

24. Control through standard costs

Learning objectives

After studying this chapter, you should be able to:

- Discuss the nature of standard costs, including how standards are set.
- Define budgets and discuss how budgets are used in a standard cost system.
- Discuss the advantages and disadvantages of using standard costs.
- Calculate the six variances from standard and determine if the variance is favorable or unfavorable.
- Discuss what each of the six variances shows and prepare journal entries to record the variance.
- Discuss the three selection guidelines used to investigate variances from standard.
- Discuss theoretical and practical methods for disposing of variances from standard.

This chapter discusses the uses of standard costs, the advantages and disadvantages of using standard costs, and how to compute the difference, or variance, between an actual cost and a standard cost. We discuss how managers can improve efficiency by investigating variances and taking corrective action.

Uses of standard costs

Whenever you have set goals that you have sought to achieve, these goals could have been called standards. Periodically, you might measure your actual performance against these standards and analyze the differences to see how close you are to your goal. Similarly, management sets goals, such as standard costs, and compares actual costs with these goals to identify possible problems.

This section begins with a discussion of the nature of standard costs. Next, we explain how managers use standard costs to establish budgets. Then we describe how management uses the concept of **management by exception** to investigate variances from standards. We also explain setting standards and how management decides whether to use ideal or practical standards. The section closes with a discussion of the other uses of standard costs.

Nature of standard costs

A **standard cost** is a carefully predetermined measure of what a cost should be under stated conditions. Standard costs are not only estimates of what costs will be but also goals to be achieved. When standards are properly set, their achievement represents a reasonably efficient level of performance.

Usually, effective standards are the result of engineering studies and of time and motion studies undertaken to determine the amounts of materials, labor, and other services required to produce a product. Also considered in

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setting standards are general economic conditions because these conditions affect the cost of materials and other services that must be purchased by a manufacturing company.

Manufacturing companies determine the standard cost of each unit of product by establishing the standard cost of direct materials, direct labor, and manufacturing overhead necessary to produce that unit. Determining the standard cost of direct materials and direct labor is less complicated than determining the standard cost of manufacturing overhead.

The standard direct materials cost per unit of a product consists of the standard amount of material required to produce the unit multiplied by the standard price of the material. You must distinguish between the terms standard price and standard cost. Standard price usually refers to the price per unit of inputs into the production process, such as the price per pound of raw materials.

Standard cost, however, is the standard quantity of an input required per unit of output times the standard price per unit of that input. For example, if the standard price of cloth is USD 3 per yard and the standard quantity of material required to produce a dress is 3 yards, the standard direct materials cost of the dress is 3 yards x USD 3 per yard = USD 9. Similarly, a company computes the standard direct labor cost per unit for a product as the standard number of hours needed to produce one unit multiplied by the standard labor or wage rate per hour.

Standard manufacturing overhead cost To find the standard manufacturing overhead cost of a unit, use the following steps. First, determine the expected level of output for the year. This level of output is called the **standard level of output**. Second, determine the total budgeted manufacturing overhead cost at the standard level of output. The total budgeted overhead cost includes both fixed and variable components. Total fixed cost is the same at every level of output within a relevant range. Total variable overhead varies in direct proportion to the number of units produced. Third, compute the standard manufacturing overhead cost per unit by dividing the total budgeted manufacturing overhead cost at the standard level of output by the standard level of output. The result is standard overhead cost (or rate) per unit of output.

The formula to compute the standard overhead cost per unit is:

$$\text{Standard overhead cost (rate) per unit} = \frac{\text{Total budgeted overhead cost at the standard level of output}}{\text{Standard level of output}}$$

Sometimes accountants find the standard overhead rate per unit of input, such as direct labor-hour instead of per unit. To find the standard overhead cost per unit, multiply the direct labor-hours per unit times the standard overhead cost per direct labor-hour. For instance, if the standard overhead costs per direct labor-hour is USD 5 and the standard number of direct labor-hours is two hours per unit, the standard overhead cost per unit is USD 5 x 2 hours = USD 10.

As discussed in Chapter 23, **budgets** are formal written plans that represent management's planned actions in the future and the impacts of these actions on the business. As a business incurs actual expenses and revenues, management compares them with the budgeted amounts. To control operations, management investigates any differences between the actual and budgeted amounts and takes corrective action.

When management compares actual expenses and revenues with budgeted expenses and revenues, differences—called variances—are likely to occur. The responsibility of management is to investigate significant variances.

Obviously, management must determine when a variance is significant. This process of focusing on only the most significant variances is known as **management by exception**. The process of management by exception enables management to concentrate its efforts on those variances that could have a big effect on the company, ignoring those variances that are not significant.

In developing standards, management must consider the assumed conditions under which these standards can be met. Standards generally fall into two groups—ideal and practical.

A company attains **ideal standards** under the best circumstances—with no machinery problems or worker problems. The company can attain these unrealistic standards only when it has highly efficient, skilled workers who are working at their best effort throughout the entire period needed to complete the job.

Practical standards are strict but attainable standards that have allowances made for machinery problems and rest periods for workers. Companies can meet these standards if average workers are efficient at their work. These standards are generally used in planning.

Generally, management does not use ideal standards because ideal standards do not allow for normal repairs to machinery or rest periods for workers. A company rarely runs its operations under ideal conditions. Since planning under ideal standards is unrealistic, managers rarely use ideal standards in budgeting. Instead, management uses practical standards in planning because these standards are more realistic, allowing for machinery repairs and rest periods for workers. Any variances that result when practical standards are used indicate abnormal or unusual problems.

In addition to developing budgets, companies use standard costs in evaluating management's performance, evaluating workers' performance, and setting appropriate selling prices.

Firms evaluate management's and workers' performances through the use of a budget. When management compares actual results with budgeted amounts, it can see how well it is performing its own duties and managing its employees. Management also can evaluate workers based on how well they performed relative to the budgeted amounts pertaining to the activities they performed.

Standard costs are useful in setting selling prices. The budget shows the expected expenses incurred by the business. By considering these expenses, management can determine how much to charge for a product so that it can produce the desired net income. As the business actually incurs these expenses, management determines if the selling prices set are still reasonable and, when necessary, considers some price adjustments after taking competition into account.

Advantages and disadvantages of using standard costs

Five of the benefits that result from a business using a standard cost system are:

- Improved cost control.
- More useful information for managerial planning and decision making.
- More reasonable and easier inventory measurements.
- Cost savings in record-keeping.

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- Possible reductions in production costs.

Improved cost control Companies can gain greater cost control by setting standards for each type of cost incurred and then highlighting exceptions or variances—instances where things did not go as planned. Variances provide a starting point for judging the effectiveness of managers in controlling the costs for which they are held responsible.

Assume, for example, that in a production center, actual direct materials costs of USD 52,015 exceeded standard costs by USD 6,015. Knowing that actual direct materials costs exceeded standard costs by USD 6,015 is more useful than merely knowing the actual direct materials costs amounted to USD 52,015. Now the firm can investigate the cause of the excess of actual costs over standard costs and take action.

Further investigation should reveal whether the exception or variance was caused by the inefficient use of materials or resulted from higher prices due to inflation or inefficient purchasing. In either case, the standard cost system acts as an early warning system by highlighting a potential hazard for management.

More useful information for managerial planning and decision making When management develops appropriate cost standards and succeeds in controlling production costs, future actual costs should be close to the standard. As a result, management can use standard costs in preparing more accurate budgets and in estimating costs for bidding on jobs. A standard cost system can be valuable for top management in planning and decision making.

More reasonable and easier inventory measurements A standard cost system provides easier inventory valuation than an actual cost system. Under an actual cost system, unit costs for batches of identical products may differ widely. For example, this variation can occur because of a machine malfunction during the production of a given batch that increases the labor and overhead charged to that batch. Under a standard cost system, the company would not include such unusual costs in inventory. Rather, it would charge these excess costs to variance accounts after comparing actual costs to standard costs.

Thus, in a standard cost system, a company assumes that all units of a given product produced during a particular time period have the same unit cost. Logically, identical physical units produced in a given time period should be recorded at the same cost.

Cost savings in record-keeping Although a standard cost system may seem to require more detailed record-keeping during the accounting period than an actual cost system, the reverse is true. For example, a system that accumulates only actual costs shows cost flows between inventory accounts and eventually into cost of goods sold. It records these varying amounts of actual unit costs that must be calculated during the period. In a standard cost system, a company shows the cost flows between inventory accounts and into cost of goods sold at consistent standard amounts during the period. It needs no special calculations to determine actual unit costs during the period. Instead, companies may print standard cost sheets in advance showing standard quantities and standard unit costs for the materials, labor, and overhead needed to produce a certain product.

