Standard Costs and Variances

Chapter 12

Standard Costs

Standards are benchmarks or "norms" for measuring performance. In managerial accounting, two types of standards are commonly used.

Quantity standards specify how much of an input should be used to make a product or provide a service.

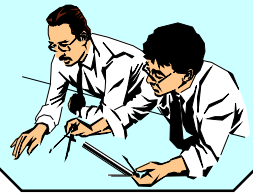
Price standards specify how much should be paid for each unit of the input.

Examples: Firestone, Sears, McDonald's, hospitals, construction and manufacturing companies.

Setting Direct Material Standards

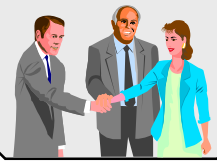
Quantity Standards

Summarized in a Bill of Materials.



Price Standards

Final, delivered cost of materials, net of discounts.



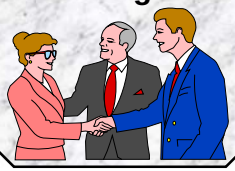
Setting Direct Labor Standards

Time Standards

Use time and motion studies for each labor operation.

Rate Standards

Often a single rate is used that reflects the mix of wages earned.



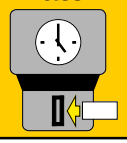
Setting Variable Manufacturing Overhead Standards

Quantity Standards

The quantity is the activity in the allocation base for predetermined overhead.

Rate Standards

The rate is the variable portion of the predetermined overhead rate.



Standard Cost Card – Variable Production Cost

A standard cost card for one unit of product might look like this:

Inputs	A Standard Quantity or Hours	B Standard Price or Rate	A x B Standard Cost per Unit
Direct materials	3.0 lbs.	$ 4.00 per lb.	$ 12.00
Direct labor	2.5 hours	14.00 per hour	35.00
Variable mfg. overhead	2.5 hours	3.00 per hour	7.50
Total standard unit cost			$ 54.50

Using Standards in Flexible Budgets

Standard costs per unit for direct materials, direct labor, and variable manufacturing overhead can be used to compute **activity** and **spending** variances.

Spending variances become more useful by breaking them down into price and quantity variances.

A General Model for Variance Analysis

Variance Analysis

- **Price Variance** → Difference between actual price and standard price
- **Quantity Variance** → Difference between actual quantity and standard quantity

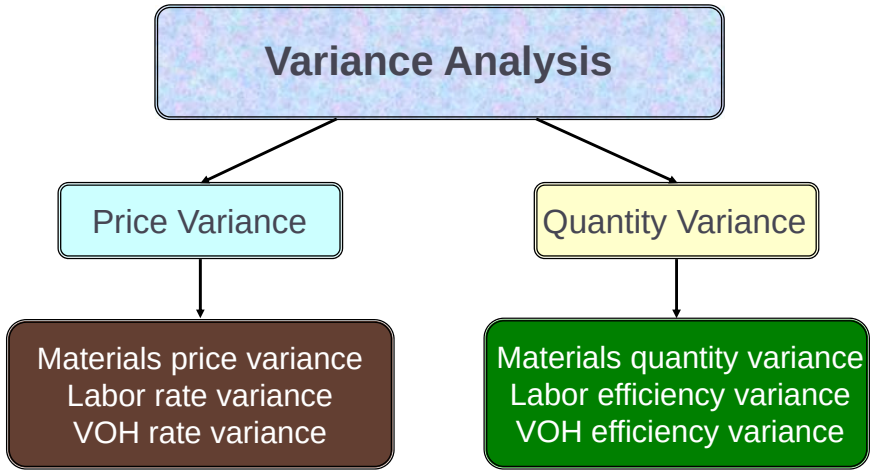
Price and Quantity Standards

Price and quantity standards are determined separately for two reasons:

❶ The purchasing manager is responsible for raw material purchase prices and the production manager is responsible for the quantity of raw material used.

❷ The buying and using activities occur at different times. Raw material purchases may be held in inventory for a period of time before being used in production.

A General Model for Variance Analysis



A General Model for Variance Analysis

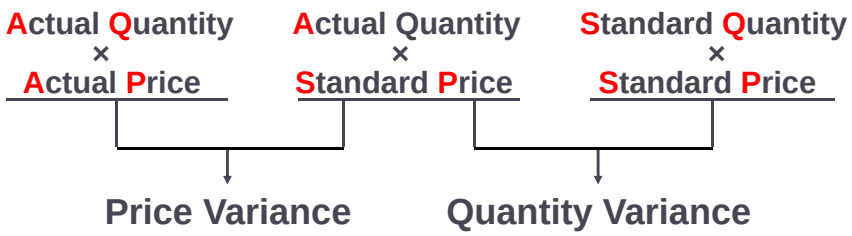
A General Model for Variance Analysis

Actual quantity is the amount of direct materials, direct labor, and variable manufacturing overhead actually used.

