Standard Costs and Variances

Chapter 10

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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.
Deviations from standards deemed significant are brought to the attention of management, a practice known as **management by exception**.
Variance Analysis Cycle

1. Identify questions
2. Receive explanations
3. Take corrective actions
4. Conduct next period’s operations
5. Analyze variances
6. Prepare standard cost performance report

Begin
Setting Standard Costs

Should we use ideal standards that require employees to work at 100 percent peak efficiency?

I recommend using practical standards that are currently attainable with reasonable and efficient effort.
Setting Direct Materials Standards

Standard Price per Unit

Final, delivered cost of materials, net of discounts.

Standard Quantity per Unit

Summarized in a Bill of Materials.
Setting Direct Labor Standards

- **Standard Rate per Hour**
  - Often a single rate is used that reflects the mix of wages earned.

- **Standard Hours per Unit**
  - Use time and motion studies for each labor operation.
Setting Variable Manufacturing Overhead Standards

**Price Standard**

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

**Quantity Standard**

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

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

<table>
<thead>
<tr>
<th>Inputs</th>
<th>A</th>
<th>B</th>
<th>A x B</th>
<th>Standard Cost per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct materials</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard Quantity or Hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0 lbs.</td>
<td></td>
<td>$ 4.00</td>
<td></td>
<td>$ 12.00</td>
</tr>
<tr>
<td>2.5 hours</td>
<td></td>
<td>14.00 per lb.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct labor</td>
<td></td>
<td>3.00 per hour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variable mfg. overhead</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total standard unit cost</td>
<td></td>
<td></td>
<td></td>
<td>$ 54.50</td>
</tr>
</tbody>
</table>
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 quantity and price variances.
A General Model for Variance Analysis

Variance Analysis

- Quantity Variance: Difference between actual quantity and standard quantity
- Price Variance: Difference between actual price and standard price
Quantity and Price Standards

Quantity and price standards are determined separately for two reasons:

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

2. 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

Variance Analysis

Quantity Variance
- Materials quantity variance
- Labor efficiency variance
- VOH efficiency variance

Price Variance
- Materials price variance
- Labor rate variance
- VOH rate variance
A General Model for Variance Analysis

1. Standard Quantity Allowed for Actual Output, at Standard Price \((SQ \times SP)\)
2. Actual Quantity of Input, at Standard Price \((AQ \times SP)\)
3. Actual Quantity of Input, at Actual Price \((AQ \times AP)\)

**Quantity Variance**
\[(2) - (1)\]

**Price Variance**
\[(3) - (2)\]

**Spending Variance**
\[(3) - (1)\]
A General Model for Variance Analysis

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

\[
\begin{align*}
(1) & \quad \text{Standard Quantity Allowed for Actual Output, at Standard Price} \\
       & \quad (SQ \times SP) \\
(2) & \quad \text{Actual Quantity of Input, at Standard Price} \\
       & \quad (AQ \times SP) \\
(3) & \quad \text{Actual Quantity of Input, at Actual Price} \\
       & \quad (AQ \times AP)
\end{align*}
\]

Quantity Variance: 
\[
(2) - (1)
\]

Price Variance: 
\[
(3) - (2)
\]

Spending Variance: 
\[
(3) - (1)
\]
A General Model for Variance Analysis

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

1. **Standard Quantity**
   - Allowed for Actual Output, at Standard Price
   - \((SQ \times SP)\)
   - Quantity Variance: \((2) - (1)\)

2. **Actual Quantity**
   - of Input, at Standard Price
   - \((AQ \times SP)\)
   - Price Variance: \((3) - (2)\)

3. **Actual Quantity**
   - of Input, at Actual Price
   - \((AQ \times AP)\)
   - Spending Variance: \((3) - (1)\)
A General Model for Variance Analysis

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

(1) Standard Quantity Allowed for Actual Output, at Standard Price (SQ \times SP)

(2) Actual Quantity of Input, at Standard Price (AQ \times SP)

(3) Actual Quantity of Input, at Actual Price (AQ \times AP)

Quantity Variance
(2) – (1)

Price Variance
(3) – (2)

Spending Variance
(3) – (1)
A General Model for Variance Analysis

**Standard price** is the amount that should have been paid for the input used.

(1) Standard Quantity Allowed for Actual Output, at Standard Price \((SQ \times SP)\)