Possible reductions in production costs A standard cost system may lead to cost savings. The use of standard costs may cause employees to become more cost conscious and to seek improved methods of completing

their tasks. Only when employees become active in reducing costs can companies really become successful in cost control.

Three of the disadvantages that result from a business using standard costs are:

- Controversial materiality limits for variances.
- Nonreporting of certain variances.
- Low morale for some workers.

Controversial materiality limits for variances Determining the materiality limits of the variances may be controversial. The management of each business has the responsibility for determining what constitutes a material or unusual variance. Because materiality involves individual judgment, many problems or conflicts may arise in setting materiality limits.

Nonreporting of certain variances Workers do not always report all exceptions or variances. If management only investigates unusual variances, workers may not report negative exceptions to the budget or may try to minimize these exceptions to conceal inefficiency. Workers who succeed in hiding variances diminish the effectiveness of budgeting.

Low morale for some workers The management by exception approach focuses on the unusual variances. Management often focuses on unfavorable variances while ignoring favorable variances. Workers might believe that poor performance gets attention while good performance is ignored. As a result, the morale of these workers may suffer.

An accounting perspective:

Business insight

A few forward-looking companies have succeeded in allowing employees to set their own work standards. In most cases, industrial engineers shut themselves in a room and ponder how to set standards. The industrial engineers ignored the workers, who in turn ignored the standards. In the alternative scenario, workers themselves hold the stopwatches and set the standards. Worker team members time each other, looking for the most efficient and safest way to do the work. They standardize each task so everyone in the team does it the same way. The workers are more informed about how to do the work than industrial engineers, and they are more motivated to meet the standards they set.

Source: Based on the authors' research.

Computing variances

As stated earlier, standard costs represent goals. Standard cost is the amount a cost should be under a given set of circumstances. The accounting records also contain information about actual costs.

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The amount by which actual cost differs from standard cost is called a **variance**. When actual costs are less than the standard cost, a cost variance is favorable. When actual costs exceed the standard costs, a cost variance is unfavorable. Do not automatically equate favorable and unfavorable variances with good and bad. You must base such an appraisal on the causes of the variance.

The following section explains how to compute the dollar amount of variances, a process called isolating variances, using data for Beta Company. Beta manufactures and sells a single product, each unit of which has the following standard costs:

Materials – 5 sheets at \$6	\$30
Direct labor – 2 hours at \$10	20
Manufacturing overhead – 2 direct labor hours at \$5	10
Total standard cost per unit	\$60

We present additional data regarding the production activities of the company as needed.

The standard materials cost of any product is simply the standard quantity of materials that should be used multiplied by the standard price that should be paid for those materials. Actual costs may differ from standard costs for materials because the price paid for the materials and/or the quantity of materials used varied from the standard amounts management had set. These two factors are accounted for by isolating two variances for materials—a price variance and a usage variance.

Accountants isolate these two materials variances for three reasons. First, different individuals may be responsible for each variance—a purchasing agent for the price variance and a production manager for the usage variance. Second, materials might not be purchased and used in the same period. The variance associated with the purchase should be isolated in the period of purchase, and the variance associated with usage should be isolated in the period of use. As a general rule, the sooner a variance can be isolated, the greater its value in cost control. Third, it is unlikely that a single materials variance—the difference between the standard cost and the actual cost of the materials used—would be of any real value to management for effective cost control. A single variance would not show management what caused the difference, or one variance might simply offset another and make the total difference appear to be immaterial.

Materials price variance In a manufacturing company, the purchasing and accounting departments usually set a standard price for materials meeting certain engineering specifications. They consider factors such as market conditions, vendors' quoted prices, and the optimum size of a purchase order when setting a standard price. A **materials price variance (MPV)** occurs when a company pays a higher or lower price than the standard price set for materials. Materials price variance (MPV) is the difference between actual price paid (AP) and standard price allowed (SP) multiplied by the actual quantity of materials purchased (AQ). In equation form, the materials price variance is:

$$\text{Materials price variance} = (\text{Actual price} - \text{Standard price}) \times \text{Actual quantity purchased}$$

To illustrate, assume that a new supplier entered the market enabling Beta Company to purchase 60,000 sheets of material at a price of USD 5.90 each. Since the standard price set by management is USD 6 per sheet, the materials price variance is computed as:

$$\text{Materials price variance} = (\text{Actual price} - \text{Standard price}) \times \text{Actual quantity purchased}$$

$$\begin{aligned} &= (\text{USD } 5.90 - \text{USD } 6.00) \times 60,000 \\ &= \text{USD } -0.10 \times 60,000 \\ &= \text{USD } -6,000 \text{ (favorable)} \end{aligned}$$

The materials price variance of USD 6,000 is considered favorable since the materials were acquired for a price less than the standard price. If the actual price had exceeded the standard price, the variance would be unfavorable because the costs incurred would have exceeded the standard price. The journal entry to record the purchase of materials is:

(a) Materials inventory (+A)	360,000
Materials price variance (-A)	6,000
Accounts payable (+L)	354,000
To record the purchase of materials at less than standard cost.	

Note that the Accounts Payable account shows the actual debt owed to suppliers, while the Materials Inventory account shows the standard price of the actual quantity of materials purchased. The Materials Price Variance account shows the difference between the actual price and standard price multiplied by the actual quantity purchased.

Materials usage variance Because the standard quantity of materials used in making a product is largely a matter of physical requirements or product specifications, usually the engineering department sets it. But if the quality of materials used varies with price, the accounting and purchasing departments may perform special studies to find the right quality.

The **materials usage variance** occurs when more or less than the standard amount of materials is used to produce a product or complete a process. The variance shows only differences from the standard quantity caused by the quantity of materials used; it does not include any effect of variances in price. Thus, the materials usage variance (MUV) is equal to actual quantity used (AQ) minus standard quantity allowed (SQ) multiplied by standard price (SP):

$$\text{Materials usage variance} = (\text{Actual quantity used} - \text{Standard quantity allowed}) \times \text{Standard price}$$

To illustrate, assume that Beta Company used 55,500 sheets of material to produce 11,000 units of a product for which the standard quantity allowed is 55,000 sheets (5 sheets per unit allowed \times 11,000 units actually produced). Since the standard price of the material is USD 6 per sheet, the materials usage variance of USD 3,000 would be computed as follows:

$$\begin{aligned} &\text{Materials usage variance} = (\text{Actual quantity used} - \text{Standard quantity allowed}) \times \text{Standard price} \\ &= (55,500 - 55,000) \times \text{USD } 6 \\ &= 500 \times \text{USD } 6 \\ &= \text{USD } 3,000 \text{ (unfavorable)} \end{aligned}$$

The variance is unfavorable because more materials were used than the standard quantity allowed to complete the job. If the standard quantity allowed had exceeded the quantity actually used, the materials usage variance would have been favorable.

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The journal entry to record the use of the materials is:

(b) Work in process inventory (+A)	330,000	
Materials usage variance (+A)	3,000	
Materials inventory (-A)		333,000

To record the use of materials and to establish the materials usage variance.

The Materials Usage Variance account shows the standard cost of the excess materials used. Note also that the Work in Process Inventory account contains both standard quantity and standard prices.

In the equations for both the materials variances, positive amounts were unfavorable variances and negative amounts were favorable variances. Unfavorable variances are debits in variance accounts because they add to the costs incurred, which are recorded as debits. Similarly, favorable variances are shown as negative amounts because they are reductions in costs. Thus, favorable variances are recorded in variance accounts as credits. We use this format in this text, but a word of caution is in order. Far greater understanding is achieved if you determine whether a variance is favorable or unfavorable by reliance on reason or logic. If more materials were used than the standard quantity, or if a price greater than the standard price was paid, the variance is unfavorable. If the reverse is true, the variance is favorable.

Exhibit 49 below shows the relationship between standard and actual materials cost and the computation of the materials variances; it is based on the following data relating to Beta Company:

Standard price per sheet of material	\$6.00
Actual price per sheet of material	\$5.90
Number of sheets of material purchased	60,000
Standard number of sheets of material per unit 5 of product	
Units of product produced in period	11,000
Actual number of sheets of material used	\$5,500

Purchase of materials

Actual cost of materials purchased:

Actual price X actual quantity purchased
 5.90 X 60,000 sheets = \$354,000

Standard cost of materials purchased:

Standard price	X actual quantity purchased	<--Price variance:
\$6.00	X 60,000 sheets = \$360,000	\$354,000 - \$360,000
		= -\$6,000 (favorable)

Use of materials

Standard cost of Produce 11,000 units: materials used to

Actual number of sheets used	X standard price	
55,500	X \$6.00 = \$333,000	<--Usage variance:
Standard cost of materials allowed to	Produce 11,000 units:	\$333,000 - \$330,000
		=

Standard number of sheets allowed	X standard price	\$ 3,000 (unfavorable)
55,500*	X \$ 6.00 = \$330,000	

*(11,000 x 5) = 55,000.

