CHAPTER 7

STANDARD COSTING AND VARIANCE ANALYSIS

22. a. Total purchases = AP × AQₚ = $0.13 × 115,000 = $14,950

  b. Material price variance = (AP × AQₚ) – (SP × AQₚ)
                             = $14,950 – ($0.14 × 115,000)
                             = $14,950 – $16,100
                             = $1,150 F

  b. Material quantity variance = (SP × AQᵤ) – (SP × SQ)
                               = ($0.14 × 100,000) – ($0.14 × 97,900)
                               = $14,000 – $13,706
                               = $294 U

23. a. $10,080 ÷ 4,200 = $2.40 per quart

    SQ = 1,000 units × 4 quarts = 4,000

    \[
    \begin{array}{ccc}
    \text{AQ} \times \text{AP} & \text{AQ} \times \text{SP} & \text{SQ} \times \text{SP} \\
    4,200 \times $2.40 & 4,200 \times $2.50 & 4,000 \times $2.50 \\
    $10,080 & $10,500 & $10,000 \\
    \end{array}
    \]

    \[
    \begin{array}{c}
    \text{Material Price Variance} \quad \text{Material Usage Variance} \\
    \text{Material Price Variance} \quad \text{Material Usage Variance} \\
    \end{array}
    \]

    b. The price variance would be based on the quantity of material purchased, while
    the usage variance would be based on the quantity of material used in produc-
    tion. Because the usage variance is based on the same quantities as in (a), it
    does not change.

    \[
    \begin{array}{ccc}
    \text{AQₚ} \times \text{AP} & \text{AQₚ} \times \text{SP} \\
    6,000 \times $2.40 & 6,000 \times $2.50 \\
    $14,400 & $15,000 \\
    \end{array}
    \]

    \[
    \begin{array}{c}
    $600 \text{ F} \\
    \text{Material Price Variance} \\
    \text{Material Price Variance} \\
    \end{array}
    \]

    c. Raw Material Inventory 15,000

    Material Price Variance 600

    Accounts Payable 14,400

    Work in Process Inventory 10,000

    Material Usage Variance 500

    Raw Material Inventory 10,500

    d. The purchasing agent would have responsibility for the price variance and the
    production manager would have responsibility for the usage variance.

    (CPA adapted)
24. a. Material purchase price variance = \((\$2.10 - \$1.40) = \$0.70\) F variance per pound; \(0.70 \times 100,000\) lbs. = \$70,000 F

b. June \(3,000 \times 5 = 15,000\) SQ; \(\$2.10 \times (16,400 - 15,000) = \$2,940\) U
July \(3,400 \times 5 = 17,000\) SQ; \(\$2.10 \times (17,640 - 17,000) = \$1,344\) U
Aug. \(2,900 \times 5 = 14,500\) SQ; \(\$2.10 \times (14,950 - 14,500) = \$945\) U
Sept. \(2,500 \times 5 = 12,500\) SQ; \(\$2.10 \times (13,100 - 12,500) = \$1,260\) U

c. It is possible that the material purchased had been damaged in some way or became tainted for use while being stored at the bankrupt vendor’s location. (Bell Inc. should carefully assess the effect of this material’s usage on labor efficiency to see if there is an unfavorable variance there.)

25. a. & b.

Purchasing agent’s responsibility:
Material price variance = \((\text{AP} \times \text{AQ}_p) - (\text{SP} \times \text{AQ}_p)\)
\[= (\$0.64 \times 25,600) - (\$0.70 \times 25,600)\]
\[= \$16,384 - \$17,920\]
\[= \$1,536\] F

Production supervisor’s responsibility:
Standard quantity of materials = 600 \(\times 35\) lbs. = 21,000
Material quantity variance = \((\text{SP} \times \text{AQ}_u) - (\text{SP} \times \text{SQ})\)
\[= (\$0.70 \times 21,400) - (\$0.70 \times 21,000)\]
\[= \$14,980 - \$14,700\]
\[= \$280\] U

c. Explanations offered should consider the pattern of the variances. The pattern is a favorable price variance and an unfavorable quantity variance. A favorable price variance could have been obtained because the material was acquired in a larger-than-normal quantity with a pricing discount. Or the material was acquired from a vendor having a distress sale. Another reason would be that the quality of the scrap iron was not as high as the quality usually purchased. If the latter is the case, it could have influenced the excessive material usage and waste. Alternatively, the quantity variance could be just inefficiency in the production process.

