Module 13 – Standard Costing

**13.1 Introduction:**

* Management needs detailed costs and revenues of individual components of the business so that corrective action can be taken if these components do not perform as expected
* Budget figures are too high level for this
* Standard costs are used – a standard cost is a budgeted cost for an individual cost item
* Any difference between actual costs and standard costs requires explanation

**13.2 Setting Standards**

* For setting standards for materials and labor, the best indicator of material usage per unit of product will be the consumption records of the previous period
* An engineering study will produce the *ideal* or engineered standard of material per unit
* The *normal* or operating standards are those which could be expected to be achieved by a productive operation operating efficiently but taking into account the realities of the process
* The materials price will be based on the expected purchase pattern – those companies subject to volatile changes in raw materials may consider restricting the budget period to weeks - e.g. the oil industry
* *Labor usage* is set as a direct result of the engineering study described above – it is measured in units of time and includes refreshment breaks etc.
* The *price standard*, or *rate of pay*, for direct labor is calculated having regard for current rates and any changes that may occur during the budget period
* Overhead standards are determined by reference to one of the four standards above – they depend on the budgeted cost of the overhead, the allocation key and the volume expected of each allocation key used.

**13.3 Motivation**

* Standard costs, like budgets, should be used to motivate
* To ensure an element of ‘stretch’ in the standard costs, the production process should be reviewed periodically – new technologies, better training etc. may lead to a lowering of the standard cost and avoid inefficiencies creeping in over time

**13.4 Flexible Budget**

Consider the following budget

# Budget Actual

Units Produced 2000 1800

Cost of materials 8000 7380

Cost of Labor 6000 5310

Cost of Overhead 2000 2050

16000 14740

Note: The overhead is $1000 fixed and the rest is variable @ $0.50 per unit produced

* Although the production dept came in below budget, it also produced less than budgeted, so to get a true picture the budget should be adjusted downward to reflect the lower output

# Budget Actual Variance

## Planned Units 2000

Actual production 1800 1800

Cost of materials 72001 7380 (180)

## Cost of Labor 5400 5310 90

Cost of Overhead 19002 2050 (150)

14500 14740 (240)

1 1800/2000 = 0.9, 0.9 x 8000 = 7200

2 1000 + 0.5 x 1800 = 1900

* This budget give a clearer picture of what’s actually occurring

**13.5 Anatomy of Variances: Materials and Labor**

* The Variance figure above for Cost of Materials shows us that $180 more was spent on materials than expected – this is too general
* Material costs can be more (or less) than standard for only two reasons

1. actual production used more (or less) material than planned

*or expressed another way*

* Material Efficiency variance = [Standard Quantity – Actual Quantity] x [Standard price per unit price]

= [SQ-AQ]SP

1. the price to purchase the material was more (or less) than expected

or expressed another way

* Material Price Variance = [Standard price per unit – Actual Price per unit] x

[Actual Quantity used]

= [SP-AP]AQ

# Example

A company makes 50 units a month. Last month, against a budgeted production cost of $3000 it reported a production cost of $2860. Why?

Each unit contains 4 meters of raw material which are purchased at $15 per meter. Last month each unit consumed 4.4 meters of material and each meter cost $13.

Material Efficiency variance = [50 x 4 – 50 x 4.4]15 = -$300

Material Price variance = [15- 13](50 x 4.4) = +$440

Total Material variance = $440 (favorable) - $300 (adverse) = $140 favorable, hence the difference in total production costs

* Material Efficiency of $300 adverse could be caused by
* faulty production equipment leading to wastage
* inexperienced staff
* poor maintenance
* poor quality raw material
* Material Price = $440 favorable could be due to
* cheaper supplier
* quantity discounts better than before
* inferior quality material

\*\*\*\*\*\*NOTE: in calculating the SQ, you use the actual number of units produced x the standard specification of raw materials per unit. You do not use the BUDGETED quantity\*\*\*\*\*\*\*\*