Exhibit 49: Materials price and usage variances

The standard labor cost of any product is equal to the standard quantity of labor time allowed multiplied by the wage rate that should be paid for this time. Here again, it follows that the actual labor cost may differ from standard labor cost because of the wages paid for labor, the quantity of labor used, or both. Thus, two labor variances exist—a rate variance and an efficiency variance.

Labor rate variance The **labor rate variance (LRV)** occurs when the average rate of pay is higher or lower than the standard cost to produce a product or complete a process. The labor rate variance is similar to the materials price variance.

To compute the labor rate variance (LRV), multiply the difference between the actual direct labor-hour rate paid (AR) and the standard direct labor-hour rate allowed (SR) by the actual hours of direct labor services worked (AH):

$$\text{Labor rate variance} = (\text{Actual rate} - \text{Standard rate}) \times \text{Actual hours worked}$$

To continue the Beta example, assume that the direct labor payroll of the company consisted of 22,200 hours at a total cost of USD 233,100 (an average actual hourly rate of USD 10.50). Because management has set a standard direct labor-hour rate of USD 10 per hour, the labor rate variance is:

$$\begin{aligned} \text{Labor rate variance} &= (\text{Actual rate} - \text{Standard rate}) \times \text{Actual hours worked} \\ &= (\text{USD } 10.50 - \text{USD } 10.00) \times 22,200 \\ &= \text{USD } 0.50 \times 22,200 \\ &= \text{USD } 11,100 \text{ (unfavorable)} \end{aligned}$$

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The variance is positive and unfavorable because the actual rate paid exceeded the standard rate allowed. If the reverse were true, the variance would be favorable.

Labor efficiency variance Usually, the company's engineering department sets the standard amount of direct labor-hours needed to complete a product. Engineers may base the direct labor-hours standard on time and motion studies or on bargaining with the employees' union. The **labor efficiency variance (LEV)** occurs when employees use more or less than the standard amount of direct labor-hours to produce a product or complete a process. The labor efficiency variance is similar to the materials usage variance.

To compute the labor efficiency variance (LEV), multiply the difference between the actual direct labor-hours worked (AH) and the standard direct labor-hours allowed (SH) by the standard direct labor-hour rate per hour (SR):

$$\begin{aligned}\text{Labor efficiency variance} &= (\text{Actual rate} - \text{Standard rate}) \times \text{Actual hours worked} \\ &= (\text{USD } 10.50 - \text{USD } 10.00) \times 22,200 \\ &= \text{USD } 0.50 \times 22,200 \\ &= \text{USD } 11,100 \text{ (unfavorable)}\end{aligned}$$

The variance is positive and unfavorable because the actual rate paid exceeded the standard rate allowed. If the reverse were true, the variance would be favorable.

Labor efficiency variance Usually, the company's engineering department sets the standard amount of direct labor-hours needed to complete a product. Engineers may base the direct labor-hours standard on time and motion studies or on bargaining with the employees' union. The **labor efficiency variance (LEV)** occurs when employees use more or less than the standard amount of direct labor-hours to produce a product or complete a process. The labor efficiency variance is similar to the materials usage variance.

To compute the labor efficiency variance (LEV), multiply the difference between the actual direct labor-hours worked (AH) and the standard direct labor-hours allowed (SH) by the standard direct labor-hour rate per hour (SR):

$$\text{Labor efficiency variance} = (\text{Actual hours worked} - \text{Standard hours allowed}) \times \text{Standard rate}$$

To illustrate, assume that the 22,200 hours of direct labor-hours worked by Beta Company employees resulted in 11,000 units of production. Assume these units have a standard direct labor-hours of 20,000 hours (11,000 units at 2 hour unit). Since the standard direct labor rate is USD 10 per hour, the labor efficiency variance is USD 2,000, computed as follows:

$$\begin{aligned}\text{Labor efficiency variance} &= (\text{Actual hours worked} - \text{Standard hours allowed}) \times \text{Standard rate} \\ &= (22,200 - 20,000) \times \text{USD } 10 \\ &= 2,200 \times \text{USD } 10 \\ &= \text{USD } 2,000 \text{ (unfavorable)}\end{aligned}$$

The variance is unfavorable since more hours than the standard number of hours were required to complete the period's production. If the reverse were true, the variance would be favorable.

The standard direct labor-hours allowed for the period's output are 22,000 hours (11,000 units at 2 hours per unit). The standard direct labor cost is USD 10 per hour; therefore, the standard direct labor cost for the output achieved is assigned to inventory, regardless of the actual direct labor cost.

The journal entry to charge the direct labor cost to Work in Process Inventory is:

(c) Work in process inventory (+A)	220,000	
Labor rate variance (+A)	11,100	
Labor efficiency variance (+A)	2,000	
Payroll summary (+L)		233,100
To charge work in process with direct labor and to establish the two labor variances.		

With this entry, gross wages earned by direct-production employees (USD 233,100) are distributed as follows: USD 220,000 (the standard labor cost of production) to Work in Process Inventory and the balance to the two labor variance accounts. The unfavorable labor rate variance is not necessarily caused by paying employees more wages than they are entitled to receive. More probable reasons are either that more highly skilled employees with higher wage rates worked on production than originally anticipated, or that employee wage rates increased after the standard was developed and the standard was not revised. Favorable rate variances, on the other hand, could be caused by using less-skilled, cheaper labor in the production process. Typically, the hours of labor employed are more likely to be under management's control than the rates that are paid. For this reason, labor efficiency variances are generally watched more closely than labor rate variances.

In Exhibit 50, at the top of the next page, we show the relationship between standard and actual direct labor cost and the computation of the labor variances. The illustration is based on the following data relating to Beta Company:

Standard direct labor-hours per unit	2 hours
Equivalent units produced in period	11,000 units
Standard labor rate per direct labor-hour	\$ 10
Total direct labor wages paid (at actual rate of \$10.50 per hour)	\$233,100
Actual direct labor-hours worked	22,200 hours

Actual Labor Cost:		
Actual labor rate	X actual hours worked	
\$ 10.50	X 22,200 = \$233,100	
Standard cost of actual hours worked:		Labor rate variance:
		\$233,100 - \$222,000
		=
Standard labor rate	X actual hours worked	\$11,100
\$10.00	X 22,200 = \$222,000	(unfavorable)
Standard cost of hours allowed to produce 11,000 units:		Labor efficiency variance:
Standard labor rate	X standard hours allowed	\$222,000 - \$220,000
\$10.00	X 22,000* = \$220,000	=
		\$2,000 (unfavorable)

* 2 hours x 11,000 units = 22,000.

Exhibit 50: Labor rate and efficiency variances

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Summary of labor variances The accuracy of the two labor variances can be checked by comparing their sum with the difference between actual and standard labor cost for a period. In the Beta Company illustration, this difference was:

Actual labor cost incurred (22,200 hours x \$10.50)	\$233,100
Standard labor cost allowed (22,000 hours x \$10)	220,000
Total labor variance (unfavorable)	\$ 13,100

This USD 13,100 is made up of two labor variances, both unfavorable:

Labor rate variance (22,200 x \$0.50)	\$11,100
Labor efficiency variance (200 x \$10)	2,000
Total labor variance (unfavorable)	\$ 13,100

Labor costs are typically a major cost in service organizations. Banks, public accounting firms, law firms, hospitals, and parking enforcement agencies are just a few organizations that monitor labor costs closely. University officials developed the following standards for a university's parking enforcement people. (The university's officials explained that they do not have ticket quotas, but they expect their parking ticket writers "to be enforcing parking laws, not hanging out at the coffee house".)

Standard direct labor time per ticket	12 minutes
Number of tickets written in March	2,000 tickets
Standard labor rate per hour	\$14
Total labor costs for ticket writing (at an average rate of \$13.50 per hour)	\$5,670
Actual ticket writing hours worked	420 hours

The university has calculated labor rate and efficiency variances as follows:

$$\text{Labor rate variance} = (\text{Actual rate} - \text{Standard rate}) \times \text{Actual hours}$$

$$= (\text{USD } 13.50 - \text{USD } 14.00) \times 420 \text{ hours}$$

$$= \text{USD } -0.50 \times 420 \text{ hours}$$

$$= \text{USD } -210 \text{ (favorable)}$$

$$\text{Labor rate variance} = (\text{Actual hours} - \text{Standard hours}) \times \text{Standard rate}$$

$$\text{Standard hours} = \frac{12 \text{ minutes}}{60 \text{ minutes}} \times 2,000 \text{ tickets}$$

$$= 0.2 \text{ hours} \times 2,000 \text{ tickets}$$

$$= 400 \text{ hours}$$

$$\text{Labor efficiency variance} = (420 \text{ hours} - 400 \text{ hours}) \times \text{USD } 14$$

$$= 20 \text{ hours} \times \text{USD } 14$$

$$= \text{USD } 280 \text{ (unfavorable)}$$

In a standard cost system, accountants apply the manufacturing overhead to the goods produced using a standard overhead rate. They set the rate prior to the start of the period by dividing the budgeted manufacturing overhead cost by a standard level of output or activity. Total budgeted manufacturing overhead varies at different

levels of standard output, but since some overhead costs are fixed, total budgeted manufacturing overhead does not vary in direct proportion with output.

