

Learning Objectives

After studying this chapter you should be able to;

- Understand the meaning of standard cost and variances.
- Understand the concept of capacity with reference to a product cost sheet.
- Understand the difference between controllable and uncontrollable variances.
- Compute variances related to material, labour, overhead and sales.
- Understand the reporting pattern which may be adopted for control and decision making purposes.
- Understand the meaning of disposition of variances.
- Understand the advantages and disadvantages of standard costing and variance analysis.

11.1 Introduction

Standard Costing is a method of costing which is used as a control tool by the management. Controlling is a principal function of management alongwith planning, directing and staffing. Every organisation sets a goal and to achieve it management of the organisation make plans, get these plans executed and monitor the work for any deviation from the plan. Please note the word deviation. Deviation means the amount by which a single measurement differs from a fixed value such as the mean or standard (here it is used in the context of cost accounting). Deviation is measured by comparing actual figure with the standard figure.

11.1.1 What is a standard or Standard Cost?

Standard cost is defined in the CIMA Official Terminology as “the planned unit cost of the product, component or service produced in a period. The standard cost may be determined on a number of bases. The main use of standard costs is in performance measurement, control, stock valuation and in the establishment of selling prices.” From the above definition Standard costs can be said as

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- Planned cost
- Determined on a base or number of bases.

11.1.2 Why Standard or Standard Cost?

Standards or Standard costs are established to evaluate the performance of a particular cost centre or responsibility centre and to control costs. Apart from performance evaluation and cost control, standard costs are also used to value inventory where actual figures are not reliably available and to determine selling prices particularly while preparing quotations.

11.2 Standard Costing

Standard costing is a method of costing which measure the performance or an activity by comparing actual cost with standard cost, analyse the variances (deviations) and reporting of variances for investigation and appropriate action. Official Terminology of CIMA, London defines standard costing as "Control technique that reports variances by comparing actual costs to pre-set standards so facilitating action through management by exception."

11.3 Setting Up of Standard Cost

Standard cost is set on the basis of management estimation. Cost is estimated on the basis of technical specification provided by the engineering department or other expert such as production engineer. Generally while setting standards consideration is given to historical data, current production plan and expected conditions of future. For the sake of detailed analysis and control standard cost is set for each element of cost i.e. material, labour, variable overheads and fixed overheads. Apart from this standards are also set for the sales quantity and sales value; this is generally known as budgeted sales.

Standards are set in both quantity (units or hours) and in cost (price or rate). It is thus a measure in quantities, hours and value of the factors of production.

Standard costs are divided into three main cost components, such as

- (a) Direct Material Cost (b) Direct Labour Cost and (c) Overheads

Standards are set in both physical and monetary terms for each cost components. Details are as follows:

(i) Physical Standards: Physical standards refer to expression of standards in units or hours. At this stage standard quantity and standard hours are determined for a particular product or service. The purpose of setting standards are to secure economies in scale of production and to set selling price for quotation purpose.

In manufacturing organisations, the task of setting physical standards is assigned to the industrial engineering department. While setting standards consideration is given to the

- Company's operating plan i.e. budgets
- Final output to be produced
- Material specification, in both quantity and quality provided by the engineering department.
- Proportion of material to be used in case of multiple inputs.
- Method of production i.e. fully automated, semi-automated or manual.
- Skill set of workers and availability of workers.
- Working conditions and internal factors.
- External factors (such as Labour Law, Factories Act, Govt. policy etc.).

Material quantity standards: The following procedure is usually followed for setting material quantity standards.

- (a) Standardisation of products: At this phase products to be produced is decided based on production plan and customer's order. Generally following questions are answered at this stage: (i) What to be produced? (ii) Which type to be produced and (iii) How much to be produced?
- (b) Product study: Product to be produced is analysed and studied for developments and production. Product study is carried out by the engineering department or product consultants. At this phase answers to the following questions are satisfied: (i) How can it be produced? (ii) What are the pre-requisites? (iii) Which type of materials to be used? (iv) How products can be accepted in the market? Etc.
- (c) Preparation of specification list: After the product study a list of material is prepared. It specifies types (quality) and quantity of materials to be used, substitute of the materials, quantity and proportion of materials to be used, process to be followed, pre-requisites and condition required etc. While preparing specification list consideration to expected amount of wastage is given. It must be customised to adopt changes in the product.
- (d) Test runs: Sample or test runs under specified conditions are carried out and sample products are tested for the desired quality and quantity. Any deviation from the specification is noted down and specification list is updated.

Labour time standards: The following are the steps involved in setting labour quantity standards:

- (a) Standardisation of product and product study is carried out as explained above.
- (b) Labour specification: Types of labour and labour time is specified. Labour time specification is based on past records and it takes into account normal wastage of time.

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- (c) Standardisation of methods: Selection of proper machines to use proper sequence and method of operations.
- (d) Manufacturing layout: A plan of operation for each product listing the operations to be performed is prepared.
- (e) Time and motion study: It is conducted for selecting the best way of completing the job or motions to be performed by workers and the standard time which an average worker will take for each job. This also takes into account the learning efficiency and learning effect.
- (f) Training and trial: Workers are trained to do the work and time spent at the time of trial run is noted down.

Overheads time/ quantity standards: Variable overhead time/ quantity is estimated based on specification made by the engineering departments. Variable overheads may either be based on direct material quantity or labour hour. Generally it is based on labour time worked.

Fixed overhead time is based on budgeted production volume.

Problems faced while setting physical standards: The problems involved while setting physical standards will vary from industry to industry and may be illustrated as under:

- (a) A situation may arise where the company is introducing the manufacture of a new line of product. In such case, it may be necessary to employ workers who have no experience in the job. This creates a problem of setting standard time because it is necessary to make adjustment for the inexperience of workers.
- (b) Changes in technology may necessitate installation of sophisticated machines. When such machines are installed, the precise estimation of output and standard of efficiency achievable will pose a problem until after a long time when the working conditions are settled. Thus, setting standards for these machines and estimating the standard costs will need considerable amount of work.
- (c) Often manufacturers prefer to product diversification to improve profitability. One of the most important problems that arise with the proposed change in product is re-setting of production facilities. For example, when an old copper part is to be changed into one made of bronze to suit the new product, special care has to be taken to order new tools which in turn, pose the problem of setting up of standard time in respect of the new tools.
- (d) Standards of material specifications are established and if the materials are not available as per specifications, the standards may not be achievable.
- (e) Very often the cost accountant is confronted with the problem of choosing the type of standards to be adopted. For example, the industrial engineer has furnished the standard time for all direct labour operations as under:

1. Standard time attainable by the best operations is 2 hours per unit of product including allowances for personal fatigue and delay.
2. Attainable good performance for the average trained operator is 2.10 hours per unit of product.
3. Average past performance is 2.60 hours per unit.

The problem is, should direct labour standard hour be based on maximum efficiency or attainable good performance or average past performance? If costs are to represent maximum efficiency, the unit cost used in selling price will relatively be low but a high debit variance may arise if the standard efficiency is not achieved.

If, however, the standard cost is based on attainable good performance, the variances may tend to be nil. If efficiency is to be gauged, maximum efficiency standard will reflect the off standard performance, thereby enabling the departmental head to exercise control.

Similar problems as those mentioned above, may also arise in setting of waste standards. For example, the question may arise as to whether only absolutely unavoidable wastage should be provided or the past average level of wastage may be provided. This will again have different impact on the standard cost of production.

(ii) Price or Rate Standards: Broadly, the price or rate standards can be set on either of the following bases:

- (a) Actual average or mean price expected to prevail during the coming period, say one year; or
- (b) Normal prices expected to prevail during a cycle of seasons which may be of a number of years.

Material price standards: Material prices are not altogether within the control of the manufacturer; but the purchasing department, on being apprised of production quantities required, should be able, from its knowledge of current market conditions and trends, to state with reasonable accuracy price for the constituent items. The standards for prices of materials should be based on the following factors, if price fluctuations are small and are not serious.

- (a) Stock of materials on hand and the prices at which they are held;
- (b) The prices at which orders for future deliveries of materials (agreement entered into) have already been placed,
- (c) Minimum support price fixed by the appropriate authority and
- (d) Anticipated fluctuation in price levels

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In case there are unsystematic fluctuations in the market price, it may be difficult to determine standard costs of materials; fluctuations in the market price may be of different sorts; prices may be different from month to month, from one season to another or from one year to another. There may be a secular trend which, on the whole, is pushing price upwards or downwards. The nature of difficulties encountered in fixing standard costs of materials will naturally be different in each case. In addition the purchasing policy of the company and the objective to be achieved (from cost accounting) will make a difference.

The difficulty in determining the standard cost of material in such a situation can be resolved as follows:

- (a) In case prices fluctuate from month to month, the average of prices of a year corrected for the known secular changes and any other expected change can very well serve as the standard price for the next year.
- (b) If the fluctuations are seasonal, but the whole year's requirements are purchased at one time, the weighted average of the likely prices to be paid should be treated as the standard price. But, if buying is also spread over the whole year, the weighted average of the prices for the whole year should be the standard price.
- (c) If prices fluctuate from one year to another, a careful estimate of the price likely to prevail next year, based on a statistical study, should be adopted as the standard price.

Wage rate standard: The type of labour required for performing a specific job would be the most important factor for deciding the rate of wage to be paid to workers. Standard wage rate for skilled and unskilled workers are set based on the following basis:

- Time taken by the workers to complete a unit of production.
- Time or piece rate prevailing in the industry. It can be known from the peers.
- Wage agreement entered into between the management and workers' union.
- Law prevailing in the area of operation, law like Payment of minimum wages Act, Payment of bonus Act etc.

Overhead expense standards: In computing the overhead expense standards, consideration should be given to the level of output and the expenses budgeted. A budget showing the level of output to be considered for arriving at overhead expense standards may be based on the practical manufacturing capacity or the average sales capacity or the budgeted capacity to be utilised in the coming year. After having chosen one of the bases for computing output level, the expenses can be budgeted under different heads for the level of output chosen. These expenses are classified under fixed and variable categories. Thus, the overhead expenses standards are set by computing the optimum level of output for the production departments and thereafter drafting a budget for fixed and variable expenses which will be incurred at this level. If production is seasonal or it fluctuates during the year, a flexible budget may be prepared to facilitate comparison between the target set and the actual expenditure for the period.

11.4 Types of Standards

The accuracy and relevance of an established standard cost depends upon the reliability of the standards being set up. In order to set standards we must know the degree of accuracy proximity of the standards with the actual result. Below are the few standards have been discussed below:

(i) Ideal Standards: These represent the level of performance attainable when prices for material and labour are most favourable, when the highest output is achieved with the best equipment and layout and when the maximum efficiency in utilisation of resources results in maximum output with minimum cost.

These types of standards are criticised on three grounds:

- (a) Since such standards would be unattainable, no one would take these seriously.
- (b) The variances disclosed would be variances from the ideal standards. These would not, therefore, indicate the extent to which they could have been reasonably and practically avoided.
- (c) There would be no logical method of disposing of these variances.

(ii) Normal Standards: These are standards that may be achieved under normal operating conditions. The normal activity has been defined as “the number of standard hours which will produce at normal efficiency sufficient good to meet the average sales demand over a term of years”.

