggregating the different Standard Cost Cards of different processes. These Cost Cards are useful to the firm in production planning and pricing policies.

VARIANCE ANALYSIS

Standard Costing guides as a measuring rod to the management for determination of "Variances" in order to evaluate the production performance. The term "Variances" may be defined as the difference between Standard Cost and actual cost for each element of cost incurred during a particular period. The term "Variance Analysis" may be defined as the process of analyzing variance by subdividing the total variance in such a way that management can assign responsibility for off-Standard Performance.

The variance may be favourable variance or unfavourable variance. When the actual performance is better than the Standard, it resents "Favourable Variance." Similarly, where actual performance is below the standard it is called as "Unfavourable Variance."

Variance analysis helps to fix the responsibility so that management can ascertain —

- (a) The amount of the variance
- (b) The reasons for the difference between the actual performance and budgeted performance

- (c) The person responsible for poor performance
- (d) Remedial actions to be taken

Types of Variances : Variances may be broadly classified into two categories (A) Cost Variance and (B) Sales Variance.

(A) Cost Variance

Total Cost Variance is the difference between Standards Cost for the Actual Output and the Actual Total Cost incurred for manufacturing actual output. The Total Cost Variance Comprises the following :

- I. Direct Material Cost Variance (DMCV)
- II. Direct Labour Cost Variance (DLCV)
- III. Overhead Cost Variance (OCV)

I. Direct Material Variances

Direct Material Variances are also termed as Material Cost Variances. The Material Cost Variance is the difference between the Standard cost of materials for the Actual Output and the Actual Cost of materials used for producing actual output. The Material Cost Variance is calculated as:

$$\begin{aligned}
 \text{Material Cost Variance} &= \text{Standard Cost} - \text{Actual Cost} \\
 \text{MCV} &= \text{SC} - \text{AC} \\
 \text{(or)} & \\
 \text{MCV} &= \left\{ \begin{array}{cc} \text{Standard} & \text{Standard} \\ \text{Quantity} & \times & \text{Price} \end{array} \right\} - \left\{ \begin{array}{cc} \text{Actual} & \text{Actual} \\ \text{Quantity} & \times & \text{Price} \end{array} \right\} \\
 &= (\text{SQ} \times \text{SP}) - (\text{AQ} \times \text{AP})
 \end{aligned}$$

Note : If the actual costs is more than standard cost the variance will be unfavourable or adverse variance and, on the other hand, if the actual cost is less than standard cost the variance will be favourable variance. The material cost variance is further classified into :

- (1) Material Price Variance
- (2) Material Usage Variance
- (3) Material Mix Variance
- (4) Material Yield Variance

(1) Material Price Variance (MPV) : Material Price Variance is that portion of the Material Cost Variance which is due to the difference between the Standard Price specified and the Actual Price paid for purchase of materials. Material Price Variance may be calculated by

$$\begin{aligned}
 \text{Material Price Variance} &= \text{Actual} \times \left\{ \begin{array}{cc} \text{Standard} & \text{Actual} \\ \text{Price} & - & \text{Price} \end{array} \right\} \\
 \text{MPV} &= \text{AQ} (\text{SP} - \text{AP})
 \end{aligned}$$

Note : If actual cost of materials used is more than the standard cost the variance is adverse, it represents negative (-) symbol. And on the other hand, if the variance is favourable it is to be represented by positive (+) symbol.

(2) Material Usage Variance (MUV): Material Usage Variance is that part of Material Cost Variance which refers to the difference between the standard cost of standard quantity of material for actual output and the Standard cost of the actual material used. Material Usage Variance is calculated as follows :

$$\begin{aligned} \text{Material Usage Variance} &= \text{Standard Price} \times \left\{ \begin{array}{l} \text{Standard Quantity} \\ \text{Actual Quantity} \end{array} - \text{Actual Quantity} \right\} \\ \text{MUV} &= \text{SP} (\text{SQ} - \text{AQ}) \end{aligned}$$

Note : This Variance will be favourable when standard cost of actual material is more than the Standard material cost for actual output, and Vice Versa.

(3) Material Mix Variance (MMV) : It is the portion of the material usage variance which is due to the difference between the Standard and the actual composition of mix. Material Mix Variance is calculated under two situations as follows :

- (a) When actual weight of mix is equal to standard weight to mix
- (b) When actual weight of mix is different from the standard mix .

(a) When Actual Weight and Standard Weight of Mix are equal :

- (i) The formula is used to calculate the Variance :

$$\begin{aligned} \text{Material Mix Variance} &= \text{Standard Price} \left\{ \begin{array}{l} \text{Standard Quantity} \\ \text{Actual Quantity} \end{array} - \text{Actual Quantity} \right\} \\ \text{MMV} &= \text{SP} (\text{SQ} - \text{AQ}) \end{aligned}$$

(ii) In case standard quantity is revised due to shortage of a particular category of materials, the formula will be changed as follows :

$$\begin{aligned} \text{Material Mix Variance} &= \text{Standard Price} \left\{ \begin{array}{l} \text{Revised Standard Quantity} \\ \text{Actual Quantity} \end{array} - \text{Actual Quantity} \right\} \\ \text{MMV} &= \text{SP} (\text{RSQ} - \text{AQ}) \end{aligned}$$

(b) When Actual Weight and Standard Weight of Mix are different :

- (i) The formula used to calculate the Variance is :

$$\text{Material Mix Variance} = \left\{ \frac{\text{Total Weight of Actual Mix}}{\text{Total Weight of Standard Mix}} \times \text{Standard Cost of Standard Mix} \right\} - \left\{ \begin{array}{l} \text{Standard Cost of} \\ \text{Actual Mix} \end{array} \right\}$$

(ii) In case the standard is revised due to the shortage of a particular category of materials, the alternative formula will be as follows :

$$\text{Material Mix Variance} = \left\{ \frac{\text{Total Weight of Actual Mix}}{\text{Total Weight of Standard Mix}} \times \text{Standard Cost of Revised Standard Mix} \right\} - \left\{ \begin{array}{l} \text{Standard Cost of} \\ \text{Actual Mix} \end{array} \right\}$$

(4) Materials Yield Variance (MYV): It is the portion of Material Usage Variance. This variance arises due to spoilage, low quality of materials and defective production planning etc. Materials Yield

Variance may be defined as “the difference between the Standard Yield Specified and the Actual Yield Obtained.” This variance may be calculated as under :

$$\text{Material Yield Variance} = \text{Standard Rate} \times \left\{ \begin{array}{c} \text{Actual} \\ \text{Yield} \end{array} - \begin{array}{c} \text{Standard} \\ \text{Yield} \end{array} \right\}$$

Where :

Standard Rate is calculated as follows :

$$\text{Standard Rate} = \frac{\text{Standard Cost of Standard Mix}}{\text{Net Standard Output}}$$

Verification :

The following equations may be used for verification of Material Cost Variances :

- (1) Material Cost Variance = Material Price Variance + Material Usage Variance
- (2) Material Usage Variance = Material Mix Variance – Material Yield Variance
- (3) Material Cost Variance = Material Mix Variance + Material Yield Variance

Illustration: 1

Calculate Material Cost Variance from the following information :

Standard Price of material per kg = Rs. 4

Standard Usage of materials = 800 kgs

Actual Usage of materials = 920 kgs

Actual Price of materials per kg = Rs. 3

Actual Cost of materials Rs. 2,760

Standard cost of material for actual production Rs. 3,200

Solution:

$$\begin{aligned} (1) \text{ Material Cost Variance} &= \left\{ \begin{array}{c} \text{Standard} \\ \text{Price} \end{array} \times \begin{array}{c} \text{Standard} \\ \text{Quantity} \end{array} \right\} - \left\{ \begin{array}{c} \text{Actual} \\ \text{Price} \end{array} \times \begin{array}{c} \text{Actual} \\ \text{Quantity} \end{array} \right\} \\ &= (4 \times 800) - (3 \times 920) \\ &= \text{Rs. } 3,200 - \text{Rs. } 2,760 = \text{Rs. } 440 \text{ (F)} \\ \\ (2) \text{ Material Price Variance} &= \text{Actual Quantity} \times \left\{ \begin{array}{c} \text{Standard} \\ \text{Price} \end{array} - \begin{array}{c} \text{Actual} \\ \text{Price} \end{array} \right\} \\ &= 920 (4 - 3) \\ &= 920 \times \text{Rs. } 1 = \text{Rs. } 920 \text{ (F)} \\ \\ (3) \text{ Material Usage Variance} &= \begin{array}{c} \text{Standard} \\ \text{Price} \end{array} \times \left\{ \begin{array}{c} \text{Standard} \\ \text{Quantity} \end{array} - \begin{array}{c} \text{Actual} \\ \text{Quantity} \end{array} \right\} \\ &= 4 (800 - 920) \\ &= 4 \times 120 = \text{Rs. } 480 \text{ (A)} \end{aligned}$$

Illustration: 2

From the following particulars calculate:

- (a) Material Cost Variance
- (b) Material Price Variance
- (c) Material Usage Variance
- (d) Material Mix Variance

The Standard Mix of Product is :

- X 300 Units at Rs. 7.50 per unit
- Y 400 Units at Rs. 10 per unit
- Z 500 Units at Rs. 12.50 per unit

The Actual Consumption was :

- X 320 Units at Rs. 10 per unit
- Y 480 Units at Rs. 7.50 per unit
- Z 420 Units at Rs. 15 per unit

Solution:

Standard Cost of Standard Materials :

X	300	x	7.50	=	Rs. 2,250
Y	400	x	10	=	Rs. 4,000
Z	500	x	12.50	=	Rs. 6,250
	1,200				Rs. 12,500

Actual Cost of Actual Materials :

X	320	x	10	=	Rs. 3,200
Y	480	x	7.50	=	Rs. 3,600
Z	420	x	15	=	Rs. 6,300
	1,220				Rs. 13,100

Revised Quantity :

$$\begin{aligned}
 X &= \frac{1,220}{1,200} \times 300 = 305 \text{ units} \\
 Y &= \frac{1,220}{1,200} \times 400 = 406.66 \text{ units} \\
 Z &= \frac{1,220}{1,200} \times 500 = 508.33 \text{ units}
 \end{aligned}$$

Calculation of Variance :

(a) *Material Cost Variance*

$$\begin{aligned}
 &= \text{Standard Cost} - \text{Actual Cost} \\
 &= \text{Rs. 12500} - \text{Rs. 13100} = \text{Rs. 600 (A)}
 \end{aligned}$$

(b) *Material Price Variance*

$$= \text{Actual Quantity} \times \left\{ \begin{array}{cc} \text{Standard} & \text{Actual} \\ \text{Price} & \text{Price} \end{array} \right\} - \left\{ \begin{array}{cc} \text{Standard} & \text{Actual} \\ \text{Price} & \text{Price} \end{array} \right\}$$

	= (or) AQ (SP – AP)
X = 320 (7.50 – 10)	= Rs. 800 (A)
Y = 480 (10 – 7.50)	= Rs. 1200 (F)
Z = 420 (12.50 – 15)	= <u>Rs. 1050 (A)</u>
Material Price Variance	= <u>Rs. 650 (A)</u>
 (c) Material Usage Variance	 = Standard Price x $\left\{ \begin{array}{l} \text{Standard} \\ \text{Quantity} \end{array} - \begin{array}{l} \text{Actual} \\ \text{Quantity} \end{array} \right\}$
	= SP (SQ – AQ)
X = 7.50 (300 – 320)	= Rs. 150 (A)
Y = 10 (400 – 480)	= Rs. 800 (A)
Z = 12.50 (500 – 420)	= <u>Rs. 1000 (F)</u>
Material Mix Variance	= <u>Rs. 50 (F)</u>
 (d) Material Mix Variance	 = Standard Price x $\left\{ \begin{array}{l} \text{Revised Standard} \\ \text{Quantity} \end{array} - \begin{array}{l} \text{Actual} \\ \text{Quantity} \end{array} \right\}$
	= SP (RSQ – AQ)
X = 7.50 (305 – 320)	= Rs. 112.50 (A)
Y = 10 (407 – 480)	= Rs. 730 (A)
Z = 12.50 (508 – 420)	= <u>Rs. 1100 (F)</u>
Material Mix Variance	= <u>Rs. 257.50 (F)</u>

Illustration: 3

X Y Z products Company produces a gasoline additive Gas Gain. This product increases engine efficiency and improves gasoline mileage by creating a more complex burn in the combustion process.

Careful controls are required during the production process to ensure that the proper mix of input chemicals is achieved and that evaporation is controlled. If controls are not effective, there can be loss of output and efficiency.