26. a. Standard hours = \(5 \times 670 = 3,350\)

b. Wage rate per hour = \$60,407.50 \div 3,310 = \$18.25

c. \begin{align*}
\text{AP} \times \text{AQ} & \quad \text{SP} \times \text{AQ} \\
\$60,407.50 & \quad \$18 \times 3,310 \\
\text{SP} \times \text{SQ} & \quad \text{SP} \times \text{SQ} \\
\$60,300 & \quad \$18 \times 3,350 \\
\end{align*}

\[
\begin{array}{c}
\text{\$827.50 U} \\
\text{\$720 F} \\
\text{\$107.50 U} \\
\text{Total Labor Variance} \\
\end{array}
\]
27. a. Since the labor rate variance is favorable, the actual cost of direct labor is less (by $5,500) than the standard cost. The standard cost is $80,500.

\[
\begin{array}{c|c|c}
AP \times AQ & SP \times AQ & \text{Labor Rate Variance} \\
$7.50 \times 10,000 & SP \times 10,000 & \$5,500 \text{ F} \\
$75,000 & $80,500 & \\
\end{array}
\]

\[
\frac{80,500}{10,000} \text{ actual direct labor hours equals a standard rate of } $8.05.
\]

b. Since the actual hours are 1,000 less than the standard, the efficiency variance is 1,000 hours \( \times \$8.05 = $8,050 \text{ U}. \)

\[
\begin{array}{c|c|c|c}
AP \times AQ & SP \times AQ & SP \times SQ & \text{Labor Rate Variance} \quad \text{Labor Efficiency Variance} \\
$7.50 \times 10,000 & $8.05 \times 10,000 & $8.05 \times 9,000 & \$5,500 \text{ F} \quad $8,050 \text{ U} \\
$75,000 & $80,500 & $72,450 & \\
\end{array}
\]

c. Work in Process Inventory \( 72,450 \)
Labor Efficiency Variance \( 8,050 \)
Labor Rate Variance \( 5,500 \)
Wages Payable \( 75,000 \)

(\textit{CPA adapted})

28. a. Actual cost = Standard cost + Total unfavorable variance
\[
= (250 \times 350) + 3,500 \\
= 87,500 + 3,500 \\
= 91,000
\]

b. Labor efficiency variance = \( (SP \times AH) - (SP \times SH) \)
\[
= (250 \times 330) - (250 \times 350) \\
= 82,500 - 87,500 \\
= 5,000 \text{ F}
\]

c. Rate variance + Efficiency variance = Total variance
Rate variance + \(-5,000 \text{ F}\) = 3,500 U
Rate variance = 3,500 + 5,000
Rate variance = 8,500 U

d. Work in Process Inventory \( 87,500 \)
Labor Rate Variance \( 8,500 \)
Labor Efficiency Variance \( 5,000 \)
Wages Payable \( 91,000 \)

e. Because the favorable efficiency variance is coupled with an unfavorable rate variance, one explanation is that the firm used, on average, a more skilled mix of labor than it expected to use. For example, the firm may have used more senior auditors and managers than it intended to use. Without additional information on the original mix of employees and the actual mix of employees, no specific conclusions can be reached.
29. | Units produced | Case A | Case B | Case C | Case D |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard hours per unit</td>
<td>3.5</td>
<td>0.9</td>
<td>2.5</td>
<td>3.0</td>
</tr>
<tr>
<td>Standard hours</td>
<td>3,500</td>
<td>900</td>
<td>600</td>
<td>4,500</td>
</tr>
<tr>
<td>Standard rate per hour</td>
<td>$7.25</td>
<td>$10.20</td>
<td>$10.50</td>
<td>$7.00</td>
</tr>
<tr>
<td>Actual hours worked</td>
<td>3,400</td>
<td>975</td>
<td>560</td>
<td>4,900</td>
</tr>
<tr>
<td>Actual labor cost</td>
<td>$23,800</td>
<td>$8,970</td>
<td>$6,180</td>
<td>$31,850</td>
</tr>
<tr>
<td>Labor rate variance</td>
<td>$850 F</td>
<td>$975 F</td>
<td>$300 U</td>
<td>$2,450 F</td>
</tr>
<tr>
<td>Labor efficiency variance</td>
<td>$725 F</td>
<td>$765 U</td>
<td>$420 F</td>
<td>$2,800 U</td>
</tr>
</tbody>
</table>

**Case A:**

\[
\text{Standard hours} = 1,000 \times 3.5 = 3,500
\]

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

\[
-850 = 3,400 (AP - 7.25)
\]

\[
-850 = 3,400AP - 24,650
\]

\[
23,800 = 3,400AP
\]

\[
7.00 = AP
\]

Actual labor cost = $7.00 \times 3,400 = $23,800

\[
\text{LEV} = SP \times (AQ - SQ)
\]

\[
765 = SP (975 - 900)
\]

\[
765 = SP (75)
\]

\[
10.20 = SP
\]

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

\[
-975 = 975 (AP - 10.20)
\]

\[
-975 = 975AP - 9,945
\]

\[
8,970 = 975AP
\]

\[
9.20 = AP
\]

Actual labor cost = $9.20 \times 975 = $8,970

**Case B:**

Units produced = 900 \div 0.9 = 1,000

\[
\text{LEV} = SP \times (AQ - SQ)
\]

\[
765 = SP (975 - 900)
\]

\[
765 = SP (75)
\]

\[
10.20 = SP
\]

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

\[
-975 = 975 (AP - 10.20)
\]

\[
-975 = 975AP - 9,945
\]

\[
8,970 = 975AP
\]

\[
9.20 = AP
\]