Managers use a **flexible budget** to isolate overhead variances and to set the standard overhead rate. Flexible budgets show the budgeted amount of manufacturing overhead for various levels of output.

Look at Beta Company's flexible budget for the period in Exhibit 51 below. Note that Beta's flexible budget shows the variable and fixed manufacturing overhead costs expected to be incurred at three levels of activity: 9,000 units, 10,000 units, and 11,000 units. For product costing purposes, Beta must estimate the expected level of activity in advance and set a rate based on that level. The level chosen is called the standard volume of output. This standard volume of output (or activity) may be expressed in terms of any of the activity bases used in setting standard overhead rates. These activity bases include percentage of capacity, units of output machine-hours, and direct labor-hours, among others. In our example, standard volume is assumed to be 10,000 units produced. Management expects to use 20,000 machine-hours of services.

Beta Company			
Flexible manufacturing overhead budget			
Machine-hours	18,000	20,000	22,000
Units of output	9,000	10,000	11,000
Variable overhead:			
Indirect materials	\$ 7,200	\$ 8,000	\$ 8,800
Power	9,000	10,000	11,000
Royalties	1,800	2,000	2,200
Other	18,000	20,000	22,000
Total variable overhead	\$36,000	\$40,000	\$44,000
Fixed overhead:			
Insurance	\$4,000	\$ 4,000	\$ 4,000
Property taxes	6,000	6,000	6,000
Depreciation	20,000	20,000	20,000
Other	30,000	30,000	30,000
Total fixed overhead	\$60,000	\$60,000	\$ 60,000
Standard overhead rate (\$100,000/20,000 hours)		\$5	

Exhibit 51: Flexible manufacturing overhead budget

Assume that Beta applies manufacturing overhead using a rate based on machine-hours. According to the flexible manufacturing overhead budget, the expected manufacturing overhead cost at the standard volume (20,000 machine-hours) is USD 100,000, so the standard overhead rate is USD 5 per machine-hour (USD 100,000/20,000 machine-hours).

Knowing the separate rates for variable and fixed overhead is useful for decision making, as discussed in Chapters 21 and 22. The variable overhead rate is USD 2 per hour (USD 40,000/20,000 hours), and the fixed overhead rate is USD 3 per hour (USD 60,000/20,000 hours). If the expected volume had been 18,000 machine-hours, the standard overhead rate would have been USD 5.33 (USD 96,000/18,000 hours). If the standard volume had been 22,000 machine-hours, the standard overhead rate would have been USD 4.73 (USD 104,000/22,000 hours).

Note that the difference in rates is due solely to dividing fixed overhead by a different number of machine-hours. That is, the variable overhead cost per unit stays constant (USD 2 per machine-hour) regardless of the number of units expected to be produced, and only the fixed overhead cost per unit changes.

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Continuing with the Beta Company illustration, assume that the company incurred USD 108,000 of actual manufacturing overhead costs in a period during which 11,000 units of product were produced. The actual costs would be debited to Manufacturing Overhead and credited to a variety of accounts such as Accounts Payable, Accumulated Depreciation, Prepaid Insurance, Property Taxes Payable, and so on. According to the flexible budget, the standard number of machine-hours allowed for 11,000 units of production is 22,000 hours. Therefore, USD 110,000 of manufacturing overhead is applied to production (USD 5 per machine-hour times 22,000 hours) by debiting Work in Process Inventory and crediting Manufacturing Overhead for USD 110,000. The journal entry to apply manufacturing overhead to production would be:

Work in process inventory (+A)	110,000
Manufacturing overhead (+SE)	110,000

To apply manufacturing overhead to production
(22,000 hours at \$5 per hour).

These accounts show that manufacturing overhead has been overapplied to production by the USD 2,000 credit balance in the Manufacturing Overhead account. Because of its fixed component, manufacturing overhead tends to be over applied when actual production is greater than standard production.

Although various complex computations can be made for overhead variances, we use a simple approach in this text. In this approach, known as the two-variance approach to overhead variances, we calculate only two variances—an overhead budget variance and an overhead volume variance.

Overhead budget variance The **overhead budget variance (OBV)** shows in one amount how economically overhead services were purchased and how efficiently they were used. This overhead variance is similar to a combined price and usage variance for materials or labor. The overhead budget variance (OBV) is equal to the difference between total actual overhead costs (actual OH) and total budgeted overhead costs (BOH) for the actual output attained.

To calculate the total budgeted overhead costs, multiply the variable overhead rate times the standard machine-hours allowed for production achieved, plus the constant amount of fixed overhead. For Beta Company, this would be USD 2 variable overhead times 22,000 hours, or USD 44,000 variable overhead, plus USD 60,000 of fixed overhead—a total of USD 104,000. Since the total actual overhead was USD 108,000 and the total budgeted overhead was USD 104,000, the overhead budget variance is computed as follows:

$$\begin{aligned}\text{Overhead budget variance} &= \text{Actual overhead} - \text{Budgeted overhead at actual production volume level} \\ &= \text{USD } 108,000 - \text{USD } 104,000 \\ &= \text{USD } 4,000 \text{ (unfavorable)}\end{aligned}$$

The variance is unfavorable because actual overhead costs were USD 108,000, while according to the flexible budget, they should have been USD 104,000.

Overhead volume variance The **overhead volume variance (OVV)** is caused by producing at a level other than that used in setting the standard overhead application rate. The OVV shows whether plant assets produced more or fewer units than expected. Because fixed overhead is not constant on a per unit basis, any deviation from planned production causes the overhead application rate to be incorrect. The OVV is the difference

between the budgeted amount of overhead for the actual volume achieved (BOH) and the applied overhead (Applied OH):

$$\text{Overhead volume variance} = \text{Budgeted overhead} - \text{Applied overhead}$$

In the Beta Company illustration, the 11,000 units produced in the period have a standard allowance of 22,000 machine-hours. We calculated budgeted overhead when computing the overhead budget variance. The flexible budget in Exhibit 51, at the top of the previous page, shows that the budgeted overhead for 22,000 machine-hours is USD 104,000. Overhead is applied to work in process on the basis of standard hours allowed for a particular amount of production; in this case, 22,000 hours at USD 5 per hour. The overhead volume variance then is:

$$\begin{aligned} \text{Overhead volume variance} &= \text{Budgeted overhead} - \text{Applied overhead} \\ &= \text{USD } 104,000 - \text{USD } 110,000 \\ &= \text{USD } -6,000 \text{ (favorable)} \end{aligned}$$

Note that the amount of the overhead volume variance is related solely to fixed overhead. As we show in Exhibit 51, fixed overhead at all levels of activity is USD 60,000. Since Beta Company used 20,000 machine-hours as its standard, the fixed overhead rate is USD 3 per machine-hour. Beta worked 2,000 more standard hours (22,000 - 20,000) than was expected. Beta also can calculate the overhead volume variance as follows:

(Number of hours used in setting predetermined overhead rates	- Number of standard hours allowed for production level achieved)	X Fixed overhead rate per hour	= Overhead volume variance
(20,000	- 22,000)	X USD 3	=USD -6,000 (favorable)

The variance is favorable because the company achieved a higher level of production than was expected.

Recording overhead variances These journal entries are related to overhead:

(d) Work in Process (+A)	110,000		
Manufacturing Overhead (+SE)		110,000	
To record the application of manufacturing overhead to work in process.			
(e) Manufacturing overhead (-SE)	108,000		
Various accounts (Varies)		108,000	
To record actual manufacturing overhead.			
(f) Manufacturing overhead (-SE)	2,000		
Overhead budget variance (-SE)	4,000		
Overhead volume variance (+SE)		6,000	
To record the variances related to overhead and close the manufacturing overhead account.			

The first entry applies manufacturing overhead to Work in Process at the rate of USD 5 per standard machine-hour. The second entry records the actual manufacturing overhead costs incurred during the period by Beta Company. The final entry reduces the Manufacturing Overhead account balance to zero and sets up the two variances calculated for overhead; these two variance accounts reveal the causes of the overapplied manufacturing overhead for the period.