The Standard cost of producing a 500 litre batch of Gas Gain is Rs.6075. The Standard Material Mix and related standard cost of each chemical used in a 500 litre batch as follows :

Chemicals	Mix Litres	Standard Purchase Price Rs.	Standard Cost Rs.
Echol	200	9	1800
Protex	100	19.125	1912.50
Benz	250	6.75	1687.50
CT – 40	50	13.50	675
Total	600		6075

The quantities of chemicals purchased and used during the current production period are shown below. A total of 140 batches of Gas Gain were manufactured during the current production period. X Y Z products company determines its costs and chemical usage variations at the end of each production period.

Chemical	Quantity used (in Ltrs)
Echol	26,600
Protex	12,880
Benz	37,800
CT – 40	7,140
Total	84,420

Required : Compute the total material usage variance and then breakdown this variance into mix and yield components.

Solution:**A. Standard Cost of Standard Mix for actuals of 140 batches**

<i>Chemicals</i>	<i>Standard Mix</i>	<i>Standard Cost per unit Rs.</i>	<i>Standard Cost Rs.</i>
Echol	200 Litres x 140 = 28,000 Litres	9	2,52,000
Protex	100 Litres x 140 = 14,000 Litres	19.125	2,67,750
Benz	250 Litres x 140 = 35,000 Litres	6.75	2,36,250
CT - 40	50 Litres x 140 = 7,000 Litres	13.50	94,500
Total	84,000 Litres		Rs. 8,50,500

B. Standard Cost of Actual Mix for Actual of 140 batches

<i>Chemicals</i>	<i>Actual Quantity used</i>	<i>Standard Per unit (Liters)</i>	<i>Standard Cost of Actual Quantity</i>
Echol	26,600 Liters	Rs. 9	Rs. 2,39,400
Protex	12,880 Liters	Rs. 19.125	Rs. 2,46,330
Benz	37,800 Liters	Rs. 6.75	Rs. 2,55,150
CT - 40	7,140 Liters	Rs. 13.50	Rs. 96,390
Total	84,420 Liters		Rs. 8,37,270

Material Usage Variance

<i>Chemical</i>	<i>Standard Cost of Standard Mix for = Actual output of 140 Batches</i>	<i>(—)</i>	<i>Standard Cost of Actual Mix for Actual output</i>
Echol	Rs. 2,52,000	(—)	Rs. 2,39,400 = Rs. 12,600 (F)
Protex	Rs. 2,67,750	(—)	Rs. 2,46,330 = Rs. 21,420 (F)
Benz	Rs. 2,36,250	(—)	Rs. 2,55,150 = Rs. 18,900 (A)
CT - 40	Rs. 94,500	(—)	Rs. 96,390 = Rs. 1,890 (A)
Total	Rs. 8,50,500	(—)	Rs. 8,37,270 = Rs. 13,230 (F)

Standard Cost of Standard Mix for Actual Input (84,420 Litres)

<i>Chemical</i>	<i>Standard Mix in Actual Quantity</i>	<i>Standard Cost Per unit (Litres)</i>	<i>Standard Cost of Standard Mix in Actual Quantity</i>
Echol	= $\frac{200}{600}$ x 84,420 = 28,140 Litres	Rs. 9	Rs. 2,53,260
Protex	= $\frac{100}{600}$ x 84,420 = 14,070 Litres	Rs. 19.125	Rs. 2,69,088.75
Benz	= $\frac{250}{600}$ x 84,420 = 35,175 Litres	Rs. 6.75	Rs. 2,37,431.25

Echol	= $\frac{50}{600} \times 84,420$ = 7,035 Litres		
		Rs. 13.50	Rs. 94,972.50
Total	84,420 Litres		Rs. 8,54,752.50

Material Mix Variance

Chemical	Standard Cost of Standard Mix in = Actual input used	(—)	Standard Cost of Actual Mix in Actual input used (Rs.)
Echol	Rs. 2,53,260	(—)	Rs. 2,39,400 = Rs. 13,860 (F)
Protex	Rs. 2,69,088.55	(—)	Rs. 2,46,330 = Rs. 22,758.75 (F)
Benz	Rs. 2,37,431.25	(—)	Rs. 2,55,150 = Rs. 17,718.75 (A)
CT – 40	Rs. 94,972.50	(—)	Rs. 96,390 = Rs. 1,417.50 (A)
Total	Rs. 8,54,752.50		Rs. 8,37,270 = Rs. 17,482.50 (F)

Material Yield Variance :

$$\begin{aligned}
 &= \text{Standard Rate} \left\{ \begin{array}{l} \text{Actual} \\ \text{Output} \end{array} - \begin{array}{l} \text{Output Expected} \\ \text{from Actual input} \end{array} \right\} \\
 &= \frac{\text{Rs. 8,50,500}}{140 \text{ batches}} \left\{ 140 - \frac{84,420 \text{ Litres}}{600 \text{ Ltrs / batch}} \right\} \\
 &= \text{Rs. 6,075 (140 – 140.7 batches)} \\
 &= \text{Rs. 4,252.50 (A)}
 \end{aligned}$$

II. Labour Variances

Labour Variances can be classified into:

- Labour Cost Variance (LCV)
- Labour Rate Variance or Wage Rate Variance
- Labour Efficiency Variance
- Labour Idle Time Variance
- Labour Mix Variance
- Labour Revised Efficiency Variance
- Labour Yield Variance

(a) **Labour Cost Variance (LCV):** Labour Cost Variance is the difference between the Standard Cost of labour allowed for the actual output achieved and the actual wages paid. It is also termed as Direct Wage Variance or Wage Variance. Labour Cost Variance is calculated as follows:

$$\text{Labour Cost Variance} = \text{Standard Cost of Labour} - \text{Actual Cost of Labour}$$

(or)

$$\text{Labour Cost Variance} = \left\{ \begin{array}{l} \text{Standard} \\ \text{Rate} \end{array} \times \begin{array}{l} \text{Standard Time} \\ \text{for Actual Output} \end{array} \right\} - \left\{ \begin{array}{l} \text{Actual} \\ \text{Rate} \end{array} \times \begin{array}{l} \text{Actual} \\ \text{Time} \end{array} \right\}$$

Note : If actual labour cost is more than the standard labour cost, the variance represents negative and vice versa.

(b) Labour Rate Variance: It is that part of labour cost variance which is due to the difference between the standard rate specified and the actual rate paid. This variances arise from the following reasons :

- (a) Change in wage rate.
- (b) Faulty recruitment.
- (c) Payment of overtime.
- (d) Employment of casual workers etc.

It is expressed as follows :

$$\text{Labour Rate Variance} = \text{Actual Time} \left\{ \begin{array}{l} \text{Standard} \\ \text{Rate} \end{array} - \begin{array}{l} \text{Actual} \\ \text{Rate} \end{array} \right\}$$

Note : If the Standard rate is higher than the actual rate, the variance will be favourable and vice versa.

(c) Labour Efficiency Variance: Labour Efficiency Variance otherwise known as Labour Time Variance. It is that portion of the Labour Cost Variance which arises due to the difference between standard labour hours specified and the actual labour hours spent. The usual reasons for this variance are (a) poor supervision (b) poor working condition (c) increase in labour turnover (d) defective materials. It may be calculated as following:

Note : If actual time taken is more than the specified standard time, the variance represents unfavourable and vice versa.

(d) Labour Idle Time Variance: Labour Idle Time Variance arises due to abnormal situations like strikes, lockout, breakdown of machinery etc. In other words, idle time occurs due to the difference between the time for which workers are paid and that which they actually expend upon production. It is calculated as follows :

$$\text{Idle Time Variance} = \text{Idle Hours} \times \text{Standard Rate}$$

(e) Labour Mix Variance: It is otherwise known as Gang Composition Variance. This variance arises due to the differences between the actual gang composition than the standard gang composition. Labour Mix Variance is calculated in the same way of Materials Mix Variance. This variance is calculated in two ways :

- (i) When Standard Labour Mix is equal to Actual Labour Mix.
- (ii) When Standard Labour mix is different from Actual Labour Mix.
- (i) **When Standard and actual times of the labour mix are same :** The formula for its computation may be as follows :

$$\text{Labour Mix Variance} = \left\{ \begin{array}{l} \text{Standard Cost of} \\ \text{Standard Labour Mix} \end{array} - \begin{array}{l} \text{Standard Cost of} \\ \text{Actual Labour Mix} \end{array} \right\}$$

- (ii) **When Standard and actual times of the labour mix are different :** Changes in the composition of a gang may arise due to shortage of a particular grade of labour. It may be calculated as follows :

$$\text{Labour Mix Variance} = \left\{ \begin{array}{c} \text{Revised Standard} \\ \text{Time} \end{array} - \begin{array}{c} \text{Actual} \\ \text{Time} \end{array} \right\} \times \left\{ \begin{array}{c} \text{Standard} \\ \text{Rate} \end{array} \right\}$$

Where :

$$\text{Revised Standard Time} = \frac{\text{Total Actual Time}}{\text{Total Standard Time}} \times \text{Actual Time}$$

(f) Labour Yield Variance: This variance is calculated in the same way as Material Yield Variance. Labour Yield Variance arises due to the variation in labour cost on account of increase or decrease in yield or output as compared to relative standard. The formula for this purpose is as follows :

$$\text{Labour Yield Variance} = \frac{\text{Standard Labour}}{\text{Cost per unit of output}} \times \left\{ \begin{array}{c} \text{Standard output} \\ \text{for Actual Time} \end{array} - \begin{array}{c} \text{Actual} \\ \text{Output} \end{array} \right\}$$

Note : If actual output is more than Standard output for actual time, the variance is favourable and vice versa.

Verification : Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance

Illustration: 4

From the following particulars, calculate Labour Variance:

Standard hours = 200

Standard rate for actual production = Re. 1 per hour

Actual hour = 190

Actual Rate = Rs. 1.25 per hour

Solution:

$$\begin{aligned} (1) \text{ Labour Cost Variance} &= \left\{ \begin{array}{c} \text{Standard} \\ \text{Hours} \end{array} \times \begin{array}{c} \text{Standard} \\ \text{Rate} \end{array} \right\} - (\text{Actual hours} \times \text{Actual Rate}) \\ (\text{or}) &= (\text{SH} \times \text{SR}) - (\text{AH} \times \text{AR}) \\ &= (200 \times \text{Re.1}) - (190 \times \text{Rs. 1.25}) \\ &= \text{Rs. 200} - \text{Rs. 237.50} = \text{Rs. 37.50 (A)} \end{aligned}$$

$$\begin{aligned} (2) \text{ Labour Rate Variance} &= \left\{ \begin{array}{c} \text{Standard} \\ \text{Rate} \end{array} - \begin{array}{c} \text{Actual} \\ \text{Rate} \end{array} \right\} \times \text{Actual hours} \\ &= (\text{Re. 1} - \text{Rs. 1.25}) \times 190 \\ &= \text{Rs. 0.25} \times 190 = \text{Rs. 47.50 (A)} \end{aligned}$$

$$\begin{aligned} (3) \text{ Labour Efficiency Variance} &= \left\{ \begin{array}{c} \text{Standard} \\ \text{Hours} \end{array} - \begin{array}{c} \text{Actual} \\ \text{Hours} \end{array} \right\} \times \text{Standard Rate} \\ &= (200 - 190) \times \text{Re. 1} \\ &= 10 \times \text{Re. 1} = \text{Rs. 10 (F)} \end{aligned}$$

Verification:

$$\begin{aligned} \text{Labour Cost Variance} &= \text{Labour Rate Variance} + \text{Labour Efficiency Variance} \\ \text{Rs. 37.50 (A)} &= \text{Rs. 47.50 (A)} + \text{Rs. 10 (F)} \\ \text{Rs. 37.50 (A)} &= \text{Rs. 37.50 (A)} \end{aligned}$$

Illustration: 5

The details regarding the composition and the weekly wage rates of labour force engaged on a job scheduled to be completed in 30 weeks are as follows :

Category of Workers	Standard		Actual	
	No. of workers	Weekly wage Rate per worker	No. of workers	Weekly wage Rate per worker
Skilled	75	60	70	70
Semi-Skilled	45	40	30	50
Unskilled	60	30	80	20

The work was actually completed in 32 weeks. Calculate the various labour variances.