(2) Actual Quantity of Input, at Standard Price \((AQ \times SP)\)

(3) Actual Quantity of Input, at Actual Price \((AQ \times AP)\)

**Quantity Variance**

(2) – (1)

**Price Variance**

(3) – (2)

**Spending Variance**

(3) – (1)
Learning Objective 1

Compute the direct materials quantity and price variances and explain their significance.
Glacier Peak Outfitters has the following direct materials 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 materials cost a total of $1,029.
### Materials Variances Summary

<table>
<thead>
<tr>
<th>Standard Quantity</th>
<th>Actual Quantity</th>
<th>Actual Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Standard Price</td>
<td>Standard Price</td>
<td>Actual Price</td>
</tr>
<tr>
<td>$5.00 per kg.</td>
<td>× $5.00 per kg.</td>
<td>× $4.90 per kg.</td>
</tr>
</tbody>
</table>

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

- **Quantity variance**: $50 unfavorable
- **Price variance**: $21 favorable
# Materials Variances Summary

<table>
<thead>
<tr>
<th>Standard Quantity</th>
<th>Actual Quantity</th>
<th>Actual Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>× Standard Price</td>
<td>× Standard Price</td>
<td>× Actual Price</td>
</tr>
<tr>
<td>200 kgs × $5.00 per kg.</td>
<td>210 kgs × $4.90 per kg.</td>
<td></td>
</tr>
<tr>
<td>= $1,000</td>
<td>= $1,050</td>
<td>= $1,029</td>
</tr>
</tbody>
</table>

- **0.1 kg per parka × 2,000 parkas = 200 kgs**
- **Quantity variance**: $50 unfavorable
- **Price variance**: $21 favorable
## Materials Variances Summary

<table>
<thead>
<tr>
<th></th>
<th>Standard Quantity</th>
<th>Actual Quantity</th>
<th>Actual Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>× Standard Price</td>
<td>× Actual Quantity</td>
<td>× Actual Price</td>
<td></td>
</tr>
<tr>
<td>200 kgs.</td>
<td>210 kgs.</td>
<td>210 kgs.</td>
<td></td>
</tr>
<tr>
<td>× $5.00 per kg.</td>
<td>×</td>
<td>×</td>
<td></td>
</tr>
<tr>
<td>$1,000</td>
<td>$1,050</td>
<td>$1,029</td>
<td></td>
</tr>
</tbody>
</table>

- **Quantity variance:**
  - $50 unfavorable

- **Price variance:**
  - $21 favorable

- $1,029 ÷ 210 kgs = $4.90 per kg
Materials Variances: Using the Factored Equations

Materials quantity variance

\[ MQV = (AQ \times SP) - (SQ \times SP) \]
\[ = SP(AQ - SQ) \]
\[ = \$5.00/kg \times (210 \text{ kgs} - (0.1 \text{ kg/parka} \times 2,000 \text{ parkas})) \]
\[ = \$5.00/kg \times (210 \text{ kgs} - 200 \text{ kgs}) \]
\[ = \$5.00/kg \times 10 \text{ kgs} = \$50 \text{ U} \]

Materials price variance

\[ MPV = (AQ \times AP) - (AQ \times SP) \]
\[ = AQ(AP - SP) \]
\[ = 210 \text{ kgs} \times (\$4.90/kg - \$5.00/kg) \]
\[ = 210 \text{ kgs} \times (-\$0.10/kg) = \$21 \text{ F} \]
Responsibility for Materials Variances

Materials Quantity Variance

Materials Price Variance

Production Manager

Purchasing 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 Materials Variances

I am not responsible for this unfavorable materials quantity variance. You purchased cheap material, so my people had to use more of it.

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

Production Manager

Purchasing Manager
Hanson Inc. has the following direct materials standard to manufacture one Zippy:

1.5 pounds per Zippy at $4.00 per pound

Last week, 1,700 pounds of materials were purchased and used to make 1,000 Zippies. The materials cost a total of $6,630.
How many pounds of materials should Hanson have used to make 1,000 Zippies?

a. 1,700 pounds.
b. 1,500 pounds.
c. 1,200 pounds.
d. 1,000 pounds.
Quick Check ✔

How many pounds of materials should Hanson have used to make 1,000 Zippies?

a. 1,700 pounds.
b. 1,500 pounds.
c. 1,200 pounds.
d. 1,000 pounds.

