

A close-up of a financial statement table with numerical data.

100,000
10,000
10,000
75,000
\$205,000



Standard Costs and Variances

Chapter 10

Learning Objectives

- Understand standard costing methods and variance analysis.
- Compute the direct materials price and quantity variances and explain their significance.
- Compute the direct labor rate and efficiency variances and explain their significance.
- Compute the variable manufacturing overhead rate and efficiency variances.
- Compute and evaluate fixed overhead variances
- Explain the advantages and disadvantages of using standard costs and variances

Standard Costs

- A budget for a single unit of product
- Benchmark for evaluating actual costs

Standards are benchmarks or “norms” for measuring performance. Two types of standards are commonly used.

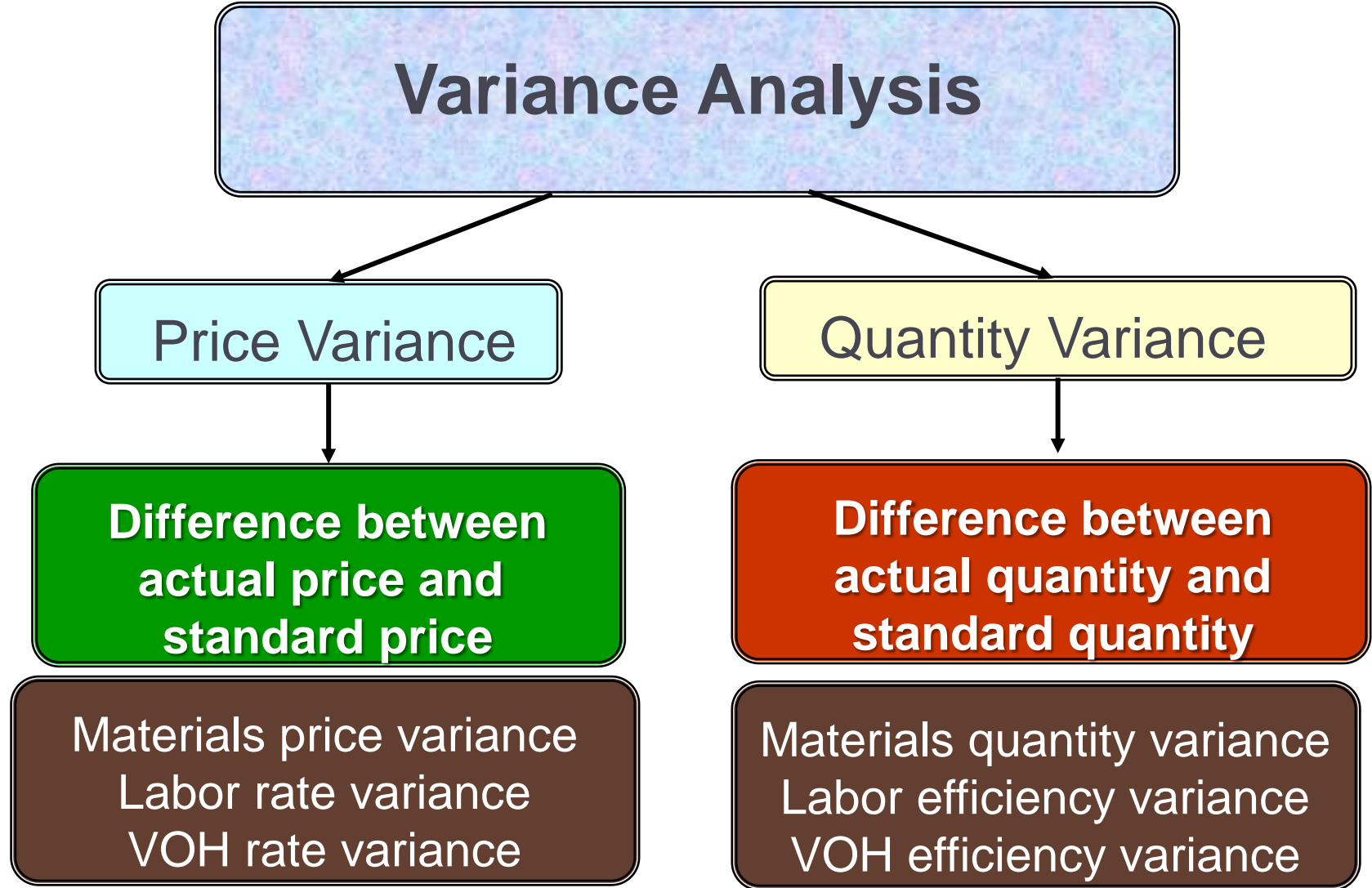
Quantity standards

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

Price (Cost)