Solution:

$$(1) \text{ Labour Cost Variance} = \text{Standard Labour Cost} - \text{Actual Labour Cost}$$

Calculation of Standard Labour Cost :**Category of Standard Workers :**

		Week		Rate Rs.		Amount Rs.
Skilled	=	75	x	30	=	2,250
Semi Skilled	=	45	x	30	=	1,350
Unskilled	=	60	x	30	=	1,800
						<u>5,400</u>
						<u>2,43,000</u>

Calculation of Actual Labour Cost :

		Actual Week		Rate Rs.		Amount Rs.
Skilled	=	75	x	32	=	2,240
Semi Skilled	=	30	x	32	=	960
Unskilled	=	80	x	32	=	2,560
						<u>5,760</u>
						<u>2,56,000</u>

$$(1) \text{ Labour Cost Variance} = \text{Standard Labour} - \text{Actual Labour Cost}$$

$$= 2,43,000 - 2,56,000 = \text{Rs. } 13,000 \text{ (A)}$$

$$(2) \text{ Labour Rate Variance} = (\text{Standard Rate} - \text{Actual Rate}) \times \text{Actual Time}$$

$$\text{Skilled} = (\text{Rs. } 60 - \text{Rs. } 70) \times 2,240 = \text{Rs. } 22,400 \text{ (A)}$$

$$\text{Semi Skilled} = (\text{Rs. } 40 - \text{Rs. } 50) \times 960 = \text{Rs. } 9,600 \text{ (A)}$$

$$\text{Unskilled} = (\text{Rs. } 30 - \text{Rs. } 20) \times 2,560 = \text{Rs. } 25,600 \text{ (F)}$$

$$\text{Labour Rate Variance} = \text{Rs. } 6,400 \text{ (A)}$$

$$(3) \text{ Labour Efficiency Variance} = \left\{ \begin{array}{l} \text{Standard} \\ \text{Time} \end{array} - \begin{array}{l} \text{Actual} \\ \text{Time} \end{array} \right\} \times \text{Standard Rate}$$

Skilled	=	(2,250 - 2,240)	x	60	=	Rs. 600 (F)
Semi Skilled	=	(1,350 - 960)	x	40	=	Rs. 15,600 (F)
Unskilled	=	(1,800 - 2,560)	x	30	=	Rs. 22,800 (A)
						<u>Rs. 6,600 (A)</u>
						<u>Rs. 6,600 (A)</u>

$$(4) \text{ Labour Mix Variance} = \left\{ \begin{array}{c} \text{Revised Standard} \\ \text{Time} \end{array} - \begin{array}{c} \text{Actual} \\ \text{Time} \end{array} \right\} \times \text{Standard Rate}$$

Where :

$$\begin{array}{l} \text{Revised Standard Time} = \frac{\text{Standard Time}}{\text{Total Standard Time}} \times \text{Actual Time} \\ \\ \text{Skilled} = \frac{2,250}{5,400} \times 5,760 = 2,400 \text{ hours} \\ \\ \text{Semi Skilled} = \frac{1,350}{5,400} \times 5,760 = 1,440 \text{ hours} \\ \\ \text{Unskilled} = \frac{1,800}{5,400} \times 5,760 = 1,920 \text{ hours} \end{array}$$

Labour Mix Variance

$$\begin{array}{l} \text{Skilled} = (2,400 - 2,240) \times 60 = \text{Rs. } 9,600 \text{ (F)} \\ \text{Semi Skilled} = (1,440 - 960) \times 40 = \text{Rs. } 19,200 \text{ (F)} \\ \text{Unskilled} = (1,920 - 2,560) \times 30 = \text{Rs. } 19,200 \text{ (A)} \\ \hline \text{Labour Mix Variance} = \text{Rs. } 9,600 \text{ (F)} \end{array}$$

$$(5) \text{ Labour Revised Efficiency Variance} = \left\{ \begin{array}{c} \text{Standard} \\ \text{Time} \end{array} - \begin{array}{c} \text{Revised Standard} \\ \text{Time} \end{array} \right\} \times \text{Standard Rate}$$

$$\begin{array}{l} \text{Skilled} = (2,250 - 2,400) \times \text{Rs. } 60 = \text{Rs. } 9,000 \text{ (A)} \\ \text{Semi Skilled} = (2,350 - 1,440) \times \text{Rs. } 40 = \text{Rs. } 3,600 \text{ (A)} \\ \text{Unskilled} = (1,800 - 1,920) \times \text{Rs. } 30 = \text{Rs. } 300 \text{ (A)} \\ \hline \text{Labour Revised Efficiency Variance} = \text{Rs. } 16,200 \text{ (A)} \end{array}$$

Verification :

$$\begin{array}{l} (1) \text{ Labour Cost Variance} = \begin{array}{c} \text{Labour Rate} \\ \text{Variance} \end{array} + \begin{array}{c} \text{Labour Efficiency Variance} \\ \text{Variance} \end{array} \\ \text{Rs. } 13,000 \text{ (A)} = \text{Rs. } 6,400 \text{ (A)} + \text{Rs. } 6,600 \text{ (A)} \\ \text{Rs. } 13,000 \text{ (A)} = \text{Rs. } 13,000 \text{ (A)} \end{array}$$

$$\begin{array}{l} (2) \text{ Labour Efficiency Variance} = \begin{array}{c} \text{Labour Mix} \\ \text{Variance} \end{array} + \begin{array}{c} \text{Labour Revised Variance} \\ \text{Variance} \end{array} \\ \text{Rs. } 6,600 \text{ (A)} = \text{Rs. } 9,600 \text{ (F)} + \text{Rs. } 16,200 \text{ (A)} \\ \text{Rs. } 6,600 \text{ (A)} = \text{Rs. } 6,600 \text{ (A)} \end{array}$$

III. Overhead Variances

Overhead may be defined as the aggregate of indirect material cost, indirect labour cost and indirect expenses. Overhead Variances may arise due to the difference between standard cost of overhead for actual production and the actual overhead cost incurred. The Overhead Cost Variance may be calculated as follows :

$$\text{Overhead Cost Variance} = \left\{ \begin{array}{l} \text{Standard Overhead} \\ \text{Rate Per Unit} \end{array} - \begin{array}{l} \text{Actual Overhead} \\ \text{Cost} \end{array} \right\} \times \text{Actual Output}$$

(or)

$$\left\{ \begin{array}{l} \text{Standard Hours for} \\ \text{Actual Output} \end{array} \times \begin{array}{l} \text{Standard Overhead} \\ \text{Rate Per Hour} \end{array} \right\} - \text{Actual Overhead Cost}$$

Essentials of Certain Terms : For the purpose of measuring various Overhead Variances it is essential to know certain technical terms related to overheads are given below :

- (a) Standard Overhead Rate per unit = $\frac{\text{Budgeted Overheads}}{\text{Budgeted Output}}$
- (b) Standard Overhead Rate per hour = $\frac{\text{Budgeted Overheads}}{\text{Budgeted Hours}}$
- (c) Standard Output for Actual Time = $\frac{\text{Budgeted Output}}{\text{Budgeted Hours}} \times \text{Actual Hours}$
- (d) Standard Hours for Actual Output = $\frac{\text{Budgeted Hours}}{\text{Budgeted Output}} \times \text{Actual Output}$
- (e) When Output is measured in Standard Hours
 Recorded Overheads = $\frac{\text{Standard Rate}}{\text{Per Hour}} \times \text{Standard Hours for Actual Output}$

When Output is measured in Units:

- Absorbed Overheads = $\frac{\text{Standard Rate}}{\text{Per Unit}} \times \text{Budgeted Output In Units}$
- (f) Budgeted Overheads = $\frac{\text{Standard Rate}}{\text{Per Unit}} \times \text{Budgeted Output In Units}$
- (or)
- = $\frac{\text{Standard Rate}}{\text{Per Hour}} \times \text{Budgeted Hours}$
- (g) Actual Overheads = $\frac{\text{Actual Rate}}{\text{Per unit}} \times \text{Actual Output in units}$
- (or)
- = $\frac{\text{Actual Rate}}{\text{Per Hour}} \times \text{Actual Hours}$

(3) **Variable Overhead Efficiency Variance:** This variance arises due to the difference between variable overhead recovered from actual output produced and the standard variable overhead for actual hours worked. The formula is as follows :

$$\left. \begin{array}{l} \text{Variable Overhead} \\ \text{Efficiency Variance} \end{array} \right\} = \begin{array}{l} \text{Standard Rate} \\ \text{Per Hour} \end{array} \times \left\{ \begin{array}{l} \text{Standard Hours} \\ \text{for Actual Production} \end{array} - \begin{array}{l} \text{Actual} \\ \text{Hours} \end{array} \right\}$$

Verification :

$$\begin{array}{l} \text{Variable Overhead} \\ \text{Cost Variance} \end{array} = \begin{array}{l} \text{Variable Overhead} \\ \text{Expenditure Variance} \end{array} + \begin{array}{l} \text{Variable Efficiency} \\ \text{Variance} \end{array}$$

Illustration: 6

From the following particulars, compute the Variable Overhead Variances :

	<i>Standard</i>	<i>Actual</i>
Output in Units	2,500 units	2,000 units
Labour Hours	5,000	6,000
Variable Overheads	Rs. 1,000	Rs. 1,500

Solution:

$$\left. \begin{array}{l} \text{Standard Variable} \\ \text{Overhead rate per hour} \end{array} \right\} = \frac{\text{Budgeted Variable Overhead}}{\text{Budgeted Hours}}$$

$$= \frac{1,000}{5,000} = 0.20 \text{ per hour}$$

$$\left. \begin{array}{l} \text{Standard Variable} \\ \text{Overhead rate per} \\ \text{Unit of output} \end{array} \right\} = \frac{\text{Budgeted Variable Overheads}}{\text{Budgeted Output}}$$

$$= \frac{1,000}{2,500} = \text{Rs. } 0.40 \text{ per hour}$$

Calculation of Variances:

$$\begin{aligned} (1) \quad \left. \begin{array}{l} \text{Variable Overhead} \\ \text{Cost Variance} \end{array} \right\} &= \left\{ \begin{array}{l} \text{Actual Variable} \\ \text{Overheads} \end{array} \right\} - \left\{ \begin{array}{l} \text{Standard Variable} \\ \text{Overhead for Actual} \\ \text{Production} \end{array} \right\} \\ &= 1,500 - (2,000 \times 0.40) \\ &= \text{Rs. } 1,500 - \text{Rs. } 800 = \text{Rs. } 700 \text{ (A)} \end{aligned}$$

$$\begin{aligned} (2) \quad \left. \begin{array}{l} \text{Variable Overhead} \\ \text{Expenditure Variance} \end{array} \right\} &= \left\{ \begin{array}{l} \text{Actual Variable} \\ \text{Overheads} \end{array} \right\} - \left\{ \begin{array}{l} \text{Standard Variable} \\ \text{Overhead for Actual} \\ \text{Hours Worked} \end{array} \right\} \\ &= 1,500 - (6,000 \times 0.20) \\ &= \text{Rs. } 1,500 - \text{Rs. } 1,200 = \text{Rs. } 300 \text{ (A)} \end{aligned}$$

$$\begin{aligned} (3) \quad \left. \begin{array}{l} \text{Variable Overhead} \\ \text{Efficiency Variance} \end{array} \right\} &= \left\{ \begin{array}{l} \text{Standard Variable} \\ \text{Overhead for Actual} \\ \text{Hours} \end{array} \right\} - \left\{ \begin{array}{l} \text{Standard Variable} \\ \text{Overhead for Actual} \\ \text{Output} \end{array} \right\} \\ &= (\text{Rs. } 6,000 \times 0.20) - (2,000 \times 0.40) \\ &= \text{Rs. } 1,200 - \text{Rs. } 800 = \text{Rs. } 400 \text{ (A)} \end{aligned}$$

Verification:

$$\left. \begin{array}{l} \text{Variable Overhead} \\ \text{Cost Variance} \end{array} \right\} = \begin{array}{l} \text{Variable Overhead} \\ \text{Expenditure Variance} \end{array} + \begin{array}{l} \text{Variable Overhead} \\ \text{Efficiency Variance} \end{array}$$

$$\text{Rs. 700 (A)} = \text{Rs. 300 (A)} + \text{Rs. 400 (A)}$$

$$\text{Rs. 700 (A)} = \text{Rs. 700 (A)}$$

II. Fixed Overhead Variance

(a) Fixed Overhead Cost Variance: It is that portion of overhead cost variance which is due to over absorption or under absorption of overhead for the actual production. In other words, the variance is the difference between the standard fixed overheads allowed for the actual production and the actual fixed overheads incurred. The variance can be calculated as follows:

$$\text{Fixed Overhead Cost Variance} = \left\{ \begin{array}{l} \text{Actual Fixed} \\ \text{Overhead} \end{array} \right\} - \left\{ \begin{array}{l} \text{Standard Fixed} \\ \text{Overhead for Actual} \\ \text{Production} \end{array} \right\}$$

(or)

$$= \left\{ \begin{array}{l} \text{Standard Fixed} \\ \text{Overhead Rate Per Hour} \end{array} \right\} - \left\{ \begin{array}{l} \text{Actual Fixed} \\ \text{Overheads} \end{array} \right\} \times \text{Actual Output}$$

(b) Fixed Overhead Expenditure Variance: This is otherwise termed as "Budget Variance." It is the difference between the budgeted fixed overheads and the actual fixed overheads incurred during the particular period. The formula for calculation of this Variance is

$$\text{Fixed Overhead Expenditure Variance} = \left\{ \begin{array}{l} \text{Budgeted Fixed} \\ \text{Overheads} \end{array} \right\} - \left\{ \begin{array}{l} \text{Actual Fixed} \\ \text{Overheads} \end{array} \right\}$$

(c) Fixed Overhead Volume Variance: This Variance is the difference between the budgeted fixed overheads and the standard fixed overheads recovered on the actual production. The formula is as follows:

$$\text{Fixed Overhead Volume Variance} = \left\{ \begin{array}{l} \text{Budgeted Fixed} \\ \text{Overheads} \end{array} \right\} - \left\{ \begin{array}{l} \text{Standard Fixed} \\ \text{Overheads on} \\ \text{Actual Production} \end{array} \right\}$$

Note : If budgeted fixed overhead is greater than standard fixed overhead on actual production, the variance is unfavourable and vice versa.