The standard quantity is:

1,000 × 1.5 pounds per Zippy.
Quick Check ✔

Hanson’s materials quantity variance (MQV) for the week was:

- a. $170 unfavorable.
- b. $170 favorable.
- c. $800 unfavorable.
- d. $800 favorable.
Hanson’s materials quantity variance (MQV) for the week was:

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

MQV = SP(AQ - SQ)

MQV = $4.00(1,700 lbs - 1,500 lbs)
MQV = $800 unfavorable
Hanson’s materials price variance (MPV) for the week was:
   a. $170 unfavorable.
   b. $170 favorable.
   c. $800 unfavorable.
   d. $800 favorable.
Hanson’s materials price variance (MPV) for the week was:

a. $170 unfavorable.

b. $170 favorable.

c. $800 unfavorable.

d. $800 favorable.

\[ MPV = AQ(\text{AP} - \text{SP}) \]

\[ MPV = 1,700 \text{ lbs.} \times ($3.90 - 4.00) \]

\[ MPV = $170 \text{ Favorable} \]
## Quick Check ✓

<table>
<thead>
<tr>
<th>Standard Quantity</th>
<th>Actual Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>× $4.00 per lb.</td>
<td>× $4.00 per lb.</td>
</tr>
<tr>
<td>× $3.90 per lb.</td>
<td>× $3.90 per lb.</td>
</tr>
</tbody>
</table>

- **Standard Quantity:** 1,500 lbs.
- **Actual Quantity:** 1,700 lbs.

**Quantity variance:** $800 unfavorable

**Price variance:** $170 favorable
Recall that the standard quantity for 1,000 Zippies is $1,000 \times 1.5$ pounds per Zippy = 1,500 pounds.

Standard Quantity \times Standard Price

1,500 lbs. \times $4.00 per lb.

= $6,000

Actual Quantity \times Standard Price

1,700 lbs. \times $4.00 per lb.

= $6,800

Actual Quantity \times Actual Price

1,700 lbs. \times $3.90 per lb.

= $6,630

Quantity variance: $800 unfavorable

Price variance: $170 favorable
Learning Objective 2

Compute the direct labor efficiency and rate variances and explain their significance.
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 Summary

<table>
<thead>
<tr>
<th></th>
<th>Standard Hours</th>
<th>Actual Hours</th>
<th>Actual Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>× Standard Rate</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>2,400 hours</td>
<td>2,500 hours</td>
<td>2,500 hours</td>
<td></td>
</tr>
<tr>
<td>× $10.00 per hour</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td></td>
<td>$24,000</td>
<td>$25,000</td>
<td>$26,250</td>
</tr>
</tbody>
</table>

- **Efficiency variance**: $1,000 unfavorable
- **Rate variance**: $1,250 unfavorable
# Labor Variances Summary

<table>
<thead>
<tr>
<th>Standard Hours</th>
<th>Actual Hours</th>
<th>Actual Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>× Standard Rate</td>
<td>× Standard Rate</td>
<td>× Actual Rate</td>
</tr>
<tr>
<td>2,400 hours</td>
<td>2,500 hours</td>
<td>2,500 hours</td>
</tr>
<tr>
<td>$10.00 per hour</td>
<td>$10.00 per hour</td>
<td>$10.50 per hour</td>
</tr>
<tr>
<td>[= \text{$24,000}]</td>
<td>[= \text{$25,000}]</td>
<td>[= \text{$26,250}]</td>
</tr>
</tbody>
</table>

- **Efficiency variance**: $1,000 unfavorable
- **Rate variance**: $1,250 unfavorable

1.2 hours per parka × 2,000 parkas = 2,400 hours
Labor Variances Summary

Standard Hours × Standard Rate
2,400 hours × $10.00 per hour = $24,000

Actual Hours × Standard Rate
2,500 hours × $10.00 per hour = $25,000

Actual Hours × Actual Rate
2,500 hours × $10.50 per hour = $26,250

Efficiency variance: $1,000 unfavorable
Rate variance: $1,250 unfavorable

$26,250 ÷ 2,500 hours = $10.50 per hour
Labor Variances: Using the Factored Equations