Summary of overhead variances To easily determine the accuracy of the two overhead variances, Beta would compare the sum of the budget and volume variances with the difference between the costs of actual manufacturing overhead and applied manufacturing overhead (the amount of over- or underapplied overhead). For Beta Company, the difference between actual and applied manufacturing overhead was:

24. Control through standard costs

Actual manufacturing overhead incurred	\$ 108,000
Applied manufacturing overhead allowed (22,000 machine-hours x \$5 per hour)	<u>110,000</u>
Total overhead variance (favorable)	\$ -2,000

This difference is made up of the two overhead variances:

Overhead budget variance – unfavorable (\$108,000 - \$104,000)	\$ 4,000
Overhead volume variance -favorable [\$104,000 – (22,000 x \$5)]	-6,000
Total overhead variance (favorable)	\$ -2,000

For a summary of the six variances from standard discussed in this chapter, see Exhibit 52 below.

Materials price variance =	(Actual price – Standard price) x Actual quantity purchased
Materials usage variance =	(Actual quantity used – Standard quantity allowed) x Standard price
Labor rate variance =	(Actual rate – standard rate) x Actual hours worked
Labor efficiency variance =	(Actual hours worked – standard hours allowed) x Standard rate
Overhead budget variance =	Actual overhead – budgeted overhead
Overhead volume variance =	Budgeted overhead – applied overhead

Exhibit 52: Summary of variances from standard

An accounting perspective:

Uses of technology

Although standard costing often appears more difficult than actual costing to students, standard costing is generally easier in the real world. The key to this simplicity is the computer's capability to store, retrieve, and update standards. Once a firm sets standards for a product, it is relatively simple to update these standards for changes in labor rates, product prices, and efficiency improvements.

Goods completed and sold

To complete the standard cost system example, assume Beta Company completed and transferred 11,000 units to finished goods and sold on account 10,000 units at a price equal to 160 per cent of standard cost. Also, there were no beginning or ending work in process inventories, and no beginning finished goods inventory. Journal entry (g) transfers the standard cost of the units completed, 11,000 x USD 60 = USD 660,000, from Work in Process Inventory to Finished Goods Inventory. Entry (h) records the sales for the period, 160 per cent x USD 60 x 10,000 = USD 960,000. Entry (i) records the cost of goods sold, 10,000 x USD 60 = USD 600,000.

(g)	Finished goods inventory (+A)	660,000	
	Work in process inventory (-A)		660,000
	To record the transfer of completed units to finished goods inventory.		
(h)	Accounts receivable (+A)	960,000	
	Sales (+SE)		960,000
	To record sales for the period.		
(i)	Cost of goods sold (-SE)	600,000	
	Finished goods inventory (-A)		600,000
	To record cost of goods sold for		

the period.

Beta debits the Work in Process Inventory with the standard cost of materials, labor, and manufacturing overhead for units put into production. Therefore, the entry recording the transfer of the standard cost of the completed units, $11,000 \times \text{USD } 60 = \text{USD } 660,000$, reduces Work in Process Inventory to a zero balance.

Sales for the period amount to 10,000 units at USD 96 each (160 per cent of USD 60). It is fairly common practice to base selling prices at least partially on standard costs. Note that Beta debited Finished Goods Inventory with the standard cost of goods completed and credited it with the standard cost of goods sold. Thus, the ending Finished Goods Inventory consists of the units actually on hand (1,000) at their standard cost of USD 60 each, or USD 60,000.

Investigating variances from standard

Once all variances have been computed, management must decide which variances should be investigated further. Because numerous variances occur, managers cannot investigate all of them. Management needs some selection guidelines. Possible guidelines include the (1) amount of the variance; (2) size of the variance relative to the cost incurred; and (3) controllability of the cost associated with the variance—that is, whether it is considered controllable or noncontrollable. Managers also may use statistical analysis in deciding which variances to investigate. For instance, they could determine the average value of actual costs for a period so that only those variances deviating from the average by more than a certain percentage would be investigated. To decide which selection guidelines are most useful, management should seek the opinions of knowledgeable operating personnel.

Any analysis of variances is likely to disclose some variances that are controllable within the company and others that are not. For instance, quantities used are generally controllable internally. Prices paid for materials purchased may or may not be controllable. Management may discover that the purchasing agent is not getting competitive bids; therefore, the price paid for materials would have been more controllable had the agents sought competitive bids. On the other hand, a raw materials shortage may exist that drives the price upward, and the price paid may be beyond the buyer's control.

Another point to remember about the analysis of variances is that separate variances are not necessarily independent. For example, an unfavorable labor rate variance may result from using higher paid employees in a certain task. However, higher paid employees may be more productive, resulting in a favorable labor efficiency variance. These employees also may be more highly skilled and may waste fewer materials, resulting in a favorable materials usage variance. Therefore, significant variances, both favorable and unfavorable, should be investigated.

At the end of a month or quarter, management may develop performance reports that compare the actual results and costs with the budgeted results and costs. These reports enable management to determine how well they and their workers were able to perform within the budget. At the bottom of the performance report, the supervisor or manager responsible for the elements mentioned in the report gives reasons for any variances. Management then investigates any variance not supported by an acceptable reason.

Disposing of variances from standard

At the end of the year, variances from standard must be disposed of in the accounting records. The variances may be (1) viewed as losses due to inefficiency and closed to the Income Summary; (2) allocated as adjustments to the recorded cost of Work in Process Inventory, Finished Goods Inventory, and Cost of Goods Sold; or (3) closed to

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Cost of Goods Sold. Theoretically, the alternative chosen should depend on whether the standards set were reasonably attainable and whether the variances were controllable by company employees. For instance, a firm may consider an unfavorable materials usage or labor efficiency variance caused by carelessness or inefficiency a loss and close it to the Income Summary because the standard was attainable and the variance was controllable. The business may consider an unfavorable materials price variance caused by an unexpected price change an added cost and allocate it to the inventory accounts and Cost of Goods Sold because the standard was unattainable and the variance was uncontrollable. As a practical matter, companies usually close small variances to the Cost of Goods Sold account rather than allocate them to the inventory accounts and to cost of goods sold.

Entry (j) reflects this practical disposition of Beta Company's variances by closing them to Cost of Goods Sold:

(j) Materials price variance (+A)	6,000	
Overhead volume variance (+A)	6,000	
Cost of goods sold (-SE)	8,100	
Materials usage variance (-A)		3,000
Labor rate variance (-A)		11,100
Labor efficiency variance (-A)		2,000
Overhead budget variance (-A)		4,000
To close the variance accounts.		

Companies do not report variances separately in financial statements released to the public but simply include them in the reported cost of goods sold amount. Reports prepared for internal use may list the variances separately after the cost of goods sold is shown at standard cost.

A broader perspective: Quality management and the Baldrige award

Many of the methods successfully used in the Japanese quality movement originated in the United States. The use of statistical controls in assessing processes originated in the United States, but Japanese managers applied the concept and had much greater employee involvement in quality improvement than US companies. Although lagging in implementing quality management programs, many US companies have jumped on the quality management bandwagon.

The US Congress created the Malcolm Baldrige National Quality Award in honor of a former secretary of commerce. The award is given to businesses that excel in major aspects of quality, such as quality planning, human resource development, and customer focus. Companies that have won this award include well-known manufacturing companies such as Motorola, Westinghouse (Commercial Nuclear Fuel Division), IBM, Texas Instruments (Defense Systems and Electronics Group), and General Motors (Cadillac Division). The award has also been given to large service organizations—Ritz-Carlton Hotels, Federal Express, and AT&T (Network Systems Group)—and to small businesses such as Granite Rock Co. in Watsonville, California, USA, and Globe Metallurgical in Cleveland, Ohio, USA. The Baldrige Award promotes sharing of information about effective quality management programs and identifies companies with role-model quality management systems.

Source: Authors' research.

Nonfinancial performance measures

Although variances provide important measures of performance, nonfinancial performance measures are also important. Nonfinancial performance measures are particularly important for evaluating quality and customer service. Chapter 20 discussed various nonfinancial measures of performance.

Businesses measure quality by the number and type of customer complaints or by the number of product defects. If they reduce the number of product defects, firms are likely to reduce the number of customer complaints. The objective is to increase customer satisfaction with their products, increase repeat sales, reduce the costs of dealing with customer complaints, and reduce the costs of repairing products.