These standards are, however, difficult to set because they require a degree of forecasting. The variances thrown out under this system are deviations from normal efficiency, normal sales volume, or normal production volume.

If the actual performance is found to be abnormal, large variances may result and necessitate revision of standards.

(iii) Basic or Bogey Standards: These standards are used only when they are likely to remain constant or unaltered over a long period. According to this standard, a base year is chosen for comparison purposes in the same way as statisticians use price indices. Since basic standards do not represent what should be attained in the present period, current standards should also be prepared if basic standards are used. Basic standards are, however, well suited to businesses having a small range of products and long production runs. Basic standards are set, on a long-term basis and are seldom revised. When basic standards are in use, variances are not calculated. Instead, the actual cost is expressed as a percentage of basic cost. The current cost is also similarly expressed and the two percentages are compared to find out how much the actual cost has deviated from the current standard. The percentages are next compared with those of the previous periods to establish the trend of

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actual and current standard from basic cost.

(iv) Current Standards: These standards reflect the management's anticipation of what actual costs will be for the current period. These are the costs which the business will incur if the anticipated prices are paid for the goods and services and the usage corresponds to that believed to be necessary to produce the planned output.

The variances arising from expected standards represent the degree of efficiency in usage of the factors of production, variation in prices paid for materials and services and difference in the volume of production.

11.5 Need for Standard Costs

Standard costing system is widely accepted as it serves the different needs of an organisation. The standard costing is preferred for the following reasons:

- (a) **Prediction of future cost for decision making:** Standard costs are set after taking into account all the future possibilities and can be termed as future cost. Standard cost is used for calculating profitability from a project/ order/ activity proposed to be undertaken. Hence, standard cost is very useful for decision making purpose.
- (b) **Provide target to be achieved:** Standard costs are the target cost which should be no be crossed. It keeps challenging target before the responsibility centres. Management of responsibility centres monitor the performance continuously against the set standards and deviations are immediately corrected.
- (c) **Used in budgeting and performance evaluation:** Standard costs are used to set budgets and based on these budgets managerial performance is evaluated. This is of two benefits, one managers of a responsibility centre will not compromise with the quality to fulfill the budgeted quantity and second, variances can be traced with the responsible department or person.
- (d) **Interim profit measurement and inventory valuation:** Actual profit is known only after the closure of the account. Few organisations used to prepare profitability statement for some interim periods as per the requirement of the management. To arrive at the profitability figure standard costs are deducted from the revenue.

11.6 The Process of Standard Costing

The process of standard cost is as below:

- (i) **Setting of Standards:** The first step is to set standards which are to be achieved, the process of standard setting is explained above.
- (ii) **Ascertainment of actual costs:** Actual cost for each component of cost is ascertained.

Actual costs are ascertained from books of account, material invoices, wage sheet, charge slip etc.

(iii) **Comparison of actual cost and standard cost:** Actual costs are compared with the standards costs and variances are determined.

(iv) **Investigation of variances:** Variances arises are investigated for further action. Based on this performance is evaluated and appropriate actions are taken.

(v) **Disposition of variances:** Variances arise are disposed off by transferring it the relevant accounts (costing profit and loss account) as per the accounting method (plan) adopted.

11.7 Types of Variances

11.7.1 Controllable and un-controllable variances: The purpose of the standard costing reports is to investigate the reasons for significant variances so as to identify the problems and take corrective action.

Variances are broadly of two types, namely, controllable and uncontrollable. Controllable variances are those which can be controlled by the departmental heads whereas uncontrollable variances are those which are beyond their control. Responsibility centres are answerable for all adverse variances which are controllable and are appreciated for favourable variances. Controllability is a subjective matter and varies from situation to situation. If the uncontrollable variances are of significant nature and are persistent, the standard may need revision.

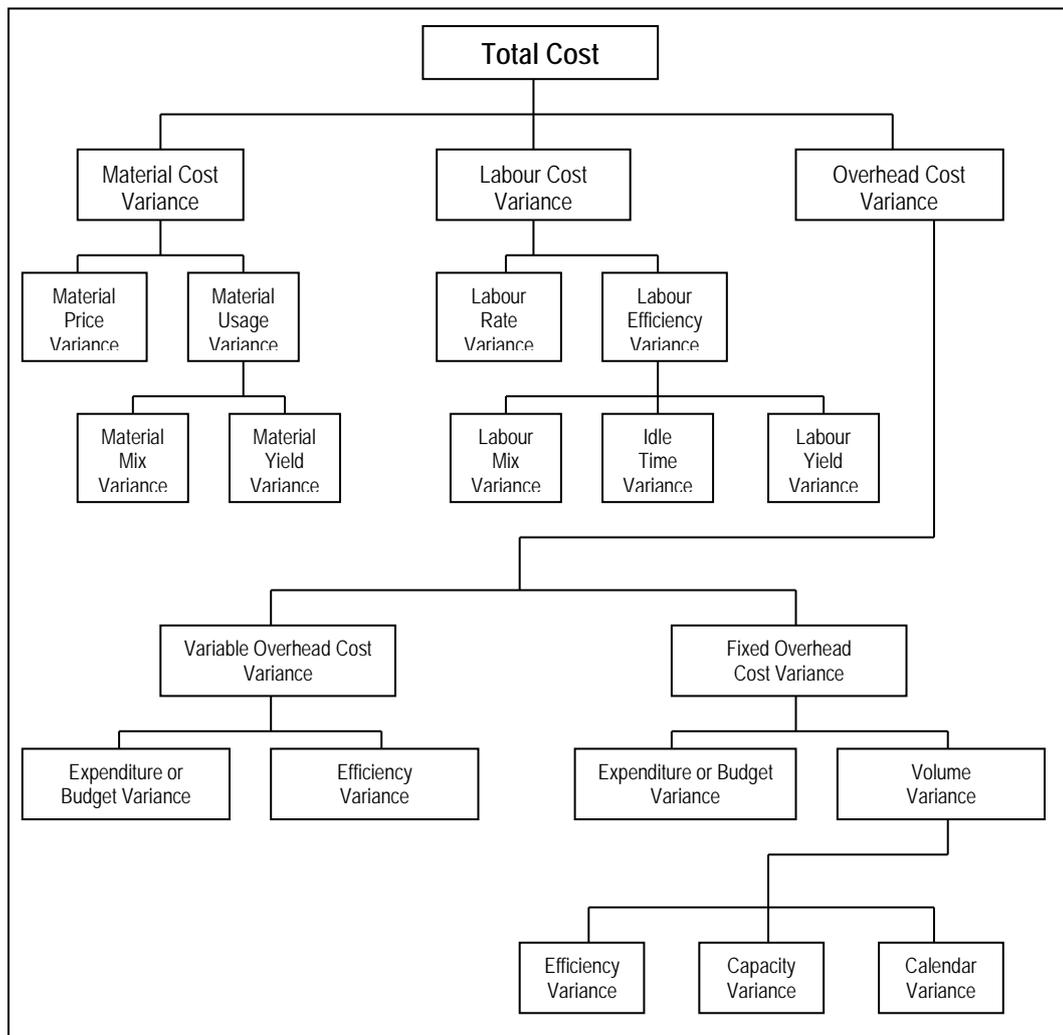
11.7.2 Favourable and Adverse variance: Favourable variances are those which are profitable for the company and adverse variances are those which causes loss to the company. While computing cost variances favourable variance means actual cost is less than standard cost. On the other hand adverse variance means actual cost is exceeding standard cost. The situation will be reversed for sales variance. Favourable variances means actual is more than budgeted and on contrary adverse variance is where actual is less than budgeted. These are credited and debited in the costing profit and loss account respectively. Favourable variance in short denoted by capital 'F' and adverse variances by capital 'A'.

Students may note that signs of favourable and adverse variance may or may not match exactly with mathematical signs i.e. (+) or (-).

11.8 Classification of Variances

Variances are broadly classified into two parts namely Revenue variance and Cost variance. At Revenue side variances is calculated by comparing actual sales from budgeted (standard) sales. On the other hand Cost side reflects variances in cost components. Cost variance classification is shown below with the help of a structured diagram.

Fig 8.1: Classification of Variances



11.8.1 Computation of variances: As discussed earlier variances are classified into two parts. Here we will start from cost side and discuss all cost components one by one with the help of appropriate example and illustrations.

(a) **Material Cost Variance:** Material cost variance is the difference between standard cost and actual cost. Mathematically it is written as.

Material Cost variance = (Standard quantity x Standard Price) – (Actual quantity x Actual price)

Or

$$MCV = (SQ \times SP) - (AQ \times AP)$$

Reasons: Material cost variance arises mainly because of either difference in material price from the standard price or difference in material consumption from standard consumption or because of both reasons. Analysis of material cost variance is done dividing it into two parts namely Material Price variance and Material Usage variance.

(i) **Material Price variance:** It measures variance arises in the material cost due to difference in actual material purchase price from standard material price. Mathematically it is written as:

$$\begin{aligned} \text{Material Price Variance} &= \text{Actual quantity}^* \times (\text{Standard price} - \text{Actual price}) \\ &\text{Or} \\ \text{MPV} &= \text{AQ} \times (\text{SP} - \text{AP}) \end{aligned}$$

*Here actual quantity means actual quantity of material purchased. If in the question material purchase is not given, it is taken as equal to material consumed.

Material price variance can also be calculated taking material used as actual quantity instead of material purchased. This method is also correct but does not serve the purpose of variance computation. Material price variance may arise from variety of reasons out of which some may be controllable and some may be beyond the control of the purchase department. If price variance arises due to inefficiency of purchase department or any other reason within the control of the company, then it is very important to report variance as early as possible and this can be done by taking purchase quantity as actual quantity for price variance computation.

Responsibility: Generally, purchase department purchases materials from the market. Purchase department is expected to perform its function very prudently so that company never suffers loss due to its inefficiency. Purchase department is held responsible for adverse price variance arises due to the factors controllable by the department.

(ii) **Material Usage Variance:** It measures variance in material cost due to usage/ consumption of materials. It is computed as below:

$$\begin{aligned} \text{Material Usage variance} &= \text{Standard price} (\text{Standard quantity} - \text{Actual quantity}^*) \\ &\text{Or} \\ \text{MUV} &= \text{SP} \times (\text{SQ} - \text{AQ}) \end{aligned}$$

*Here actual quantity means actual quantity of material used.

Responsibility: Material usage is the responsibility of production department and it is held responsible for adverse usage variance.

Reasons of material usage variance: Actual material consumption may differ from the standard quantity due to either difference in proportion used from standard proportion or due to

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difference in actual yield from standard yield. Material usage variance is divided into two parts (ia) Material usage mix variance and (iib) Material yield variance.