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

A General Model for Variance Analysis



“VOH”= Variable MOH

Set the standards for Direct Materials

**Quantity
Standards**

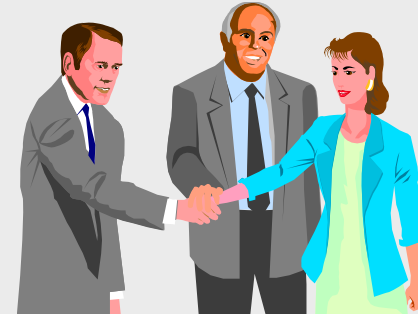


**Price
Standards**

**Summarized in
a Bill of Materials.**



**Final, delivered
cost of materials,
net of discounts.**



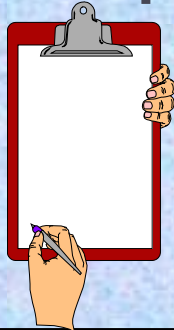
Set the standards for Direct Labor Costs

**Time
Standards**

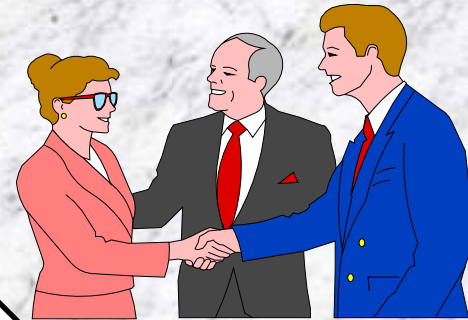


**Rate
Standards**

**Use time and
motion studies for
each labor operation.**



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



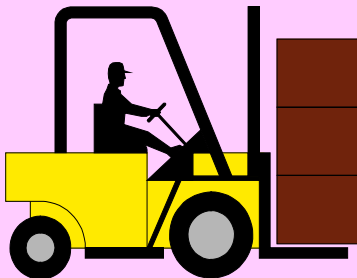
Set the standards for Variable Manufacturing Overhead

**Quantity
Standards**

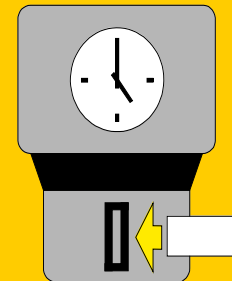


**Rate
Standards**

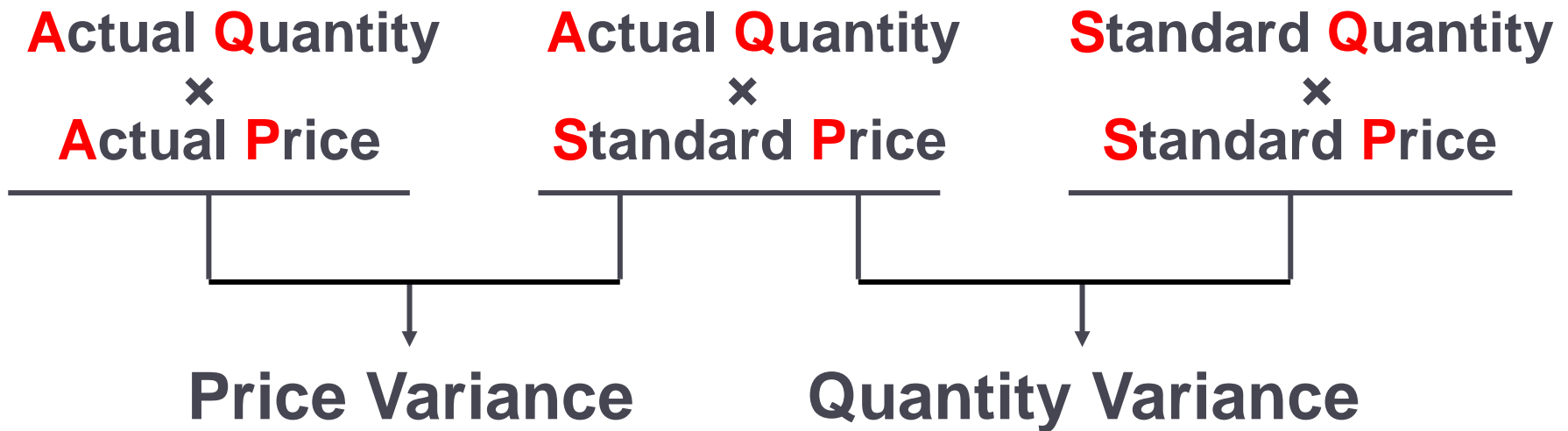
The quantity is the activity in the allocation base (e.g. in terms of labor hours).