Standard quantity is the standard quantity allowed for the actual output of the period.

Actual price is the amount actually paid for the input used.

A General Model for Variance Analysis



(AQ × AP) – (AQ × SP)	(AQ × SP) – (SQ × SP)
AQ = Actual Quantity	SP = Standard Price
AP = Actual Price	SQ = Standard Quantity

Another Way to Look at the Problems: The line-by-line method

Actual Quantity	x Actual Price	= AQ x AP	
Actual Quantity	x Standard Price	= AQ x SP	Price variance
Standard Quantity	x Standard Price	= SQ x SP	Quantity variance
			Total Variance

SQ = (A_{ouput} x standard quantity for production)
= standard quantity allowed for the actual output

Notes:

Material Variances – An Example

Glacier Peak Outfitters has the following direct material standard for the fiberfill in its mountain parka.

0.1 kg. of fiberfill per parka at $5.00 per kg.

Last month 210 kgs. of fiberfill were purchased and used to make 2,000 parkas. The material cost a total of $1,029.

Material Variances Summary: The tradition method

Actual Quantity × Actual Price	Actual Quantity × Standard Price	Standard Quantity × Standard Price
210 kgs. × $4.90 per kg.	210 kgs. × $5.00 per kg.	200 kgs. × $5.00 per kg.
= $1,029	= $1,050	= $1,000

Price variance $21 favorable

Quantity variance $50 unfavorable

Material Variances: The line-by-line method

AQ x AP =	210	x AP =	1,029	(21) F	Price variance
AQ x SP =	210	x 5 =	1,050	50 U	Quantity variance
SQ x SP = (2000 x 0.1)	x 5 =		1,000	29 U	Total Variance

SQ = (Aouput x standard quantity for production)
= standard quantity allowed for the actual output

Calculation of Actual Purchase Price (AP) per unit can be done but is not necessary because AP will not be used in subsequent calculations and the total actual purchase cost in total is sufficient for the variance calculation.

Material Variances: Using the Factored Equations

Materials price variance

MPV = AQ (AP - SP)
= 210 kgs ($4.90/kg - $5.00/kg)
= 210 kgs (-$0.10/kg)
= $21 F

Materials quantity variance

MQV = SP (AQ - SQ)
= $5.00/kg (210 kgs-(0.1 kg/parka × 2,000 parkas))
= $5.00/kg (210 kgs - 200 kgs)
= $5.00/kg (10 kgs)
= $50 U

Notes:

Isolation of Material Variances

I need the price variance sooner so that I can better identify purchasing problems.

You accountants just don't understand the problems that purchasing managers have.

I'll start computing the price variance when material is purchased rather than when it's used.

Material Variances

Hanson purchased and used 1,700 pounds. How are the variances computed if the amount purchased differs from the amount used?

The price variance is computed on the entire quantity purchased.

The quantity variance is computed only on the quantity used.

Responsibility for Material Variances

Materials Price Variance

Purchasing Manager

Materials Quantity Variance

Production Manager

The standard price is used to compute the quantity variance so that the production manager is not held responsible for the purchasing manager's performance.

Responsibility for Material Variances

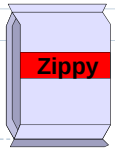
Your poor scheduling sometimes requires me to rush order material at a higher price, causing unfavorable price variances.

I am not responsible for this unfavorable material quantity variance.

You purchased cheap material, so my people had to use more of it.

Notes:

Quick Check ✓



Hanson Inc. has the following direct material standard to manufacture one Zippy:

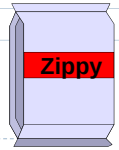
1.5 pounds per Zippy at $4.00 per pound

Last week, 1,700 pounds of material were purchased and used to make 1,000 Zippies. The material cost a total of $6,630.

Hanson's material price variance (MPV) for the week was:

a. $170 unfavorable.
b. $170 favorable.
c. $800 unfavorable.
d. $800 favorable.

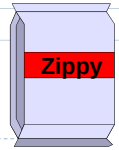
Quick Check ✓



Hanson's material quantity variance (MQV) for the week was:

a. $170 unfavorable.
b. $170 favorable.
c. $800 unfavorable.
d. $800 favorable.