(ia) **Material Mix Variance:** Variance in material consumption may arise due to difference in proportion used actually from the standard mix/ proportion. It arises only when two more inputs are used to produce a product. Mathematically,

$$\begin{aligned} \text{Material Mix Variance} &= (\text{Revised standard quantity} - \text{Actual quantity}) \times \text{Standard price} \\ &\text{Or} \\ \text{MMV} &= (\text{RSQ} - \text{AQ}) \times \text{SP} \end{aligned}$$

Where,

Revised standard quantity =

$$\frac{\text{Standard quantity of one material}}{\text{Total of standard quantities of all materials}} \times \text{Total of actual quantities of all materials}$$

(iib) **Material Yield Variance (or Material Sub-usage Variance):** Variance in material consumption which arise due to yield or productivity of the inputs. It may arise due to use of sub standard quality of materials, inefficiency of workers or due to wrong processing.

$$\begin{aligned} \text{Material Revised usage variance} &= (\text{Standard quantity} - \text{Revised standard quantity}) \times \\ &\text{Standard price} \\ \text{MRUV} &= (\text{SQ} - \text{RSQ}) \times \text{SP} \end{aligned}$$

Or

$$\begin{aligned} \text{Material Yield Variance} &= (\text{Actual yield} - \text{Standard yield}) \times \text{Standard output price} \\ \text{MYV} &= (\text{AY} - \text{SY}) \times \text{SOP} \end{aligned}$$

Note: Material revised usage variance is also known as material sub – usage variance.

In each case there will be only one variance either material yield or material revised usage variance.

Verification of the formulae:

Material Cost Variance = Material Usage Variance + Material Price Variance*

Or, **Material Cost Variance** = (Material Mix Variance + Material Revised usage Variance) + Material price variance

*If material purchase quantity and material consumed quantity is same

Meaning of the terms used in the formulae:

Term	Meaning
Standard Quantity (SQ)	Quantity of <u>inputs</u> to be used to produce actual <u>output</u> .
Actual Quantity (AQ)	Quantity of <u>inputs</u> actually used to produce actual <u>output</u> .
Revised Standard Quantity (RSQ)	If <u>Actual total quantity</u> of <u>inputs</u> were used in standard proportion.
Actual Yield (AY)	Actual Output
Standard Yield (SY)	Actual output if inputs used in standard ratio
Standard Output Price (SOP)	Standard material cost for actual output

Illustration 1 (Calculation of material cost variance)

The standard and actual figures of product 'Z' are as under:

	<i>Standard</i>	<i>Actual</i>
<i>Material quantity</i>	<i>50 units</i>	<i>45 units</i>
<i>Material price per unit</i>	<i>₹ 1.00</i>	<i>₹ 0.80</i>

Calculate material cost variance.

Solution:

The variances may be calculated as under:

- (a) Standard cost = Std. qty × Std. price = 50 units × ₹ 1.00 = ₹ 50
 (b) Actual cost = Actual qty. × Actual price = 45 units × ₹ 0.80 = ₹ 36

Variances:

- (i) Price variance = Actual qty (Std. price – Actual price)
 = 45 units (₹ 1.00 – ₹ 0.80) = ₹ 9 (F)
 (ii) Usage variance = Std. price (Std. qty – Actual qty.)
 = ₹ 1 (50 units – 45 units) = ₹ 5 (F)
 (iii) Material cost variance = Standard cost – Actual cost
 (Total variance) = ₹ 50 – ₹ 36 = ₹ 14 (F)

Illustration 2 (Calculation of material usage, price and total cost variance)

NXE Manufacturing Concern furnishes the following information:

<i>Standard:</i>	<i>Material for 70 kg finished products</i>	<i>100 kg.</i>
	<i>Price of material</i>	<i>₹ 1 per kg.</i>
<i>Actual:</i>	<i>Output</i>	<i>2,10,000 kg.</i>

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	<i>Material used</i>	2,80,000 kg.
	<i>Cost of Materials</i>	₹ 2,52,000
<p>Calculate: (a) <i>Material usage variance</i>, (b) <i>Material price variance</i>, (c) <i>Material cost variance</i>.</p>		

Solution:

$$\text{Standard Quantity of input for actual output (SQ)} = 2,10,000 \text{ kg} \times \frac{100 \text{ kg}}{70 \text{ kg}} = 3,00,000 \text{ kg.}$$

$$\text{Actual Price (AP)} = (\text{₹}2,52,000 \div 2,80,000 \text{ kg}) = \text{₹}0.90 \text{ per kg.}$$

$$\begin{aligned} \text{(a) Material Usage Variance} &= (\text{SQ} - \text{AQ}) \times \text{SP} \\ &= (3,00,000 - 2,80,000) \times 1 \\ &= \text{₹}20,000 \text{ (F)} \end{aligned}$$

$$\begin{aligned} \text{(b) Material Price Variance} &= (\text{SP} - \text{AP}) \times \text{AQ} \\ &= (1 - 0.90) \times 2,80,000 \\ &= \text{₹}28,000 \text{ (F)} \end{aligned}$$

$$\begin{aligned} \text{(c) Material Cost Variance} &= (\text{SQ} \times \text{SP}) - (\text{AQ} \times \text{AP}) \\ &= (3,00,000 \times 1) - (2,80,000 \times 0.90) \\ &= \text{₹}48,000 \text{ (F)} \end{aligned}$$

$$\begin{aligned} \text{Check} \quad \text{MCV} &= \text{MPV} + \text{MUV} \\ \text{₹}48,000 \text{ (F)} &= \text{₹}28,000 \text{ (F)} + \text{₹}20,000 \text{ (F)} \end{aligned}$$

Illustration 3 (Calculation of Material cost, price and usage variance)

For making 10 kg. of CEMCO, the standard material requirements is:

Material	Quantity	Rate per kg. (₹)
A	8	6.00
B	4	4.00

During April, 1,000 kg of CEMCO were produced. The actual consumption of materials is as under:

Material	Quantity (Kg.)	Rate per kg. (₹)
A	750	7.00
B	500	5.00

Calculate (A) *Material Cost Variance*; (b) *Material Price Variance*; (c) *Material usage Variance*.

Solution:

Basic Calculations

	Standard for 1,000 kg.			Actual for 1,000 kg.		
	Qty.	Rate	Amount	Qty.	Rate	Amount
A	Kg. 800*	(₹) 6	(₹) 4,800	Kg. 750	(₹) 7	(₹) 5,250
B	400*	4	1,600	500	5	2,500
Total	1,200		6,400	1,250		7,750

(* A- $8 \div 10 \times 1000 = 800$ B- $4 \div 10 \times 1000 = 400$)

Calculation of Variances:

(a) Material Cost Variance = Std. cost for actual output – Actual cost

MCV = 6,400 – 7,750

= ₹1,350 (A)

(b) Material Price Variance = (SP – AP) × AQ

A = (6 – 7) × 750 = ₹ 750 (A)

B = (4 – 5) × 500 = ₹ 500 (A)

MPV = ₹1,250 (A)

(c) Material Usages Variance = (SQ – AQ) × SP

A = (800 – 750) × 6 = ₹ 300 (F)

B = (400 – 500) × 4 = ₹ 400 (A)

MUV = ₹ 100 (A)

Check

MCV = MPV + MUV

1,350 (A) = 1,250 (A) + 100 (A)

Illustration 4 (Calculation of material mix and material yield variance)

*The standard cost of a chemical mixture is as follows:**40% material A at ₹ 20 per kg.**60% material B at ₹ 30 per kg.**A standard loss of 10% of input is expected in production. The cost records for a period showed the following usage :**90 kg material A at a cost of ₹ 18 per kg.**110 kg material B at a cost of ₹ 34 per kg.*

Illustration 5 (calculation of material mix variance and material yield variance)

The standard mix to produce one unit of product is as follows:

Material X	60 units @ ₹ 15 per unit	=	900
Material Y	80 units @ ₹ 20 per unit	=	1,600
Material Z	<u>100 units @ ₹ 25 per unit</u>	=	<u>2,500</u>
	<u>240 units</u>		<u>5,000</u>

During the month of April, 10 units were actually produced and consumption was as follows:

Material X	640 units @ ₹ 17.50 per unit	=	11,200
Material Y	950 units @ ₹ 18.00 per unit	=	17,100
Material Z	<u>870 units @ ₹ 27.50 per unit</u>	=	<u>23,925</u>
	<u>2460 units</u>		<u>52,225</u>

Calculate all material variances.

Solution:

Material	Standard for 10 units			Actual for 10 units		
	Qty. units	Rate (₹)	Amount (₹)	Qty. units	Rate (₹)	Amount (₹)
X	600	15	9,000	640	17.50	11,200
Y	800	20	16,000	950	18.00	17,100
Z	1,000	25	25,000	870	27.50	23,925
Total	2,400		50,000	2460		52,225

- Material Cost Variance = Standard cost – Actual cost
= ₹ 50,000 – ₹ 52,225
MCV = ₹ 2,225 (A)
- Material Price Variance = (Std. Price – Actual Price) × Actual Qty.
Material X = (15 – 17.50) × 640 = ₹ 1,600 (A)
Material Y = (20 – 18) × 950 = ₹ 1,900 (F)
Material Z = (25 – 27.50) × 870 = ₹ 2,175 (A)
MPV = ₹ 1,875 (A)
- Material Usage Variance = (Std. Qty. – Actual Qty.) × Std. Price
Material X = (600 – 640) × 15 = ₹ 600 (A)
Material Y = (800 – 950) × 20 = ₹ 3,000 (A)
Material Z = (1,000 – 870) × 25 = ₹ 3,250 (F)
MUV = ₹ 350 (A)

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Check $MCV = MPV + MUJ$
 $₹2,225 (A) = ₹1,875 (A) + ₹350 (A)$

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

Material X	=	(615* – 640) × 15	=	₹ 375 (A)
Material Y	=	(820* – 950) × 20	=	₹2,600 (A)
Material Z	=	(1,025 – 870) × 25	=	<u>₹3,875 (F)</u>
MMV			=	<u>₹ 900 (F)</u>

*Revised Standard Quantity (RSQ) is calculated as follows:

$$\text{Material X} = \frac{2460}{2400} \times 600 = 615 \text{ units}$$

$$\text{Material Y} = \frac{2460}{2400} \times 800 = 820 \text{ units}$$

$$\text{Material Z} = \frac{2460}{2400} \times 1,000 = 1,025 \text{ units}$$

5. Material Yield Variance

For yield variance, certain basic calculations have to be made as follows :

$$\text{Standard Yield Variance} = \frac{\text{Actual usage of materials}}{\text{Standard usage per unit of output}} = \frac{2460}{240} = 10.25 \text{ units}$$

$$\text{SOP (Std. material cost per unit of output)} = ₹50,000 \div 10 \text{ units} = ₹5,000$$

$$\text{Material Yield Variance} = (AY - SY) \times \text{SOP}$$

$$\text{MYV} = (10 - 10.25) \times 5,000 = ₹1,250 (A)$$

Material Revised Usage (or Sub-usage) Variance (MRUV)

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

$$\text{Material X} = (600 - 615) \times 15 = ₹ 225 (A)$$

$$\text{Material Y} = (800 - 820) \times 20 = ₹ 400 (A)$$

$$\text{Material Z} = (1,000 - 1,025) \times 25 = ₹ 625 (A)$$

$$\text{MRUV} = ₹1,250 (A)$$

Note : Either MMV or MRUV is calculated. These two are always equal.