**\*\*\*\*NOTE: quantities in these formulas are quantities of the raw material, not the product\*\*\*\***

* Labor cost variance are caused by a combination of the same two reasons:
* actual production requiring more (or less) time than planned, and/or
* the labor rates were more (or less) than planned
* Labor Efficiency variance = [Standard time allowed – actual time taken] x [Standard rate per hour] = [ST-AT]SR
* Labor rate variance = [Standard rate per hour – Actual rate per hour] x Actual time taken = [SR-AR]AT

**Example:**

Taking the example above [50 units produced], in the same month the production dept reported actual labor costs equaling budgeted. Each unit takes 3 hours to produce, each hour paid at the standard rate of $20/hour. During this month, 175 hours were used costing $2999.50.

Labor Efficiency = [50 x 3 – 175]20 = - $500

Labor rate variance = [20-17.14]175 = + $500 (2999.59/175 = 17.14)

Total labor variance = $500 - $500 = 0, hence the budgeted labor costs = actual labor costs.

* Labor Efficiency = $500 adverse could be due to:
* faulty material causes more time per unit
* inexperienced staff
* faulty equipment leading to downtime
* Labor Rate = $500 favorable
* cheaper staff
* less overtime than budgeted for
* pay rise deferred

**13.6 Responsibilities for Variance**

* Personnel should only be held responsible for variances within their control

**13.6.1 DIY Example**

Material Efficiency = (SQ-AQ)SP = (0.4 x 6000 – 2280)20 = $2400 favorable

Caused by:

* New machinery
* New staff
* Better training this year
* Better quality of metal

Material Price = (SP-AP)AQ = (20-22)2100 = $4200 Adverse

Caused by:

* Change of supplier
* Inflation

Note: the Material Efficiency and Price variance are the responsibilities of the Production and Purchasing manager respectively. Hence the AQ in the Material Efficiency is what is under the control of the Production manager (meters used) whereas the Material price uses the meters purchased.

Labor Efficiency = (ST-AT)SR = (2 x 6000 – 11000)10 = $10,000 favorable

Caused by:

* More experienced staff
* New machinery

Labor Rate: (SR-AR)AQ = (10-10.10)11000 = $1100 Adverse

* Inflation
* New wage deal
* More overtime
* More skilled operatives

Note:

1. Variances should be calculated at the stage when they arise and standard costs should be passed on to the next dept in the production process
2. If consistent variances occur again and again (e.g. the labor efficiency remains favorable year after year), then the standard cost may need to be adjusted

**13.7 Variable and Fixed Overhead analysis:**

* Variance analysis, as it applies to overhead, is the examination of the difference between how much overhead was incurred and how much should have been incurred
* Variance analysis is therefore based on the allocation keys used to spread overhead

**Example of Variable Overhead variance analysis:**

A company planned to make 60,000 units per year and each unit would take 2 hours to make. Variable overheads for 120,000 direct labor hours were budgeted at $180,000, or $1.50 per direct labor hour, or $3 per unit.

In the month under review, variable overheads amounted to $17,200 when 6000 units were manufactured and 11,100 hours were recorded

*So, how much variable overhead should have occurred given 6000 units produced vs. how much did occur?*

The Standard cost of variable overhead = (6000 x 2 x $1.50) = $18,000

Actual cost of variable overhead =$17,200

* $800 favorable

Since the company uses direct labor hours as the allocation key, we can delve more deeply and find out the efficiency and price (usually called spending) variances

Efficiency variance = Standard cost of flexible budgeted time – standard costs of actual time taken for units produced

= (6000 x 2 x $1.50) – (11,100 x $1.50)

=$18,000 - $16,650

= $1350 Favorable

Note: Flexible budgeted time is the amount of the key allocation units (in this case direct labor hours) that should have been expended in producing the actual output. So 6000 units should have resulted in 12000 hours.

Here we are trying to find out the cost variance that can be attributed to the difference in the key allocation, i.e. the difference in direct labor hours between what was expected (6000 x 2 hours = 12,000) and what actually happened (11,100). Less hours means less variable overhead

Spending Variance = Standard cost of actual time taken – actual costs incurred

= 11,100 x $1.50 - $17,200

=$16,650 - $17,200

= $550 Adverse

So given the actual number of direct labor hours, there was $550 more overhead than there should have been, possibly caused by an increase in price of the components that make up the variable overhead (e.g. electricity) or an inefficiency in the use of those components.

