CHAPTER 8

The Standard Cost Accounting System Part 2: Journal Entries, Cost Variances, and Reports

REVIEW QUESTIONS:

8.1 *One product firms:*

SCASs were first applied to process systems because most activities are routinized and well-known. In these environments, standard costs were developed, and then, given few changes in the production process, only updated from year-to-year to reflect changing economic conditions. The stable production environment supports the implementation of an SCAS.

Profit-oriented service firms:

With the advent of a renewed emphasis on cost management, many service firms that provide routine services also have begun using standards and variances. For the most part, this is a response to increasing competition in profit-oriented service firms. For example, CPA firms have to devote considerable attention to budgeting audit jobs. As late as the mid-1980's, many "Big Six" firms could still budget and bid audit jobs using "seat-of-the-pants" budgeting. Since then, auditor switching and mergers have forced more formal budgeting, bidding, and cost control activities on these firms. While many cost variances may not be as sophisticated and detailed as in a manufacturing firm, nor journalized in a full-blown SCAS, cost variances on key activities are routinely calculated and reported. Usually, these variances are reported in total dollars and quantities, e.g., reporting the total audit staff hours and cost per engagement.

Not-for-profit service firms:

Worsening economic conditions are also eroding the tax base and funds available from governmental entities for these firms. Many governmental agencies perform routine tasks for which standards can be developed. The standards and cost variances, especially if activity-based, can provide justification for funding requests and the level of services provided by specific agencies.

For example, one state governmental agency has developed activity-based standard costs to use in billing federal programs for monthly funding of grant program administration costs. This is in direct response to the need for more equitable and timely billing rates and funding to cover state administration costs as they are incurred.

Job order firms:
Many job order firms have been using standards and cost variances for quite some time. Construction companies are a good example. General contractors prepare detailed cost estimates for each phase, and activity within the phases, of a construction project. This was illustrated in the last major section of Chapter 5 (see, for example, Exhibits 5-21 and 5-22). Although jobs may not be recorded in the general ledger at standard cost, with cost variances formally journalized, setting standards and calculating cost variances have become very important as increased competition and worsening economic conditions globally are "squeezing-out" profit margins.

One-of-a-kind service firms:
A hospital can be characterized as a "mushroom process" (see Chapter 2 and Exhibit 2-5), in that many unique services are provided, but many diagnostic and laboratory activities are routinized. Declining sources of revenues, increased competition, and specialization, all have fueled the development of standard bills of activities (see Chapter 10) and standard costs. To better control the costs of support services, activity-based costing is becoming as common in hospitals as it is in manufacturing. Apparently, contrary to profit-oriented service firms, more formal SCASs are implemented by hospitals as a management tool for cost measurement and tracking.

8.2 In a "full-blown" SCAS, products and inventories are valued (journalized) at their standard cost allowed. Cost variances are calculated and journalized into the general ledger system through the use of subsidiary ledger accounts organized by responsibility center. In contrast, actual costs are used in the journal entries of actual and normal cost accounting systems (normal CASs apply overhead with standard prices). In all three CASs, standard costs and cost variances can be used as planning and evaluating techniques. In many enterprises, standards are set and cost variances calculated for management control purposes, although they are not used in the CAS journal entries. This is an example of hybrid accounting systems design first introduced in Chapter 1.

8.3 A favorable cost variance results when actual costs are less than standard costs. An unfavorable cost variance occurs when actual costs are greater than standard costs. Specifically, a favorable spending variance results when the actual price for a cost element is less than its standard price. Similarly, a favorable usage variance results when the actual quantity of a cost element used in production is less than its standard quantity allowed.

8.4 Management-by-exception involves the reporting of differences from standards (i.e., cost variances). This philosophy emphasizes the need to report problems (cost variances) to those responsible for their control. Management time is a critical resource that needs to be focused on problem solving. Cost variances represent the financial results of problems occurring within a responsibility center.

The Scientific Management philosophy has had a significant impact on the misuse of cost variance reporting in performance evaluation. This philosophy is based, in part, on division-of-labor and task fractionalization. When applied to SCAS reporting, a pervasive assumption has been that each department is responsible for the cost variances that occur within it. The division-of-labor principle has led many traditional managements and management accountants to assume that production departments operate independently. Little attention has been given to the interdepartmental cause-effect chains that create the most pervasive cost variances, such as the costs of product quality discussed in Chapter 12.

The historic emphasis on financial reporting in CAS design has confounded the misuse of cost variance reporting in performance evaluation. For example, abnormal spoilage and product failures within the field have been journalized to expense accounts outside the production accounts. What is not reported is often not controlled. What has been reported to production departments are their efficiency variances. An emphasis on direct labor and direct materials efficiency variances, and hitting production quotas, has led to a "pounds-in-the-bucket" mentality on the shop floor. Without an adequate regard for quality control, and a lack of reporting on the total costs of quality, poor quality subassemblies and products have been passed through the production departments and into large WIP inventories.