Quick Check ✓ Continued

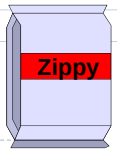


Hanson Inc. has the following material standard to manufacture one Zippy:

1.5 pounds per Zippy at $4.00 per pound

Last week, 2,800 pounds of material were purchased at a total cost of $10,920, and 1,700 pounds were used to make 1,000 Zippies.

Quick Check ✓ Continued
The line-by-line method



AQp x AP	=	2,800	x	AP =	10,920	
						(280) F Price variance
AQp x SP	=	2,800	x	4 =	11,200	
						4,400 U Inventory @ Std cost
AQu x SP	=	1,700	x	4 =	6,800	
						800 U Usage variance (Quantity variance)
SQ x SP	= (1000 x 1.5)		x	4 =	6,000	
						4,920 U Total Variance

AQp = Actual Quantity Purchased
AQu = Actual Quantity used
SQ = (Aouput x standard quantity for production use)
= standard quantity allowed for the actual output

Labor Variances – An Example

Glacier Peak Outfitters has the following direct labor standard for its mountain parka.

1.2 standard hours per parka at $10.00 per hour

Last month, employees actually worked 2,500 hours at a total labor cost of $26,250 to make 2,000 parkas.

Labor Variances

AH x AR	=	2,500	x	AR =	26,250	
						1,250 U Rate variance
AH x SR	=	2,500	x	10 =	25,000	
						1,000 U Efficiency variance
SH x SR	= (2000 x 1.2)		x	10 =	24,000	
						2,250 U Total Variance

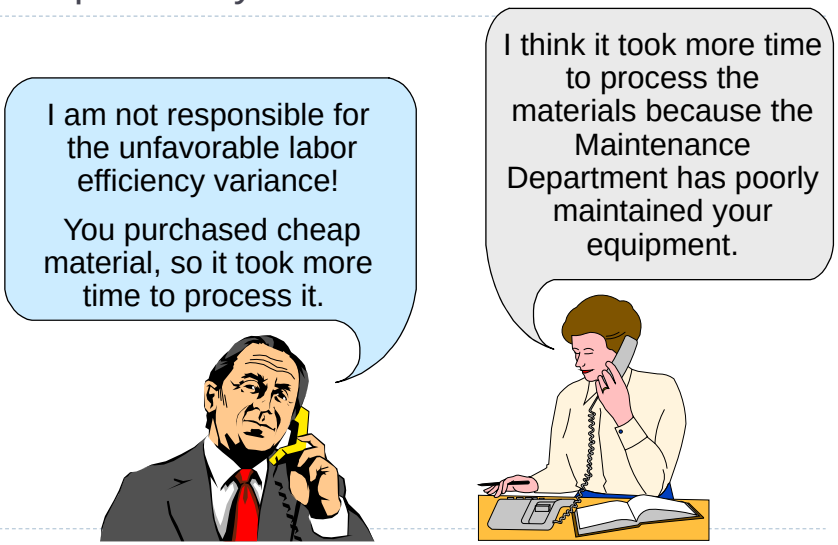
AH = Actual hour paid (and worked in this case)
AR = Actual rate per hour
SR = Standard rate per hour
SH = (Aouput x standard hours for the production)
= standard hours allowed for the actual output

Responsibility for Labor Variances

Production managers are usually held accountable for labor variances because they can influence the:

- Mix of skill levels assigned to work tasks.
- Level of employee motivation.
- Quality of production supervision.
- Quality of training provided to employees.

Responsibility for Labor Variances



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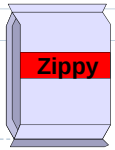
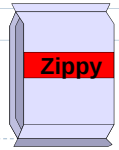


Hanson Inc. has the following direct labor standard to manufacture one Zippy:

1.5 standard hours per Zippy at $12.00 per direct labor hour

Last week, 1,550 direct labor hours were worked at a total labor cost of $18,910 to make 1,000 Zippies.

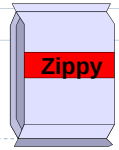
Quick Check ✓



Hanson's labor rate variance (LRV) for the week was:

a. $310 unfavorable.
b. $310 favorable.
c. $300 unfavorable.
d. $300 favorable.

Quick Check ✓



Hanson's labor efficiency variance (LEV) for the week was:

a. $590 unfavorable.
b. $590 favorable.
c. $600 unfavorable.
d. $600 favorable.

Variable Manufacturing Overhead Variances – An Example

Glacier Peak Outfitters has the following direct variable manufacturing overhead labor standard for its mountain parka.

1.2 standard hours per parka at $4.00 per hour

Last month, employees actually worked 2,500 hours to make 2,000 parkas. Actual variable manufacturing overhead for the month was $10,500.

