

## Chapter 11 - Standard Costing

### **Case Study 3 – Learning Curve & Control Ratios**

Bhatia Motor Works (BMW) is one of the renowned coach builders (fabricator) in North India, with a mission to design and fabricate high-quality buses that are innovative in style and engineering; whilst maintaining standards of reliability. BMW has market both locally and internationally.

Human resource at BMW is highly skilled and well versed with latest tools and techniques of respective functional area. BMW is innovative company and always try to improve its performance.

Till date standard costing at BMW is limited only up to calculation of variance. Analysis and classification of variances are never performed. But newly appointed cost controller is highly motivated. Recently, post his appointment, the budgetary system at BMW was revamped drastically as part of cost efficiency drive. Same was done to give best response to variance identified, if any. Not only this, but cost controller is also interest in incorporation of relevant costing and learning curve in standard costing and budgetary control system. With help of management accountant, he able to fetch following data, pertaining to different divisions–

Fabrication division of BMW manufactures two products seat handle (product code B-SH- 101) and seat cover (B-SC-102) with BMW logo imprint on both apart from fabrication. Product B-SH-101 takes 6 men hours to make while product B-SC-102 takes 12 hours. In a month of 25 actual working days of 8 hours each, 1,200 units of B-SH-101 and 750 units of B-SC-102 were produced. BMW employs 75 men in the department responsible for producing these two products. The budgeted hours are 1,86,000 per annum. No. of budgeted working days were 26 but due to break-down, production function actually remains in operation for 25 days only.

#### **Painting Division**

The budget was prepared by management accountant for painting division based upon performance report of last year, he assumes that workers learning curve rate will be 95%. But workers are skilled and specification of task is well known to them, so they assure their manager of 90% learning curve rate (learning index value will be -0.152). Since BMW believe in participatory budgeting, hence management accountant revised the budget estimate post feedback from worker's group.

In each month 15 buses are made ready for delivery after painting & fabrication. It is estimated that initial bus will take 20 hours for painting. It is estimated that learning will be terminated post 6th unit.

#### **Extracts and Values from tables**

Log 2 = 0.3010, Log 3 = 0.4771, Log 5 = 0.6990; Antilog of 1.1827 is 15.23, Antilog of 1.2808

is 19.08 and Antilog of 1.1948 is 15.66.

#### **Required**

- i. Is favourable variance being conclusive proof of efficiency, or investigation of variances is essential? ILLUSTRATE.
- ii. EXPLAIN planning and operating variance.
- iii. 'Standard cost used for variance analysis is not always relevant cost'. EXPLAIN the importance of relevant cost while determine standard cost for variance analysis.

- iv. 'Largely the standard yardsticks are static in nature, during a particular period for ease of variance analysis for said period; but not in case of labour related standard yardsticks; due to learning curve' ASSESS the validity of the statement, in light of need of recognition of learning curve, while establishing the standards.
- v. COMPUTE revised budgeted labour hours for management accountant incorporating learning curve.
- vi. EXPLAIN and INTERPRET control ratios.

### **Solution**

#### **(i) Investigation of variances are essential**

Variance identified post comparison of actual cost against standard cost are not a conclusive sign of performance. No doubt variances are strong indicator of the potential problem. However, investigation of root cause of the adverse variances is necessary. Some of variances are composite of in nature (for e.g., material usage variance can be further classified in material efficiency and material yield variance) hence break down them in part and investigation of each element becomes essential.

So even favourable variances need to be investigated. To understand this statement a suitable illustration can be of raw materials that too in competitive pricing environment. Suppose inferior quality good (whose price is comparatively less) is ordered, on the one side favourable price variance will arise; on the other side most likely there will be substantially more scrap & rework, and thus a higher usage variance.

#### **(ii) Planning & Operating Variances**

Planning Variance – These variances are arising due to revision of standards. In order to compute planning variance original standard needs to be compared with a revised standard. Revised standard is that standard, which may be used as yard stick, if what happen earlier known to person responsible for planning. These are also known as planning variance

Operating Variance – These variances are on account if variance of actual performance or results from revised standard.

#### **(iii) Variance Analysis and Relevant cost**

Traditional approach to variance analysis is to compute variance based on acquisition cost (incurred out of pocket) and standard price for the acquisition of such resources. This may be misleading when resources are scarce in nature, because if scarce resources are not effectively used; it will not only increase the purchase cost (because finance cost is also incurred in addition to acquisition cost) but also result in loss of contribution.