(d) Fixed Overhead Capacity Variance: This is that portion of volume variance which is due to working at higher or lower capacity than the budgeted capacity. In other words, fixed overhead capacity variance arising due to a particular cause, i.e., unexpected holidays, breakdown of machinery, strikes, power failure etc. This is calculated as follows :

$$\left. \begin{array}{l} \text{Fixed Overhead} \\ \text{Capacity Variance} \end{array} \right\} = \left\{ \begin{array}{l} \text{Actual Hours} \\ \text{Worked} \end{array} - \begin{array}{l} \text{Budgeted} \\ \text{Hours} \end{array} \right\} \times \begin{array}{l} \text{Standard Fixed Overhead} \\ \text{Rate Per Hour} \end{array}$$

(or)

$$= \left\{ \begin{array}{l} \text{Standard Fixed} \\ \text{Overheads} \end{array} \right\} - \left\{ \begin{array}{l} \text{Budgeted Fixed} \\ \text{Overheads} \end{array} \right\}$$

(e) **Fixed Overhead Efficiency Variance:** It is that portion of the Volume Variance which shows the lower or higher output arising from the efficiency or inefficiency of the workers. This is an outcome of the performance of the workers and is calculated as :

$$\left. \begin{array}{l} \text{Fixed Overhead} \\ \text{Efficiency Variance} \end{array} \right\} = \text{Standard Fixed Overhead Rate Per Hour} \times \left\{ \begin{array}{l} \text{Standard} \\ \text{Quantity} \end{array} - \begin{array}{l} \text{Actual} \\ \text{Quantity} \end{array} \right\}$$

(f) **Fixed Overhead Calendar Variance:** This is part of Capacity Variance which is due to the difference between the actual number of working days and the budgeted working days. Calendar Variance can be calculated as follows :

$$\left. \begin{array}{l} \text{Fixed Overhead} \\ \text{Calendar Variance} \end{array} \right\} = \text{Standard Rate Per hour / Per day} \times \begin{array}{l} \text{Excess or Deficit hours} \\ \text{or days worked} \end{array}$$

Note : If the actual days worked are more than the budgeted working days, the variance is favourable and vice versa.

Combined Overhead Variances

Analysis of overhead variance can be calculated by combined overhead variances methods. It may be:

- (a) Two Variance Method and
- (b) Three Variance Method

(a) **Two Variance Method :** If the Overhead Variances are analysed on the basis of both expenditure and volume is called as "Two Variance Analysis."

Illustration: 7

From the following particulars calculate Fixed Overhead Variances :

	<i>Standard</i>	<i>Actual</i>
Output in Units	5,000	5,200
Labour Hours	20,000	20,100
Fixed Overhead	Rs. 10,000	Rs. 10,200

Standard time for one unit 4 hours.

Solution:

Standard Hours for Actual Output

For 1 unit standard time 4 hours
 For 5,200 units = 5,200 x 4 = 20,800 hours

Standard Overhead Rate per Hour

For 1 unit 4 hours
 For 5,000 units = 5,000 x 4 = 20,000 hours
 For 20,000 hours Fixed Overhead is Rs. 10,000

$$\text{For 1 hour} = \frac{10,000}{20,000} = \text{Re. } 0.50$$

Standard Overhead Rate per Unit

For 500 units Fixed Overhead is Rs. 10,000

$$\text{For 1 unit} = \frac{10,000}{5,000} = \text{Rs. 2 per unit}$$

(1) Fixed Overhead Cost Variance:

$$\begin{aligned} &= \frac{\text{Standard Hours for}}{\text{Actual Output}} \times \frac{\text{Standard Overhead}}{\text{Rate Per Hour}} - \text{Actual Overhead} \\ &= (20,800 \times \text{Rs. } 0.50) - \text{Rs. } 10,400 \\ &= \text{Rs. } 10,400 - 10,200 = \text{Rs. } 200 \text{ (F)} \end{aligned}$$

(2) Fixed Overhead Expenditure of Budget Variance:

$$\begin{aligned} &= \text{Budgeted Fixed Overhead} - \text{Actual Fixed Overhead} \\ &= \text{Rs. } 10,000 - \text{Rs. } 10,200 = \text{Rs. } 200 \text{ (A)} \end{aligned}$$

(3) Fixed Overhead Volume Variance:

$$\begin{aligned} &= (\text{Budgeted Production} - \text{Actual Production}) \times \text{Standard Overhead Rate Per Unit} \\ &= (\text{Rs. } 5,000 - 5,200) \times 2 = \text{Rs. } 400 \text{ (F)} \end{aligned}$$

(4) Fixed Overhead Efficiency Variance:

$$\begin{aligned} &= \left\{ \begin{array}{l} \text{Standard Hours for} \\ \text{Actual Production} \end{array} - \begin{array}{l} \text{Actual} \\ \text{Hours} \end{array} \right\} \times \text{Standard Overhead Rate Per Hour} \\ &= (20,800 - 10,200) \times \text{Rs. } 0.50 \\ &= \text{Rs. } 350 \text{ (F)} \end{aligned}$$

(5) Fixed Overhead Capacity Variance:

$$\begin{aligned} &= (\text{Budgeted Hours} - \text{Actual Hours}) \times \text{Standard Overhead Rate Per Hour} \\ &= (20,000 - 20,100) \times \text{Rs. } 0.50 = \text{Rs. } 50 \text{ (F)} \end{aligned}$$

Verification:

$$\begin{aligned} (1) \text{ Fixed Overhead Cost Variance} &= \text{Expenditure Variance} + \text{Volume Variance} \\ \text{Rs. } 200 \text{ (F)} &= \text{Rs. } 200 \text{ (A)} + \text{Rs. } 400 \text{ (F)} \\ \text{Rs. } 200 \text{ (F)} &= \text{Rs. } 200 \text{ (F)} \\ (2) \text{ Fixed Overhead Volume Variance} &= \text{Efficiency Variance} + \text{Capacity Variance} \\ \text{Rs. } 400 \text{ (F)} &= \text{Rs. } 350 \text{ (F)} + \text{Rs. } 50 \text{ (F)} \\ \text{Rs. } 400 \text{ (F)} &= \text{Rs. } 400 \text{ (F)} \end{aligned}$$

Illustration: 8

Calculate Overhead Variances from the following information :

	<i>Standard</i>	<i>Actual</i>
Fixed Overheads	Rs. 4,000	Rs. 4,250
Variable Overheads	Rs. 6,000	Rs. 5,600
Output in Units	2,000	1,900

Solution:

$$\begin{aligned} \text{Fixed Overhead Rate Per Unit} &= \frac{\text{Budgeted Fixed Overheads}}{\text{Output in Units}} \\ &= \frac{4,000}{2,000} = \text{Rs. 2} \end{aligned}$$

$$\begin{aligned} \text{Variable Overhead Rate Per Unit} &= \frac{\text{Budgeted Variable Overheads}}{\text{Output in Units}} \\ &= \frac{6,000}{2,000} = \text{Rs. 3} \end{aligned}$$

(1) Variable Overhead Variance:

$$\begin{aligned} &= (\text{Actual Output} \times \text{Standard Variable Overhead Rate}) - \text{Actual Variable Overhead} \\ &= (1,900 \times 3) - 5,600 \\ &= 5,700 - 5,600 = \text{Rs. 100 (F)} \end{aligned}$$

(2) Fixed Overhead Variance:

$$\begin{aligned} &= (\text{Actual Output} \times \text{Standard Fixed Overhead Rate}) - \text{Actual Fixed Overhead} \\ &= (1,900 \times 2) - 4,250 \\ &= 3,800 - 4,250 = \text{Rs. 450 (A)} \end{aligned}$$

(3) Fixed Overhead Volume Variance:

$$\begin{aligned} &= (\text{Actual Output} \times \text{Standard Rate}) - \text{Budgeted Fixed Overheads} \\ &= (1,900 \times 2) - 4,000 \\ &= 3,800 - 4,000 = \text{Rs. 200 (A)} \end{aligned}$$

(4) Fixed Overhead Expenditure Variance:

$$\begin{aligned} &= \text{Budgeted Fixed Overheads} - \text{Actual Fixed Overheads} \\ &= \text{Rs. 4,000} - \text{Rs. 4,250} = \text{Rs. 250 (A)} \end{aligned}$$

Illustration: 9

A Company has normal capacity of 100 machines working 8 hours per day of 25 days in a month. The budgeted fixed overheads of a month are Rs. 1,50,000. The Standard time required to manufacture one unit of product is 4 hours. In a particular month, the company worked for 24 days of 750 machine hours per day and produced 4,500 units of the product. The actual fixed overheads incurred were Rs. 1,45,000. Compute :

- (a) Efficiency Variance
- (b) Capacity Variance
- (c) Calendar Variance
- (d) Expenditure Variance
- (e) Volume Variance
- (f) Total Fixed Overhead Variance

Solution:

Standard Hours Produced :

$$\begin{aligned} \text{Units Produced} &= 4,500 \text{ units} \\ \text{Hours Per Unit} &= 4 \text{ hours} \\ \text{Total Standard Hours} &= 4,500 \times 4 = 18,000 \text{ units} \end{aligned}$$

Calculation of Standard Rate:

$$\begin{aligned} \text{Standard Rate} &= \frac{1,50,000}{100 \times 25 \times 8} \\ &= \frac{1,50,000}{20,000} = \text{Rs. 7.50 per hour} \end{aligned}$$

Actual hours worked 750 x 24 days = 18,000 hours

Budgeted hours in actual days = 24 x 8 x 100 = 19,200 hours

Variance Analysis:

(A) Charged to Production = 18,000 x 7.50 Rs. 1,35,000

(B) Standard Cost of Actual Hours = 18,000 x 7.50 = Rs. 1,35,000

(C) Standard Cost of Budgeted Hours in actual days = 19,200 x 7.50 = Rs. 1,44,000

(D) Budget = Rs. 1,50,000

(E) Actuals = Rs. 1,45,000

(1) Efficiency Variance (A – B)	=	Rs. 1,35,000 – Rs. 1,35,000	= Nil
(2) Capacity Variance (B – C)	=	Rs. 1,35,000 – Rs. 1,44,000	= Rs. 9,000 Adverse
(3) Calendar Variance (C – D)	=	Rs. 1,44,000 – Rs. 1,50,000	= Rs. 6,000 Adverse
(4) Volume Variance (A – D)	=	Rs. 1,35,000 – Rs. 1,50,000	= Rs. 15,000 Adverse
(5) Expense Variance (D – E)	=	Rs. 1,50,000 – Rs. 1,45,000	= Rs. 5,000 Favourable
(6) Total Variances (A – E)	=	Rs. 1,35,000 – Rs. 1,45,000	= Rs. 10,000 Adverse

(B) Sales Variances

The Variances so far analysed are related to the cost of goods sold. Quantum of profit is derived from the difference between the cost and sales revenue. Cost Variances influence the amount of profit favourably or adversely depending upon the cost from materials, labour and overheads. In addition, it is essential to analyse the difference between actual sales and the targeted sales because this difference will have a direct impact on the profit and sales. Therefore the analysis of sales variances is important to study profit variances.

Sales Variances can be calculated by Two methods:

- I. Sales Value Method.
- II. Sales Margin or Profit Method.