Managers can reduce materials waste by improving the quality of raw materials so there is less waste from defective materials. Managers also can increase employee training so workers make fewer mistakes and improve the production process. Materials waste may show up in the materials efficiency variance. Workers are generally motivated to find ways to reduce waste if companies keep track of materials waste every day. While reporting variances from standard costs is important to department heads and plant managers, workers are more likely to be motivated by immediate feedback in nonfinancial language.

Activity-based costing, standards, and variances

Activity-based costing is commonly used with standard costing. Hewlett-Packard, a pioneer in the development of activity-based costing, uses it to develop standard costs. In our example, we applied overhead using just one cost driver—machine-hours. Using activity-based costing, a company uses multiple activity-bases, or cost drivers, as discussed in Chapter 20.

By striving to meet standards, management assumes responsibility for reducing the production costs of its products. In Chapter 25, you will learn about responsibility accounting in a broader sense. Many successful companies rely on responsibility accounting to make their business operations profitable.

An accounting perspective:

Business insight

Managers of many companies criticize standard costing because they believe it keeps workers from continuous improvement. These managers argue that workers who achieve standards do not try to improve beyond those standards. We believe workers can beat the standards and strive for continuous improvement if they are properly motivated.

Understanding the learning objectives

- A standard cost is a carefully predetermined measure of what a cost should be under stated conditions.
- Engineering studies and time and motion studies are undertaken to determine the amounts of materials, labor, and other services required to produce a product.
- Budgets are formal written plans that represent management's planned actions in the future and the impacts of these actions on the business.

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- Comparison of actual amounts to the budgeted amounts allows management to evaluate their own performance and that of their workers.

- Advantages of using standard costs include improved cost control, more useful information for managerial planning and decision making, more reasonable inventory measurements, cost savings in record-keeping, and possible reductions in production costs incurred.

- Disadvantages of using standard costs include controversial materiality limits for variances, nonreporting of certain variances, and low morale for some workers.

- **Materials price variance:**

$(\text{Actual price} - \text{Standard price}) \times \text{Actual quantity purchased}$.

- **Materials usage variance:**

$(\text{Actual quantity used} - \text{Standard quantity allowed}) \times \text{Standard price}$.

- **Labor rate variance:**

$(\text{Actual rate} - \text{Standard rate}) \times \text{Actual hours worked}$.

- **Labor efficiency variance:**

$(\text{Actual hours worked} - \text{Standard hours allowed}) \times \text{Standard rate}$.

- **Overhead budget variance:**

Actual overhead - Budgeted overhead.

- **Overhead volume variance:**

Budgeted overhead - Applied overhead.

- The **materials price variance**, shows whether the price paid for materials purchased was higher or lower than the standard price. This journal entry records the purchase of materials:

Materials inventory (debit)
Materials price variance (debit or credit)
Accounts payable (credit)

The Materials Price Variance account is debited if the variance is unfavorable and credited if the variance is favorable.

- The **materials usage variance** shows whether the actual quantity of materials used was higher or lower than the standard quantity. The journal entry to record materials usage is:

Work in process inventory (debit)
Materials usage variance (debit or credit)
Materials inventory (credit)

The Materials Usage Variance account is debited if unfavorable and credited if favorable.

- The **labor rate variance** shows whether the actual direct labor-hour rate paid is higher or lower than the standard rate.

- The **labor efficiency variance** shows whether the actual direct labor-hours worked were greater or less than the standard hours. This journal entry charges the direct labor cost to Work in Process Inventory:

Work in process inventory (debit)
Labor rate variance (debit or credit)
Labor efficiency variance (debit or credit)
Payroll Summary (credit)

The Labor Rate Variance account is debited if the variance is unfavorable and credited if the variance is favorable. The Labor Efficiency Variance account is debited if the variance is unfavorable and credited if the variance is favorable.

- The **overhead budget variance** shows the difference between total actual overhead costs and total budgeted overhead costs.
- The **overhead volume variance** shows the difference between the budgeted amount of overhead for the actual volume achieved and the applied overhead. This journal entry records the overhead variance:

Manufacturing overhead (debit or credit)
Overhead budget variance (debit or credit)
Overhead volume variance (debit or credit)

The debit or credit to Manufacturing Overhead closes that account. The Overhead Budget Variance account is debited if the variance is unfavorable and credited if the variance is favorable. The Overhead Volume Variance account is credited if the variance is favorable and debited if the variance is unfavorable.

- Three possible selection guidelines are (1) amount of variance, (2) size of the variance relative to cost incurred, and (3) controllability of the cost associated with the variance.
- Significant variances, both favorable and unfavorable, should be investigated.
- Variances may be viewed as losses due to inefficiency and closed to the Income Summary account; allocated as adjustments to the recorded cost of Work in Process Inventory, Finished Goods Inventory, and Cost of Goods Sold; or closed to Cost of Goods Sold.
- Practically, variances are usually closed to Cost of Goods Sold.

Demonstration problem

Gleim Company manufactures children's toys that are identical. The standard cost of each toy is:

Direct materials:

Three blocks of wood at \$0.24 \$0.72
Direct labor (1 hour at \$6) 6.00

Overhead:

Fixed (\$21,600/60,000 units) 0.36
Variable 0.48
\$7.56

Gleim bases the standard overhead rate on a volume of 60,000 units per month. In May, it manufactured 50,000 units. Using the following detailed data relative to production, compute the six variances from standard for the month.

Materials purchased:

160,000 blocks of wood at \$ 0.26

Materials used:

152,000 blocks of wood
Direct labor: 49,000 hours at \$ 6.12
Fixed manufacturing overhead \$ 21,840
Variable manufacturing overhead \$ 24,420

Solution to demonstration problem

Materials price variance:

$(\$0.026 - \$0.24) \times 160,000$ \$ 3,200

24. Control through standard costs

	(unfavorable)
<u>Materials usage variance:</u>	
(152,000 – 150,000*) x \$0.24	480 (unfavorable)
Total materials variance	\$ 3,680 (unfavorable)
<u>Labor rate variance:</u>	
(\$6.12 - \$6.00) x 49,000	\$ 5,880 (unfavorable)
<u>Labor efficiency variance:</u>	
(49,000 – 50,000) x \$6.00	-6,000 (favorable)
Net labor variance	\$ -120 (favorable)
<u>Overhead budget variance:</u>	
Actual (\$21,840 + \$24,420)	\$46,260
Budgeted [\$21,600 x (50,000 x \$0.48)]	45,600
Overhead budget variance	\$660 (unfavorable)
<u>Overhead volume variance:</u>	
Budget – Applied [\$45,600 – (50,000 x \$ 3,600 \$0.84)]	(unfavorable)
Total overhead variance	\$ 4,260 (unfavorable)
Total variance for month	\$ 7,820 (unfavorable)

*50,000 units x 3 blocks per unit.

Key terms

Budgets Formal written plans that represent management's planned actions in the future and the impacts of these actions on the business.

Flexible budget A budget that shows the budgeted amount of manufacturing overhead for various levels of output; used in isolating overhead variances and setting standard overhead rates.

Ideal standards Standards that can be attained under the best circumstances—that is, with no machinery problems or worker problems. These unrealistic standards can only be met when the company has highly efficient, skilled workers who are working at their best effort throughout the entire period needed to complete the job.

Labor efficiency variance (LEV) A variance from standard caused by using more or less than the standard amount of direct labor-hours to produce a product or complete a process; computed as (Actual hours worked - Standard hours allowed) x Standard rate per hour.

Labor rate variance (LRV) A variance from standard caused by paying a higher or lower average rate of pay than the standard cost to produce a product or complete a process; computed as (Actual rate - Standard rate) x Actual hours worked.

Management by exception The process where management only investigates those variances that are unusually favorable or unfavorable or that have a material effect on the company.

Materials price variance (MPV) A variance from standard caused by paying a higher or lower price than the standard for materials purchased; computed as (Actual price - Standard price) x Actual quantity purchased.

Materials usage variance (MUV) A variance from standard caused by using more or less than the standard amount of materials to produce a product or complete a process; computed as (Actual quantity used - Standard quantity allowed) x Standard price.

Overhead budget variance (OBV) A variance from standard caused by incurring more or less than the standard manufacturing overhead for the actual production volume achieved, as shown by a flexible budget; computed as Actual overhead - Budgeted overhead at the actual production volume level.

Overhead volume variance (OVV) A variance from standard caused by producing at a level other than that used in setting the standard overhead application rates; computed as Budgeted overhead - Applied overhead.

Practical standards Standards that are strict but attainable. Allowances are made for machinery problems and rest periods for workers. These standards are generally used in planning.

Standard cost A carefully predetermined measure of what a cost should be under stated conditions.

Standard level of output A carefully predetermined measure of what the expected level of output should be for a specified period of time, usually one year.