Let's Talk

Review Questions 8.4 through 8.6 can be easily related and assigned together. They also serve as a good unifying vehicle with the behavioral issues discussed in Chapter 7.

The "Let's Talk" box on the next page continues this idea and provides specific references to related Chapter 7 problems.

Let's Talk

The management-by-exception philosophy was discussed in detail with respect to standard setting in Chapter 7. We have found that it is very difficult to keep these two chapters independent. Obviously, these two chapters are intimately linked. Too often, students expect each chapter to represent an independent topic. While this may be true to a greater degree in financial accounting, and many nonaccounting courses, as we move into cost management, it is not.

Students need to have the interdependencies between topics reinforced through the text. To facilitate this, the text has been uniquely organized so that each chapter, and each section of the text, builds off of the previous materials. Without explicit attention to the linkages across chapters, students may fail to see the "big picture" of modern management accounting.

Personally, we believe that a fundamental cause of the failure to provide relevant information through CAS designs has been due to textbooks not optimally linking concepts, providing a logical flow of ideas from chapter-to-chapter. Both within the text and within the solutions manual, we have attempted to overcome this by numerous references to related materials presented in other chapters.

As an example, you may wish to have your students consider Think-Tank Problem 7.75. Think-Tank Problems 7.69, 7.70, and 7.71 are also relevant to this discussion. Review Questions 7.10 and 7.11 also discuss management-by-exception.

8.5 *The importance of standards in short-run performance evaluation:*
In the SCAS's role as a responsibility accounting system, standards are goals used to judge actual short-run performance. Cost variances are important inputs in the performance evaluation process. Thus, employees are motivated to avoid unfavorable variances (i.e., perform at the level of the standards), or to exceed the standards (resulting in favorable cost variances), if possible. Just how demanding should standards be? Should they be based on theoretical perfection or various factors that prevent perfect performance? For example, a small unfavorable variance implies very good performance if ideal standards are set, while the same variance implies average performance, at best, if practical standards are used. This variance from an ideal standard may not lead to further investigation, whereas it may lead to investigation and corrective action if based on practical standards.

Practical standards are tight but achievable. They do not tolerate abnormal waste and lost time, although they allow for normal machine downtime, employee rest periods, and the like. Employees are motivated by practical standards, especially if they've had input into their development, and will normally put forth their best efforts to achieve them. Moreover, these standards can serve several purposes. In addition to indicating abnormal variances in costs, they can also be used in estimating and planning. Ideal standards do not allow for normal inefficiencies and may result in unrealistic estimating and planning information. Generally, practical standards have been considered to be the most useful in determining how effectively and efficiently *present* operations are being carried out.

The importance of standards in long-range performance evaluation:
Standards can be set as goals toward which employees work for continuous improvement, a concept of world-class manufacturing (WCM). Cost variances from practical standards may not provide the kind of performance information managers need if these standards typically ignore continuous improvement and have avoidable inefficiencies built in. Thus, with practical standards, long-range (often graphical) trend analysis of the change in standards is needed.

Variances from ideal standards will almost always be unfavorable, but continuous improvement will result in them becoming smaller over time. The reduction in cost variances over time (i.e., movement toward the ideal standards) can provide this long-range, continuous improvement information.

The best standards for today's competitive environment seek to *improve future performance.* Practical standards can be used to measure short-run goal achievement. The difference between last year's standards and this year's is the short-run continuous improvement goal. The difference between the ideal standards and this year's standards is the long-range continuous improvement goal. Thus, both ideal and practical standards are important motivational devices: practical standards for motivating short-run improvement, and ideal standards for motivating long-range standards.

8.6 As discussed in the previous question, trend analysis is important in measuring continuous improvement. Cost variances report on short-run operating performance. If practical standards are used, cost variances measure the attainment of the short-run improvement goal. Trend analysis on the change in practical standards over time provides long-run continuous improvement information.

When using ideal standards, cost variances each period may not provide easily interpretable information for measuring short-run improvement, as they should be always unfavorable. The change in cost variances over time, though, provides useful information for long-range continuous improvement.

Both ideal and practical standards are important in WCM firms. How they work in harmony, synergistically motivating continuous improvement, is discussed in the last paragraph of the preceding question.

8.7 *Favorable variances and good performance:*
Favorable variances can represent good performance if the proper control activities are conducted by employees. Favorable variances can result from standards that are outdated or too loose, though. They represent dysfunctional behaviors when:

- *For direct materials purchases:* Lower quality materials are purchased at a below-standard price.
- *For direct materials usage:* Workers use less than needed resulting in the output specification not being satisfied.
- *Direct labor spending:* Lesser skilled workers are used and other, more significant, unfavorable cost variances result.
- *Direct labor efficiency:* Workers do not perform maintenance and control activities as allowed in the standard quantity.
- *VOH spending and usage:* Workers do not use the necessary supplies in performing maintenance and control activities.