Variable Manufacturing Overhead Variances: The line-by-line method

AH x AR	=	2,500	x	AR =	10,500	
						500 U Rate variance
AH x SR	=	2,500	x	4 =	10,000	
						400 U Efficiency variance
SH x SR	=	(2000 x 1.2)	x	4 =	9,600	
						900 U Total Variance

AH = Actual hour paid (and worked in this case)
AR = Actual rate per hour
SR = Standard rate per hour
SH = (Aouput x standard hours for the production)
= standard hours allowed for the actual output

Variable Manufacturing Overhead Variances: Using Factored Equations

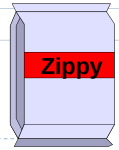
Variable manufacturing overhead rate variance

VMRV = AH (AR - SR)
= 2,500 hours ($4.20 per hour – $4.00 per hour)
= 2,500 hours ($0.20 per hour)
= $500 unfavorable

Variable manufacturing overhead efficiency variance

VMEV = SR (AH - SH)
= $4.00 per hour (2,500 hours – 2,400 hours)
= $4.00 per hour (100 hours)
= $400 unfavorable

Quick Check ✓

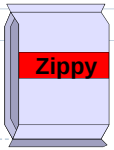


Hanson Inc. has the following variable manufacturing overhead standard to manufacture one Zippy:

1.5 standard hours per Zippy at $3.00 per direct labor hour

Last week, 1,550 hours were worked to make 1,000 Zippies, and $5,115 was spent for variable manufacturing overhead.

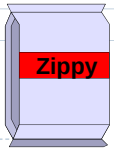
Quick Check ✓



Hanson's rate variance (VMRV) for variable manufacturing overhead for the week was:

a. $465 unfavorable.
b. $400 favorable.
c. $335 unfavorable.
d. $300 favorable.

Quick Check ✓



Hanson's efficiency variance (VMEV) for variable manufacturing overhead for the week was:

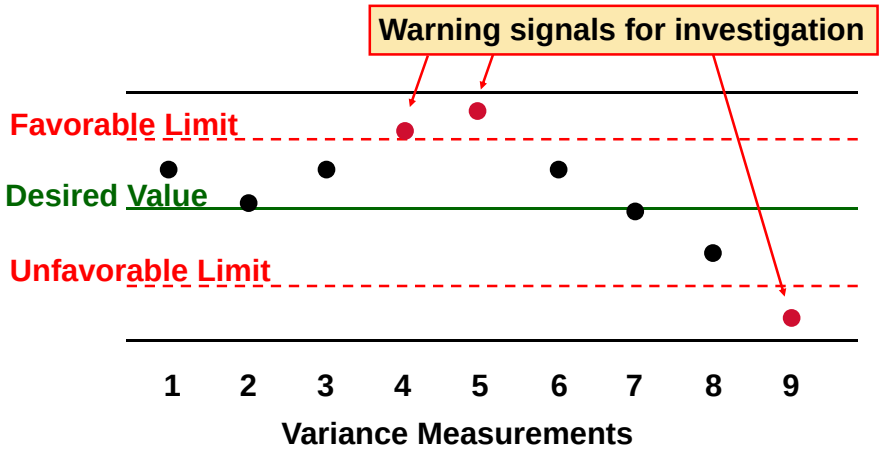
a. $435 unfavorable.
b. $435 favorable.
c. $150 unfavorable.
d. $150 favorable.

Variance Analysis and Management by Exception

How do I know which variances to investigate?

Larger variances, in dollar amount or as a percentage of the standard, are investigated first.

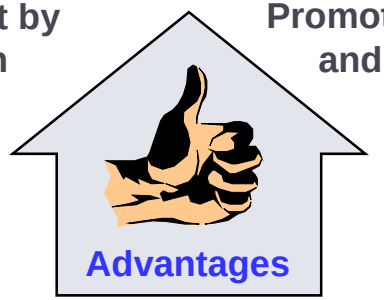
A Statistical Control Chart



Advantages of Standard Costs

Management by exception

Promotes economy and efficiency



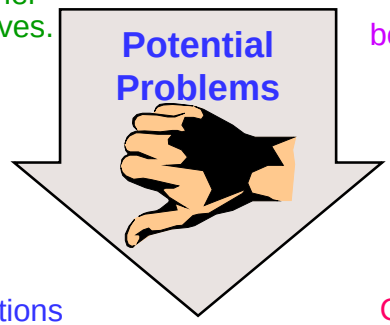
Simplified bookkeeping

Enhances responsibility accounting

Potential Problems with Standard Costs

Emphasizing standards may exclude other important objectives.

Favorable variances may be misinterpreted.