## **Example with Fixed Overhead Variance**

In the above example, the budgeted fixed overheads for the year were $360,000 i.e. $30,000 a month. This is based on 120,000 hours of direct labor and 60,000 units produced. Each unit takes 2 hours of direct labor.

Actual fixed overhead for the month was $32,500. Fixed overhead is allocated using direct labor hours.

So, the allocation rate is $360,000/120,000 = $3 per direct labor hour.

If, in the month under review, 5000 units were produced then 10,000 hours are incurred and if $30,000 was the actual level of fixed overhead, then no variance would occur (an unlikely scenario).

However, according to the information in the Variable Overhead variance example above, 6000 units were produced

*How much fixed overhead was incurred vs. how much was budgeted for?*

Budgeted –Actual = 30,000 – 32,500 = 2,500 adverse.

This is the ***fixed overhead spending variance***. This is adverse but it does not take into account that more products were produced in this month (6000) than budgeted for (5000). Hence we need to calculate another variance:

Fixed Overhead denominator Variance = Budgeted Amount less Amount applied to units produced

= $30000 - (6000 units x 2 hours x $3 an hour)

= $30,000 - $36,000

= $6000 favorable (favorable because more units were produced than budgeted)

* Management would look not at one month, but look for trends over time
* If the monthly fixed overhead denominator variances were continuously favorable (budgeted>actual), this would indicate that the original budgeted production level was underestimated.
* This in turn could cause the product to be over priced (as the price is based on budgeted costs) – as it took more than its fair share of fixed overhead allocation
* On the other hand, continuous adverse denominator variances could mean that the denominator volume figure is overstated
* Hence each product takes too small a share of fixed overheads
* In the P&L, small budgeted fixed overheads would cause relatively high gross profit figures (as fixed overheads is a cost of sales) – but this would have to be corrected in the P&L

**13.7.1 DIY Example**

Standard cost of a disc, based on one million discs per year, includes 4 machine hours of variable overhead @ $0.50/hour and 4 hours of machine hours of fixed overhead @ $10/hour.

Actual output for the year was 1.2 million discs; actual variable overhead was $1.9 million, actual machine hours recorded were 4,100,000; actual fixed overhead was $39M.

Variable Overhead Variances:

Efficiency Variance = [standard cost of budgeted time for units produced]

– [standard cost of actual time taken for units produced]

= (4 x $0.50 x 1,200,000) – (4,100,000 x $0.5)

= $2,400,00 - $2,050,000

= $350,000 favorable

Reason? Better maintenance, better quality raw materials, possibly the standard time for one unit needs to be revised down from $4

Spending Variance = standard cost of actual time taken for units produced – Actual costs incurred

= $2,050,000 - $1,900,000

= $150,000 favorable

Reason? more advantageous price negotiations for variable costs such as power and heat

Fixed Overhead variances:

Spending Variance = Budgted amount – Actual amount

= (4 hours @ $10/hour x 1,000,000) - $39M

=$40M – $39M

=$1M favorable

Reason: Less expensive machines means less depreciation

Denominator Variance = Budgeted Amount – Amount applied to units actually produced

= $40M – (1,200,000 units x $4 x $10)

= $40M - $48

= $8M favorable

Reason: Understatement of denominator volume figure

**13.8 Investigation of Variances:**

* Management need to know about significant variances from budget only and the reason for them
* This form of reporting is called *exception reporting* or *management by exception*
* This enables management to see which items are out of control
* Out of control is usually defined by a percentage limit, above which management is notified
* Software can be used to alert management to consistently variant items
* Often variances are interdependent , e.g
* Averse materials efficiency variance may be caused by the use of inferior materials may cause a favorable material price variance

**13.9 Sales Variance**

* Management need to know the consequences of not achieving the sales volume and sales mix (how much each product sells) planned for in the budget

**Example:**

A manager is happy that his contribution margin on tennis shoes rose by $25,000 from the budgeted level of $85,000, even though sales volume fell. He sells two types of shoe: Ace’em for $50 and a cheaper version ‘Plodder’ for $12.50.