Unfavorable variances and bad performance:
Unfavorable variances do not always represent sub-par performance. Outdated or ideal standards often produce unfavorable variances. When using ideal standards that do not contain an allowance for operational control activities, for example, unfavorable variances due to worker control actions is actually "good news."

Unfavorable variances also can be preplanned. Consider the situation of Almost Fresh Sandwich Company (the Think-Tank Problem 7.69 example). Its product is a ham and cheese sandwich distributed through vending machines. Purchasing is only able to obtain an inferior grade of lettuce. The SCAS database provides a history of the costs of processing inferior lettuce, as this is a recurring problem. The least-cost corrective actions are in the sandwich assembly department (rather than in the lettuce preparation department). Management preplans the labor and materials usage variances that are expected. While still incurring these unfavorable variances, they were less than planned. In this situation, an unfavorable variance is "good news."

8.8 Variance analysis and management control involve 8 steps:

• *Set the standards*	Prepare the standard cost card and manufacturing cost equation.
• *Collect data and measure performance*	Online collection through an ICBIS using bar code scanning and a visual factory control display.
• *Process data and calculate variances*	Real-time data processing within the production and management accounting LANs.
• *Report variances*	Timely availability to promote immediate control actions.
• *Determine the significance of each variance*	Develop rules for when to investigate variances.
• *Take appropriate corrective actions*	Correct the production problem that caused the variance.
• *Change performance*	Prevent the problem and bring performance in line with standard.
• *Revise standards*	If the standards are no longer relevant, they should be changed.

8.9 The key factor for operational control is the timely arrival of variance information and immediate action by managers and operating personnel. Production variances occur as tasks are being performed. Therefore, the quicker the variances are reported, the sooner corrective action can be taken, if warranted. For example, if an operation is using excessive amounts of direct materials and the usage variance is not reported until a month later, management can do little to correct it during the month. Operational control must occur at the place and time where the cost variance originates.

8.10 Operational control activities are performed as part of the normal production tasks assigned all workers. Thus, in WCM firms:

- Workers are properly trained in product quality controls, safety measures, and equipment maintenance.
- They are empowered and rewarded for performing these tasks.
- To acknowledge that these control tasks are important, and so that unfavorable cost variances do not result from them, the materials, time, and support needed are budgeted within standard quantities.

8.11 Feedforward information is critical for coordinated control activities across departments or production cells. Information concerning a potential problem is fed forward to subsequent operations where the problem can be fixed with the minimum cost variance and disturbance in production.

In JITs, jidoka plays a feedforward role. Jidoka signals the stop of production due to a problem. Workers in subsequent cells, if not participating in corrective measures, know that this time is available for maintenance or training.

8.12 The use of standard costs in valuing inventories increases information processing efficiency. The cost accountant, knowing the production volume of a process or job, can prepare journal entries transferring WIP between departments (in a PCAS) and transferring completed output from a process or job to FGI, and then to COGS. For example, if the standard absorptive manufacturing cost of a product is $10 and 100 products are completed, the SCAS journal entry to transfer these products to FGI costs them at $1,000.

8.13 There are two basic types of variances:

- *Spending variances* — The difference between the budgeted and actual price of a cost element.
- *Efficiency variances* — The difference between the quantity of a cost element that should have been used (given the actual output) and the quantity actually used.

8.14 The four formulas for cost variance analysis are listed in Exhibit 8-5. This is available as an acetate transparency. They are the:

- *Variable costs spending variances* = AQp x (SP - AP)
- *Variable costs usage variances* = SP x (SQA - AQu)
- *Fixed overhead budget variance* = Budgeted FOH - Actual FOH
- *Fixed overhead volume variance* = FOH standard cost x (Actual output - Budgeted output)

A variation of the FOH volume variance is based on inputs rather than outputs. Also, alternatives to the four-way overhead variance analysis method yield different overhead variances. Both of these are shown in Exhibit 8-5.