**Labor efficiency variance**

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

\[ = SR (AH - SH) \]

\[ = $10.00 \text{ per hour} \times (2,500 \text{ hours} - 2,400 \text{ hours}) \]

\[ = $10.00 \text{ per hour} \times 100 \text{ hours} \]

\[ = $1,000 \text{ unfavorable} \]

**Labor rate variance**

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

\[ = AH (AR - SR) \]

\[ = 2,500 \text{ hours} \times ($10.50 \text{ per hour} - $10.00 \text{ per hour}) \]

\[ = 2,500 \text{ hours} \times $0.50 \text{ per hour} \]

\[ = $1,250 \text{ unfavorable} \]
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

I am not responsible for the unfavorable labor efficiency variance!
You purchased cheap material, so it took more time to process it.

I think it took more time to process the materials because the Maintenance Department has poorly maintained your equipment.
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 efficiency variance (LEV) for the week was:

a. $590 unfavorable.
b. $590 favorable.
c. $600 unfavorable.
d. $600 favorable.
Hanson’s labor efficiency variance (LEV) for the week was:

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

LEV = SR(AH - SH)
LEV = $12.00(1,550 hrs - 1,500 hrs)
LEV = $600 unfavorable
Hanson’s labor rate variance (LRV) for the week was:

a. $310 unfavorable.
b. $310 favorable.
c. $300 unfavorable.
d. $300 favorable.
Hanson’s labor rate variance (LRV) for the week was:

a. $310 unfavorable.

b. $310 favorable.

c. $300 unfavorable.

d. $300 favorable.

$$LRV = AH(AR - SR)$$

$$LRV = 1,550 \text{ hrs} ($12.20 - $12.00)$$

$$LRV = $310 \text{ unfavorable}$$
Quick Check ✓

Standard Hours × Standard Rate
1,500 hours × $12.00 per hour
= $18,000

Efficiency variance
$600 unfavorable

Actual Hours × Standard Rate
1,550 hours × $12.00 per hour
= $18,600

Rate variance
$310 unfavorable

Actual Hours × Actual Rate
1,550 hours × $12.20 per hour
= $18,910
Learning Objective 3

Compute the variable manufacturing overhead efficiency and rate variances and explain their significance.
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 Summary

<table>
<thead>
<tr>
<th>Standard Hours × Standard Rate</th>
<th>Actual Hours × Standard Rate</th>
<th>Actual Hours × Actual Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,400 hours × $4.00 per hour</td>
<td>2,500 hours × $4.00 per hour</td>
<td>2,500 hours × $4.20 per hour</td>
</tr>
<tr>
<td>= $9,600</td>
<td>= $10,000</td>
<td>= $10,500</td>
</tr>
</tbody>
</table>

- **Efficiency variance**: $400 unfavorable
- **Rate variance**: $500 unfavorable
**Variable Manufacturing Overhead Variances Summary**

<table>
<thead>
<tr>
<th></th>
<th>Standard Hours</th>
<th>Actual Hours</th>
<th>Actual Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard Hours</strong></td>
<td>2,400 hours</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td><strong>Standard Rate</strong></td>
<td>$4.00 per hour</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td><strong>Actual Hours</strong></td>
<td>×</td>
<td>2,500 hours</td>
<td>2,500 hours</td>
</tr>
<tr>
<td><strong>Actual Rate</strong></td>
<td>×</td>
<td>× $4.00 per hour</td>
<td>× 20 per hour</td>
</tr>
</tbody>
</table>

1.2 hours per parka × 2,000 parkas = 2,400 hours

- **Efficiency variance**: $400 unfavorable
- **Rate variance**: $500 unfavorable

\[
\text{Efficiency variance} = (2,400 - 2,500) \times 4 \times 4.00 = 400 \text{ unfavorable}
\]

\[
\text{Rate variance} = 2,500 \times (4.20 - 4.00) = 500 \text{ unfavorable}
\]
Variable Manufacturing Overhead Variances Summary

Standard Hours × Standard Rate
2,400 hours × $4.00 per hour
= $9,600

Actual Hours × Standard Rate
2,500 hours × $4.20 per hour
= $10,500

$10,500 ÷ 2,500 hours
= $4.20 per hour

Efficiency variance $400 unfavorable

Actual Hours × Actual Rate
2,500 hours × $4.20 per hour
= $10,500

Rate variance $500 unfavorable
Variable Manufacturing Overhead Variances: Using Factored Equations