The budgeted and actual sales figures for May are:

# Budgeted Figures

**Ace’Em Plodder Total**

# Units Price Total Units Price Total Units Price Total

Sales 2000 $50 $100,000 18000 $12.50 $225000 20,000 $16.251 $325,000

## Cost 2000 $30 $60,000 18000 $10 $180000 20,000 $12 $240,000

Contr

Margin2000 $20 $40000 18000$2.50 $45000 20,000 $4.252 $85,000

1 $50 x 2000/20,000 + $12.50 x 18,000/20,000 = $5 + 11.25 = $16.25

2$85,000/20,000 = $4.25

# Actual results

**Ace’Em Plodder Total**

# Units Price Total Units Price Total Units Price Total

Sales 4000 $51.25$205000 10000 $12.50 $125000 14,000 $23.571 $330,000

## Cost 4000 $30 $120,000 10000 $10 $100000 14,000 $15.71 $220,000

Contr

Margin4000 $21.25 $10000 10000$2.50 $25000 14,000 $7.86 $110,000

Why the increase in contribution margin of $25,000 when sales actually declined?

Lets check the contribution margin as a percentage of sales price:

**Ace’Em Plodder Total**

Budget 40% 1 20% 26.154%2

## Actual 41.463% 20% 33.347%

1 $20/$50 x 100% = 40%

2 $4.25/$16.25 x 100% = 26.15%

So, a small increase in the contribution % of Ace’em results in a large increase in the combined contribution margin percentage, hence the large increase in contribution margin.

* Sales Variance analysis allows the manager to gain detailed insight beyond the casual view shown above
* Total contribution earned from sales depends on *contribution per unit* and *volume*

***Contribution Variance =***

***[Difference between actual and budgeted contribution margin per unit] –***

***[Actual sales in units]***

Ace’em = ($21.25 - $20) x 4000 = $5000 favorable

Plodder = ($2.50 - $2.50) x 10,000 = $0

$5000 favorable

NOTE: Its Acutal –Budgeted, not Budgeted - Actual

***Volume Variance = [Actual Sales less Budgeted sales] x***

***[Budgeted Contribution Margin per unit]***

Ace’em = (4000-2000) x $20 = $40,000 favorable

Plodder = (10,000 – 18,000) x $2.50 = $20,000 Adverse

$20,000 favorable

So, $5000 contribution variance (caused by the change in contribution margin for each of the products) plus $20,000 volume variance (caused by the change in volume sold from budgeted to actual) results in the $25,000 total difference in contribution margin.

* From the above information, a manager can see that the volume variance figure for Ace’em caused by the increase in sales is far more important than the increase in Ace’ems contribution margin due to the higher selling price ($51.25 vs. $50)
* A manager may choose to drop the Plodder line

Volume Variance can be further explored:

***Sales Quantity = [Actual Sales less budgeted sales] x***

***[Budgeted weighted average contribution margin per unit]***

Ace’em = (4000-2000) x $4.25 = $8500 favorable

Plodder = (10000 – 18000) x $4.25 = $34,000 Adverse

$25,500 adverse

* Sales quantity variance treats both products as being of equal worth ($4.25 ea.), a drop in overall volume between budgeted and actual means an adverse variance

***Sales Mix Variance = [Actual sales less budgeted sales] x***

***[Budgeted contribution margin per unit less budgeted weighted contribution margin per unit]***

Ace’em = (4000 – 2000) x ($20 - $4.25) = $31,500 favorable

Plodder = (10000 – 18000) x ($2.50 - $4.25) = $14,000 Favorable

$45,500 Favorable

* Here a drop in the volume of Plodder sold actually results in a favorable variance – so selling fewer Plodder’s is beneficial

*Sales Mix Variance + Sales Quantity Variance should equal Sales Volume Variance*

$45,500 - $25,500 = $20,000 : CORRECT

* IMPORTANT: In this case the manager would be better off with just the volume variance, as the sales mix and sales quantity variance just confuse the issue!!