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



A General Model for Variance Analysis



$$(AQ \times AP) - (AQ \times SP)$$

AQ = **A**ctual **Q**uantity

AP = **A**ctual **P**rice

$$(AQ \times SP) - (SQ \times SP)$$

SP = **S**tandard **P**rice

SQ = **S**tandard **Q**uantity

Learning Objective 1

Compute the price and quantity variances for direct materials (DM) and explain their significance.



Responsibility for DM 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.

One issue for Direct Materials

Purchased \neq Used materials



The price variance is computed on the entire quantity **purchased**.

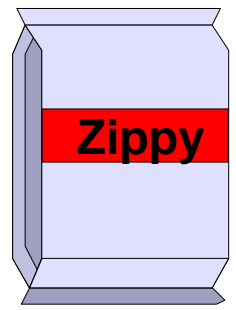
The quantity variance is computed only on the quantity **used**.

- ▶ **DM Price Variance**
 $= \text{AQP} \times (\text{AP} - \text{SP})$
- ▶ **DM Quantity Variance**
 $= \text{SP} \times (\text{AQU} - \text{SQ})$

“AQP” = actual quantity purchased;

“AQU” = actual quantity used.

Quick Check ✓

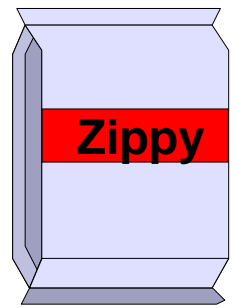


Hanson Inc. has the following material standard to manufacture one Zippy:

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.

Zippy case



$$\begin{array}{r} \text{Actual Quantity} \\ \text{Purchased} \\ \times \\ \text{Actual Price} \\ \hline \end{array}$$

2,800 lbs.

×

\$3.90 per lb.

= \$10,920

$$\begin{array}{r} \text{Actual Quantity} \\ \text{Purchased} \\ \times \\ \text{Standard Price} \\ \hline \end{array}$$

2,800 lbs.

×

\$4.00 per lb.

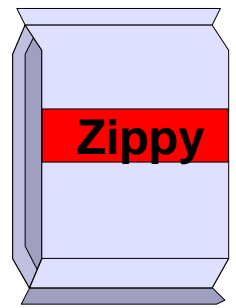
= \$11,200



Price variance
\$280 favorable

Zippy case

Standard Quantity (SQ) = standard DM amount per unit X actual units
= 1.5 x 1,000 = 1,500 lbs



**Actual Quantity
Used**
×
Standard Price

1,700 lbs.

×
\$4.00 per lb.

= \$6,800

Standard Quantity
×
Standard Price

1,500 lbs.

×
\$4.00 per lb.

= \$6,000

Quantity variance
\$800 unfavorable

Exercise

Dawson Toys, Ltd, produces a toy called the Maze. The company has recently established a standard cost system to help control costs and has established the following standards for the Maze toy:

Direct materials: *6 microns per toy at \$0.50 per micron.*

During July, the company produced 3,000 Maze toys. Production data are:

25,000 microns were purchased at a cost of \$0.48 per micron. 5,000 of these microns were still in inventory at the end of the month. (Assume zero beginning inventory)

Required:

1. Compute Direct materials price and quantity variance.

Solutions:

$AQ_p \times AP$	25 000	$\times 0.48 = 12,000$	
$AQ_p \times SP$	25 000	$\times 0.50 = 12,500$	
$AQ_u \times SP$	20 000	$\times 0.50 = 10,000$	
$SQ_u \times SP$	$(3,000 \times 6)$	$\times 0.50 = 9,000$	
			3,000 [Total]

F: Favorable variance;

UF: Unfavorable variance;