Check

$$\text{MUJ} = \text{MMV} + \text{MYV (Or MRUV)}$$

$$₹350 (A) = ₹900 (F) + ₹1,250 (A)$$

or

$$\text{MCV} = \text{MPV} + \text{MMV} + \text{MYV (Or MRUV)}$$

$$₹2,225 (A) = ₹1,875 (A) + ₹900 (F) + ₹1,250 (A)$$

(b) **Labour Cost Variance:** Labour cost variance is the difference between actual labour cost and standard cost. Mathematically

$$\text{Labour Cost Variance} = (\text{Std. hours for actual output} \times \text{Std. rate per hour}) - (\text{Actual hours} \times \text{Actual rate per hour})$$

Or

$$\text{LCV} = (\text{SH} \times \text{SR}) - (\text{AH} \times \text{AR})$$

Reason: Difference in labour cost arises either due to difference in the actual labour rate from the standard rate or difference in numbers of hours worked from standard hours. Labour cost variance can be divided into two parts namely (i) Labour Rate Variance and (ii) Labour Efficiency Variance.

(i) **Labour Rate Variance:** Labour rate variance arises due to difference in actual rate paid from standard rate. It is very similar to material price variance. It is calculated as below:

$$\text{Labour Rate Variance} = \text{Actual time}^* (\text{Std. rate} - \text{Actual rate})$$

$$\text{LRV} = \text{AH} \times (\text{SR} - \text{AR})$$

*Here actual time means time for which wage has been paid/ credited.

Responsibility: Generally labour rates are influenced by the external factors which are beyond the control of the organisation. However personnel manager is responsible for labour rate negotiation.

(ii) **Labour Efficiency Variance:** Labour efficiency variance arises due to deviation in the working hour from the set standard.

$$\text{Labour Efficiency Variance} = \text{Std. rate} (\text{Std. hours for actual output} - \text{Actual hours}^*)$$

$$\text{LEV} = \text{SR} \times (\text{SH} - \text{AH})$$

*Actual time worked

Responsibility: Efficiency variance may arise due to ability of the workers, inappropriate team of workers, inefficiency of production manager or foreman etc. However, production manager or foreman can be held responsible for the adverse variance which otherwise can be controlled.

Labour efficiency variance is further divided into the following variances:

(iia) Idle Time Variance

(iib) Labour Mix Variance or Gang variance

(iic) Labour Yield Variance (or Labour Revised-efficiency Variance)

(iia) **Idle Time Variance:** It is calculated for the unproductive labour hours. Here idle time means labour idle time arises due to abnormal reasons. It is calculated as below:

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Idle Time Variance = Idle hours x Standard rate

$$\text{ITV} = \text{IH} \times \text{SR}$$

- (iib) **Labour Mix Variance:** Labour efficiency variance which arises due to change in the proportion or combination of different skill set i.e. number of skilled workers, semi-skilled workers and un-skilled workers. Mathematically,

Labour Mix Variance = (Revised std. hours – Actual hours) x Standard rate

$$\text{LMV} = (\text{RSH} - \text{AH}) \times \text{SR}$$

- (iic) **Labour Revised Efficiency Variance or Labour Yield Variance:** Labour efficiency variance which arises due to productivity of workers.

Labour Revised Efficiency Variance = (Std. hours for actual output – Revised std. hours) x Standard rate

$$\text{LREV} = (\text{SH} - \text{RSH}) \times \text{SR}$$

OR

Labour Yield Variance = (Actual yield – Std. yield from actual input) x Std. labour cost per unit of output

$$\text{LYV} = (\text{AY} - \text{SY}) \times \text{SLC}$$

Verification of formulae:

Labour Cost Variance = Labour Rate Variance + Labour Efficiency Variance (if hours paid and hours worked is same)

OR

Labour Cost Variance = Labour Rate Variance + Idle Time Variance + Labour Efficiency Variance (if there is idle time)

Labour Efficiency Variance = Labour Mix Variance + Labour Yield Variance

Illustration 6 (Calculation of labour cost variance, labour efficiency and labour rate variance)

The standard and actual figures of a firm are as under

<i>Standard time for the job</i>	<i>1,000 hours</i>
<i>Standard rate per hour</i>	<i>₹ 0.50</i>
<i>Actual time taken</i>	<i>900 hours</i>
<i>Actual wages paid</i>	<i>₹ 360</i>
<i>Compute the variances</i>	

Solution:

(a) Std. labour cost	(₹)
(1,000 hours × ₹ 0.50)	500
(b) Actual wages paid	360
(c) Actual rate per hour: ₹ 360/900 hours =	₹ 0.40

Variances

- (i) Rate variance = Actual time (Std. rate – Actual rate)
= 900 hours (₹ 0.50 – ₹0.40) = ₹ 90 (F)
- (ii) Efficiency variance = Std. rate per hr. (Std. time – Actual time)
= ₹ 0.50 (1,000 hrs. – 900 hrs.) = ₹ 50 (F)
- (iii) Total labour cost variance = Std. labour cost – Actual labour cost = ₹140(F)

Illustration 7 (Calculation of material price and usage variance and labour rate and efficiency variance)

The following standards have been set to manufacture a product:

<i>Direct Material:</i>	(₹)
2 units of A @ ₹ 4 per unit	8.00
3 units of B @ ₹3 per unit	9.00
15 units of C @ ₹1 per unit	<u>15.00</u>
	32.00
<i>Direct Labour: 3 hrs @ ₹8 per hour</i>	<u>24.00</u>
<i>Total standard prime cost</i>	<u>56.00</u>

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

12,500 units of A at ₹4.40 per unit

18,000 units of B at ₹2.80 per unit

88,500 units of C at ₹1.20 per unit

The company worked 17,500 direct labour hours during the year. For 2,500 of these hours, the company paid at ₹12 per hour while for the remaining, the wages were paid at standard rate. Calculate materials price variance and usage variance and labour rate and efficiency variances.

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Solution:

For Material Cost Variances

	SQ × SP	AQ × AP	AQ × SP
A	12,000 × 4 = 48,000	12,500 × 4.40 = 55,000	12,500 × 4 = 50,000
B	18,000 × 3 = 54,000	18,000 × 2.80 = 50,400	18,000 × 3 = 54,000
C	90,000 × 1 = 90,000	88,500 × 1.20 = 1,06,200	88,500 × 1 = 88,500
Total	₹ 1,92,000	₹ 2,11,600	₹ 1,92,500

Variances:

Material Price Variance = Actual quantity (Std. price – Actual price)

Or, = (AQ × SP) – (AQ × AP)

Or, = ₹ 1,92,500 – ₹ 2,11,600

= ₹ 19,100 (A)

Material Usage Variance = Standard Price (Std. Quantity – Actual Quantity)

Or, = (SP × SQ) – (SP × AQ)

Or, = ₹ 1,92,000 – ₹ 1,92,500 = ₹ 500 (A)

For Labour Cost Variance :

	SH × SR	AH × AR	AH × SR
Labour	(6,000 × 3) × ₹ 8 = 1,44,000	2,500 × 12 = 30,000 15,000 × 8 = 1,20,000	17,500 × 8 = 1,40,000
Total	₹ 1,44,000	₹ 1,50,000	₹ 1,40,000

Variances :

Labour Rate Variance : Actual Hours (Std. Rate – Actual Rate)

Or, = (AH × SR) – (AH × AR)

Or, = ₹ 1,40,000 – ₹ 1,50,000

= ₹ 10,000 (A)

Labour Efficiency Variance : Standard Rate (Std. Hours – Actual Hours)

Or, = (SR × SH) – (SR × AH)

Or, = ₹ 1,44,000 – ₹ 1,40,000

= ₹ 4,000 (F)

Illustration 8 (Calculation of labour cost, rate, efficiency, mix and yield variance)

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

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

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

- (a) Labour Cost Variance (b) Labour Rate Variance
 (c) Labour Efficiency Variance (d) Labour Mix Variance
 (e) Labour Yield Variance

Solution:

Category of workers	SH* x SR	AH [®] x SR	AH [®] x AR	RSH# x SR
Skilled	1,152 x 3 = 3,456	1,120 x 3 = 3,360	1,120 x 4 = 4,480	1,280 x 3 = 3,840
Semi-skilled	432 x 2 = 864	720 x 2 = 1,440	720 x 3 = 2,160	480 x 2 = 960
Unskilled	216 x 1 = 216	160 x 1 = 160	160 x 2 = 320	240 x 1 = 240
Total	₹ 4,536	₹ 4,960	₹ 6,960	₹ 5,040

$$* \text{Actual hours produced} \times \frac{\text{Std. labour hours}}{\text{Total Std. labour hours}}$$

Std. hrs. for actual output are calculated as follows :

$$\begin{aligned} \text{Skilled} &= \frac{1,800}{2,000} \times 1,280 = 1,152 \text{ hrs.} \\ \text{Semi-skilled} &= \frac{1,800}{2,000} \times 480 = 432 \text{ hrs.} \\ \text{Unskilled} &= \frac{1,800}{2,000} \times 240 = 216 \text{ hrs.} \end{aligned}$$

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@ Actual no. of workers x 40 hours

$$\# \text{ Actual hours worked} \times \frac{\text{Std. hours}}{\text{Total Std. hours}}$$

$$\text{Labour Cost Variance} = (\text{SH} \times \text{SR}) - (\text{AH} \times \text{AR})$$

$$\text{Or,} = ₹4,536 - 6,960 = \underline{₹2,424 (A)}$$

$$\text{Labour Rate Variance} = \text{AH} (\text{SR} - \text{AR}) \text{ or } (\text{AH} \times \text{SR}) - (\text{AH} \times \text{AR})$$

$$\text{Skilled} = 3,360 - 4,480 = ₹1,120 (A)$$

$$\text{Semi-skilled} = 1,440 - 2,160 = ₹ 720 (A)$$

$$\text{Unskilled} = 160 - 320 = \underline{₹ 160 (A)} \quad 2,000 (A)$$

$$\text{Labour Efficiency Variance} = \text{SR} (\text{SH} - \text{AH}) \text{ or } (\text{SR} \times \text{SH}) - (\text{SR} \times \text{AH})$$

$$\text{Skilled} = 3,456 - 3,360 = ₹ 96 (F)$$

$$\text{Semi-skilled} = 864 - 1,440 = ₹ 576 (A)$$

$$\text{Unskilled} = 216 - 160 = \underline{₹ 56 (F)} \quad \underline{₹424 (A)}$$

$$\text{Labour Mix Variance} = \text{SR} (\text{RSH} - \text{AH}) \text{ or } (\text{SR} \times \text{RSH}) - (\text{SR} \times \text{AH})$$

$$\text{Skilled} = 3,840 - 3,360 = ₹480 (F)$$

$$\text{Semi-skilled} = 960 - 1,440 = ₹480 (A)$$

$$\text{Unskilled} = 240 - 160 = \underline{₹ 80 (F)} \quad ₹ 80 (F)$$

$$\text{Labour Yield Variance} = \text{SR} (\text{SH} - \text{RSH}) \text{ or } (\text{SR} \times \text{SH}) - (\text{SR} \times \text{RSH})$$

$$\text{Skilled} = 3,456 - 3,840 = ₹384 (A)$$

$$\text{Semi-skilled} = 864 - 960 = ₹96 (A)$$

$$\text{Unskilled} = 216 - 240 = \underline{₹ 24 (A)} \quad ₹ 504 (A)$$

Check

$$\begin{aligned} \text{(i) LCV} &= \text{LRV} + \text{LEV} \\ ₹2,424 (A) &= ₹2,000 (A) + ₹424 (A) \end{aligned}$$

$$\begin{aligned} \text{(ii) LEV} &= \text{LMV} + \text{LYV} \\ ₹424 (A) &= ₹80 (F) + ₹504 (A) \end{aligned}$$

(c) **Overheads** – Normally, for several type of overhead expenses either a single recovery rate or two recovery rates, one representing fixed overheads and the other representing variable overheads, will be prepared.