Hence it makes sense, if we incorporate relevant costing to variance analysis; in term of contribution lost on scarce resource/bottleneck activities. To illustrate, while computing material usage variance, lost contribution should be embedded in standard price (to reflect how efficiently, scarce resources is being used) as follows–

$$(Standard\ Quantity - Actual\ Quantity) \times Relevant\ Standard\ Price$$

Where, relevant standard price is standard cost of acquisition of scarce resource (material) added by contribution lost (for else product, where this material; otherwise supposed to be used)

**(iv) Recognition of learning curve while establishing the standards**

Learning Curve recognises the progression of learning potential of people, it presumes worker become quicker if he repeats the process. Now this presumption has implication on standard setting process, in regard to computation of labour related variance and interpretation thereto.

Due to learning curve, standard time established soon become outdated yardstick for performance evaluation, hence computing labour variance with such out-dated standard date is meaningless from prospective planning and control.

Hence in order to accommodate, rapid change in form of reduction of time required/taken producing further each unit of same product with identical specification; effect of learning curve should be considered while computing labour variance. Effect of learning curve should be embedded while setting the standard.

Even in case of material related variances, learning curve has critical implication; because while producing identical product for second time or thereafter; there is high probability of elimination of defect and wastage. Same may improve both the material price and usage variances. Variable production overhead, which are associated to labour hours may also impacted by learning curve. Hence considering the effect of learning curve is essential for material and overhead variances too.

**(v) Revised budgeted hours**

A learning curve is geometric with the general form  $Y = ax^b$

Whereas—

Y = cumulative average time per unit or batch.

a = time taken to produce initial quantity.

x = the cumulative units of production or, if in batches, the cumulative number of batches

b = the learning index or coefficient

Time taken to paint 6<sup>th</sup> unit is 13.08 hours i.e. (91.38 – 78.30) (See working note 1 & 2)

Time required to paint unit 6<sup>th</sup> onward = 13.08 hours (because learning curve will cease post 6<sup>th</sup> unit)

Revised budgeted time required to paint 15 buses = 78.3 hours (for first 5) + 13.08 hours × 10 units (next 10 – 6<sup>th</sup> to 15<sup>th</sup>) = 78.3 hours + 130.8 hours = 209.10 hours

**Working note 1 - Time required for painting first 6 buses**

$$Y = 20 \times (6)^{-0.152}$$

$$\text{Log } Y = \text{Log } 20 - 0.152 \times \text{Log } 6$$

$$\text{Log } Y = \text{Log } 20 - 0.152 \times \text{Log } (2 \times 3)$$

$$\text{Log } Y = \text{Log } 20 - 0.152 \times (\text{Log } 2 + \text{Log } 3)$$

$$\text{Log } Y = 1.3010 - 0.152 \times (0.3010 + 0.4771)$$

$$\text{Log } Y = 1.3010 - 0.152 \times (0.7781)$$

$$\text{Log } Y = 1.3010 - 0.1183$$

$$\text{Log } Y = 1.1827$$

$$Y = \text{antilog of } 1.1827$$

$$Y = 15.23 \text{ hours}$$

Time required for painting first 6 buses is 91.38 hours (15.23 hours × 6 buses)

### Working note 2 - Time required for painting first 5 buses

$$Y = 20 \times (5)^{-0.152}$$

$$\text{Log } Y = \text{Log } 20 - 0.152 \times \text{Log } 5$$

$$\text{Log } Y = 1.3010 - 0.152 \times (0.6990)$$

$$\text{Log } Y = 1.3010 - 0.1062$$

$$\text{Log } Y = 1.1948$$

$$Y = \text{antilog of } 1.1948$$

$$Y = 15.66 \text{ hours}$$

Time required for painting first 5 buses is 78.3 hours (15.66 hours × 5 buses)

### (vi) Control Ratios

- Activity Ratio measures the level of activity attained over a period by expressing number of standard hours required for actual production as percentage of the budgeted hours, as follows–

$$\frac{\text{Standard hours for actual production} \times 100}{\text{Budgeted hours}}$$

$$= (16,200 / 15,500) \times 100 = 104.52\%$$

104.52% signify that BMW is need to work 4.52% extra than what it budgeted for to manufacture what actually it manufactured.