Variance A deviation of actual costs from standard costs; may be favorable or unfavorable. That is, actual costs may be less than or more than standard costs. Variances may relate to materials, labor, or manufacturing overhead.

Self-test

True-false

Indicate whether each of the following statements is true or false.

Standard cost usually refers to the standard price per unit of inputs into the production process.

Standard costs are useful in evaluating management's and workers' performance.

Under a standard cost system, all units of a given product produced during a particular period are typically in inventory at the same unit cost.

This journal entry records the use of materials and establishes a Materials Usage Variance account: debit Accounts Payable and Materials Usage Variance; credit Materials Inventory.

Favorable variances are credits in variance accounts.

Multiple-choice

Select the best answer for each of the following questions.

Which of the following explain why accountants separate materials variances into a purchase price variance and a usage variance?

- Different individuals may be responsible for each variance.
- Materials might not be purchased and used in the same period.
- These two variances are likely to be more informative to top management than one overall materials variance.
- All of the above.

Determine the materials usage variance and materials price variance from the following data:

Materials purchased	30,000 units
Price per unit purchased	\$3.00
Standard price per unit	\$3.10
Materials used	25,000 units
Standard quantity allowed	22,000 units

a. USD 9,300 favorable (MUV)

USD 3,000 unfavorable (MPV).

b. USD 9,300 unfavorable (MUV)

USD 3,000 favorable (MPV).

c. USD 9,000 unfavorable (MUV)

USD 2,200 favorable (MPV).

d. USD 9,000 favorable (MUV)

USD 2,500 unfavorable (MPV).

24. Control through standard costs

To which account would an unfavorable materials usage or labor efficiency variance caused by carelessness or inefficiency be closed?

- a. Materials Inventory.
- b. Income Summary.
- c. Work in Process.
- d. Finished Goods Inventory.

Which of the following journal entries is correct for closing out the variance accounts?

a. Sales

Materials Usage Variance

Labor Rate Variance

Materials Price Variance

Overhead Volume Variance

Labor Efficiency Variance

Overhead Budget Variance

b. Materials Price Variance

Overhead Volume Variance

Accounts Payable

Materials Usage Variance

Labor Rate Variance

Labor Efficiency Variance

Overhead Budget Variance

c. Materials Price Variance

Overhead Volume Variance

Cost of Goods Sold

Materials Usage Variance

Labor Rate Variance

Labor Efficiency Variance

Overhead Budget Variance

d. Materials Price Variance

Overhead Budget Variance

Accounts Receivable

Materials Usage Variance

Overhead Volume Variance

Labor Efficiency Variance

Labor Rate Variance

Now turn to “Answers to self-test” at the end of the chapter to check your answers.

Questions

- Is a standard cost an estimated cost? What is the primary objective of employing standard costs in a cost system?
- What is a budget?
- What is the difference between ideal and practical standards? Which standard generally is used in planning?
- What is meant by the term management by exception?
- What are some advantages of using standard costs? What are some disadvantages?
- Describe how the materials price and usage variances would be computed from the following data:
- Standard—1 unit of material at USD 20 per unit. Purchased—1,200 units of material at USD 20.30; used—990 units. Production—1,000 units of finished goods.
- When might a given company have a substantial favorable materials price variance and a substantial unfavorable materials usage variance?
- What is the usual cause of a favorable or unfavorable labor rate variance? What other labor variance is isolated in a standard cost system? Of the two variances, which is more likely to be under the control of management? Explain.
- Identify the type of variance indicated by each of the following situations and indicate whether it is favorable or unfavorable:
 - The cutting department of a company during the week ending July 15 cut 12 size-S cogged wheels out of three sheets of 12-inch high-tempered steel. Usually three wheels of such size are cut out of each sheet.
 - A company purchased and installed an expensive new cutting machine to handle expanding orders. This purchase and the related depreciation had not been anticipated when the overhead was budgeted.
 - Edwards, the band saw operator, was on vacation last week. Lands took her place for the normal 40-hour week. Edwards' wage rate is USD 12 per hour, while Lands' is USD 10 per hour. Production was at capacity last week and the week before.

24. Control through standard costs

- Theoretically, how would an accountant dispose of variances from standard? How does an accountant typically dispose of variances?
- Why are variances typically isolated as soon as possible?
- Is it correct to consider favorable variances as always being desirable? Explain.
- How does the use of standard costs permit the application of the principle of management by exception?
- How do standards help in controlling production costs?
- **Real world question** Refer to the discussion of employees setting standards in "An accounting perspective: Business insight". What are the advantages and disadvantages of having employees set their own standards?
- **Real world question** Imagine you are making and selling pizzas for Domino's Pizza. How would you set standards for one pizza to be made and delivered?

Exercises

Exercise A During July, the cutting department completed 8,000 units of a product that had a standard materials cost of 2 square feet per unit at USD 2.40 per square foot. The actual materials purchased consisted of 16,400 square feet at USD 2.20 per square foot, for a total cost of USD 36,080. The actual material used this period was 16,160 square feet. Compute the materials price and usage variances. Indicate whether each is favorable or unfavorable.

Direct materials – 4 pounds at \$5 per pound	\$20
Direct labor – 3 hours at \$6 per hour	18
Manufacturing overhead – 150% of direct labor	<u>27</u>
	\$65

Exercise B Whitewater's purchasing agent took advantage of a special offer from one of its suppliers to purchase 44,000 pounds of material at USD 4.10 per pound. Assume 5,500 units were produced and 34,100 pounds of material were used. Compute the variances for materials. Comment on the purchasing agent's decision to take the special offer.

Exercise C Compute the labor variances in the following situation:

Actual direct labor payroll (51,600 hours at \$18)	\$928,800
Standard direct labor allowed per unit, 4.20 hours at \$19.20	80.64
Production for month (in units)	10,000

Exercise D Blackman Company manufactures a product that has a standard direct labor cost of four hours per unit at USD 24 per hour. In producing 6,000 units, the foreman used a different crew than usual, which resulted in a total labor cost of USD 26 per hour for 22,000 hours. Compute the labor variances and comment on the foreman's decision to use a different crew.

Exercise E The following data relates to the manufacturing activities of Strauss Company for the first quarter of the current year:

Standard activity (in units)	30,000
Actual production (units)	24,000

Budgeted fixed manufacturing overhead	\$36,000
Variable overhead rate (per unit)	\$ 4.00
Actual fixed manufacturing overhead	\$37,200
Actual variable manufacturing overhead	\$88,800

Compute the overhead budget variance and the overhead volume variance. (Assume overhead is applied based on units produced.)

Exercise F Assume that the actual production in the previous exercise was 26,000 units rather than 24,000. What was the overhead volume variance?

Exercise G The standard cost variance accounts of Sun City Company at the end of its fiscal year had the following balances:

Materials price variance (unfavorable)	\$18,000
Materials usage variance (unfavorable)	14,400
Labor rate variance (favorable)	10,800
Labor efficiency variance (unfavorable)	39,600
Overhead budget variance (favorable)	2,000
Overhead volume variance (unfavorable)	21,600

Prepare one journal entry to record the closing of the variance accounts to Cost of Goods Sold.

Problems

Problem A A product has a standard materials usage and cost of 4 pounds per unit at USD 7.00 per pound. During the month, 2,400 pounds of materials were purchased at USD 7.30 per pound. Production for the month totaled 550 units requiring 2,100 pounds of materials.

Compute the materials variances.

Problem B During December, a department completed 2,500 units of a product that has a standard materials usage and cost of 1.2 square feet per unit at USD 0.48 per square foot. The actual material used consisted of 3,050 square feet at an actual cost of USD 2,664.48. The actual purchase of this material amounted to 4,500 square feet at a total cost of USD 3,931.20.

Prepare journal entries (a) for the purchase of the materials and (b) for the issuance of materials to production.

Problem C Martin Company makes plastic garbage bags. One box of bags requires one hour of direct labor at an hourly rate of USD 6. The company produced 200,000 boxes of bags using 208,000 hours of direct labor at a total cost of USD 1,144,000.

Compute the labor variances.

Problem D The finishing department of Mozart Company produced 25,000 units during November. The standard number of direct labor-hours per unit is two hours. The standard rate per hour is USD 37.80. During the month, 51,250 direct labor-hours were worked at a cost of USD 1,742,500.

- Compute labor variances. Record the labor data in a journal entry.
- Record the journal entry to dispose of any variances (close to Cost of Goods Sold).

Problem E The standard amount of output for the Chicago plant of Worldworth Company is 50,000 units per month. Overhead is applied based on units produced. The flexible budget of the month for manufacturing overhead

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allows USD 180,000 for fixed overhead and USD 4.80 per unit of output for variable overhead. Actual overhead for the month consisted of USD 181,440 of fixed overhead; the actual variable overhead follows.