Overheads have been classified as both fixed and variable thereby giving a standard fixed

cost (overhead) per unit and standard variable cost (overhead) per unit.

The recovery of the fixed components of the estimated overheads depends upon capacity utilization.

In case a company produces less than the projected utilization it shall not be able to recover all the budgeted fixed overheads. This unrecovered portion is known as production volume variance.

The other variance is because of variations in actual spending when compared with both estimated fixed and estimated variable overheads. Such a variance is known as Overhead expenses variance.

The following detailed discussion shall help you have a clear understanding of these two variances.

(1) Production Volume Variance:

The term fixed overheads implies that the element of cost does not vary directly in proportion to the output. In other words fixed overheads do not change within a given range of activity.

However the unit cost changes even though the fixed overheads are constant in total within the given range of output. So, higher the level of activity, the lower will be the unit cost or vice versa.

The management is, therefore, faced with a costing difficulty because it requires a representative rate for charging fixed overheads irrespective of changes in volume of output. For example, if the fixed overheads are ₹ 10,000 and the output varies from 8,000 to 11,000 units, the cost per unit of output would be as under:

<i>Fixed Overheads (₹)</i>	<i>Output in units</i>	<i>Cost per unit of output (₹)</i>
10,000	8,000	1.25
10,000	9,000	1.11
10,000	10,000	1.00
10,000	11,000	0.91

We have, however, seen that in standard costing, a predetermined rate of overhead recovery is established for costing purposes. This involves the establishment of a predetermined capacity.

If we take, for example; 10,000 units as predetermine volume/capacity, the pre-determined rate will be ₹ 1 per unit. If the factory produces only 8,000 units, there will be a loss due to under-recovery which can be explained in two-ways:

- (a) The actual cost will be ₹ 10,000 ÷ 8,000 units = ₹ 1.25 per unit whereas the absorbed cost is ₹ 1 per unit. Since the cost is more by ₹ 0.25 per unit, the total loss is 8,000 units × ₹ 0.25 or ₹ 2,000.
- (b) Since the factory has produced only 8,000 units, the amount of overheads recovered is 8,000 units × ₹1 or ₹ 8,000. Since fixed overheads are constant, the amount which should have been ideally incurred for the department is ₹10,000. Hence there is a difference of ₹ 2,000 between the overheads recovered and the overheads estimated. This variance is known as production volume variance.

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This shows the cost of failure on the part of the factory to produce at the planned activity of 10,000 units. If the company produces 11,000 units, the variance will show the benefits of operating at a level above the budgeted activity. If, however, the factory has produced 10,000 units, there will be no production volume variance because the actual activity equals what was budgeted i.e. the production of 10,000 units.

(2) Overhead Expenses Variance: As discussed above, the Production Volume Variance analyses the unrecovered fixed overheads. Apart from this, there can be variations in the actual spending of both fixed and variable overheads when compared to what was established as a standard. Such variations can be accounted for by analyzing an overhead expenses variance.

The following illustration shows how overhead expense rates are computed and variance analysed.

The analysis of overhead variances is different from that of material and labour variances. As overhead is the aggregate of indirect materials, indirect labour and indirect expenses, this variance is considered to be a difficult part of variance analysis. It is important to understand that overhead variance is nothing but under or over-absorption of overhead. There is a separate computation for overhead variances for fixed and variable overheads.

Variable Overheads Cost Variance: Variable overheads consist of expenses other than direct material and direct labour which vary with the level of production. If variable overhead consist of indirect materials then in this case it vary with the direct material used. On the other hand if variable overhead is depend on number of hours worked then in this case it will vary with labour hour or machine hours. If nothing is mentioned specifically then we take labour hour as basis. Variable overhead cost variance calculation is similar to labour cost variance. Variable overhead cost variance is divided into two parts (i) Variable Overhead Expenditure Variance and (ii) Variable Overhead Efficiency Variance.

Variable Overhead Cost Variance = Standard Cost – Actual Cost

OR

$$(SR \times SH) - (AR \times AH)$$

(i) Variable Overhead Expenditure Variance = Actual hours (Std. rate – Actual rate)

(ii) Variable Overhead Efficiency Variance = Std. Rate (Std. hours – Actual hours)

Meaning of the terms used in the formulae:

Term	Meaning
Standard Hours (SH)	Hours required producing actual <u>output</u> .
Actual Hours (AH)	Actual Hours taken to produce actual <u>output</u> .
Revised Standard Hours (RSH)	If actual labour hours worked were worked by standard mix (combination) of labour.
Actual Yield (AY)	Actual Hours worked
Standard Yield (SY)	Actual hours if labour worked in standard ratio
Standard Labour Cost (SLC)	Standard labour cost for actual output

Fixed Overhead Cost Variance: Fixed overhead cost variance is the difference between actual fixed overhead and absorbed fixed overhead. Fixed overhead variance is divided into two parts (i) Fixed Overhead Expenditure Variance and (ii) Fixed Overhead Volume Variance.

$$\text{Fixed Overhead Cost Variance} = \text{Absorbed Fixed Overheads} - \text{Actual Fixed Overheads}$$

Or, $\quad = (\text{Std. hours for actual output} \times \text{Std. fixed overhead rate}) - \text{Actual Fixed Overhead}$

(i) Fixed Overhead Expenditure Variance: This is the difference between the actual fixed overhead incurred and budgeted fixed overhead.

$$\text{Fixed Overhead Expenditure Variance} = \text{Budgeted Fixed Overhead} - \text{Actual Fixed Overheads}$$

Or, $\quad = (\text{Budgeted hours} \times \text{Std. fixed overhead rate}) - \text{Actual fixed overhead}$

(ii) Fixed Overhead Volume Variance: Variance in fixed overhead which arise due to the volume of production is called fixed overhead volume variance. Mathematically

$$\begin{aligned} \text{Fixed Overhead Volume Variance} &= \text{Absorbed Overhead} - \text{Budgeted Overhead} \\ &= \text{SR} (\text{Std. hours for actual output} - \text{Budgeted hours}) \\ &= \text{SR} (\text{SH} - \text{BH}) \end{aligned}$$

Fixed overhead volume variance is further divided into the three variances:

(iia) Efficiency Variance (iib) Capacity Variance and (iic) Calendar Variance

(iia) F.O. Efficiency Variance = (Absorbed fixed overhead – Standard fixed overhead)

$$\begin{aligned} &= (\text{Std. hours for actual output} - \text{Actual hours}) \times \text{Std. fixed overhead rate} \\ &= \text{SR} (\text{SH} - \text{AH}) \end{aligned}$$

(iib) F.O. Capacity Variance = (Standard fixed overhead – Budgeted overhead)

$$\begin{aligned} &= (\text{Actual hours} - \text{Budgeted hours}) \times \text{Std. fixed overhead rate} \\ &= \text{SR} (\text{AH} - \text{BH}) \end{aligned}$$

(iic) F.O. Calendar Variance = (Actual No. of working days – Std. No. of working days) × Std. fixed rate per day

Or $\quad = (\text{Revised budgeted hours} - \text{Budgeted hours}) \times \text{Std. fixed rate per hour}$

Where,

$$\text{Revised budgeted hours} = \text{Actual days} \times \frac{\text{Budgeted hours}}{\text{Budgeted days}}$$

Note: When calendar variance is computed, there will be a modification in the capacity variance. In that case revised capacity variance will be calculated and the formula is:

$$\text{Revised Capacity Variance} = (\text{Actual hours} - \text{Revised budgeted hours}) \times \text{Std. fixed rate per hour}$$

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Verification of formulae:

F.O. Cost Variance = F.O. Expenditure Variance + F.O. Volume Variance

F. O. Volume Variance = Efficiency Variance + Capacity Variance + Calendar Variance

Basic terms used in the computation of overhead variance

$$\text{Standard overhead rate (per hour)} = \frac{\text{Budgeted Overhead}}{\text{Budgeted hours}}$$

Or

$$\text{Standard overhead rate (per unit)} = \frac{\text{Budgeted Overhead}}{\text{Budgeted output in units}}$$

Note: Separate overhead rates will be computed for fixed and variable overheads.

Basic calculations before the computation of overhead variances:

The following basic calculation should be made before computing variances.

(i) When overhead rate per hour is used:

(a) Standard hours for actual output (SHAO)

$$\text{SHAO} = \frac{\text{Budgeted Hours}}{\text{Budgeted Output}} \times \text{Actual Output}$$

(b) Absorbed (or Recovered) overhead = Std. hours for actual output × Std. overhead rate per hour

(c) Standard overhead = Actual hours × Std. overhead rate per hour

(d) Budgeted overhead = Budgeted hours × Std. overhead rate per hour

(e) Actual overhead = Actual hours × Actual overhead rate per hour

(ii) When overhead rate per unit is used

(a) Standard output for actual hours (SOAH)

$$\text{SOAH} = \frac{\text{Budgeted Output}}{\text{Budgeted Hours}} \times \text{Actual Hours}$$

(b) Absorbed overhead = Actual output × Std. overhead rate per unit

(c) Standard overhead = Std. output for actual time × Std. overhead rate per unit

(d) Budgeted overhead = Budgeted output × Std. overhead rate per unit

- (e) Actual overhead = Actual output × Actual overhead rate per unit
 Overhead cost variance = Absorbed overhead – Actual overhead
 OCV = (Std. hours for actual output × Std. overhead rate) – Actual overhead

The following illustration shows how overhead expense rates are computed and variance analysed.

Illustration 9 (Calculation of production volume variance and overhead expense variance)

The overhead expense budget for a factory producing to a capacity of 200 units per month is as follows:

<i>Description of overhead</i>	<i>Fixed cost per unit in ₹</i>	<i>Variable cost per unit in ₹</i>	<i>Total cost per unit in ₹</i>
<i>Power and fuel</i>	1,000	500	1,500
<i>Repair and maintenance</i>	500	250	750
<i>Printing and stationary</i>	500	250	750
<i>Other overheads</i>	1,000	500	1,500
	₹ 3,000	₹ 1,500	4,500

The factory has actually produced only 100 units in a particular month. Details of overheads actually incurred have been provided by the accounts department and are as follows:

<i>Description of overhead</i>	<i>Actual cost</i>
<i>Power and fuel</i>	₹ 4,00,000
<i>Repair and maintenance</i>	₹ 2,00,000
<i>Printing and stationary</i>	₹ 1,75,000
<i>Other overheads</i>	₹ 3,75,000

You are required to compute the production volume variance and the overhead expenses variance.