Review:

1. FALSE
2. b
3. d
4. c
5. 4600/5000 = 0.92; 0.92 x 10000= 9200 = a
6. 0.92 x 2500= 2300; 2600-2300=300 Adverse = d
7. 0.92 x 16250=14950; 15600-14950=650 adverse = c
8. SQ = 16250/5000 = 3.25 = c
9. b
10. d
11. Materials efficiency = [SQ-AQ]SP =

[10000 units x 5kg –48500kg] x ($4 per kg) = 1500 kg x $4 = $6000 favorable =a

1. Materials Price variance = [SP-AP]AQ = [$4 per kg – $3.5 per kg] x 48500kgs = $24250 favorable = d
2. Materials price variance = [SP=AP]AQ = [$2 per kg - $1.75] x 28000 =$7000 favorable = c
3. Materials efficiency = [(9000 x 3kg) – 28000] $2 = (-1000)$2= $2000 adverse=b
4. Price = [2-3]16000 = $16000 adverse, Efficiency = [(3kg x 8000) – 16000 kg]$2 = $16000 favorable

Ans: b

1. b
2. a
3. Labor efficiency = [ST-AT]SR = [3hrs/unit x1100units – 3200hours]$4.80 = $480 favorable = c
4. Labor rate = [SR-AR]AT = [4.80-$15680/3200]3200= [4.8-4.9]3200 = $320 adverse =a
5. Materials Efficiency = [sq-aq]SR = [1x100 – 110]$2 = -$20 = d
6. [SR-AR]AQ = [2-209/110]110 = [2-1.9]110 = $11 favorable = b
7. [SR-AR]AT = [5-900/150]150 = [5-6]150 = -$150 = c
8. [ST-AT]SR = [2x100 – 150]$5= 50 x $5 = $250 favorable=d
9. d
10. b
11. FALSE
12. Variable overhead efficiency variance = Standard cost of budgeted time – Standard cost of actual time

= ($1.20 per hour x 2 hours x 11,000) – ($1.20 x 21600 hours)=$26,400 - $25,920 = Favorable $480 = a

1. Variable Overhead Spending variance = Standard Cost of Actual time taken – Actual cost = ($1.20 x 21600) - $25,000 = $920 Favorable = b
2. Monthly budgeted Fixed Overhead = $247,500/12 = $20,625.

Overhead Spending Variance = $20,625 – $22,500 = $1875 adverse = c

1. Denominator Variance = Budgeted amount – amount applied to actual production

= $20.625 – (28000 x $247500/82500x ¼) = $20,625 -$21,000 = -$375 = a

1. a
2. FALSE
3. Sales Contribution Margin = (Actual Contribution/ unit – Budgeted Contribu/unit) x Actual Number of units sold

Chicago: ($58750/250 - $45,000/200) x 250 = ($235-$225) x 250 = +$2500

Stuttgart: (56,875/325 - 60,000/300) x 325 = ($175 - $200) x 325 = - $8125

- $5625 =c

1. Sales Volume Variance = (Actual Sales – Budgeted Sales) x Budgeted Contribution Margin per unit

Chicago = (250-200) x $225 = $11,250

Stuttgart = (325-300) x $200 = $5000

$16,250 = d

1. Sales Quantity Variance = (Actual Sales- Budgeted) x Weighted Budgeted Contribution margin per unit

Weighted Contribution Margin per unit = $105,000/500 = $210

Chicago = (50) x ($210) = $10,500

Stuttgart = (25) x ($210)= $5250

$15,750 = c

1. Mix = (Actual Sales – Budgeted Sales) x ( Budgeted Contribution Margin /unit – Budgeted Weighted Contribution margin per unit)

Chicago = (50) x ($225 - $210) = $750

Stuttgart = (25) x ($200 - $210) = -$250

$500 = b