Standard cost reports may not be timely.

Emphasis on negative may impact morale.

Invalid assumptions about the relationship between labor cost and output.

Continuous improvement may be more important than meeting standards.

End of Chapter 12

Generalized Model of the Row by Row Approach and Its Preparation of the Performance Report (Reconcile Actual Results to the Budgeted Figures)

Supplementary Note

Generalized Model of the Row by Row Approach and Its Preparation of the Performance Report (Reconcile Actual Results to the Budgeted Figures)

Actual Quantity x Actual Price = AQ x AP

Actual Quantity x Standard Price = AQ x SP → Price variance

Standard Quantity x Standard Price = SQ x SP → Quantity variance

Total Flexible Variance

Budgeted Quantity x Standard Price = BQ x SP → Activity Variance

Static variance

SQ = (Aouput x standard quantity for production)
= standard quantity allowed for the actual output

BQ = Budgeted quantity

Performance Report for Variance Analysis: Recall Example from Chapter 11

Larry's Lawn Service
Flexible Budget Performance Report
For the Month Ended June 30

	Revenue/Cost Formulas	Planning Budget	Activity Variances	Flexible Budget	Revenue and Spending Variances	Actual Results
Number of lawns (Q)		500		550		550
Revenue	($75Q)	$ 37,500	$ 3,750 F	$ 41,250	$ 1,750 F	$ 43,000
Expenses:						
Wages and salaries	($5,000 + $30Q)	$ 20,000	$ 1,500 U	$ 21,500	$ 2,000 U	$ 23,500
Gasoline and supplies	($9Q)	4,500	450 U	4,950	150 U	5,100
Equipment maintenance	($3Q)	1,500	150 U	1,650	350 F	1,300
Office and shop utilities	($1,000)	1,000	-	1,000	50 F	950
Office and shop rent	($2,000)	2,000	-	2,000	-	2,000
Equipment Depreciation	($2,500)	2,500	-	2,500	-	2,500
Insurance	($1,000)	1,000	-	1,000	200 U	1,200
Total expenses		32,500	2,100 U	34,600	1,950 U	36,550
Net operating income		$ 5,000	$ 1,650 F	$ 6,650	$ 200 U	$ 6,450

Predetermined Overhead Rates and Overhead Analysis in a Standard Costing System

Appendix 12A

Obj.#4 Compute and interpret the fixed OH budget and volume variance

Fixed Manufacturing Overhead Variances: The line-by-line method

Actual Fixed Overhead

Budgeted Fixed Overhead = BH x SR → Budget variance (Spending variance)

Applied Fixed Overhead = SH x SR → Volume variance

Total Variance

BH = Budgeted hours (a.k.a. Denominator hours)
SH = (Aouput x standard hours for the production)
= standard hours allowed for the actual output

Fixed Overhead Budget Variance: The traditional method

Actual Fixed Overhead	Budgeted Fixed Overhead	Fixed Overhead Applied

Budget variance

Budget variance = Actual fixed overhead – Budgeted fixed overhead

Fixed Overhead Volume Variance: The traditional method

Actual Fixed Overhead	Budgeted Fixed Overhead	Fixed Overhead Applied

Volume variance

Volume variance = Budgeted fixed overhead – Fixed overhead applied to work in process

Fixed Overhead Volume Variance: The traditional method

Actual Fixed Overhead	Budgeted Fixed Overhead	Fixed Overhead Applied
	DH × FR	SH × FR

Volume variance

Volume variance = FPOHR × (DH – SH)

FPOHR = Fixed portion of the predetermined overhead rate
DH = Denominator hours
SH = Standard hours allowed for actual output

Computing Fixed Overhead Variances

ColaCo
Production and Machine-Hour Data

Budgeted production	30,000	units
Standard machine-hour per unit	3	hours
Budgeted machine-hour	90,000	hours
Actual production	28,000	units
Standard machine-hour allowed for the actual production	84,000	hours
Actual machine-hour	88,000	hours

Computing Fixed Overhead Variances

ColaCo Cost Data	
Budgeted variable manufacturing overhead	$ 90,000
Budgeted fixed manufacturing overhead	270,000
Total budgeted manufacturing overhead	$ 360,000
Actual variable manufacturing overhead	$ 100,000
Actual fixed manufacturing overhead	280,000
Total actual manufacturing overhead	$ 380,000