Variable manufacturing overhead efficiency variance

\[ VMEV = (AH \times SR) - (SH - SR) \]
\[ = SR (AH - SH) \]
\[ = $4.00 \text{ per hour} (2,500 \text{ hours} - 2,400 \text{ hours}) \]
\[ = $4.00 \text{ per hour} (100 \text{ hours}) \]
\[ = $400 \text{ unfavorable} \]

Variable manufacturing overhead rate variance

\[ VMRV = (AH \times AR) - (AH - SR) \]
\[ = AH (AR - SR) \]
\[ = 2,500 \text{ hours} ($4.20 \text{ per hour} - $4.00 \text{ per hour}) \]
\[ = 2,500 \text{ hours} ($0.20 \text{ per hour}) \]
\[ = $500 \text{ unfavorable} \]
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.
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.
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.

\[
\text{VMEV} = SR(AH - SH)
\]
\[
\text{VMEV} = \$3.00(1,550 \text{ hrs} - 1,500 \text{ hrs})
\]
\[
\text{VMEV} = \$150 \text{ unfavorable}
\]
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.
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.

VMRV = AH(AR - SR)
VMRV = 1,550 hrs($3.30 - $3.00)
VMRV = $465 unfavorable
Quick Check ✔

Efficiency variance:

$$
\text{Standard Hours} \times \text{Standard Rate} = 1,500 \text{ hours} \times \$3.00 \text{ per hour} = \$4,500
$$

$$
\text{Actual Hours} \times \text{Actual Rate} = 1,550 \text{ hours} \times \$3.30 \text{ per hour} = \$5,115
$$

Rate variance:

$$
\text{Actual Hours} \times \text{Actual Rate} = 1,550 \text{ hours} \times \$3.00 \text{ per hour} = \$4,650
$$

Comparison:

- Efficiency variance: $150 unfavorable
- Rate variance: $465 unfavorable
Materials Variances—An Important Subtlety

The quantity variance is computed only on the quantity used.

The price variance is computed on the entire quantity purchased.
Materials Variances—An Important Subtlety

Glacier Peak Outfitters has the following direct materials 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 at a cost of $1,029. Glacier used 200 kgs. to make 2,000 parkas.
Materials Variances—An Important Subtlety

Standard Quantity × Standard Price

200 kgs. × $5.00 per kg.

= $1,000

Actual Quantity × Standard Price

200 kgs. × $5.00 per kg.

= $1,000

Quantity variance

$0
Materials Variances—An Important Subtlety

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

Actual Quantity × Actual Price
210 kgs. × $4.90 per kg.
= $1,029

Price variance
$21 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

Warning signals for investigation

Favorable Limit

Desired Value

Unfavorable Limit

Variance Measurements
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.

Standard cost reports may not be timely.

Invalid assumptions about the relationship between labor cost and output.

Favorable variances may be misinterpreted.

Emphasis on negative may impact morale.

Continuous improvement may be more important than meeting standards.
Appendix 10A

Predetermined Overhead Rates and Overhead Analysis in a Standard Costing System

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Learning Objective 4

(Appendix 10A)

Compute and interpret the fixed overhead volume and budget variances.
Fixed Overhead Volume Variance

\[
\text{Volume variance} = \text{Budgeted fixed overhead} - \text{Fixed overhead applied to work in process}
\]
Fixed Overhead Volume Variance

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

- **FPOHR** = Fixed portion of the predetermined overhead rate
- **DH** = Denominator hours
- **SH** = Standard hours allowed for actual output
Fixed Overhead Budget Variance

\[
\text{Budgeted Fixed Overhead} - \text{Actual Fixed Overhead} = \text{Budget variance}
\]

Fixed Overhead Applied

Budget variance = Actual fixed overhead – Budgeted fixed overhead
## Computing Fixed Overhead Variances