Solution:

Production volume variance	
Standard fixed overheads per unit	: ₹ 3,000 (Given)
Actual production	: 100 units
Standard production (capacity)	: 200 units
Unabsorbed units	: 100 units (200 – 100)
Production volume variance	: ₹ 3,000 × 100 units
	= ₹ 3,00,000 (Adverse)

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Overhead expenses variance

Standard fixed overheads for actual production	:	₹ 6,00,000
Standard variable overheads for actual production	:	₹ 1,500 × 100 units
		= ₹ 1,50,000
Std total overheads for actual production	:	₹ 7,50,000
Actual overheads	:	₹ 11,50,000
Overhead expense variance	:	₹ 4,00,000 (Adverse)

Illustration10 (Calculation of production volume variance and overhead expense variance)

XYZ Company has established the following standards for factory overheads.

Variable overhead per unit:	₹ 10/-
Fixed overheads per month	₹ 1,00,000
Capacity of the plant	20,000 units per month.
The actual data for the month are as follows:	
Actual overheads incurred	₹ 3,00,000
Actual output (units)	15,000 units

Required:

Calculate overhead variances viz :

- (i) Production volume variance
- (ii) Overhead expense variance

Solution:

Unutilised capacity	:	20,000 units less 15,000 units
	=	5,000 units
Std fixed overheads per unit	=	₹ 5 per unit
Production volume variance	=	5,000 units × ₹ 5
	=	₹ 25,000 (Adverse)
Std variable overheads for actual production	:	₹ 10 × 15,000 units
	=	₹ 1,50,000
Std fixed overheads	=	₹ 1,00,000
Total overheads on standards for actual production	=	₹ 2,50,000

Actual overheads incurred = ₹ 3,00,000

Overhead expense variance = ₹ 50,000

Illustration 11 (Calculation of variable overhead variance, fixed overhead expenditure and volume variance)

The following information was obtained from the records of a manufacturing unit using standard costing system.

	Standard	Actual
Production	4,000 units	3,800 units
Working days	20	21
Fixed Overhead	₹ 40,000	₹ 39,000
Variable Overhead	12,000	12,000

You are required to calculate the following overhead variance:

(a) Variable overhead variance

(b) Fixed overhead variances

(i) Expenditure variances

(ii) Volume variance

Solution:

(a) For Variable Overhead Variance:

Actual variable overhead = ₹12, 000

Standard variable overhead for production (Budgeted output × Std. variable overhead rate per unit) = (12,000 ÷ 4,000) × 3,800

= ₹11, 400

Variable overhead variance: Standard variable overhead - Actual variable overhead

= ₹11, 400 - ₹12, 000

= 600 (A)

(b) For Fixed Overhead Variance:

Actual fixed overhead incurred = ₹ 39, 000

Budgeted fixed overhead for the period = ₹ 40, 000

Standard fixed overhead for production (Standard output for actual time × Standard Fixed Overhead per unit)

= (₹40, 000 ÷ 4,000 units) × 3,800 units = ₹38, 000.

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Variances:

- (i) Fixed Overhead Expenditure Variances:
Budgeted fixed overhead – Actual fixed overhead
= ₹40,000 – ₹39,000 = 1,000 (F)
- (ii) Fixed Overhead Volume Variance : Standard fixed overhead – Budgeted fixed overhead
= ₹38,000 – ₹40,000 = ₹2,000 (A)
- (iii) Fixed Overhead Variance : Standard fixed overhead – Actual fixed overhead
= ₹38,000 – ₹39,000 = ₹1,000 (A)

Illustration12 (Calculation of Fixed overhead cost, expenditure and volume variance)

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

In April, 2012, the company worked 24 days of 840 machine hours per day and produced 5,305 units of output. The actual fixed overheads were ₹1,42,000.

Compute:

- (i) Expense variance
(ii) Volume variance
(iii) Total fixed overheads variance.

Solution

Working Notes:

	Budget	Actual
1. Working hours per month	24,000	20,160
2. Production units per month = (Budget 24,000 ÷ 4 hrs, Actual given)	6,000	5,305
3. Standard fixed overhead rate per unit = ₹1,44,000 ÷ 6,000 = ₹ 24		
4. Standard fixed overhead rate per hour = ₹1,44,000 ÷ 24,000 = ₹6		
5. Standard fixed overhead rate per day = ₹1,44,000 ÷ 25 = ₹ 5,760		

Fixed Overhead Variances:

Actual Fixed overhead incurred = ₹1,42,000 (given)

Budgeted fixed overhead for the period = ₹1,44,000.

Standard fixed overhead for actual production (Standard output for actual time × Standard Fixed Overhead per unit) = 5,305 × ₹24 = ₹1,27,320.

Variances:

- (i) F.O. Expenditure Variance = (Budgeted fixed overhead – Actual fixed overhead)
= 1,44,000 – 1,42,000 = ₹ 2,000 (F)
- (ii) Total Volume Variance = (Standard fixed overhead – Budgeted fixed overhead)
= 1,27,320 – 1,44,000 = ₹16,680 (A)
- (iii) Fixed overhead variance = (Standard fixed overhead – Actual Fixed overhead)
= 1,27,320 – 1,42,000 = ₹14,680 (A)

Alternatively:

Expenditure Variance + Volume Variance = 2,000 (F) + 16,680 (A) = ₹14,680 (A)

Illustration13 (calculation of Fixed overhead cost, expenditure and volume variance)

Following information is available from the records of a factory:

	Budget	Actual
Fixed overhead for June, 2012	₹10,000	₹12,000
Production in June, 2012 (units)	2,000	2,100
Standard time per unit (hours)	10	–
Actual hours worked in June	–	21,000

Compute:

- (i) Fixed overhead cost variance,
(ii) Expenditure variance,
(iii) Volume variance.

Solution:

For fixed overhead variances:

Actual F.O. incurred (given)	₹12,000
Budgeted F.O. for the period	₹10,000
Standard F.O. for production (Standard output for actual time × Standard Fixed Overhead per unit)	
2,100 units × {₹10,000 ÷ 2,000 units}	₹10,500

- (i) Fixed Overhead Variance = Standard F.O. – Actual F.O.
= ₹ 10,500 – ₹12,000
= ₹1,500 (A)

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(ii) F.O. Expenditure Variance = Budgeted F.O – Actual F.O.
= ₹10,000 – ₹12,000
= ₹2,000 (A)

(iii) F.O. Volume Variance = Standard F.O – Budgeted F.O.
= ₹10,500 – ₹ 10,000
= ₹ 500 (F)

Illustration 14 (Calculation of Fixed overhead variance and variable overhead variance)

XYZ Ltd. has furnished you the following information for the month of August, 2012:

	Budget	Actual
Output (units)	30,000	32,500
Hours	30,000	33,000
Fixed overhead	₹ 45,000	50,000
Variable overhead	₹ 60,000	68,000
Working days	25	26

Calculate overhead variances.

Solution:

Basic Calculations:

$$\text{Standard hours per unit} = \frac{\text{Budgeted hours}}{\text{Budgeted units}} = \frac{30,000}{30,000} = 1 \text{ hour}$$

$$\text{Std. hrs. for actual output} = 32,500 \text{ units} \times 1 \text{ hr} = 32,500$$

$$\text{Standard overhead rate per hour} = \frac{\text{Budgeted overhead}}{\text{Budgeted hours}}$$

$$\text{For fixed overhead} = \frac{45,000}{30,000} = ₹1.50 \text{ per hour}$$

$$\text{For variable overhead} = \frac{60,000}{30,000} = ₹2 \text{ per hour}$$

$$\text{Std. F.O. rate per day} = ₹45,000 \div 25 \text{ days} = ₹1,800$$

$$\text{Recovered overhead} = \text{Std. hrs. for actual output} \times \text{St. rate}$$

$$\text{For fixed overhead} = 32,500 \text{ hrs.} \times ₹1.50 = ₹48,750$$

$$\text{For variable overhead} = 32,500 \text{ hrs.} \times ₹2 = ₹65,000$$

Standard overhead	= Actual hours × Std. rate
For fixed overhead	= 33,000 × 1.50 = ₹49,500
For variable overhead	= 33,000 × 2 = ₹66,000
Revised budget hours	= $\frac{\text{Budgeted hours}}{\text{Budgeted days}} \times \text{Actual days}$
	= $\frac{30,000}{25} \times 26 = 31,200 \text{ hours}$

Revised budgeted overhead (for fixed overhead) = 31,200 × 1.50 = ₹46,800

Calculation of variances

Fixed Overhead Variances:

(i) F.O. cost Variance	= Recovered Overhead – Actual Overhead
	= 48,750 – 50,000
	= ₹1,250 (A)
(ii) F.O. Expenditure Variance	= Budgeted Overhead – Actual Overhead
	= 45,000 – 50,000
	= ₹ 5,000 (A)
(iii) F.O. Volume Variance	= Recovered Overhead – Budgeted Overhead
	= 48,750 – 45,000
	= ₹ 3,750 (F)
(iv) F.O. Efficiency Variance	= Recovered Overhead – Standard Overhead
	= 48,750 – 49,500 = ₹750 (A)
(v) F.O. Capacity Variance	= Standard Overhead- Revised Budgeted Overhead
	= 49,500-46800 = ₹ 2,700 (F)
(v) Calendar Variance	= $\left(\frac{\text{Actual Days} - \text{Budgeted Days}}{\text{Days}} \right) \times \text{St. rate per day.}$
	= (26 – 25) × 1,800 = ₹1,800 (F)

Variable Overhead Variances

(i) V.O. Cost variance	= Recovered Overhead – Actual Overhead
	= 65,000 – 68,000 = ₹ 3,000 (A)
(ii) V.O. Expenditure Variance	= Standard Overhead – Actual Overhead
	= 66,000 – 68,000 = ₹ 2,000 (A)

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$$\begin{aligned} \text{(iii) V.O. Efficiency Variance} &= \text{Recovered Overhead} - \text{Standard Overhead} \\ &= 65,000 - 66,000 = ₹1,000 \text{ (A)} \end{aligned}$$

Check

$$\begin{aligned} \text{(i) F.O. Cost Variance} &= \text{Expenditure variance} + \text{Volume variance} \\ 1,250 \text{ (A)} &= 5,000 \text{ (A)} + 3,750 \text{ (F)} \end{aligned}$$

$$\begin{aligned} \text{(ii) F.O. Volume Variance} &= \begin{matrix} \text{Efficiency} & \text{Capacity} & \text{Calendar} \\ \text{Variance} & \text{Variance} & \text{Variance} \end{matrix} \\ 3,750 \text{ (F)} &= 750 \text{ (A)} + 2,700 \text{ (F)} + 1,800 \text{ (F)} \end{aligned}$$

$$\begin{aligned} \text{(iii) V.O. Cost Variance} &= \text{Expenditure Variance} + \text{Efficiency Variance} \\ 3,000 \text{ (A)} &= 2,000 \text{ (A)} + 1,000 \text{ (A)}. \end{aligned}$$

Illustration 15 (Calculation of fixed overhead volume, expenditure and cost variance)

S.V. Ltd. has furnished the following data:

	Budget	Actual, July (2012)
No. of working days	25	27
Production in units	20,000	22,000
Fixed overheads	₹ 30,000	₹ 31,000

Budgeted fixed overhead rate is ₹1.00 per hour. In July, 2012, the actual hours worked were 31,500.

Calculate the following variances:

- Volume variance.
- Expenditure variance.
- Total overhead variance.