Predetermined Overhead Rates

$$\text{Predetermined overhead rate} = \frac{\text{Estimated total manufacturing overhead cost}}{\text{Estimated total amount of the allocation base}}$$

$$\text{Predetermined overhead rate} = \frac{\$360{,}000}{90{,}000 \text{ Machine-hour}}$$

$$\text{Predetermined overhead rate} = \$4.00 \text{ per machine-hour}$$

Predetermined Overhead Rates

$$\text{Variable component of the predetermined overhead rate} = \frac{\$90{,}000}{90{,}000 \text{ Machine-hour}}$$

$$\text{Variable component of the predetermined overhead rate} = \$1.00 \text{ per machine-hour}$$

$$\text{Fixed component of the predetermined overhead rate} = \frac{\$270{,}000}{90{,}000 \text{ Machine-hour}}$$

$$\text{Fixed component of the predetermined overhead rate} = \$3.00 \text{ per machine-hour}$$

Applying Manufacturing Overhead

$$\text{Overhead applied} = \text{Predetermined overhead rate} \times \text{Standard hours allowed for the actual output}$$

$$\text{Overhead applied} = \$4.00 \text{ per machine-hour} \times 84{,}000 \text{ machine-hour}$$

$$\text{Overhead applied} = \$336{,}000$$

Fixed Manufacturing Overhead Variances
The line-by-line method

Actual	=	= 280,000	
			10,000 U Budget variance
Budgeted	=	= 270,000	
			18,000 U Volume variance
SH x SR	= (28000 x 3) x 3	= 252,000	
			28,000 U Total Underapplied overhead

SH = (A_{ouput} x standard hours for the production)
= standard hours allowed for the actual output

Computing the Budget Variance:
The traditional method

Budget variance = **Actual fixed overhead** – **Budgeted fixed overhead**

Budget variance = $280,000 – $270,000

Budget variance = $10,000 Unfavorable

Computing the Volume Variance:
The traditional method

Volume variance = **Budgeted fixed overhead** – **Fixed overhead applied to work in process**

Volume variance = $270,000 – ($3.00 per machine-hour × $84,000 machine-hour)

Volume variance = $18,000 Unfavorable

Computing the Volume Variance:
The traditional method

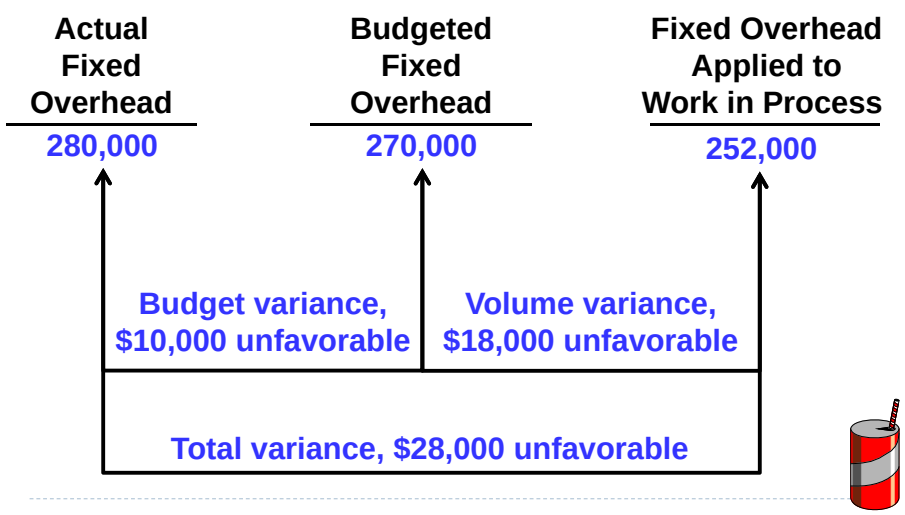
Volume variance = **FPOHR × (DH – SH)**

FPOHR = Fixed portion of the predetermined overhead rate
DH = Denominator hours
SH = Standard hours allowed for actual output

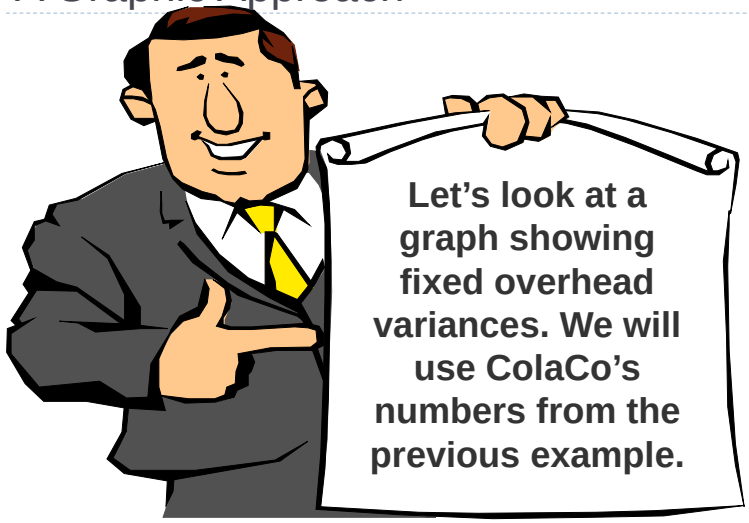
Volume variance = $3.00 per machine-hour × (90,000 machine-hour – 84,000 machine-hour)