Compute the overhead budget variance and the overhead volume variance assuming the following actual production in units and actual variable overhead in dollars:

a. 37,500 and USD 182,400.

b. 55,000 and USD 270,480.

Problem F Based on a standard volume of output of 96,000 units per month, the standard cost of the product manufactured by Tahoe Company consists of:

Direct materials (0.25 pounds x \$8 per pound)	\$2.00
Direct labor (0.5 hours x \$7.60 per hour)	3.80
Variable manufacturing overhead	2.50
Fixed manufacturing overhead (\$144,000 in total)	1.50
Total	\$9.80

A total of 25,200 pounds of materials was purchased at USD 8.40 per pound. During May, 98,400 units were produced with the following costs:

Direct materials used (24,000 pounds at \$8.40)	\$201,600
Direct labor (50,000 hours at \$7.80)	390,000
Variable manufacturing overhead	249,000
Fixed manufacturing overhead	145,000

Compute the materials price and usage variances, the labor rate and efficiency variances, and the overhead budget and volume variances. (Overhead is applied based on units produced.)

Alternate problems

Alternate problem A The following data apply to Roseanne Company for August, when 2,500 units were produced:

Materials used: 16,000 pounds
standard materials per unit: 6 pounds at 5 per pound
Materials purchased: 24,000 pounds at \$4.80 per pound
Direct labor: 5,800 hours at a total cost of \$69,600

Standard labor per unit: 2 hours at \$11 per hour.

a. Compute the materials and labor variances.

b. Prepare journal entries to record the transactions involving these variances.

Alternate problem B During April, Shakespeare Company produced 15,000 units of a product called Creative. Creative has a standard materials cost of two pieces per unit at USD 8 per piece. The actual materials used consisted of 30,000 pieces at a cost of USD 230,000. Actual purchases of the materials amounted to 40,000 pieces at a cost of USD 300,000.

Compute the two materials variances.

Alternate problem C Some of the records of Gonzaga Company's repair and maintenance division were accidentally shredded. Salvaged records indicate that actual direct labor-hours for the period were 2,000 hours. The total labor variance was USD 6,000, favorable. The standard labor rate was USD 7 per direct labor-hour, and the labor rate variance was USD 2,000, unfavorable.

Compute the actual direct labor rate per hour and prepare the journal entry to record the labor rate and the labor efficiency variances.

Alternate problem D All Fixed Overhead Company computes its overhead rate based on a standard level of output of 20,000 units. Fixed manufacturing overhead for the current year is budgeted at USD 30,000. Actual fixed manufacturing overhead for the current year was USD 31,000. Overhead is applied based on units produced.

Compute the amount of overhead volume variance for the year under each of the following assumptions regarding actual output:

- a. 12,500 units.
- b. 22,500 units.

Beyond the numbers—Critical thinking

Business decision case A Turn to the Sun City Company exercise in this chapter. For each of the variances listed, give a possible reason for its existence.

Business decision case B Diane La Hoya, the president of the Rebokk Company, has a problem that does not involve substantial dollar amounts but does involve the important question of responsibility for variances from standard costs. She has just received the following report:

Standard materials at standard price for the actual production in May	\$9,000
Unfavorable materials price variance ($\$3.60 - \3.00) \times 3,450 pounds	2,070
Unfavorable materials usage variance ($3,450 - 3,000$ pounds) \times \$3	1,350
Total actual materials cost for the month of May (3,450 pounds at \$3.60 per pound)	<u>\$12,420</u>

La Hoya has discussed the unfavorable price variance with Jim Montel, the purchasing officer. Montel agrees that under the circumstances he should be held responsible for most of the materials price variance. But he objects to the inclusion of USD 270 (450 pounds of excess materials used at USD 0.60 per pound). This, he argues, is the responsibility of the production department. If the production department had not been so inefficient in the use of materials, he would not have had to purchase the extra 450 pounds.

On the other hand, Ken Kechum, the production manager, agrees that he is basically responsible for the excess quantity of materials used. But, he does not agree that the materials usage variance should be revised to include the USD 270 of unfavorable price variance on the excess materials used. "That is Jim's responsibility," he says.

La Hoya now turns to you for help. Specifically, she wants you to tell her:

- a. Who is responsible for the USD 270 in dispute?
- b. If responsibility cannot be clearly assigned, how should the accounting department categorize the variance (price or usage)? Why?
- c. Are there likely to be other circumstances where materials variances cannot be considered the responsibility of the manager most closely involved with them? Explain.

Prepare written answers to the three questions La Hoya asked.

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A broader perspective C Refer to "A broader perspective: Quality management and Baldrige award". The Baldrige Award has been criticized for fostering a winner-versus-loser mentality, instead of encouraging every organization to improve its quality. Further, the award has been criticized for grading on the curve by awarding companies that are the best in US industry but still do not compete well against foreign competition.

Write a response to each of these criticisms of the Baldrige Award.

Group project D Many workers hate standards. Some people claim standards reduce morale and productivity. Others believe standards are necessary to motivate people. Based on your own experience in school or on a job, what do you think?

In groups of three, choose an organization or business to use as an example. List all the possible standards you could set for this organization or business. Then decide whether your group favors setting standards. If the group does, decide who should set each of the standards on your list. If the group does not favor standards, discuss your reasons. Choose one member to report for your group to the class.

Group project E The chief executive officer (CEO) of Tax Preparation Services, Incorporated, remarked to a colleague, "Establishing standard costs and performing variance analysis is only useful for companies with inventories. As a service organization, how could we possibly benefit from implementing such a system?" In groups of two or three students, write a memorandum to your instructor stating whether you agree with this comment or not and explain why. The heading of the memorandum should contain the date, to whom it is written, from whom, and the subject matter.

Group project F The controller of Plastics Manufacturing, Incorporated, states: "Let us figure the materials price variances when the materials are used rather than at the time of purchase. This way we can prepare the price and usage variances at the same time and directly link the price variance to production." In groups of two or three students, write a memorandum to your instructor stating whether you agree with this suggestion or not and explain why. The heading of the memorandum should contain the date, to whom it is written, from whom, and the subject matter.

Using the Internet—A view of the real world

Using any Internet search engine enter "standard costs" (be sure to include the quotation marks). Select an article that directly discusses standard costs and print a copy of the article. You are encouraged (but not required) to find an article that answers some of the following questions: When is the use of standard costing appropriate? How do certain industries use standard costing? How are standard costs established? How do standard costs help management in production?

Write a memorandum to your instructor summarizing the key points of the article. The heading of the memorandum should contain the date, to whom it is written, from whom, and the subject matter. Be sure to include a copy of the article used for this assignment.

Using any Internet search engine select one of the new terms at the end of the chapter and perform a key word search. Be sure to include quotation marks (for example: "Management by exception"). Select an article that directly discusses the new term used and print a copy of the article. Write a memorandum to your instructor

summarizing the key points of the article. The heading of the memorandum should contain the date, to whom it is written, from whom, and the subject matter. Be sure to include a copy of the article used for this assignment.

Answers to self-test

True-false

False. Standard cost is the standard quantity of an input required per unit of output times the standard price per unit of that input.

True. Standard costs are useful in evaluating the performance of management and workers.

True. Under a standard cost system all units of a given product are carried in inventory at the same unit cost.

False. The general journal entry to record the use of materials and establish the materials usage variance debits Work in Process Inventory (not Accounts Payable) and Materials Usage Variance and credits Materials Inventory.

True. Favorable variances are shown as credits.

Multiple-choice

d. All of these answers are correct. Different people are often responsible for the two variances, materials are sometimes purchased and used in different accounting periods, and the two separate variances are likely to provide more information to top management than just one materials variance.

b.

$$\begin{aligned}\text{Materials usage variance} &= (\text{Actual quantity used} - \text{Standard quantity allowed}) \times \text{Standard price} \\ &= (25,000 - 22,000) \times \text{USD } 3.10 \\ &= 3,000 \times \text{USD } 3.10 \\ &= \text{USD } 9,300 \text{ (unfavorable)}\end{aligned}$$

$$\begin{aligned}\text{Materials price variance} &= (\text{Actual price} - \text{Standard price}) \times \text{Actual quantity purchased} \\ &= (\text{USD } 3.00 - \text{USD } 3.10) \times 30,000 \\ &= -\text{USD } 0.10 \times 30,000 \\ &= -\text{USD } 3,000 \text{ (favorable)}\end{aligned}$$

b. An unfavorable materials usage or labor efficiency variance caused by carelessness or inefficiency may be considered a loss and closed to Income Summary because the standard was attainable and the variance was controllable.

c. The other answers incorrectly close the variance accounts. The variance accounts are closed to Cost of Goods Sold.