I. Sales Value Method

The method of computing sales variance is used to denote variances arising due to change in sales price, sales volume or the sales value. The sales variances may be classified as follows :

- (a) Sales Value Variance
- (b) Sales Price Variance
- (c) Sales Volume Variance
- (d) Sales Mix Variance
- (e) Sales Quantity Variance

(a) Sales Value Variance: This Variance refers to the difference between budgeted sales and actual sales. It may be calculated as follows :

$$\text{Sales Value Variance} = \text{Actual Value of Sales} - \text{Budgeted Value of Sales}$$

Note : If the actual sales is more than the budgeted sales, the variance will be favourable and vice versa.

(b) Sales Price Variance: This is the portion of Sales Value Variance which is due to the difference between standard price of actual quantity and actual price of the actual quantity of sales. The formula is :

$$\text{Sales Price Variance} = \text{Actual Quantity} \times (\text{Standard Price} - \text{Actual Price})$$

Note : If the actual price is more than standard price the variance is favourable and vice versa.

(c) Sales Volume Variance: It is that part of Sales Value Variance which is due to the difference between the actual quantity or volume of sales and budgeted quantity or volume of sales. The variance is calculated as :

$$\text{Sales Volume Variance} = \left\{ \begin{array}{l} \text{Actual Quantity} \\ \text{of Sales} \end{array} - \begin{array}{l} \text{Budgeted Quantity} \\ \text{of Sales} \end{array} \right\} \times \text{Standard Price}$$

Note : If the actual quantity sold is more than the budgeted quantity or volume of sales, the variance is favourable and vice versa.

(d) Sales Mix Variance: It is that portion of Sales Volume Variance which is due to the difference between the standard proportion of sales and the actual composition or mix of quantities sold. In other words it is the difference of standard value of revised mix and standard value of actual mix. It is calculated as :

$$\text{Sales Mix Variance} = \left\{ \begin{array}{l} \text{Standard Value} \\ \text{of Actual Mix} \end{array} - \begin{array}{l} \text{Standard Value of} \\ \text{Revised Standard Mix} \end{array} \right\}$$

(e) Sales Quantity Variance: It is a sub variance of Sales Volume Variance. This is the difference between the revised standard quantity of sales and budgeted sales quantity. The formula for the calculation of this variance is :

$$\text{Sales Quantity Variance} = \left\{ \begin{array}{l} \text{Revised Standard} \\ \text{Sales Quantity} \end{array} - \begin{array}{l} \text{Budgeted Sales} \\ \text{Quantity} \end{array} \right\} \times \text{Standard Selling Price}$$

Note : If the Revised Standard Quantity is greater than the standard quantity, the variance is favourable and vice versa.

Illustration: 10

From the following information is given about standard and actual sales. You are required to calculate Sales Variances.

	<i>Standard Qty. Units</i>	<i>Sales Price</i>	<i>Actual Qty. Units</i>	<i>Sales Price</i>
X	250	2.50	250	2.50
Y	200	3	300	3.25
Z	150	3.50	200	3.75
	<u>600</u>		<u>750</u>	

Solution:**(1) Sales Value Variance :**

	=	Actual Value of Sales – Standard Value of Sales
X	=	(250 x 2.50) – (250 x 2.50)
	=	Rs. 625 – Rs. 625 = Nil
Y	=	(300 x 3.25) – (200 x 3)
	=	Rs. 975 – Rs. 600 = Rs. 375 (F)
Z	=	(200 x 3.75) – (150 x 3.50)
	=	Rs. 750 – Rs. 525 = Rs. 225 (F)
Total Sales Value Variance	=	Rs. 375 (F) + Rs. 225 (F) = Rs. 600 (F)

(2) Sales Price Variance :

	=	Actual Quantity Sold x (Actual Price – Standard Price)
X	=	250 (2.50 – 2.50) = Nil
Y	=	300 (3.25 – 3) = Rs. 75 (F)
Z	=	200 (3.75 – 3.50) = Rs. 50 (F)
Total Sales Price Variance	=	Rs. 75 (F) + Rs. 50 (F) = Rs. 125 (F)

(3) Sales Quantity Variance :

	=	Standard Price x (Actual Quantity – Standard Quantity)
X	=	2.50 (250 – 250) = Nil
Y	=	3 (300 – 200) = Rs. 300 (F)
Z	=	3.50 (200 – 150) = Rs. 175 (F)
Total Sales Quantity Variance	=	Rs. 300 (F) + Rs. 175 (F) = Rs. 475 (F)

(4) Sales Mix Variance :

There is a difference between standard quantity and actual quantity so the standard will be revised in proportion to actual quantity of sales.

$$X = \frac{250}{600} \times 750 = 312.50$$

$$Y = \frac{200}{600} \times 750 = 250$$

$$Z = \frac{150}{600} \times 750 = 187.50$$

Sales Mix Variance = Standard Value of Actual Mix – Standard Value of Revised Standard Mix

Standard Value of Actual Mix

X	=	250 x 2.50 = 625
Y	=	200 x 3 = 600
Z	=	150 x 3.50 = 525
		Rs. 1750

Standard Value of Revised Standard Mix

X	=	312.50 x 2.50 = 781.25
Y	=	250 x 3 = 750.00
Z	=	187.50 x 3.50 = 656.25
		Rs. 2187.50

Sales Mix Variance = Rs. 1750 – Rs. 2187.50 = Rs. 437.50 (A)

II. Sales Margin or Profit Method

Under this method of variance analysis, variances may be computed to show the effect on profit. The sales variance according to this method can be classified as follows :

- (1) Sales Margin Value Variance
- (2) Sales Margin Volume or Quantity Variance
- (3) Sales Margin Price Variance
- (4) Sales Margin Mix Variance

(1) **Sales Margin Value Variance:** This is the difference between the actual value of sales margin and budgeted value of sales margin. It is calculated as follows :

Sales Margin Value Variance = Budgeted Profit – Actual Profit

$$= \left\{ \begin{array}{l} \text{Budget Sales} \\ \text{Quantity} \end{array} \times \begin{array}{l} \text{Budgeted} \\ \text{Profit per unit} \end{array} \right\} - \left\{ \begin{array}{l} \text{Actual} \\ \text{Quantity Sold} \end{array} \times \begin{array}{l} \text{Actual} \\ \text{Profit Per unit} \end{array} \right\}$$

Note : If the actual profit is more than budgeted profit the variance is favourable and vice versa.

(2) **Sales Margin Volume Variance:** It is that portion of Total Sales Margin Variance which is due to the difference between budgeted and actual quantity sold. The formula is as follows :

$$\text{Sales Margin Volume Variance} = \left\{ \begin{array}{l} \text{Standard} \\ \text{Quantity} \end{array} - \begin{array}{l} \text{Actual} \\ \text{Quantity} \end{array} \right\} \times \text{Standard Profit}$$

Note : If the actual quantity is more than standard quantity, the variance is favourable and vice versa.

(3) **Sales Margin Price Variance:** This variance is the difference between the standard price of the quantity of the sales effected and the actual price of those sales. It is calculated as follows :

Sales Margin Price Variance = Standard Profit – Actual Profit

$$= \left\{ \begin{array}{l} \text{Budgeted Profit} \\ \text{Per Unit} \end{array} - \begin{array}{l} \text{Actual Profit} \\ \text{Per Unit} \end{array} \right\} \times \text{Actual Quantity Sold}$$

Note : If the actual profit is greater than the standard profit, the variance is favourable and vice versa.

(4) **Sales Margin Mix Variance** : This is that portion of the Sales Margin Volume or Quantity Variance which is due to the difference between the actual and budgeted quantities of each product of which the sales mixture is composed valuing the difference of quantities at standard margin. Thus, this variance arises only where more than one product is sold. It is calculated as follows:

$$\text{Sales Margin Mix Variance} = \left\{ \begin{array}{l} \text{Revised Standard} \\ \text{Quantity} \end{array} - \begin{array}{l} \text{Actual} \\ \text{Quantity} \end{array} \right\} \times \begin{array}{l} \text{Standard Profit} \\ \text{Per Unit} \end{array}$$

Note : If the actual quantity is greater than the revised standard quantity, the variance is favourable and vice versa.

Illustration: 11

From the following details, calculate Sales Margin Variances:

Product	Budgeted		Actual	
	Quantity Units	Sales Price	Quantity Units	Sales Price
Product X	300	46	400	50
Product Y	500	28	450	26

The cost per unit of product X and Y was Rs. 45 and Rs. 20 respectively.

Solution:

(1) Total Sales Margin Value Variance:

$$= \text{Actual Profit} - \text{Budgeted Profit}$$

(or)

$$= \left\{ \begin{array}{l} \text{Actual} \\ \text{Quantity} \end{array} \times \begin{array}{l} \text{Actual Profit} \\ \text{Per Unit} \end{array} \right\} - \left\{ \begin{array}{l} \text{Budgeted} \\ \text{Quantity} \end{array} \times \begin{array}{l} \text{Budgeted} \\ \text{Profit per Unit} \end{array} \right\}$$

Actual Profit Per Unit	=	Actual Sales Price – Actual Cost
Product X	=	50 – 45 = Rs. 5
Product Y	=	26 – 20 = Rs. 6
Budgeted Profit Per Unit	=	Budgeted Sales Price – Actual Cost
Product X	=	46 – 45 = Re. 1
Product Y	=	28 – 20 = Rs. 8
Actual Profit	=	Actual Quantity x Actual Profit Per Unit
Product X	=	400 x Rs. 5 = Rs. 2,000
Product Y	=	450 x Rs. 6 = Rs. 2,700
		Actual Profit = Rs. 4,700
Budgeted Profit	=	Budgeted Quantity x Budgeted Profit Per Unit
Product X	=	300 x Re. 1 = Rs. 300
Product Y	=	500 x Rs. 8 = Rs. 4,000
		Budgeted Profit = Rs. 4,300
Sales Margin Value Variance	=	Rs. 4,700 – Rs. 4,300
	=	Rs. 400 (F)

(2) Sales Margin Price Variance :

$$= (\text{Actual Price} - \text{Standard Price}) \times \text{Actual Quantity}$$

Product X = (50 – 46) x 400
= 4 x 400 = Rs. 1600 (F)

$$\begin{aligned}
 \text{Product Y} &= (26 - 28) \times 450 \\
 &= 2 \times 450 = \text{Rs. } 900 \text{ (A)} \\
 \text{Sales Margin Price Variance} &= \text{Rs. } 1600 \text{ (F)} + \text{Rs. } 900 \text{ (A)} \\
 &= \text{Rs. } 700 \text{ (F)}
 \end{aligned}$$

(3) Sales Margin Volume Variance :

$$\begin{aligned}
 &= (\text{Actual Quantity} - \text{Standard Quantity}) \times \text{Standard Profit Per Unit} \\
 \text{Product X} &= (400 - 300) \times \text{Rs. } 1 \\
 &= 100 \times \text{Rs. } 1 = \text{Rs. } 100 \text{ (F)} \\
 \text{Product Y} &= (450 - 500) \times \text{Rs. } 8 \\
 &= 50 \times \text{Rs. } 8 = \text{Rs. } 400 \text{ (A)} \\
 \text{Sales Margin Volume Variance} &= \text{Rs. } 100 \text{ (F)} + \text{Rs. } 400 \text{ (A)} \\
 &= \text{Rs. } 300 \text{ (A)}
 \end{aligned}$$

Verification :

$$\begin{aligned}
 \text{Total Sales Margin Value Variance} &= \text{Sales Margin Price Variance} \\
 &+ \text{Sales Margin Volume Variance} \\
 \text{Rs. } 400 \text{ (F)} &= \text{Rs. } 700 \text{ (F)} + \text{Rs. } 300 \text{ (A)} \\
 \text{Rs. } 400 \text{ (F)} &= \text{Rs. } 400 \text{ (F)}
 \end{aligned}$$

Illustration: 12

The budgeted production of a company is 20,000 Units per month. The Standard Cost Sheet is as under :

Direct Materials	1.5 kg @ Rs.6 per kg
Direct Labour	6 hours @ Rs.5 per hour
Variable Overheads	6 hours @ Rs.4 per hour
Fixed Overheads	Rs. 3 per unit
Selling Price	Rs. 72 per unit

The following are the actual details for the month:

- (1) Actual production and sales 18,750 units
- (2) Direct materials consumed 29,860 kg. at Rs. 5.25 per kg.
- (3) Direct labour hours worked 1,18,125 hours at Rs. 6 per hour
- (4) Actual overheads were Rs. 5,25,000 out of which a sum of Rs. 40,000 was fixed
- (5) There is no change in the selling price.