- **Capacity Ratio** indicates the actual utilisation of budgeted hours. It is a measure which express actual working hour as percentage of budget hours (or maximum possible number of working hours).

$$\frac{\text{Actual working hours} \times 100}{\text{Budgeted Hours}}$$

$$= (15,000 / 15,500) \times 100 = 96.77\%$$

96.77% signify that BMW actually worked for 96.77 hours against every 100 possible hours.

Or Budgeted Capacity is utilised up to 96.77% and 3.23% capacity remains unutilised.

Note –

Instead of formula used above, **Capacity Usage Ratio** can also be measured using below mentioned formula –

$$\frac{\text{Actual hours worked} \times 100}{\text{Maximum possible working hours}}$$

- **Calendar Ratio** is a measure where actual number of working days are expressed as number of working days during budgeted period.

$$\frac{\text{Actual number of working days in a period} \times 100}{\text{Number of working days in related budgeted period}}$$

$$= (25/26) \times 100 = 96.15\%$$

- Efficiency ratio indicates the degree of efficiency attained in production. It is expressed in term of standard hours for actual production as a percentage of the actual hours spent in producing that work.

$$\frac{\text{Standard hours for actual production} \times 100}{\text{Actual hours worked}}$$

$$= (16,200 / 15,000) \times 100 = 108\%$$

108% signify that efficiency is 108% or task for which 108 hours is available finished in 100 hours.

#### Working Notes 1 - Calculation of standard hours for actual production

Sr. No.	Product	No. of Unit produced	No. of men hour required per unit	Total Standard Hours
1	Seat handle (B-SH-101)	1,200	6	7,200
2	Seat cover (B-SC-102)	750	12	9,000
<b>Total standard hours for actual production</b>				<b>16,200</b>

#### Working Notes 2 - Calculation of monthly budgeted hours

Annual budgeted hour = 1,86,000 , Monthly budgeted hour = 1,86,000 hours / 12 months = 15,500

#### Working Notes 3 - Calculation of actual hours for actual production

Sr.No.	Particulars	Quantum in No.
1	No. of days production function worked	25
2	No. of hour in day	8
3	No. of worker in division	75
<b>Total actual hours for month</b>		<b>15,000</b>

#### Case Scenario 13 – Critical Success factor

Osaka Tea Co. manufactures and distributes finest quality black tea to hotels, restaurants and retailers. The company has wide presence in tea market. It has become one of the largest premium brands. The customers are very happy with the finest quality of tea.

Osaka Tea Co. never compromise with the quality of the tea. The aim of the company is to deliver finest black tea to keep the customers happy. It has tied up with big tea estates for procurement of finest tea leaves directly from the estate for processing in its own plants. The tea leaves go through

various processes like plucking, withering, brushing, oxidising, grading, drying, sorting and shaping etc. Then these are packed in beautiful plastic jars for distribution to the hotels, restaurants and retailers.

During the meeting of the management, it has been decided to reduce the price per kg by 5% to increase the volume of sales. The following variances pertain to last month's operations, arose as a consequence of implementation of above decision :

Sales Price Variance	24,500 (A)
Sales Volume Variance	20,600 (F)
Purchase Price Variance	15,500 (A)
Labour Efficiency Variance	14,300 (A)
Fixed Cost Expenditure Variance	11,100 (A)

### Required

- (i) IDENTIFY the 'Critical Success Factor' for Osaka Tea Co.
- (ii) EVALUATE the management's decision with the 'Overall Corporate Strategy' and 'Critical Success Factors'.

### Solution

- i. Osaka Tea Co. manufactures and distributes finest quality tea. It is one of the largest premium brands, having wide presence in tea market. Therefore, "quality" is most critical success factor of Osaka. There are other factors which cannot be ignored such as price, delivery options, attractive packing etc. But all are secondary to the quality.
- ii. Osaka Tea Co. manufactures and distributes finest quality tea to hotels, restaurants, and retailers. It is one of the largest premium brands, having wide presence in tea market. It is important to note that premium brands are built on the premise of offering high symbolic value to a very selective segment of consumers that are more focused on high status associations than the underlying price.