Volume variance = 18,000 Unfavorable

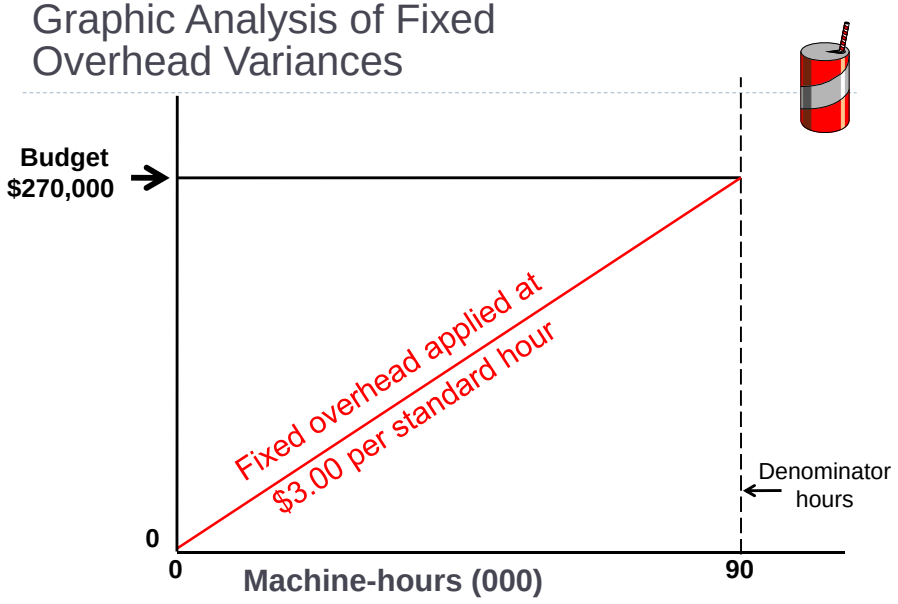
A Pictorial View of the Variances



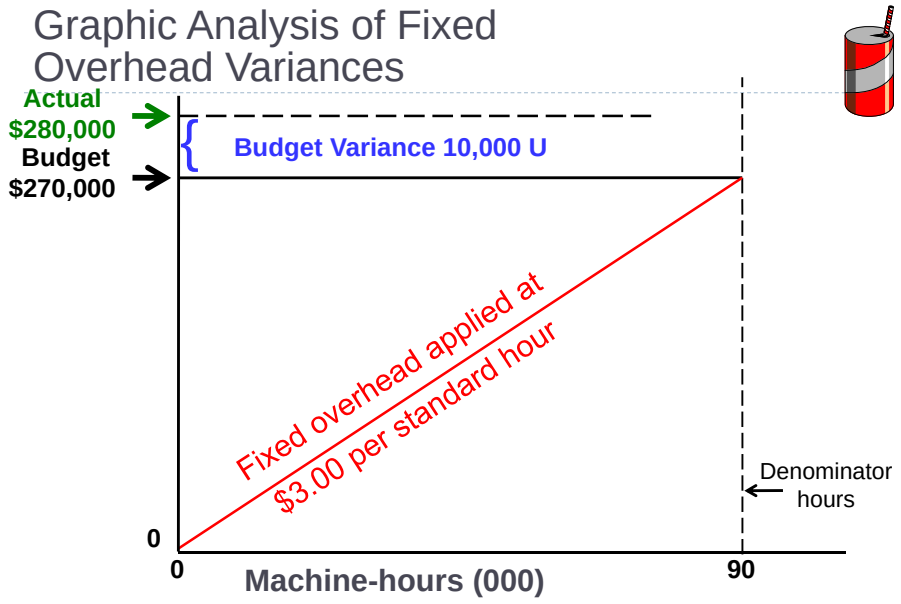
Fixed Overhead Variances – A Graphic Approach