Calculate:

- (i) Direct Materials Usage and Price Variances
- (ii) Direct Labour Efficiency and Rate Variances
- (iii) Variance Overheads Efficiency and Expense Variances
- (iv) Fixed Overhead Volume and Expense Variances
- (v) Sales Volume Variance and Gross Margin.

Solution:

Actual Output = 18,750 units

Direct Materials:

Standard Requirements	= 18,750 units x 1.5 kg.
	= 28,125 kgs.
Standard Quantity (SQ)	= 28,125 Kgs.
Actual Quantity (AQ)	= 29,860 kgs.
Standard Price (SP)	= Rs. 6 per kg.
Actual Price (AP)	= Rs. 5.25 per kg.
SQ x SP	= 28,125 x Rs. 6 = Rs. 1,68,750
AQ x SP	= 29,860 x Rs. 6 = Rs. 1,79,160
AQ x AP	= 29,860 x Rs. 5.25 = Rs. 1,56,765

Calculation of Material Variances :

(1) Material Usage Variance	= (SQ x SP) – (AQ x SP)
	= Rs. 1,68,750 – Rs. 1,79,160
	= Rs. 10,410 Adverse
(2) Material Price Variance	= (AQ x SP) – (AQ x AP)
	= Rs. 1,79,160 – Rs. 1,56,765
	= Rs. 22,395 Favourable

Direct Labour:

Standard Hours Produced 18750 x 6	= 1,12,500 hours
Standard Hours (SH)	= 1,12,500 hours
Actual Hours (AH)	= 1,18,125 hours
Standard Rate	= Rs.5
Actual Rate	= Rs.6
SH x SR	= 1,12,500 x 5 = Rs. 5,62,500
AH x SR	= 1,18,125 x 5 = Rs. 5,90,625
AH x AR	= 1,18,125 x 6 = Rs. 7,08,750

Calculation of Labour Variances:

(1) Labour Efficiency Variance	= (SH x SR) – (AH x SR)
	= Rs. 5,62,500 – Rs. 5,90,625
	= Rs. 28,125 Adverse
(2) Labour Rate Variance	= (AH x SR) – (AH x AR)
	= Rs. 5,90,625 – Rs. 7,08,750
	= Rs. 1,18,125 Adverse

Variable Overheads:

A. Charged to Production	= 1,12,500 hours x Rs. 4
	= Rs. 4,50,000
B. Standard Cost of Actual Hours	= 1,18,125 hours x Rs. 4
	= Rs. 4,72,500
C. Actuals	= Rs. 5,25,000

Calculation of Overhead Variance:

(1) Efficiency Variance (A – B)	= 4,50,000 – 4,72,500
	= Rs. 22,500 Adverse.
(2) Expenses Variance (B – C)	= Rs. 4,72,500 – Rs. 5,25,000
	= Rs. 52,500 Adverse

Fixed Overheads:

Standard Rate	$\frac{3}{6}$	=	Re. 0.50
A. Charged to Production		=	1,12,500 hours x Re. 0.50 = Rs. 56,250
B. Budget		=	20,000 hours x Rs. 3 = Rs. 60,000
C. Actuals		=	Rs. 40,000

Calculation of Fixed Overhead Variances:

(1) Volume Variance (A – B)	=	Rs. 56,250 – Rs. 60,000
	=	Rs. 3,750 Adverse
(2) Expenses Variance (B – C)	=	Rs. 60,000 – Rs. 40,000
	=	Rs. 20,000 Favourable

Sales:

Standard Quantity (SQ)	=	20,000 units
Actual Quantity (AQ)	=	18,750 units
Standard Price (SP)	=	Rs. 72
SQ x SP	=	20,000 x 72 = Rs. 14,40,000
AQ x SP	=	18,750 x 72 = Rs. 13,50,000

Calculation:

Sales Volume Variance	=	(SQ x SP) – (AQ x SP)
	=	Rs. 14,40,000 – Rs. 13,50,000
	=	Rs. 90,000 Adverse

Total Standard Cost:

Direct Material	=	Rs. 9 (1.5 kg x Rs. 6)
Direct Labour	=	Rs. 30 (6hrs x Rs. 5)
Variable Overhead	=	Rs. 24 (6 hrs x Rs. 4)
Fixed Overhead	=	Rs. 3
		Rs. 66
Standard Gross Margin (SGM)	=	Rs. 72 – Rs. 66 = Rs. 6
Standard Quantity (SQ)	=	20,000 units
Actual Quantity (AQ)	=	18,750 units
Standard Gross Margin (SGM)	=	Rs. 6
SQ x SGM	=	Rs. 1,20,000
AQ x SGM	=	Rs. 1,12,500

Calculation of GM Sales Volume Variance:

GM Sales Volume Variance	=	(SQ x SGM) – AQ x SGM)
	=	Rs. 1,20,000 – Rs. 1,12,500 = Rs. 7,500 Adverse.

Illustration: 13

A Company produces a finished product by using three basic raw materials. The following standards have been set up for raw materials :

Material	Standard Mix in Percentages	Standard Price per kg. in Rs.
A	25	4
B	35	3
C	40	2

The standard loss in process is 20% of input. During a particular month, the company produced 2,400 kgs of finished product. The details of stock and purchases for the month are as under :

Materials	Opening Stock	Closing Stock (Kgs)	Purchases during the month	
			Qty in Kgs.	Cost in Rs.
A	200	350	800	3,600
B	150	200	1,000	3,500
C	300	200	1,100	1,980

The opening stock is valued at standard cost. Compute :

(1) Material Price and Material Cost Variances, When :

- (a) Variance is calculated at the point of issue of First In – First Out basis (FIFO).
 - (b) Variance is calculated at the point of issue of Last In – First Out basis (LIFO).
- (ii) Material Usage Variance
 - (iii) Material Mix Variance
 - (iii) Material Yield Variance

Solution:

Standard Price at Standard Mix for output of 80 kg (100 kgs – 20% loss, i.e., 20 kgs)

Material	%	Qty (kgs)	Std. Price (Rs.)	Amount (Rs.)
A	25	25	4	100
B	35	35	3	105
C	40	40	2	80
		100	-	-
Standard Loss		20	-	-
		80		285

Actual Consumption : Opening Stock + Purchase – Closing Stock

For A in kgs	200 + 800 – 350	=	650
B	150 + 1,000 – 200	=	950
C	300 + 1,100 – 200	=	1,200
			2,800
		Output	2,400
		Loss	400

(1) Material Price Variance at the Point of Issue :

$$MPV = AQ (SP - AP)$$

(a) When FIFO Method is used:

A	=	issued from opening stock 200kg @ Rs.4 (no variance) + balance 450 kgs	
(Rs. 4 – 4.50)			
A	=	650 – 425	= Rs. 225 Adverse
B	=	150 (Rs. 3 – 3) + 800 (Rs. 3 – 3.50)	= Rs. 400 Adverse
C	=	300 (Rs. 2 – 2) + 900 (Rs. 2 – 1.80)	= Rs. 180 Favourable
			Rs. 445 Adverse

(b) When LIFO Method is used :

A	=	650 (Rs.4 – 4.50)	=	Rs. 325 (A)
B	=	950 (Rs.3 – 3.50)	=	Rs. 475 (A)
C	=	1,100 (Rs.2 – 1.80) + 100 (2 – 2)	=	Rs. 220 (F)
				Rs. 580 (A)

(i) Material Cost Variance at the Point of Issue :

$$\text{MCV} = (\text{TSC} - \text{TAC})$$

Material Cost Variance = Total Std. Cost – Total Actual Cost

Total Std. Quantity for Actual Output (TSC)

$$= \frac{285}{80} \times 2,400 = \text{Rs. } 8,550$$

(a) Total Actual Quantity (TAC) :

$$\text{A } (200 \times 4) + 3,600 - (350 \times 4.5) = \text{Rs. } 2,825$$

$$\text{B } (150 \times 3) + 3,500 - (200 \times 3.5) = \text{Rs. } 3,250$$

$$\text{C } (300 \times 2) + 1,980 - (200 \times 1.8) = \text{Rs. } 2,220$$

$$\text{Total Actual Quantity} = \underline{\text{Rs. } 8,295}$$

$$\text{Material Cost Variance} = \text{Rs. } 8,550 - \text{Rs. } 8,295 = \text{Rs. } 255 \text{ (F)}$$

(b) When LIFO Method is used :

$$\text{TAC} = \text{A Rs. } (200 \times 4) + 3,600 - [(150 \times 4.5) + (200 \times 4)] = \text{Rs. } 2,925$$

$$\text{B Rs. } (150 \times 3) + 3,500 - (50 \times 3.5 + 150 \times 3) = \text{Rs. } 3,325$$

$$\text{C Rs. } (300 \times 2) + 1,980 - (200 \times 2) = \text{Rs. } 2,180$$

$$\text{Total Actual Cost} = \underline{\text{Rs. } 8,430}$$

$$\text{MAC} = \text{Rs. } 8,550 - \text{Rs. } 8,430 = \text{Rs. } 120 \text{ (F)}$$

(ii) Material Usage Variance (MUV)

Calculation of standard quantity for actual output

$$\text{A} = \frac{25}{80} \times 2,400 = 750 \text{ kgs}$$

$$\text{B} = \frac{35}{80} \times 2,400 = 1,050 \text{ kgs}$$

$$\text{C} = \frac{40}{80} \times 2,400 = 1,200 \text{ kgs}$$

$$\text{MUV} = \text{SP} (\text{SQ} - \text{AQ})$$

$$\text{A} = 4 (750 - 650) = \text{Rs. } 400 \text{ (F)}$$

$$\text{B} = 3 (1,050 - 950) = \text{Rs. } 300 \text{ (F)}$$

$$\text{C} = 2 (1,200 - 1,200) = \text{Nil}$$

$$\underline{\text{Rs. } 700 \text{ (F)}}$$

(iii) Material Mix Variance (MMV) = SP (RSQ – AQ)

Calculation of Revised Standard Quantity

$$\text{A} = \frac{25}{100} \times 2,800 = 700 \text{ kgs}$$

$$\text{B} = \frac{35}{100} \times 2,800 = 980 \text{ kgs}$$

$$\text{C} = \frac{40}{100} \times 2,800 = 1,120 \text{ kgs}$$

MMV	=	A	=	4 (700 – 650)	=	200 (F)
		B	=	3 (980 – 950)	=	90 (F)
		C	=	2 (1,120 – 1,200)	=	160 (A)
						<u>Rs. 130 (F)</u>

$$(iv) \text{ Material Yield Variance} = \text{Standard Rate (Actual Yield – Standard Yield)}$$

$$= \text{MYV} = \text{SC per unit (AY – SY)}$$

$$\frac{285}{80} (2,400 – 2,240) = \text{Rs. 570 (F)}$$

Where :

$$\text{SY} = \frac{80}{100} \times 2,800 = 2,240 \text{ kgs}$$

Verification :

$$\text{MMV} + \text{MYV} = \text{MUV}$$

$$\text{Rs. 130 (F)} + \text{Rs. 570 (F)} = \text{Rs. 700 (F)}$$

Flexible Budget and Standard Costing

Budgets are prepared for different functions of business such as production, sales etc. Actuals results are compared with the budgets and control is exercised. However, fixed budgets are not suited for cost control because all costs are related to one level of activity. Flexible budgets are prepared in order to overcome the limitations, they are recast on the basis of volume of activity. Flexible budgets is as an effective tool for cost control because costs are analysed by behaviour and variable costs are allowed as per activity attained. Although budgetary control is concerned with origin of expenditure at functional levels, in practice flexible budgets are well suited with standard costing. Accordingly when flexible budgetary control operates with standard costing fixed expenses, variable expenses and semi variable expenses are computed either on the basis of ratio method or variance method for different levels of activity.

Illustration: 14

The Managing Director of your company has been given the following statement showing the results for August 2003 :

	<i>Master Budget</i>	<i>Actual</i>	<i>Variance</i>
<i>Units Produced and Sold</i>	<u>10,000</u>	<u>9,000</u>	<u>(1,000)</u>
	Rs.	Rs.	Rs.
<i>Sales</i>	<u>40,000</u>	<u>3,50,000</u>	<u>(5,000)</u>
	Rs.	Rs.	Rs.
Direct Material	10,000	9,200	800
Direct Wages	15,000	13,100	1,900
Variance Overheads	5,000	4,700	300
Fixed Overhead	<u>5,000</u>	<u>4,900</u>	<u>100</u>
Total Cost	<u>35,000</u>	<u>31,900</u>	<u>3,100</u>
Net Profit	<u>5,000</u>	<u>3,100</u>	<u>(1,900)</u>

Figures in parentheses indicate adverse variances.