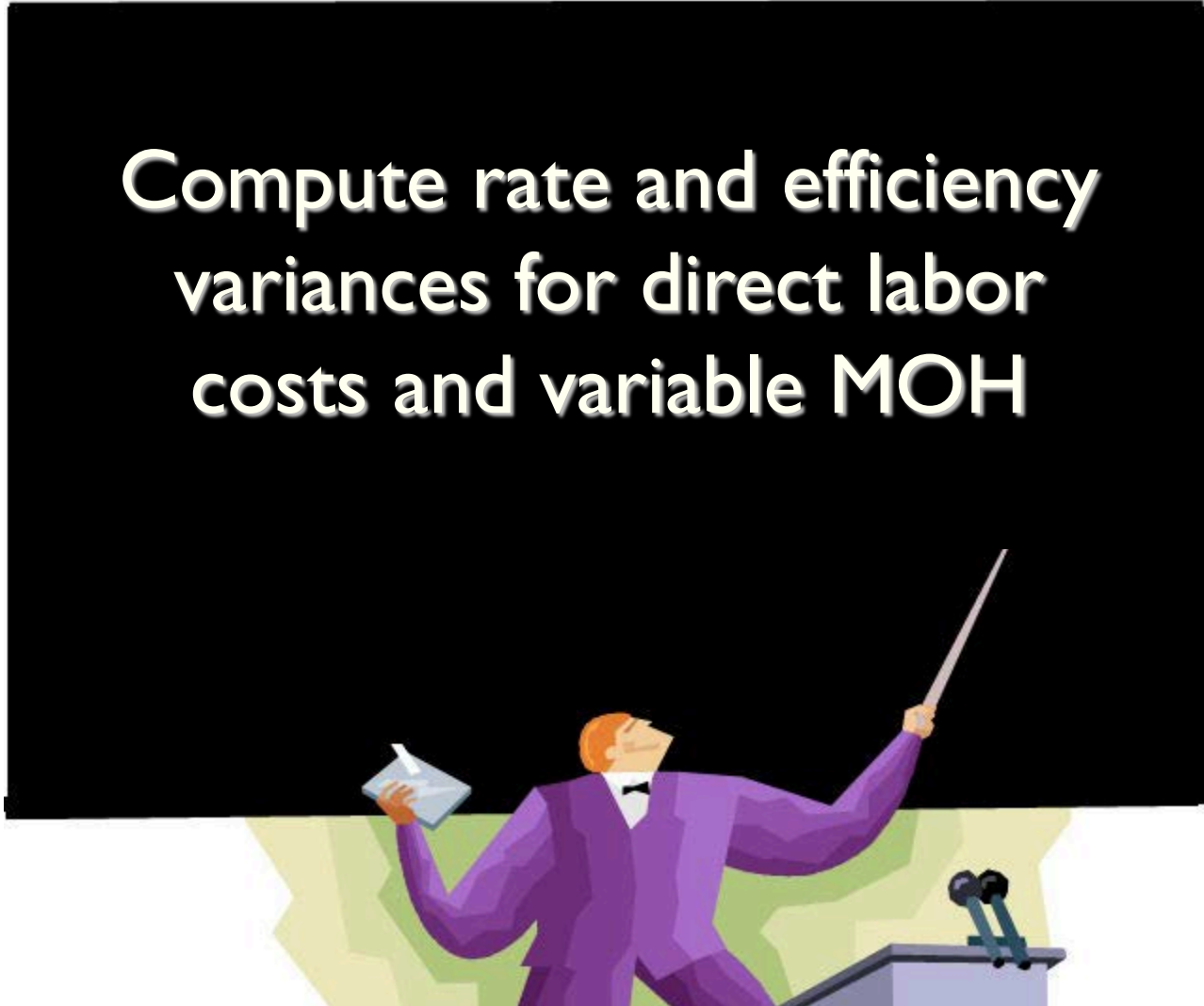
1. Possible explanations for favorable price variance

(a) the purchase of a lower grade material at a discount; (b) buying in an unusually large quantity to take advantage of quantity discounts; (c) a change in the market price of the material; or (d) particularly sharp bargaining by the purchasing department.

Insight: the reason (a) suggests that Favorable price variance does not necessarily mean that purchasing managers did a good job.

Learning Objective 2

**Compute rate and efficiency
variances for direct labor
costs and variable MOH**

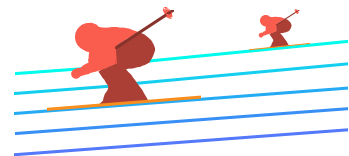


Labor Variances – An Example

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.