### ColaCo Production and Machine-Hour Data

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Budgeted production</td>
<td>30,000 units</td>
</tr>
<tr>
<td>Standard machine-hours per unit</td>
<td>3 hours</td>
</tr>
<tr>
<td>Budgeted machine-hours</td>
<td>90,000 hours</td>
</tr>
<tr>
<td>Actual production</td>
<td>28,000 units</td>
</tr>
<tr>
<td>Standard machine-hours allowed for the actual production</td>
<td>84,000 hours</td>
</tr>
<tr>
<td>Actual machine-hours</td>
<td>88,000 hours</td>
</tr>
</tbody>
</table>
## Computing Fixed Overhead Variances

<table>
<thead>
<tr>
<th>Cost Data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Budgeted variable manufacturing overhead</td>
<td>$ 90,000</td>
</tr>
<tr>
<td>Budgeted fixed manufacturing overhead</td>
<td>270,000</td>
</tr>
<tr>
<td>Total budgeted manufacturing overhead</td>
<td>$ 360,000</td>
</tr>
<tr>
<td>Actual variable manufacturing overhead</td>
<td>$ 100,000</td>
</tr>
<tr>
<td>Actual fixed manufacturing overhead</td>
<td>280,000</td>
</tr>
<tr>
<td>Total actual manufacturing overhead</td>
<td>$ 380,000</td>
</tr>
</tbody>
</table>
Predetermined Overhead Rates

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

Predetermined overhead rate = \frac{$360,000}{90,000 \text{ Machine-hours}} = $4.00 \text{ per machine-hour}
## Predetermined Overhead Rates

<table>
<thead>
<tr>
<th>Description</th>
<th>Formula</th>
<th>Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable component of the predetermined overhead rate</td>
<td>$\frac{90,000}{90,000 \text{ Machine-hours}}$</td>
<td>$1.00\text{ per machine-hour}$</td>
</tr>
<tr>
<td>Fixed component of the predetermined overhead rate</td>
<td>$\frac{270,000}{90,000 \text{ Machine-hours}}$</td>
<td>$3.00\text{ per machine-hour}$</td>
</tr>
</tbody>
</table>
Applying Manufacturing Overhead

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

\[
\text{Overhead applied} = $4.00 \text{ per machine-hour} \times 84,000 \text{ machine-hours} = $336,000
\]
Computing the Volume Variance

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

Volume variance = $270,000 - ($3.00 per machine-hour \times $84,000 machine-hours)

Volume variance = $18,000 Unfavorable
Computing the 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

\[ \text{Volume variance} = 3.00 \text{ per machine-hour} \times (90,000 - 84,000) \text{ mach-hours} = 18,000 \text{ Unfavorable} \]
Computing the Budget Variance

Budget variance = Actual fixed overhead − Budgeted fixed overhead

Budget variance = $280,000 − $270,000

Budget variance = $10,000 Unfavorable
A Pictorial View of the Variances

Fixed Overhead Applied to Work in Process  
252,000

Budgeted Fixed Overhead  
270,000

Actual Fixed Overhead  
280,000

Volume variance, $18,000 unfavorable

Budget variance, $10,000 unfavorable

Total variance, $28,000 unfavorable
Fixed Overhead Variances - A Graphic Approach

Let’s look at a graph showing fixed overhead variances. We will use ColaCo’s numbers from the previous example.
Graphic Analysis of Fixed Overhead Variances

Budget $270,000

Fixed overhead applied at $3.00 per standard hour
Graphic Analysis of Fixed Overhead Variances

Actual $280,000
Budget $270,000

Budget Variance 10,000 U

Fixed overhead applied at $3.00 per standard hour

Machine-hours (000)

Denominator hours

90
Graphic Analysis of Fixed Overhead Variances

Actual $280,000
Budget $270,000
Applied $252,000

Budget Variance 10,000 U
Volume Variance 18,000 U

Fixed overhead applied at $3.00 per standard hour
Reconciling Overhead Variances and Underapplied or Overapplied Overhead

In a standard cost system:

- **Unfavorable** variances are equivalent to underapplied overhead.
- **Favorable** variances are equivalent to overapplied overhead.