The Standard Costs of the product are as follows :

	<i>Per unit Rs.</i>
Direct Material (1kg @ Re.1 Per kg)	1.00
Direct Wages (1 hour @ Re.1.50)	1.50
Variable Overhead (1 hour @ Re.0.50)	0.50

Actual results for the month showed that 9,800 kgs of material were used and 8,800 labour hours were recorded.

Required :

- (a) Prepare a flexible budget for the month and compare with actual results and
- (b) Calculate the variances which have arisen.

Solution:

Statement Showing Flexible Budget and its Comparison with Actual

<i>Particulars</i>	<i>Master Budget For 10,000 Units Rs.</i>	<i>Flexible Budget (at Standard Cost)</i>		<i>Actual for 9,000 units Rs.</i>	<i>Variance Rs.</i>
		<i>Per unit Rs.</i>	<i>For 9,000 Units Rs.</i>		
Sales (A)	40,000	4	36,000	35,000	1,000 (A)
Direct Materials	10,000	1	9,000	9,200	200 (A)
Direct Wages	15,000	1.50	13,500	13,100	400 (F)
Variable Overhead	5,000	0.50	4,500	4,700	200 (A)
Total Variable Cost (B)	30,000	3	27,000	27,000	-
Contribution (A) – (B)	10,000	1	9,000	8,000	1,000 (A)
Less : Fixed Cost	5,000	0.50	5,000	4,900	100 (F)
Net Profit	5,000	0.50	4,000	3,100	900 (A)

Calculation of Variances:

- | | | |
|--|---------------------------|-----------------|
| (1) Material Cost Variance | = Rs. 9,000 – Rs. 9,200 | = Rs. 200 (A) |
| (2) Material Usage Variance | = Rs. 9,000 – Rs. 9,800 | = Rs. 800 (A) |
| (3) Material Price Variance | = Rs. 9,800 – Rs. 9,200 | = Rs. 600 (F) |
| (4) Labour Cost Variance | = Rs. 13,500 – Rs. 13,100 | = Rs. 400 (F) |
| (5) Labour Efficiency Variance | = Rs. 13,500 – Rs. 13,200 | = Rs. 300 (F) |
| (6) Labour Rate Variance | = Rs. 13,200 – Rs. 13,100 | = Rs. 100 (F) |
| (7) Fixed Overhead Expenditure Variance | = Rs. 5,000 – Rs. 4,900 | = Rs. 100 (F) |
| (8) Variable Overhead Efficiency Variance | = Rs. 4,500 – Rs. 4,400 | = Rs. 100 (F) |
| (9) Variable Overhead Expenditure Variance | = Rs. 4,400 – Rs. 4,700 | = Rs. 300 (A) |
| (10) Total Variable Overhead Variance | = Rs. 4,700 – Rs. 4,500 | = Rs. 200 (A) |
| (11) Sales Margin Value Variance | = Rs. 5,000 – Rs. 3,500 | = Rs. 1,500 (A) |
| (12) Sales Margin Volume Variance | = Rs. 5,000 – Rs. 4,500 | = Rs. 500 (A) |
| (13) Sales Margin Price Variance | = Rs. 4,500 – Rs. 3,500 | = Rs. 1,000 (A) |

Note : If Fixed Overhead is changed proportionately on volume basis in the Flexible Budget, then Fixed Overhead at level 9,000 units would be shown as Rs. 4,500 in the budget. In that case the total variance would become Rs. 400 (A). The break up of the Same would be :

(1) Fixed Overhead Efficiency Variance	= Rs. 4,500 – Rs. 4,400 =	Rs. 100 (F)
(2) Fixed Overhead Capacity Variance	= Rs. 4,400 – Rs. 5,000 =	Rs. 600 (A)
(3) Fixed Overhead Expenditure Variance	= Rs. 5,000 – Rs. 4,900 =	Rs. 100 (F)
		<u>Rs. 400 (A)</u>

Illustration: 15

P Q R Ltd. uses a comprehensive budgeting process and compares actual results to the budgeted amount on a monthly basis. The production is upset about the result of October 2003 that are shown below. He has implemented several cost cutting measures in the manufacturing area and is discouraged by Adverse Variance in Variable Costs.

Operating Results for the month of October, 2003

<i>Particulars</i>	<i>Master Budget</i>	<i>Actual</i>	<i>Variance</i>
Units Sold	7,500	7,200	300 (A)
Revenues	Rs. 18,00,000	Rs. 17,28,000	Rs. 72,000 (A)
Variable Costs	Rs. 11,40,000	Rs. 11,70,000	Rs. 30,000 (A)
Contribution Margin	Rs. 6,60,000	Rs. 5,58,000	Rs. 1,02,000 (A)
Fixed Overheads	2,70,000	2,70,000	-
Fixed General and Administration Overheads	1,80,000	1,72,500	7,500 (F)
Operating Income	Rs. 2,10,000	Rs. 1,15,500	Rs. 94,500 (A)

When master budget was being prepared, the Cost Accountant supplied the following unit costs data:

	<i>Rs.</i>
Direct Material	60
Direct Labour	44
Variable Overheads	36
Variable Selling Overheads	12

The total variable costs for the month of October, 2003 of Rs. 11,70,000 are comprised of :

	<i>Rs.</i>
Direct Materials	4,80,000
Direct Labour	2,88,000
Variable Overheads	2,64,000
Variable Selling Overheads	1,38,000

The Cost Accountant believes that monthly report would be more meaningful to everyone, if the company adopts flexible budgeting and prepares more detailed analysis.

Required :

Determine the flexible budget variances.

Solution:**Master Budget**

Particulars	Based on Output (Actual 7,200 Units)		Actual		Variance
	Per unit	Amount (Rs.)	Per unit	Amount (Rs.)	
Revenue (A)	Rs. 240	Rs. 17,28,000	Rs. 240	Rs. 17,28,000	Nil
Variable Cost :					
Direct Material	60	4,32,000	66.67	4,80,000	48,000 (A)
Direct Labour	44	3,16,800	40	2,88,000	28,800 (F)
Variable Overheads	36	2,59,200	36.67	2,64,000	4,800 (A)
Variable Selling Overheads	12	86,400	19.16	1,38,000	51,600 (A)
Total Variable Cost (B)	152	10,94,400	162.50	11,70,000	75,600 (A)
Contribution (A – B)	88	6,33,600	77.50	5,58,000	75,600 (A)
Fixed Costs :					
Fixed Overheads		2,70,000		2,70,000	Nil
Fixed Gen. & Admn. Overheads		1,80,000		1,72,500	7,500 (F)
Total Fixed Cost (C)		4,50,000		4,42,500	
Operating Profit (Contribution–Fixed Cost)		1,83,600		1,15,500	68,100 (A)

VARIANCE ANALYSIS

Summary of Formulas

Variances	Formulas
I. Material Variances	
(1) Material Cost Variance (MCV)	= (Standard Quantity x Standard Price) - (Actual Quantity x Actual Price) (or) = (SQ x SP) - (AQ x AP)
(2) Material Price Variance (MPV)	= Actual Quantity x (Standard Price - Actual Price) (or) = AQ (SP - AP)
(3) Material Usage Variance (MUV)	= Standard Price (Standard Quantity - Actual Quantity) (or) = SP (SQ - AQ)
(4) Material Mix Variance (MMV)	= Standard Price (Standard Quantity - Actual Quantity) (or) = SP (SQ - AQ)
(a) Revised Standard Quantity (RSQ)	= Standard Unit Cost (Revised Standard Quantity - Actual Quantity) (or) = SP (RSQ - AQ)
(b) Revised Material Usage Variance	= $\left\{ \frac{\text{Total Weight of Actual Mix}}{\text{Total Weight of Standard Mix}} \times \text{Standard Cost of Standard Mix} \right\} - [\text{Standard Cost of Actual Mix}]$
(5) Materials Yield Variance (MYV)	= Standard Rate (Actual Yield - Standard Yield)
Standard Rate	= $\frac{\text{Standard Cost of Standard Mix}}{\text{Net Standard Output}}$

Verification

- | | |
|-----------------------------|---|
| (1) Material Cost Variance | = Material Price Variance + Material Usage Variance |
| (2) Material Usage Variance | = Material Mix Variance + Material Yield Variance |
| (3) Material Cost Variance | = Material Mix Variance + Material Price Variance + Material Yield Variance |

II. Labour Variances

- | | |
|---|--|
| (1) Labour Cost Variance (LCV) | = (Standard Cost of Labour - Actual Cost of Labour)*
(or) (Standard Rate x Standard Time for Actual Output) - (Actual Rate x Actual Time) |
| (2) Labour Rate Variance (LRV) | = Actual Time Standard Rate - Actual Rate |
| (3) Labour Efficiency Variance | = Standard Rate Standard Time - Actual Time |
| (4) Labour Idle Time Variance | = Idle Hours x Standard Rate |
| (5) Labour Mix Variance (LMV) | |
| (a) When Standard & Actual Time of the Labour Mix are same | } = Standard Cost of Standard Labour Mix - Standard Cost of Actual Labour Mix |
| (b) When Standard & Actual Time of Labour Mix are different | |
| | } = Standard Rate Revised Standard Time - Actual Time |

<i>Variances</i>	<i>Formulas</i>
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Revised Standard Time	=	$\frac{\text{Total Actual Time}}{\text{Total Standard Time}}$	x	Actual Time
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Verification

Total Labour Cost Variance	=	Labour Rate Variance + Labour Efficiency Variance
Total Labour Efficiency Variance	=	Labour Efficiency Variance + Labour Idle Time Variance

III. Overhead Variances

Essentials of Certain Terms :

- | | | | |
|--|---|---|----------------|
| (1) Standard Overhead Rate per unit | = | $\frac{\text{Budgeted Overheads}}{\text{Budgeted Output}}$ | |
| (2) Standard Overhead Rate per hour | = | $\frac{\text{Budgeted Overheads}}{\text{Budgeted Hours}}$ | |
| (3) Standard Output for Actual Time | = | $\frac{\text{Budgeted Output}}{\text{Budgeted Hours}}$ | x Actual Hours |
| (4) When Output is measured in Standard Hours: | | | |
| Recorded Overheads | = | Standard Rate Per Hour x Standard Hours for Actual Output | |
| When Output is measured in units : | | | |
| Absorbed Overhead | = | Standard Rate Per Unit x Actual Output in Units | |
| (5) Budgeted Overhead | = | Standard Rate Per Unit x Budgeted Output in Units (or) = Standard Rate Per Hour x Budgeted Hours | |
| (6) Actual Overhead | = | Actual Rate Per Unit x Actual Output in Units (or) = Actual Rate Per Hour x Actual Hours | |
| (7) Standard Overhead | = | Standard Rate Per Unit x Standard Output for Actual Time (or) = Standard Rate Per Hour x Actual Hours | |

Overhead Variances

Overhead Cost Variance	=	(Actual Output x Standard Overhead Rate per Unit)-Actual Overhead Cost (or) = Standard hours for Actual Output x [Standard Overhead Rate Per Hour-Actual Overhead Cost]
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(A) Variable Overhead Variances :

(1) Variable Overhead Cost Variance	=	Standard Variable Overhead for Actual Output-Actual Variable Overhead
-------------------------------------	---	---

<i>Variations</i>	<i>Formulas</i>
(2) Variable Overhead Expenditure Variance	} = Actual Time (Standard Variable Overhead Rate per Hour - Actual Variable Overhead Rate per Hour) (or) = Standard Variable Overheads - Actual Variable Overheads
(3) Variable Overhead Efficiency Variance	
	= Standard Rate per Hour x (Standard Hours for Actual Production - Actual Hours)

(B) Fixed Overhead Variances

- (1) Fixed Overhead Cost Variance : = Actual Fixed Overhead - Standard Fixed Overhead for Actual Production
(or) = Actual Output Standard Fixed Overhead Rate per Hour - Actual Fixed Overheads
- (2) Fixed Overhead Expenditure Variance (or) Budget Variance } = (Budgeted Fixed Overheads) - (Actual Fixed Overheads)
- (3) Fixed Overhead Volume Variance = Budgeted Fixed Overheads - Standard Fixed Overheads on Actual Production
- (4) Fixed Overhead Capacity Variance = Standard Fixed Overheads - Budgeted Fixed Overheads
(or) = Standard Fixed Overhead Rate per Hour x (Actual Hours Worked - Budgeted Hours)
- (5) Fixed Overhead Efficiency Variance } = Standard Fixed Overhead Rate per Hour x (Standard Quantity - Actual Quantity)
- (6) Fixed Overhead Calendar Variance = Standard Rate per Hour / per Day x Excess or Deficit Hours or Days Worked