Actual labor cost = $9.20 \times 975 = $8,970

**Case C:**

Standard hours = 600 \div 240 = 2.5

\[
(AP \times AQ) - LRV = (SP \times AQ)
\]

\[
6,180 - 300 = 5,880
\]

\[
5,880 = 10.50 \times AQ
\]

\[
5,880 \div 10.50 = AQ
\]

AQ = 560

\[
\text{LEV} = SP \times (AQ - SQ)
\]

\[
\text{LEV} = 10.50 (560 - 600) = 10.50 (-40) = 420 F
\]

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Case D:
Actual labor rate = $31,850 ÷ 4,900 = $6.50

\[
LRV = AQ (AP - SP)
\]
\[
LRV = $31,850 - ($7 \times 4,900)
\]
\[
LRV = $31,850 - $34,300
\]
\[
LRV = $2,450 F
\]

\[
LEV = (SP \times AQ) - (SP \times SQ)
\]
\[
$2,800 = $34,300 - $7SQ
\]
\[
-31,500 = -7SQ
\]
\[
SQ = 4,500
\]

Standard hours per unit = 4,500 ÷ 1,500 = 3

30. a. Material price variance = $61,000 - ($3 × 20,000)
= $61,000 - $60,000
= $1,000 U

Standard quantity of material = 3,900 × 4.8 = 18,720 gallons
Material quantity variance = ($3 × 18,350) - ($3 × 18,720)
= $55,050 - $56,160
= $1,110 F

b. Standard quantity of time = 3,900 × 1/3 hour = 1,300 hours

\[
\begin{array}{ccc}
\text{Labor Rate Variance} & \text{Labor Efficiency Variance} & \text{Total Labor Variance} \\
$25.80 U & $90.00 F & $64.20 F \\
\end{array}
\]

c. Raw Material Inventory 60,000.00
Material Price Variance 1,000.00
Accounts Payable 61,000.00

Work in Process Inventory 56,160.00
Material Quantity Variance 1,110.00
Raw Material Inventory 55,050.00

Work in Process 11,700.00
Labor Rate Variance 25.80
Labor Efficiency Variance 90.00
Wages Payable 11,635.80

31. a. Actual material price = $83,300 ÷ 17,000 = $4.90 per square yard
Material price variance: \( AQ_p (AP - SP) = 17,000 \times ($4.90 - $5.00) = $1,700 F \)
Material usage variance: \( SP \times (AQ_u - SQ) = $5 \times (16,500 - 15,000) = $7,500 U \)

b. Raw Material Inventory 85,000
Accounts Payable 83,300
Chapter 7

 emerges with a total of 183

Material Price Variance 1,700
Work in Process Inventory 75,000
Material Usage Variance 7,500
Raw Material Inventory 82,500

c. Actual labor rate = $79,800 ÷ 7,600 = $10.50
Labor rate variance: AQ × (AP – SP) = 7,600 × ($10.50 – $10.00) = $3,800 U
Labor efficiency variance = (SP × AQ) – (SP × SQ)
= ($10 × 7,600) – ($10 × 7,500)
= $76,000 – $75,000
= $1,000 U

d. Work in Process Inventory 75,000
Labor Rate Variance 3,800
Labor Efficiency Variance 1,000
Wages Payable 79,800

e. The material price variance is favorable. The purchasing agent may have purchased an optimum quantity with a negotiated price. It is also possible that the materials are of lower quality. This possibility is suggested by both the unfavorable material usage variance and the unfavorable labor efficiency variance. It is possible that the workers had difficulty working with the materials or that the inferior quality slowed down the machinery or resulted in defective units being produced. All of these factors would require additional materials to be used to complete the required production level. The unfavorable labor rate variance could have been the result of the company using more experienced workers, a tight labor market due to a strong economy or standards that had not been updated for a change in contractual wage rates negotiated in a union contract.

(CPA adapted)

32. a. Standard quantity of material = 2 yards × 10,000 shirts = 20,000 yards
Standard labor time = 0.7 hours × 10,000 shirts = 7,000 DLHs

b. AP × AQ<sub>p</sub> SP × AQ<sub>p</sub>
$89,700 $3 × 30,000

$300 F

Material Price Variance

SP × AQ<sub>u</sub> SP × SQ
$3 × 20,120 $3 × 20,000

$60,360 $60,000

$360 U

Material Quantity Variance

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c. The pattern is a favorable material price variance and an unfavorable material quantity variance. If the quality level of cotton is below the expected level, a favorable price variance would be incurred. However, the lower quality cotton could result in more waste and shrinkage during production and thus more materials yardage is required to make a t-shirt than expected.

d. The favorable labor rate variance is coupled with an unfavorable labor efficiency variance. One explanation is that the firm used, on average, a less skilled mix of labor than it expected to use and thus the average labor time per t-shirt was greater than expected. Additionally, the use of inferior quality material could also have contributed to the excess time taken to manufacture the shirts.

e. Material Price Variance 300
   Cost of Goods Sold 60
   Material Quantity Variance 360
   To dispose of the material variances

Labor Rate Variance 794
Cost of Goods Sold 6,256
Labor Efficiency Variance 7,050
To dispose of the labor variances