The sum of the overhead variances equals the under- or overapplied overhead cost for the period.
Reconciling Overhead Variances and Underapplied or Overapplied Overhead

<table>
<thead>
<tr>
<th>Computation of Underapplied Overhead</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Predetermined overhead rate (a)</td>
<td>$4.00 per machine-hour</td>
</tr>
<tr>
<td>Standard hours allowed for the actual output (b)</td>
<td>84,000 machine hours</td>
</tr>
<tr>
<td>Manufacturing overhead applied (a) × (b)</td>
<td>$336,000</td>
</tr>
<tr>
<td>Actual manufacturing overhead</td>
<td>$380,000</td>
</tr>
<tr>
<td>Manufacturing overhead underapplied or overapplied</td>
<td>$44,000 underapplied</td>
</tr>
</tbody>
</table>
Computing the Variable Overhead Variances

**Variable manufacturing overhead efficiency variance**

\[ VMEV = (AH \times SR) - (SH \times SR) \]

\[ = $88,000 - (84,000 \text{ hours} \times $1.00 \text{ per hour}) \]

\[ = $4,000 \text{ unfavorable} \]
Computing the Variable Overhead Variances

Variable manufacturing overhead rate variance

\[ VMRV = (AH \times AR) - (AH \times SR) \]

\[ = $100,000 - (88,000 \text{ hours} \times $1.00 \text{ per hour}) \]

\[ = $12,000 \text{ unfavorable} \]
## Computing the Sum of All Variances

<table>
<thead>
<tr>
<th>ColaCo</th>
<th>Computing the Sum of All variances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable overhead rate variance</td>
<td>$12,000 U</td>
</tr>
<tr>
<td>Variable overhead efficiency variance</td>
<td>$4,000 U</td>
</tr>
<tr>
<td>Fixed overhead budget variance</td>
<td>$10,000 U</td>
</tr>
<tr>
<td>Fixed overhead volume variance</td>
<td>$18,000 U</td>
</tr>
<tr>
<td>Total of the overhead variances</td>
<td>$44,000 U</td>
</tr>
</tbody>
</table>
General Ledger Entries to Record Variances

Appendix 10B

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Learning Objective 5

(Appendix 10B)
Prepare journal entries to record standard costs and variances.
Glacier Peak Outfitters — Revisited

We will use information from the Glacier Peak Outfitters example presented earlier in the chapter to illustrate journal entries for standard cost variances. Recall the following:

<table>
<thead>
<tr>
<th>Material</th>
<th>Labor</th>
</tr>
</thead>
<tbody>
<tr>
<td>AQ × AP = $1,029</td>
<td>AH × AR = $26,250</td>
</tr>
<tr>
<td>AQ × SP = $1,050</td>
<td>AH × SR = $25,000</td>
</tr>
<tr>
<td>SQ × SP = $1,000</td>
<td>SH × SR = $24,000</td>
</tr>
<tr>
<td>MPV = $21 F</td>
<td>LRV = $1,250 U</td>
</tr>
<tr>
<td>MQV = $50 U</td>
<td>LEV = $1,000 U</td>
</tr>
</tbody>
</table>

Now, let’s prepare the entries to record the labor and material variances.
## Recording Materials Variances

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
<th>Post. Ref.</th>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Raw Materials</td>
<td></td>
<td>1,050</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Materials Price Variance</td>
<td></td>
<td></td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>Accounts Payable</td>
<td></td>
<td></td>
<td>1,029</td>
</tr>
<tr>
<td></td>
<td><em>To record the purchase of material</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work in Process</td>
<td></td>
<td></td>
<td>1,000</td>
</tr>
<tr>
<td></td>
<td>Materials Quantity Variance</td>
<td></td>
<td></td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Raw Materials</td>
<td></td>
<td></td>
<td>1,050</td>
</tr>
<tr>
<td></td>
<td><em>To record the use of material</em></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Recording Labor Variances

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
<th>Post. Ref.</th>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Work in Process</td>
<td></td>
<td>24,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Labor Rate Variance</td>
<td></td>
<td>1,250</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Labor Efficiency Variance</td>
<td></td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Wages Payable</strong></td>
<td></td>
<td></td>
<td>26,250</td>
</tr>
</tbody>
</table>

*To record direct labor*
Inventories are recorded at standard cost. Variances are recorded as follows:

• Favorable variances are credits, representing savings in production costs.
• Unfavorable variances are debits, representing excess production costs.

Standard cost variances are usually closed out to cost of goods sold.

• Unfavorable variances increase cost of goods sold.
• Favorable variances decrease cost of goods sold.
End of Chapter 10