Solution:

For Fixed Overhead Variances

Actual fixed overhead incurred	₹ 31,000
Budgeted fixed overhead for the period	30,000
Standard fixed overhead for production (Standard output for actual time × Standard Fixed Overhead per unit) (₹ 30,000 ÷ 20,000 units) × 22,000	33,000

Computation of Variances:

- (i) *Fixed overhead expenditure variance:*
 = Budgeted fixed overhead – Actual fixed overhead
 = ₹30,000 – ₹31,000 = ₹ 1,000 (A)
- (ii) *Fixed overhead volume variance:*
 = Standard fixed overhead – Budgeted fixed overhead
 = ₹33,000 – ₹ 30,000 = ₹ 3,000 (F)
- (iii) *Fixed overhead variance :*
 = Standard fixed overhead – Actual fixed overhead
 = ₹33,000 – ₹ 31,000 = ₹ 2,000 (F)

Illustration 16 (Calculation of fixed overhead volume, expenditure and cost variance)

The following data has been collected from the cost records of a unit for computing the various fixed overhead variances for a period:

Number of budgeted working days	25
Budgeted man-hours per day	6,000
Output (budgeted) per man-hour (in units)	1
Fixed overhead cost as budgeted	₹ 1,50,000
Actual number of working days	27
Actual man-hours per day	6,300
Actual output per man-hour (in-units)	0.9
Actual fixed overhead incurred	₹ 1,56,000

Calculate fixed overhead variances:

- (a) *Expenditure Variance*
 (b) *Volume Variance,*
 (c) *Fixed Cost Variance.*

Solution:**For Fixed overhead Variances:**

Actual fixed overhead incurred = ₹1,56,000

Budgeted fixed overhead for the period = 1,50,000

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Standard fixed overhead for production (Standard output for actual time × Standard Fixed Overhead per unit)

$$(6,300 \text{ hrs} \times 27 \text{ days} \times 0.9) \times (\text{₹}1,50,000 \div \text{₹}1,50,000 \text{ units}) = \text{₹}1,53,090$$

(a) Fixed Overhead Expenditure Variance	= Budgeted fixed overhead – Actual fixed overhead	₹ 6,000 (A)
	= ₹1,50,000 – ₹1,56,000 =	
(b) Fixed Overhead Volume Variance	= Standard fixed overhead – Budgeted fixed overhead	₹ 3,090 (F)
	= ₹1,53,090 – ₹ 1,50,000 =	
(c) Fixed Overhead Variance	= Standard fixed overhead – Actual fixed overhead	₹ 2,910 (A)
	= ₹1,53,090 – ₹ 1,56,000 =	

Sales Variances: We have discussed the variances which arise due to deviations in cost components from the set standards. Now we will discuss the revenue side. Sales is the main source of revenue. Variances which arise due to a change in the actual selling price and the actual quantity of units sold from that which was budgeted are known as sales variances.

These variances are computed on the basis of sales value. They provide the sales manager an idea of the effect of various factors affecting sales such as prices, quantity and sales mix on the overall sales value.

The sales value variances are more or less similar to material cost variances or labour cost variances. Sales variances may be analysed on the basis of margin or on the basis of turnover.

Sales Value Variance: It is the difference between the budgeted sales and actual sales. The variance can be bifurcated into sales price variance and sales volume variance. Sales variance

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

$$\text{Or,} = (\text{Actual Price} \times \text{Actual Quantity}) - (\text{Budgeted Price} \times \text{Budgeted Quantity})$$

If variance is calculated based on margin:

$$\text{Sales Margin Variance} = \text{Actual Margin}^* - \text{Budgeted Margin}^{**}$$

$$\text{Or,} = (\text{Actual Quantity} \times \text{Actual Margin}) - (\text{Budgeted Quantity} \times \text{Budgeted Margin})$$

(a) **Sales Price Variance:** Variance which arises due to change in sales price from the budgeted one is called sales price variance. Mathematically,

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

$$\text{Or,} = \text{AQ} (\text{AP} - \text{BP})$$

If variance is calculated based on margin:

$$\text{Sales Margin Price Variance} = \text{Actual Quantity (Actual Margin - Budgeted Margin)}$$

$$\text{Or,} \quad \quad \quad = \text{AQ (AM - BM)}$$

(b) **Sales Volume Variance:** Variance which arises due to changes in actual sales quantity from budgeted quantity is called sales volume variance. Mathematically,

$$\text{Sale Volume Variance} = \text{Budgeted Price (Actual Quantity - Budgeted Quantity)}$$

$$\text{Or,} \quad \quad \quad = \text{BP (AQ - BQ)}$$

If variance is calculated based on margin:

$$\text{Sales Margin Volume Variance} = \text{Budgeted Margin (Actual Quantity - Budgeted Quantity)}$$

$$\text{Or,} \quad \quad \quad = \text{BM (AQ - BQ)}$$

* Actual Margin = Actual Sales price per unit – Standard cost per unit

** Budgeted Margin = Budgeted Sales price per unit – Standard cost per unit

Illustration 17 (calculation of Sale value, price and volume variance)

Compute the sales variances from the following figures: -

Product	Budgeted Quantity	Budgeted Price (₹)	Actual Quantity (₹)	Actual Price (₹)
A	2,000	2.50	2,400	3.00
B	1,500	5.00	1,400	4.50
C	1,000	7.50	1,200	7.00
D	500	10.00	400	10.50

Solution:

Basic calculation:

Product	BQ x BP	AQ x AP	AQ x BP
A	2,000 x 2.50 = ₹5,000	2,400 x 3.00 = ₹ 7,200	2,400 x 2.50 = ₹ 6,000
B	1,500 x 5.00 = ₹7,500	1,400 x 4.50 = ₹ 6,300	1,400 x 5.00 = ₹ 7,000
C	1,000 x 7.50 = ₹ 7,500	1,200 x 7.00 = ₹ 8,400	1,200 x 7.50 = ₹ 9,000
D	500 x 10.00 = ₹ 5,000	400 x 10.50 = ₹ 4,200	400 x 10.00 = ₹ 4,000
Total	₹ 25,000	₹ 26,100	₹ 26,000

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Computation of Variances

Sales Price Variance	=	Actual quantity (Actual price – Budgeted price)
	=	(AQ x AP) – (AQ x BP)
	=	₹ 26,100 – ₹ 26,000 = ₹ 100(F)
Sales Volume Variance	=	Budgeted price (Actual quantity – Budgeted quantity)
	=	(BP x AQ) – (BP x BQ)
	=	₹ 26,000 – ₹ 25,000 = ₹ 1,000 (F)
Total variance	=	Actual sales – Budgeted sales
	=	₹ 26,100 – ₹ 25,000 = ₹1,100 (F)

Illustration 18 (Calculation of Material Cost, price and usage variance)

J.K. Ltd. manufactures NXE by mixing three raw materials. For every batch of 100 kg. of NXE, 125 kg. of raw materials are used. In April, 2012, 60 batches were prepared to produce an output of 5,600 kg. of NXE. The standard and actual particulars for April, 2012, are as follows :

Raw Materials	Standard		Actual		Quantity of Raw Materials Purchased (Kg.)
	Mix	Price per kg.	Mix	Price per Kg.	
	(%)	(₹)	(%)	(₹)	
A	50	20	60	21	5,000
B	30	10	20	8	2,000
C	20	5	20	6	1,200

Calculate all variances.

Solution:

Actual material used = 125 kg × 60 = 7,500 kg.

Actual cost of actual material used (AQ × AR)				(₹)
A	60%	4,500 kg × ₹21 =		94,500
B	20%	1,500 kg × ₹ 8 =		12,000
C	20%	<u>1,500</u> kg × ₹ 6 =		<u>9,000</u>
		<u>7,500</u>		<u>1,15,500</u>

Standard cost of actual material used (AQ × SR)		(₹)
A	4,500 kg × ₹20 =	90,000
B	1,500 kg × ₹10 =	15,000
C	<u>1,500</u> kg × ₹ 5 =	<u>7,500</u>
	<u>7,500</u>	<u>1,12,500</u>

Standard cost of material, if it had been used in standard proportion (Standard Proportion × Standard Rate)		(₹)
A	50% 3,750 kg × ₹20 =	75,000
B	30% 2,250 kg × ₹10 =	22,500
C	20% <u>1,500</u> kg × ₹ 5 =	<u>7,500</u>
	<u>7,500</u>	<u>1,05,000</u>

Standard cost of production (SQ for actual production × SR)

Standard cost of output for 100 kg:		(₹)
A	62.50 kg × ₹20 =	1,250
B	37.50 kg × ₹10 =	375
C	<u>25.00</u> kg × ₹ 5 =	<u>125</u>
	<u>125.00</u>	<u>1,750</u>

Standard cost for output of 5,600 kg.

$$= \frac{1,750}{100} \text{ kg} \times 5,600 \text{ kg.} = ₹ 98,000$$

Material Price Variance = Standard cost of actual material used – Actual cost of actual material used = ₹1,12,500 – ₹1,15,500 = ₹ 3,000 (A)

Material Usage Variance = Standard cost of production – Standard cost of actual material used = ₹ 98,000 – ₹1,12,500 = ₹14,500 (A)

Note: Material Price Variance can be calculated at the time of purchase as well. In that case, material variance will be as follows:

Actual cost of material used

A	5,000 kg × ₹21	= ₹	1,05,000
B	2,000 kg × ₹ 8	= ₹	16,000

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C	1,200 kg × ₹ 6	= ₹	<u>7,200</u>
			<u>1,28,200</u>

Standard cost of material used

A	5,000 kg × ₹20	= ₹	1,00,000
B	2,000 kg × ₹10	= ₹	20,000
C	1,200 kg × ₹ 5	= ₹	<u>6,000</u>
			<u>1,26,000</u>

Material Price variance (if calculated at the time of purchase)

= Standard cost of actual material used – Actual cost of actual material used

= ₹1,26,000 – ₹1,28,200 = ₹ 2,200 (A)

11.9 Preparation of Operating Statement under Standard Costing – Reporting of Variances

Computation of variances and their reporting is not the final step towards the control of various elements of cost. It demands an analysis of variances from the side of the executives, to ascertain the correct reasons for their occurrence.

After knowing the exact reasons, it becomes their responsibility to take necessary steps so as to stop the reoccurrence of adverse variances in future.

To enhance the utility of such a reporting system it is necessary that such a system of reporting should not only be prompt but should also facilitate the concerned managerial level to take necessary steps. Variance reports should be prepared after keeping in view its ultimate use and its periodicity.

Such reports should highlight the essential cost deviations and possibilities for their improvements. The variance reports should give due regard to the following points:-

- (i) The concerned executives should be informed about what the cost performance should have been.
- (ii) How close the actual cost performance is with reference to standard cost performance.
- (iii) The analysis and causes of variances.
- (iv) Reporting should be based on the principle of management by exception.
- (v) The magnitude of variances should also be stated.

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This system enables the ascertainment of variances as and when the transaction is posted to work-in-progress account. In other words, the analysis of variances is done from the original documents like invoices, labour sheets, etc., and this method of analysis is known as analysis at source.

Since, the single plan system contemplates the analysis of variances at source, the installation of this system requires more planning so that effective documentation at each stage is introduced for proper recording and analysis of variance.