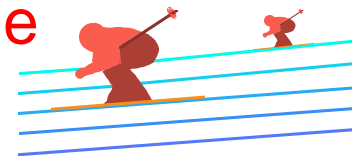


Labor Variances

Standard hours= standard DLH per unit X actual units
= 1.2 hrs x 2,000 =2,400 hrs

Actual Hours × Actual Rate	Actual Hours × Standard Rate	Standard Hours × Standard Rate
2,500 hours × \$10.50 per hour = \$26,250	2,500 hours × \$10.00 per hour. = \$25,000	2,400 hours × \$10.00 per hour = \$24,000
Rate variance \$1,250 unfavorable		Efficiency variance \$1,000 unfavorable

$$\$26,250 \div 2,500 = \$10.50$$



Summary of DM and DL Variances

Variance	Formula	Inquire with...
DM Price Variance	= AQP x (AP – SP)	Purchasing Supervisor
DM Quantity Variance	= SP x (AQU – SQA)	Production Supervisor
DL Rate Variance	= AH x (AR – SR)	Human Resources and Production Supervisors
DL Efficiency Variance	= SR x (AH – SHA)	Production Supervisor

Responsibility for Labor Variances

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



Production Manager

Mix of skill levels assigned to work tasks.

Level of employee motivation.

Quality of production supervision.

Quality of training provided to employees.

But sometimes production managers should not be held for responsibility: the purchase managers buy low-quality materials.

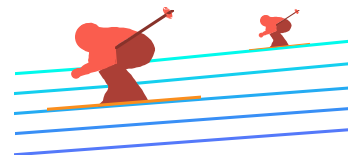
Variable Manufacturing Overhead Variances – An Example

Attention: **VARIABLE** manufacturing overheads.

Glacier Peak Outfitters has the following **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.

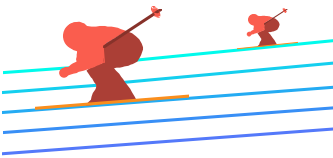


Variable Manufacturing Overhead Variances

Summary: The traditional method

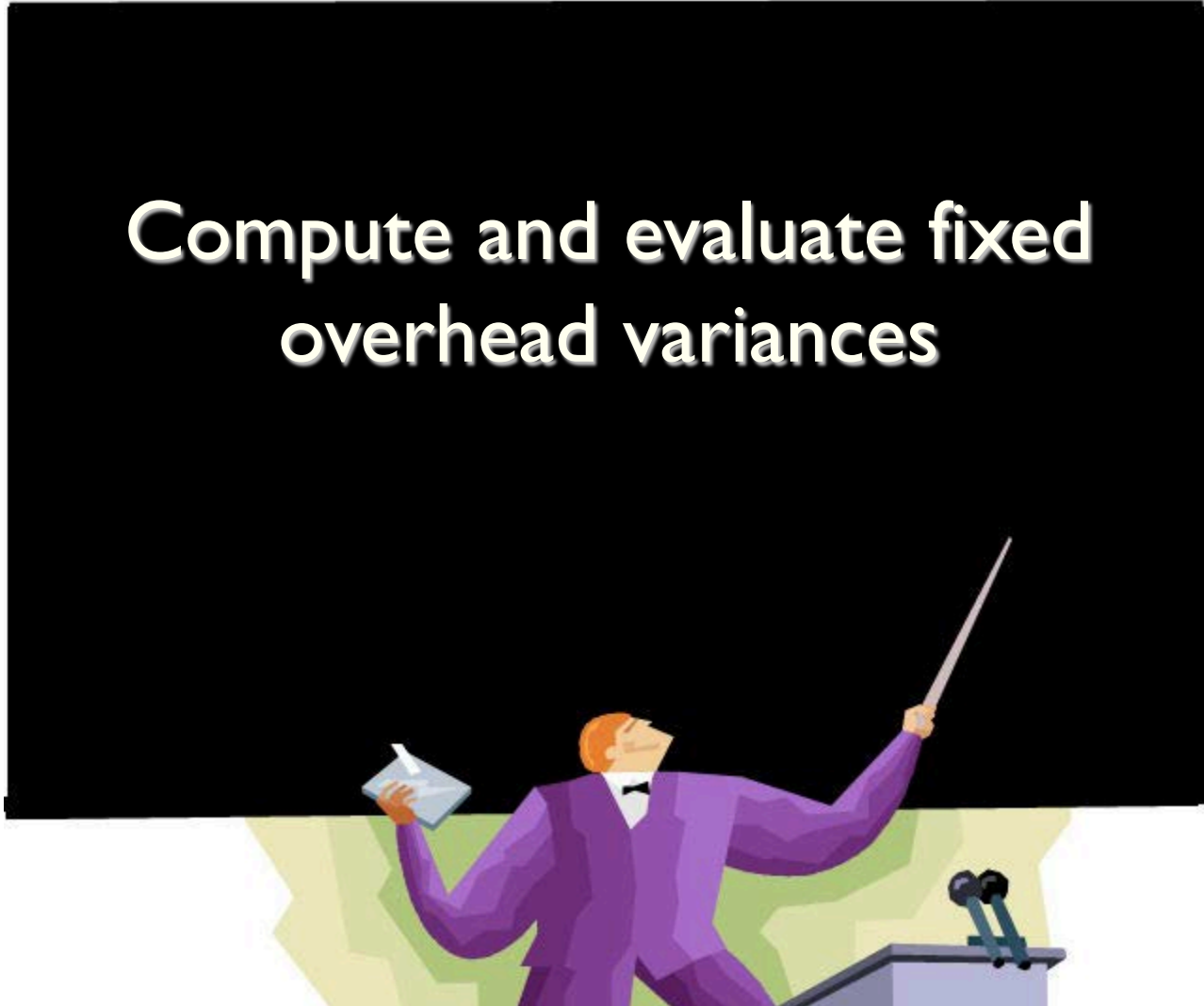
<u>Actual Hours</u> × <u>Actual Rate</u>	<u>Actual Hours</u> × <u>Standard Rate</u>	<u>Standard Hours</u> × <u>Standard Rate</u>
2,500 hours × \$4.20 per hour = \$10,500	2,500 hours × \$4.00 per hour = \$10,000	2,400 hours × \$4.00 per hour = \$9,600
Rate variance \$500 unfavorable		Efficiency variance \$400 unfavorable