IV. Sales Variances**(A) Sales Value Method Variances**

- (1) Sales Value Variance = Actual Value of Sales - Budgeted Value of Sales
- (2) Sales Price Variance = Actual Quantity x (Standard Price - Actual Price)
- (3) Sales Volume Variance = Standard Price Actual Quantity of Sales - Budgeted Quantity of Sales
- (4) Sales Mix Variance = (Standard Value of Actual Mix) - (Standard Value of Revised Standard Mix)
- (5) Sales Quantity Variance = Standard Selling Price Revised Standard Sales Quantity - Budgeted Sales Quantity

(B) Sales Margin or profit Method of Variances :

- (1) Sales Margin Value Variance = Budgeted Profit - Actual Profit (or)
(Budgeted Sales Quantity x Budgeted Profit Per Unit) - (Actual Quantity Sold x Actual Profit per Unit)
- (2) Sales Margin Volume Variance = Standard Profit x (Standard Quantity - Actual Quantity)
- (3) Sales Margin Price Variance = Standard Profit - Actual Profit (Or)
Actual Quantity Sold Budgeted per Unit - Actual Profit per Unit
- (4) Sales Margin Mix Variance = Standard Profit per Unit Revised standard Quantity - Actual Quantity)

QUESTIONS

1. Define Standard Costing.
2. What do you understand by Standard Cost and Standard Costing?
3. What are the differences between Standard Costing and Estimated Costing?
4. Briefly explain and compare and contrast between Standard Costing and Budgetary Control.
5. What are the advantages of Standard Costing?
6. Discuss the preliminary steps for determination of Standard Cost.
7. Explain the limitations of Standard Costing.
8. Explain the different types of Standards.
9. What do you understand by Variance Analysis?
10. Explain the different types of variances used in Standard Costing.
11. Write short notes on :
 - (a) Material Cost Variance. (b) Labour Mix Variance. (c) Fixed Overhead Cost Variance. (d) Fixed Overhead Calendar Variance. (e) Sales Margin Volume Variance.
12. Explain the different types of Material Cost Variance.
13. What are the important uses of Variance Analysis?

PRACTICAL PROBLEMS

- (1) From the following information, calculate:

- (a) Material Cost Variance
- (b) Material Price Variance
- (c) Material Usage Variance

Quantity of materials purchased 3,000 units

Value of material purchased Rs. 9,000

Standard quantity of material required per tone of finished product = 25 units

Standard rate of materials Rs. 2 per unit

Opening stock of materials Nil

Closing stock of materials 500 units

Finished production during the year 800 tons

[Ans : Material Cost Variance Rs. 3,500 (A) ; Material Price Variance Rs. 2,500 (A) ; Material Usage Variance Rs. 1,000 (A)].

- (2) From the following details, calculate (a) Material Cost Variance (b) Material Price Variance (c) Material Usage Variance (d) Material Mix Variance and (e) Material Yield Variance:

Materials	Standard		Actual	
	Qty.	Rate	Qty.	Rate
A	8,000	1.05	7,500	1.20
B	3,000	2.15	3,300	2.30
C	2,000	3.30	2,400	3.50

[Ans : (a) Rs. 3,540 (A) ; (b) Rs. 2,100 (A) ; (c) Rs. 1,440 (A) (d) Rs. 1,110 (A) ; (e) Cannot be Calculated]

- (3) Calculate labour variances from the following information standard hours for manufacturing a product X - 7,800 hours:

Actual Hours Worked = 8,050 hours

Actual Wages paid during the period = Rs. 16,100

Standard Wages = Rs. 15,600

[Ans : (a) Labour Cost Variance = Rs. 500 (A) ; (b) Labour Rate Variance = Nil ; (c) Labour Efficiency = Rs. 500 (A)]

- (4) From the following data, calculate labour variances : The budgeted labour force for producing product A is :

20 Semi-Skilled workers @ Re. 0.75 per hour for 50 hours

10 Skilled workers @ Rs. 1.25 per hour for 50 hours

The actual labour force employed for producing A is :

22 Semi-Skilled workers @ Re. 0.80 per hour for 50 hours

8 Skilled workers @ Rs. 1.20 per hour for 50 hours

[Ans : (a) Labour Cost Variance = Rs. 15 (F)

(b) Labour Rate Variance = Rs. 35 (A)

(c) Labour Efficiency Variance Rs. 50 (F)

(e) Labour Mix Variance = Rs. 50 (F)]

(5) From the following data, calculate Overhead Variances:

	Budgeted	Actual
Output 15,000 units	16,000 units	
Number of working days	25	27
Fixed Overheads	Rs. 30,000	Rs. 30,500
Variable Overheads	Rs. 45,000	Rs. 47,000

There was an increase of 5% in capacity

- [Ans : (1) Total Overhead Cost Variance Rs. 2,500 (F) (5) Volume Variance Rs. 2,000 (F)
 (2) Variable Overhead Expenditure Variance Rs. 1,000 (F) (6) Capacity Variance Rs. 1,620 (F)
 (3) Fixed Overhead Variance Rs. 1,500 (F) (7) Calendar Variance Rs. 2,400 (F)
 (4) Expenditure Variance Rs. 500 (A) (8) Efficiency Variance Rs. 2,020 (A)].

(6) From the following information, calculate: (1) Overhead Budget Variance (2) Volume Variance (3) Efficiency Variance (4) Capacity Variance (5) Total Overhead Cost Variance:

Normal Overhead Rate Rs. 3
 Actual hours worked 20,000
 Allowed hours for actual production 21,000
 Allowed overheads for budgeted hours Rs. 70,000
 Actual overheads Rs. 72,000

- [Ans : (1) Overhead Budget Variance Rs. 2,000 (A) (4) Capacity Variance Rs. 10,000 (A)
 (2) Volume Variance Rs. 7,000 (A) (5) Total Overhead Cost Variance Rs. 9,000 (A)
 (3) Efficiency Variance Rs. 3,000 (F)]

(7) From the following informations calculate (a) Calendar Variance (b) Capacity Variance (c) Efficiency Variance and (d) Volume Variance:

Actual Overheads Rs. 1,800
 Budgeted Overheads Rs. 2,000
 Budgeted period 4,000 labour hours
 Standard hours per unit 10 labour hours
 Budgeted number of days 20
 Standard overhead per hour Re. 0.50
 Actual number of days 22
 Actual hours 4,300
 Actual production 425 units.

- [Ans : (a) Calendar Variance Rs. 200 (F) ; (b) Capacity Variance Rs. 150 (F) (c) Efficiency Variance Rs. 25 (A) ; (d) Volume Variance Rs. 125 (F)].

(8) The budgeted and actual sales of a concern manufacturing a single product are given below :

Sales as budgeted : 10,000 units at Rs. 3 per unit Rs. 30,000 ; Actual Sales.
 5,000 units at Rs. 3 per unit Rs. 15,000
 8,000 units at Rs. 2.50 per unit Rs. 20,000

Ascertain Sales Price Variance and Sales Volume Variance

- [Ans : Sales Value Variance Rs. 5,000 (F); Sales Price Variance Rs. 4,000 (A) Sales Volume Variance Rs. 9,000 (F)]

(9) From the following information relating to the month of Jan. 2002, you are required to compute Sales Margin Variances:

Product	Budgeted Sales			Actual Sales		
	Qty.	Price Rs.	Value Rs.	Qty.	Price Rs.	Value Rs.
X	2,500	4	10,000	2,000	4	8,000
				600	3.75	2,250
Y	3,000	2	6,000	2,500	2	5,000
				350	1.80	630
				5,500		15,880
				950		

Budgeted Costs : X Rs. 3 per unit
 Y Rs. 1.50 per unit

Calculate Sales Margin Variance :

[Ans : (1) Total Sales Margin Variance X Rs.50 (A) ; Y Rs.145 (A)

(2) Sales Margin Price Variance X Rs.150 (A) ; Y Rs.70 (A)

(3) Sales Margin Volume Variance X Rs.100 (F) ; Y Rs.75 (A)

(4) Sales Margin Quantity Variance X Rs.15.63 (F) ; Y Rs.9.37 (F)

(5) Sales Margin Mix Variance X Rs.84.37 (F) ; Y Rs.84.37 (A)]

- (10) From the following information, calculate Labour Variances for the two departments.

	<i>Department X</i>	<i>Department Y</i>
Actual Gross Wages	Rs. 2,000	Rs. 1,800
Standard Hours Produced	8,000	6,000
Standard Rate per hour	80 Paise	35 Paise
Actual Hours Worked	8,200	5,800

[Ans : Labour Cost Variance X Rs.400 (F) ; Y Rs.300 (F)

Labour Rate Variance X Rs.460 (F) ; Y Rs.230 (F)

Labour Efficiency Variance X Rs.60 (A); Y Rs.70 (F)].

- (11) The standard materials required to produce 100 units is 120 kgs. A standard price of 0.50 paise per kg is fixed and 2,40,000 units were produced during the period. Actual materials purchased were 3,00,000 kgs at a cost of Rs. 1,65,000. Calculate material variance.

[Ans: material cost variance Rs. 21,000 unfavourable; material price variance Rs. 15,000 unfavourable; materials usage variance Rs. 6,000 unfavourable]

- (12) The standard cost of a certain chemical mixture is:

Material P - 40% at Rs. 20 per tonne

Material Q - 60% at Rs. 30 per tonne

A standard loss of 10% as expected in production. During a period there is used :

90 tonnes material P at the cost of Rs. 18 per tonne; 110 tonnes material Q at the cost of Rs. 354 per tonne.

The weight produced is 182 tonnes of good production. Calculate : (a) material cost variance, (b) material price variance, (c) material mix variance and (d) material yield variance.

[Ans: material cost variance Rs. 102:22 Adverse

Material price variance Rs. 260 Adverse

Material usage variance Rs. 157.78 Favourable

Material mix variance Rs. 100 Favourable

Material yield variance Rs. 57.78 Favourable]

- (13) The following figures have been extracted from the cost books of a factory for the month of January 2003 :

	<i>Standard Rs.</i>	<i>Actual Rs.</i>
Number of units produced	30,000	32,000
Capacity	100%	100%
Number of days worked	25	26
Variable overheads	60,000	63,000
Fixed overheads	90,000	93,000

Analyse the total overhead variance in to:

(a) Expenditure

(b) Capacity

(c) Calendar

(d) Efficiency variance.

[Ans: Expenditure variance Rs. 300 (A)

Efficiency variance Rs. 800 (F)

Total variable overhead variance Rs. 500(F)

Fixed overhead variance Rs. 1,500 (F)

Fixed expenditure variance Rs. 1,500 (A)

Fixed volume variance Rs. 3,000 (F)

Capacity variance Rs. 1,800 (F)

Efficiency variance Rs. 1,200(F)

Calendar variance Rs. 1,800 (F)]

- (14) RR& Co. Ltd. manufacture a simple product the standard mix of which is:

Material × 60% at Rs. 20 per kg

Material × 40% at Rs. 10 per kg

Normal loss in production is 20% of input. Due to shortage of material X, the standard mix was changed. Actual results for March 2003 were :

Materials X 105 Kg at Pr. 20 per Kg

Materials Y 95 Kg at Pr. 3 per Kg

Input 200 Kg

Loss 35 Kg

Output 165 Kg

Calculate:

- (1) Material price variance
- (2) Material usage variance
- (3) Material mix variance and
- (4) Material yield variance.

[Ans : Material price variance X Nil ; Y Rs. 95 (F)

Material usage variance X Rs. 375 (F) ; Y Rs. 125(F)

Material mix variance X Rs. 300 (F) ; Y Rs. 150 (A)

Material yield variance Rs. 100 (F)]

- (15) A gang of workers normally consists of 30 men, 15 women and 10 boys. They are paid at standard hours rates as under:

Men Re. 0.80

Women Re. 0.60

Boys Re. 0.40

In a normal week of 40 hours, the gang is expected to produce 2000 units of output. During the weekend 31st December 2003, the gang consisted of 40 men, 10 women and 5 boys. The actual wages paid were @Re. 0.70, Re. 0.65 and Re. 0.30 respectively. 4 hours were lost due to abnormal idle time and 1600 units were produced.

Calculate : (1) Wage variance (2) Wage rate variance (3) Labour efficiency variance (4) Gang composition variance (i.e., Labour mix variance) and (5) Labour idle time variance.

[Ans : Labour cost variance Rs. 256 (A)

Labour rate variance Rs. 160 (F)

Labour efficiency variance Rs. 416 (A)

Labour mix variance Rs. 108 (A)

Labour idle Time variance Rs. 160 (A)].