Thus for example, the issue of bill of materials to the stores enables the storekeeper to calculate the standard value of materials. If any material is requisitioned beyond the standard, he can mark the same for material usage variance account. In the production department, as and when the finished output is recorded, the standard waste and actual waste can be compared and necessary entries can be made by the shop supervisors for posting the excessive usage to appropriate variance accounts.

Scheme of entries: So far as materials are concerned, material price variances are recorded at the time of receipt of the material and the material quantity variances are recorded as far as possible when excess materials are used. The entries will be as illustrated below:

1. Dr. Material Control A/c
Dr. or Cr. Material Price Variance A/c
Cr. Creditors A/c.

This entry enables the firm to debit the material control account with the actual purchases at standard cost and credit the creditor's account at the actual cost of actual prices thereby transferring the variances to price variance account.

2. Dr. Work-in-progress Control A/c
Dr. or Cr. Material Usage Variances A/c
Cr. Material Control A/c

This entry charges the work-in-progress control account with the standard cost of standard quantity and credit the material control account at the standard cost of actual issue, the variance being transferred to usage variance account.

3. Dr. Wages Control A/c
Dr./Cr. Labour Rate Variances A/c
Cr. Cash A/c

This entry is passed to record the wages at standard rate thereby transferring rate variances to the appropriate account.

4. Dr. Work-in-progress Control A/c
 Dr. or Cr. Overhead Expense Variances A/c
 Cr. Overhead Expense Control A/c.

(ii) **Partial plan:** This system uses current standards in which the inventory will be valued at current standard cost figure.

Under this method the work-in-progress account is charged at the actual cost of production for the month and is credited with the standard cost of the month's production of finished product.

The closing balance of work-in-progress is also shown at standard cost. The balance after making the credit entries represent the variance from standard for the month. The analysis of the variance is done after the end of the month. This method is simple in operation because variances are analysed after the end of month but may present difficulties if the firm makes a variety of products.

Recapitulation :

- (1) Current standards are used in both the systems.
- (2) Under the partial plan, material stocks are carried at actual cost whereas the same are carried out at standard cost under the single plan.
- (3) The work-in-progress and finished goods are valued at standard cost under both the methods.
- (4) **Computation of variances :**
 - (a) In partial plan, material price variance is computed on material used in finished goods and work-in-progress whereas in single plan it is computed on the material quantity purchased.
 - (b) The partial plan is suitable where simple analysis of variance is sufficient at the end of the period whereas the single plan is preferred if frequent detailed analysis of variance is desired, as (a) the comparison of actual with standard cost of each operation or operator or (b) the daily reporting of standard cost of excess material used.

11.11 Disposition of Variances

There is no unanimity of opinion in regard to disposition of variances. The following are the various methods:–

- (a) Write off all variances to profit and loss account or cost of sales every month.
- (b) Distribute the variance pro-rata to cost of sales, work-in-progress and finished good stocks.

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- (c) Write off quantity variance to profit and loss account but the price variances may be spread over cost of sales, work-in-progress and finished goods stocks. The reason behind apportioning price variances to inventories and cost of sales is that they represent cost although they are described as variance.

11.12 Advantages and Criticism of Standard Costing

11.12.1 Advantages of Standard Costing: Following are the advantages of standard costing.

- (i) It serves as a basis for measuring operating performance and cost control. By setting standards, proper classification and determination of variances, is possible. This serves as a signal for prompt corrective action. This system provides for reporting on the principle of exception. The basis of this principle is that only matters which are not proceeding according to plan are reported upon. This enables the managers to concentrate upon essential matters and leave the non-essentials to take care of themselves. By using special forms, any excessive time taken, extra material used or additional services consumed can be brought to light as part of the ordinary routine. In other words, if the variances are negligible, it means that the performance is more or less in accordance with the standards. Significant variances which warrant the attention of the manager are brought to his knowledge.
- (ii) It aids price fixing. Standard costing can be used to predict costs. Although actual cost may vary from day to day, standard costs will remain stable over a period of time and, where demand for a product is elastic, this information can be used as a basis for fixing the selling price.
- (iii) Introduction of standard costing facilitates evaluation of jobs and introduction of incentives. Job values can be determined by the use of evaluation and scale of wages fixed according to the responsibility involved in each job.
- (iv) Standard costing facilitates the estimation of the cost of new products with greater accuracy.
- (v) It serves as a basis for inventory valuation. Standard costs are used for inventory valuation because actual costs are not typical and less clerical work is involved in carrying standard value into inventory records than actual value. A further advantage of this procedure is that material stock can be recorded in terms of quantities only.
- (vi) Standard costing is also used for the measurement of profits. The question of correct approach of calculating profit is very much related to stock valuation and to the methods of dealing with the absorption of fixed overheads. Standard costing will eliminate any variations in profit due to changes in the values of stock holding from period to period and will thus provide a true basis for the measurement of profit.

- (vii) Standard costing greatly aids business planning, budgeting and managerial decision making. Standard costs being pre-determined costs, are particularly useful in planning and budgeting.
- (viii) Standard costing aids in standardisation of products, operations and processes. Since standards are laid down for each product, its components, materials, operations, processes etc., it improves the overall production efficiency and reduces costs.
- (ix) It provides objectives and targets to be achieved by each level of management and defines the responsibilities of departmental managers. Standard costs are pre-determined on the basis of reasonable and achievable level of output. The departmental head, therefore, comes to know what is expected of him and his level of performance in comparison to the targets can be seen from the variance reports. Thus the system serves as an incentive to the departmental head to achieve the targets set by the company.
- (x) Standard costing sets a uniform basis for comparison of all elements of costs. Since care is taken in setting standards, the standards become unchanging units of comparison. The standard hour may be used as a basic unit to compare dissimilar products or processes.
- (xi) The maximum use of working capital, plant facilities and current assets is assured because wastage of materials and loss due to idle time are closely controlled.

11.12.2 Criticism of Standard Costing

The following are some of the criticism which may be leveled against the standard costing system. The arguments have been suitably answered as stated against each by advocates of the standard costing and hence they do not invalidate the usefulness of the system to business enterprises.

(i) *Variation in price:* One of the chief problem faced in the operation of the standard costing system is the precise estimation of likely prices or rate to be paid. The variability of prices is so great that even actual prices are not necessarily adequately representative of cost. But the use of sophisticated forecasting techniques should be able to cover the price fluctuation to some extent. Besides this, the system provides for isolating uncontrollable variances arising from variations to be dealt with separately.

(ii) *Varying levels of output:* If the standard level of output set for pre-determination of standard costs is not achieved, the standard costs are said to be not realised. However, the statement that the capacity utilisation cannot be precisely estimated for absorption of overheads may be true only in some industries of jobbing type. In vast majority of industries, use of forecasting techniques, market research, etc., help to estimate the output with reasonable accuracy and thus the variation is unlikely to be very large. Prime cost will not be affected by such variation and, moreover, variance analysis helps to measure the effects of idle time.

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(iii) *Changing standard of technology*: In case of industries that have frequent technological changes affecting the conditions of production, standard costing may not be suitable. This criticism does not affect the system of standard costing. Cost reduction and cost control is a cardinal feature of standard costing because standards once set do not always remain stable. They have to be revised.

(iv) *Attitude of technical people*: Technical people are accustomed to think of standards as physical standards and, therefore, they will be misled by standard costs. Since technical people can be educated to adopt themselves to the system through orientation courses, it is not an insurmountable difficulty.

(v) *Mix of products*: Standard costing presupposes a pre-determined combination of products both in variety and quantity. The mixture of materials used to manufacture the products may vary in the long run but since standard costs are set normally for a short period, such changes can be taken care of by revision of standards.

(vi) *Level of Performance*: Standards may be either too strict or too liberal because they may be based on (a) theoretical maximum efficiency, (b) attainable good performance or (c) average past performance. To overcome this difficulty the management should give thought to the selection of a suitable type of standard. The type of standard most effective in the control of costs is one which represents an attainable level of good performance.

(vii) *Standard costs cannot possibly reflect the true value in exchange*. If previous historical costs are amended roughly to arrive at estimates for ad hoc purposes, they are not standard costs in the strict sense of the term and hence they cannot also reflect true value in exchange. In arriving at standard costs, however, the economic and technical factors, internal and external, are brought together and analysed to arrive at quantities and prices which reflect optimum operations. The resulting costs, therefore, become realistic measures of the sacrifices involved.

(viii) *Fixation of standards may be costly*: It may require high order of skill and competency. Small concerns, therefore, feel difficulty in the operation of such system.

11.13 Summary

- **Standard Costing**: A technique which uses standards for costs and revenues for the purposes of control through variance analysis.
- **Standard Price**: A predetermined price fixed on the basis of a specification of a product or service and of all factors affecting that price.
- **Standard Time**: The total time in which task should be completed at standard performance.

- **Variance:** A divergence from the predetermined rates, expressed ultimately in money value, generally used in standard costing and budgetary control systems.
- **Variance Analysis:** The analysis of variances arising in standard costing system into their constituent parts.
- **Revision Variance:** It is the difference between the original standard cost and the revised standard cost of actual production.
- **Basic Standard:** A standard fixed for a fairly long period.
- **Current Standard:** A standard fixed for a short period.
- **Estimated Cost :** An estimate of what the cost is likely to be during a given period of time.
- **Ideal Cost :** A cost which should be incurred during a period under ideal conditions.

Important Formulas

- **Material Variance :**

Material Costs Variance = (Std. qty × Std. Price) – (Actual qty × Actual price)

Material Usage Variance = Std. price (Std. Qty. – Actual qty.)

Material Price Variance = Actual qty. (Std. price – Actual price)

Material Cost Variance = Material usage variance + Material price variance

Material Mix Variance = SP (RSQ – AQ)

Material Yield Variance = SP (SQ – RSQ)

- **Labour Variance :**

Labour Cost Variance = (Std. time × Std. Rate) – (Actual time × Actual rate)

Labour Efficiency Variance = Std. rate (Std. time – Actual time)

Labour Rate Variance = Actual time (Std. rate – Actual rate)

Labour Idle Time Variance = Idle time x Std. rate

Labour Cost Variance = Labour Efficiency Variance + Labour Rate Variance

Labour Mix Variance = SR (RSH – AH)

Labour Yield Variance = SR (SH – RSH)

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➤ **Fixed Overhead Variances:**

F.O. Cost Variance = Recovered Overhead – Actual Overhead

F.O. Expenditure Variance = Budgeted Overhead – Actual Overhead

F.O. Volume Variance = Recovered Overhead – Budgeted Overhead

F.O. Efficiency Variance = Recovered Overhead – Standard Overhead

F.O. Capacity Variance = Standard Overhead – Budgeted Overhead

F.O. Calendar Variance = SR (Actual no. of working days – Std. no. working days)

➤ **Variable Overhead Variances**

V.O. Cost variance = Recovered Overhead – Actual Overhead

V.O. Expenditure Variance = Standard Overhead – Actual Overhead

V.O. Efficiency Variance = Recovered Overhead – Standard Overhead

➤ **Sales Variance :**

Sales Price Variance: Actual Quantity of Sales (Actual price – Budgeted price)

Sales Volume Variance: Budgeted Price (Actual quantity – Budgeted quantity)