$\$10,500 \div 2,500 = \4.20



Learning Objective 3

**Compute and evaluate fixed
overhead variances**

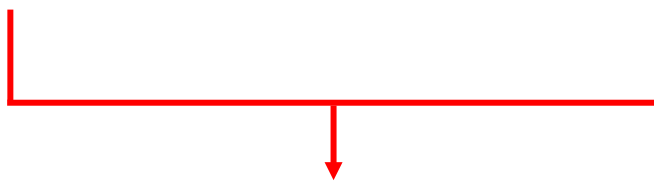


Fixed Overhead Budget Variance:

**Actual
Fixed
Overhead**

**Budgeted
Fixed
Overhead**

**Fixed
Overhead
Applied**



**Budget
variance**

$$\boxed{\text{Budget variance}} = \boxed{\text{Actual fixed overhead}} - \boxed{\text{Budgeted fixed overhead}}$$

Fixed Overhead Volume Variance:

**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**

$DH \times FR$

$SH \times FR$

Background:

The use of standard costing system implies that the standard costs are **applied** to product cost. So we call the third item “fixed overhead applied”

**Volume
variance**

Volume variance

=

$FPOHR \times (DH - SH)$

**$FPOHR$ = Fixed portion of the predetermined overhead rate
 DH = Denominator hours; SH = Standard hours *allowed* for actual output;
Volume variance = standard POHR per unit x difference between denominator units and the actual units.**

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

Q: how to get the allowed standard hours of 84,000 hours?

The *allowed* hours are also based on the predetermined productivity (denominator hours in calculating FMOHR) (i.e., each unit should allocate a budgeted fixed MOH).



Computing Fixed Overhead Variances

ColaCo Cost Data

Budgeted variable manufacturing overhead	\$ 90,000
Budgeted fixed manufacturing overhead	270,000
Total budgeted manufacturing overhead	<u>\$ 360,000</u>
Actual variable manufacturing overhead	\$ 100,000
Actual fixed manufacturing overhead	280,000
Total actual manufacturing overhead	<u>\$ 380,000</u>