In this case scenario adverse price variance indicates that firm has purchased raw material i.e. tea leaves at higher price which may be due to buying of finest-quality material to try to build strong brand image for its products in alignment with current strategy i.e. product differentiation. Similarly, adverse Efficiency Variance may have been due to following several processes which are taking longer time than normal to maintain the quality level. However, Osaka's costs would rise, to substantiate this a premium pricing would be required.

It is also important to note that adverse sales price variance and favourable sales volume variance, indicates that market is price sensitive. However, the net impact of the same is negative on the profitability. Osaka then could no longer make a profit simply by pricing its products e.g. reduce the price per kg by 5%. Osaka is intending to expand its market to retail market and street shops by reducing the price which is opposing its current strategy.

In this scenario, it is important for Osaka to have a perception of exclusivity in alignment with present strategy. Therefore, management should monitor the trends of variances on regular basis and take appropriate action in case of evidence of any decline in quality (i.e. Critical Success Factor).

**Skill Based Q.20 – Budget Reconciliation Report**

During September 2020, Sandy offers bundling and item packing facilities (for standard size 24"×12"×10") to give best facility to satisfy its industrial customers need at the Great Ocean Warehouse. Sandy plans to pack 93,750 items at the rate of Rs 4.50 per item. Sandy estimates that variable cost (all resources) will be equal to Rs 1.50 per item packed and that fixed costs (rent, electricity, and maintenance charges) will be equal to Rs 58,000 p.m. In September 2020, Sandy packed 1,12,500 items and received Rs 5,06,250 as total revenue. However, Sandy paid Rs 1,80,000 on resources (including urgent purchase of tape at retail price). In addition, Sandy paid Rs 70,000 to the warehouse administration for rent, electricity, and maintenance charges. (This past September was unusually hot, and Sandy is charged a percentage of the warehouse's actual electricity bill.

**Required**

PREPARE a budget reconciliation report along with suitable analysis.

**Solution****Workings**

The following table shows Sandy's budget profit and actual profit for the month of September 2020:

Particulars	Budgeted Profit	Actual Profit
Items packed	93,750	1,12,500
Revenue (₹)	4,21,875	5,06,250
Less: Variable Costs	1,40,625	1,80,000
Contribution Margin (₹)	2,81,250	3,26,250
Less: Fixed Costs	58,000	70,000
Profit (₹)	2,23,250	2,56,250

**Analysis**

Sandy's standard selling (packing) price is Rs 4.50 per item and her standard variable cost is Rs 1.50 per item. Therefore, Sandy's budgeted revenue =  $93,750 \times 4.50 = 4,21,875$  and her budgeted variable costs =  $93,750 \times 1.50 = \text{Rs } 1,40,625$ . From the table, we can identify that Sandy's actual profit for September 2020 was Rs 33,000 higher than his budgeted profit ( $2,56,250 - 2,23,250$ ) i.e., Sandy's total profit variance is 33,000 (F).

Sandy's sales contribution volume variance equals to the difference between his standard contribution and budgeted contribution. Each item is budgeted to contribute 3.00 toward profit; since Sandy packed 18,750 more items than budgeted, the increase in volume should have contributed  $56,250 = 18,750 \times 3.00$  to actual profit. Therefore, Sandy's sales contribution volume variance is 56,250 (F).

Sandy's overall variable cost variance equals to the difference between her standard variable costs and her actual variable costs, or  $1,68,750 - 1,80,000 = 11,250(A)$ . But there is not adequate data to segregate Sandy's variable cost variance into price and quantity elements. To compute these variances, we would require the amount of resources Sandy budgets to use per item packed and the actual & budgeted price of each resource (i.e., an adverse variable cost variance can arise as Sandy used more resources per item packed and/or She paid more than budgeted for the resources used). While the issue appears to suggest that Sandy's adverse variable cost variance arose due to spending more on tape than planned, it is not sure that the entire 11,250 variance is attributable to this. In fact, it is likely that the tape price variance was greater than 11,250 (A) and that Sandy had a favorable resource quantity variance to offset this.

Sandy's fixed cost expenditure variance equals the difference between budgeted and actual fixed costs, or  $58,000 - 70,000 = 12,000$  (A).

We can now prepare the following budget reconciliation report:

<b>Item</b>	<b>Amount (Rs.)</b>
Budgeted Profit	2,23,250
Sales Volume Variance	56,250 (F)
Variable Cost Variance	11,250 (A)
Fixed Cost Expenditure Variance	12,000 (A)
Actual Profit	2,56,250