Graphic Analysis of Fixed Overhead Variances



Graphic Analysis of Fixed Overhead Variances



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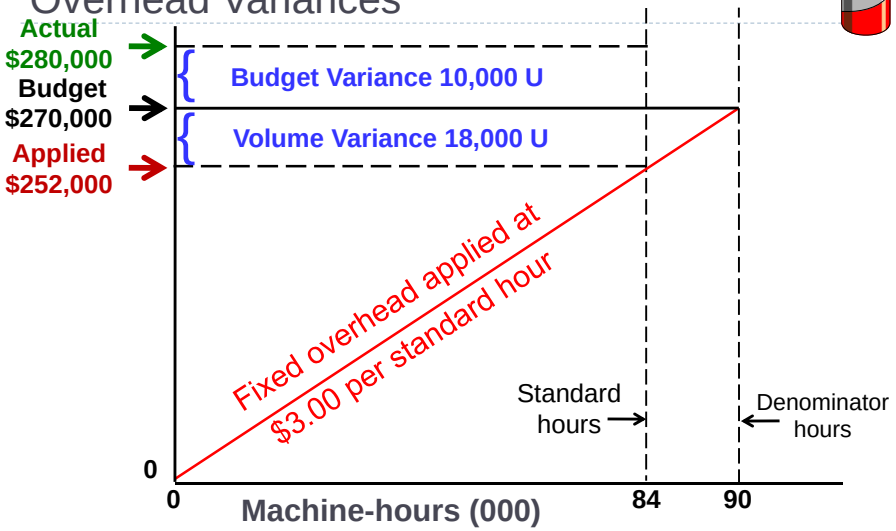
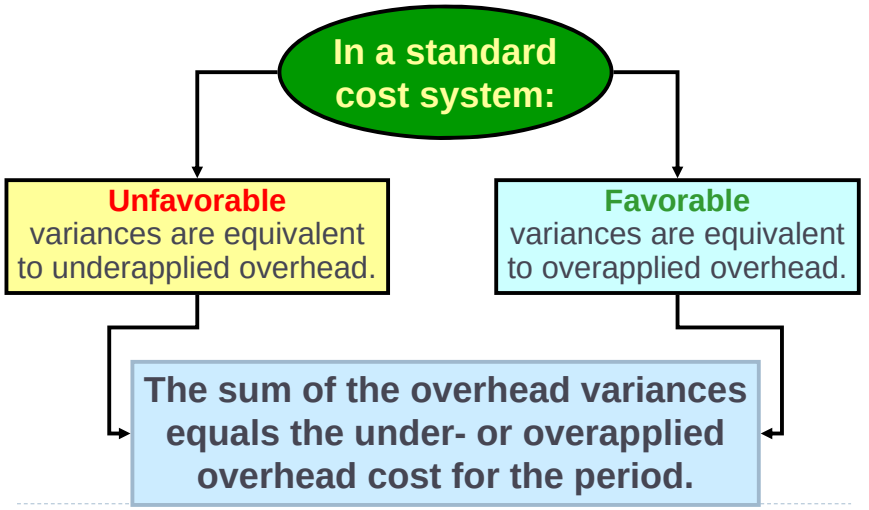


Reconciling Overhead Variances and Underapplied or Overapplied Overhead



Reconciling Overhead Variances and Underapplied or Overapplied Overhead

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Computation of Underapplied Overhead

Predetermined overhead rate (a)	$	4.00	per machine-hour
Standard hours allowed for the actual output (b)		84,000	machine hours
Manufacturing overhead applied (a) × (b)	$	336,000	
Actual manufacturing overhead	$	380,000	
Manufacturing overhead underapplied or overapplied	$	44,000	underapplied

Variable Overhead Variances: The line-by-line method

AH x AR = = 100,000

AH x SR = 88,000 x 1 = 88,000

SH x SR = 84,000 x 1 = 84,000
(= 28,000 x 3)

12,000 U Rate variance

4,000 U Efficiency variance

16,000 U Total Variance
= Total underapplied variable overhead

SR = Standard rate per hour

SH = (Aouput x standard hours for the production)
= standard hours allowed for the actual output

Computing the Variable Overhead Variances: The factored equation method

Variable manufacturing overhead rate variance

VMRV = (AH × AR) – (AH × SR)
= $100,000 – (88,000 hours × $1.00 per hour)
= $12,000 unfavorable

Computing the Variable Overhead Variances The traditional method

Variable manufacturing overhead efficiency variance

VMEV = (AH × SR) – (SH × SR)
= $88,000 – (84,000 hours × $1.00 per hour)
= $4,000 unfavorable

Computing the Sum of All Variances

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Computing the Sum of All variances

Variable overhead rate variance	$	12,000	U
Variable overhead efficiency variance		4,000	U
Fixed overhead budget variance		10,000	U
Fixed overhead volume variance		18,000	U
Total of the overhead variances	$	44,000	U