Predetermined Overhead Rates

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

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

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

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



Computing the Budget Variance: (fixed overhead)

$$\begin{array}{|c|} \hline \text{Budget} \\ \text{variance} \\ \hline \end{array} = \begin{array}{|c|} \hline \text{Actual} \\ \text{fixed} \\ \text{overhead} \\ \hline \end{array} - \begin{array}{|c|} \hline \text{Budgeted} \\ \text{fixed} \\ \text{overhead} \\ \hline \end{array}$$

$$\begin{array}{|c|} \hline \text{Budget} \\ \text{variance} \\ \hline \end{array} = \$280,000 - \$270,000$$

$$\begin{array}{|c|} \hline \text{Budget} \\ \text{variance} \\ \hline \end{array} = \$10,000 \text{ Unfavorable}$$



Computing the Volume Variance:

Recall: $\text{FPOHR} \times \text{DH} = \text{budgeted fixed MOH}$.

$$\text{Volume variance} = \text{FPOHR} \times (\text{DH} - \text{SH})$$

FPOHR = Fixed portion of the predetermined overhead rate

DH = Denominator hours

SH = Standard hours allowed for actual output

$$\text{Volume variance} = \$3.00 \text{ per machine-hour} \times (90,000 - 84,000 \text{ machine-hour})$$

Recall: $\text{FPOHR} \times \text{DH} = \$3 \times 90,000 = \text{budgeted fixed MOH}$.

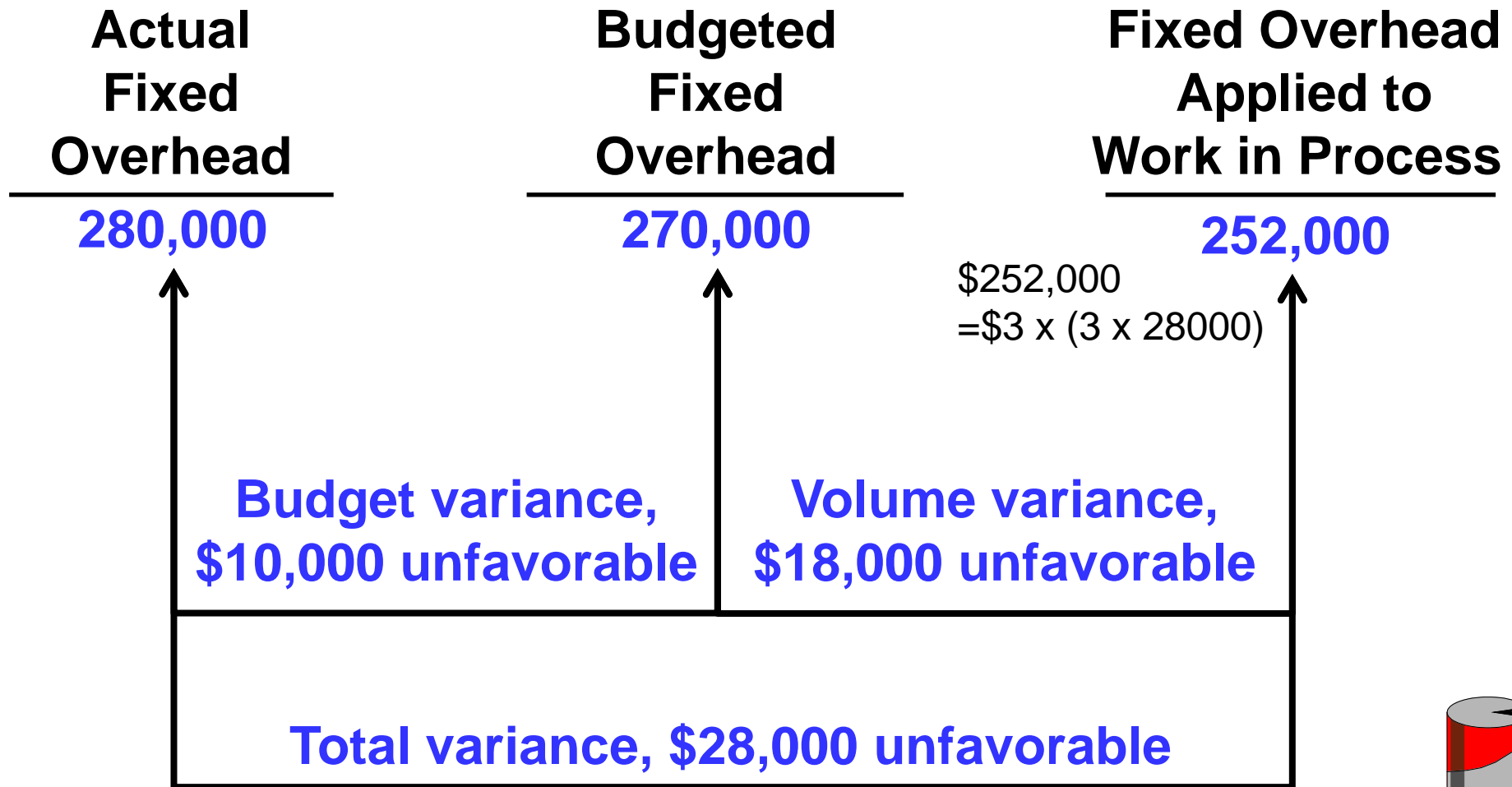
$$\text{Volume variance} = 18,000 \text{ Unfavorable}$$

Note: use the “denominator hours” 90,000 hrs, NOT the actual hours of 88,000 hrs.

Essentially, it is 30,000 budgeted units vs. only 28,000 output units. That is, with the same fixed MOH, company produces too few units. **That is why it is called “volume variance”**



A Pictorial View of the Variances



Exercise for MOHs

Norwall Company's variable MOH should be \$3.00 per standard machine-hour and its fixed MOH should be \$300,000 per year. The following information is available for a recent period:

- (a) The denominator activity of 60,000 machine-hours is used to compute the predetermined overhead rate (POHR);
- (b) At the 60,000 standard machine-hours level of activity, the company should produce 40,000 units of product.
- (c) The company's actual operating results are:

Number of units produced	42,000
Actual machine-hours	64,000
Actual variable overhead cost	\$185,600
Actual fixed overhead cost	\$302,400

Required:

Compute the variable overhead rate and efficiency variances; and the fixed overhead budget and volume variances.

Exercise for MOHs

Step 1: we should calculate the variable and fixed component of POHR.

Variable portion: \$3 per hour;

Fixed portion: $\$300,000 / 60,000 = \5 per hour

Step 2: the allowed standard hours for actual output.

$(60,000 \text{ hours} / 40,000 \text{ units}) \times 42,000 \text{ units} = 63,000 \text{ standard hours allowed.}$

Step 3: variable overhead

Variable overhead rate variance:

$$\begin{aligned} \text{Variable overhead rate variance} &= (\text{AH} \times \text{AR}) - (\text{AH} \times \text{SR}) \\ &= (\$185,600) - (64,000 \text{ hours} \times \$3 \text{ per hour}) = -\$6,400 \text{ F} \end{aligned}$$

Variable overhead efficiency variance:

$$\begin{aligned} \text{Variable overhead efficiency variance} &= \text{SR} (\text{AH} - \text{SH}) \\ &= \$3 \text{ per hour} (64,000 \text{ hours} - 63,000 \text{ hours}) = \$3,000 \text{ U} \end{aligned}$$

Exercise for MOHs

Step 4: fixed MOH.

Actual Fixed Overhead	Budgeted Fixed Overhead	Fixed Overhead Applied to Work in Process
<hr/>	<hr/>	<hr/>
\$302,400	\$300,000*	63,000 hours × \$5 per hour = \$315,000
↑	↑	↑
Budget Variance, \$2,400 U		Volume Variance, \$15,000 F

Q: \$15,000 is **FAVORABLE** variance. Why?

You apply more MOH than budgeted fixed MOH when using only standard hours allowed for actual production level.

Exercise (P10A-11)

(To be included in the practice exercises)

Flandro Company uses a standard cost system and sets predetermined overhead rates on the basis of direct labor-hours. The following data are taken from the company's budget for the current year:

Denominator activity (direct labor-hours)	5,000
Variable MOH	\$25,000
Fixed MOH	\$59,000

The standard cost card for the company's only product is given below:

Direct materials, 3 yards at \$4.40 per yard	\$13.20
Direct labor, 1 hour at \$12 per hour	\$12.00
MOH, 140% of direct labor cost	<u>\$16.80</u>
Standard cost per unit	<u>\$42.00</u>

During the year, the company produced 6,000 units of product and incurred the following costs:

Materials purchased, 24,000 yards at \$4.80 per yard	\$115,200
Materials used in production (in yards)	18,500
Direct labor cost incurred, 5,800 hours at \$13 per hour	\$75,400
Variable manufacturing overhead cost incurred	\$29,580
Fixed manufacturing overhead cost incurred	\$60,400



End of Chapter 10