8.15 Direct materials price variances can be caused by a change (from standard) in:

- Vendor
- Lot size
- Price
- Product specifications
- Freight carrier

8.16 Direct labor rate variances can be caused by a change (from standard) due to:

- Peak seasonal pay rates
- Using temporary workers
- An unexpected change in the union contract
- An unexpected change in payroll taxes and/or fringe benefits
- A change in the mix of labor used in an operation
- Poor scheduling

8.17 The variable overhead spending variance is the budgeted VOH cost for the quantity of its allocation base (a flexible budget cost based on its cost driver quantity) minus the actual VOH cost incurred. The VOH spending variance formula can be expressed as (assuming a machine hours basis):

(Actual machine hours worked x VOH POR) - Actual VOH costs

This can be factored into the basic formula for a variable cost spending variance:

AQp x (SP - AP) =
Actual machine hours worked x (VOH POR - Average VOH cost per Mhr)

The VOH cost incurred results from the prices paid for VOH items and the quantity of those items used in production. This means that the average VOH cost per Mhr includes both spending and usage factors. Thus, the difference between it and the VOH POR represents both spending and usage problems. In other words, the VOH spending variance does not isolate spending problems from usage problems. For management control, it becomes necessary to provide further detailed analyses of the individual VOH items, as illustrated in Exhibit 8-3. This more complete analysis is more useful to the managers who are responsible for the different individual cost elements comprising VOH.

8.18 A flexible budget is an "after-the-fact" budget based on the actual output for the period. The concept of a flexible budget arises because of the behavior of variable production costs. Variable costs are not stable when expressed in total dollars because total variable costs depend on volume. The original budget (sometimes referred to as a static budget) is based on the production quota. If actual output differs from the production quota, the total variable cost that should have been incurred will also be different from the original budgeted amount.

To illustrate this assume:
- 100 products are budgeted to be made
- The standard labor rate is $10 per DLhr
- The standard labor quantity is 2 DLhr per product

Budgeted direct labor cost	=	SP x Budgeted DLhr
	=	$10 per DLhr x (2 DLhr x 100 products)
	=	$2,000

Also assume that:
- Actual output = 150 products
- Actual DL cost = $2,250 ($9 per DLhr x 250 DLhr actual worked)

If the original budget is compared to the actual cost, an unfavorable direct labor cost variance of $250 results. Simply because more products were made, and hours worked, this variable cost **should be** greater than the original budget. In this situation, however, both a favorable spending and usage variance exist for direct labor:

DL rate variance	=	AQu x (SP - AP)
	=	250 DLhr x ($10 per DLhr - $9 per DLhr)
	=	$250 favorable
DL usage variance	=	SP x (SQA - AQu)
	=	$10 per DLhr x [(2 DLhr per unit x 150 units) - 250 DLhr]
	=	$500 favorable

These variances can be reconciled to the (flexible budget) amount of direct labor cost that should have been incurred for the actual output as follows:

Standard cost allowed (the flexible budget amount)	=	Standard cost x Actual output
	=	(SP x SQ) x Actual output
	=	SP x (SQ x Actual output)
	=	SP x SQA
	=	$10 per DLhr x (2 DLhr per unit x 150 units)
	=	$3,000
Total direct labor cost variance	=	SCA - Actual direct labor cost
	=	$3,000 - $2,250
	=	$750 favorable

The $750 favorable variance is broken down into a $250 favorable rate variance and a $500 favorable usage variance. This reconciliation demonstrates that the flexible budget concept is operationalized through the cost variance formulas.

Please see the "Let's Talk" box on the next page.

8.19 Standard quantity allowed (SQA) is the total amount of an input item that should have been used for the actual production volume.

8.20 Generally, each production department manager is responsible for the direct materials usage variance in that department because he or she is in charge of how direct materials are used. Remembering that problems originating in one department are often transported to subsequent departments, knowing the underlying sources and causes of cost variances is a prerequisite for assigning responsibility. In instances where direct materials are faulty, the responsibility may lie with the purchasing or receiving department. Other causes include:

- Substituted inferior materials
- Incorrect machine settings or lack of proper tools
- Failure to keep machines and tools in good working condition
- Inexperienced or inefficient workers
- Fatigue caused by pressure to complete a rush order
- Changes in production or quality control methods
- Inadequate blueprints or errors in specifications
- Variations in yield from materials
- Failure to return excess materials to the storeroom

Let's Talk

Many texts illustrate a flexible budget by constructing a set of budgets for different production volumes within the relevant range. We have chosen not to do this for the following reasons:

- A flexible budget can be constructed for any set of volumes **before-the-fact**, but if the actual output does not exactly equal one of these volumes, then the flexible budget has to be prepared again **after-the-fact**. The before-the-fact effort becomes a nonvalue-added activity.
- Any information value from a flexible budget is available in the standard cost card and manufacturing cost equation.
- The flexible budget amounts are incorporated into the cost variance formulas. In other words, the cost variance formulas are the means to operationalize the flexible budget in performance evaluation. This is demonstrated in Chapter 20 on profit center performance evaluation, specifically in Exhibits 20-12 and 20-13.

8.21 The production department managers are usually responsible for the direct labor usage variance within their departments. At times, though, the underlying source and cause of a direct labor usage variance may be outside the department. For example, an unfavorable variance can result from:

- Faulty equipment or materials
- Machine breakdowns
- Lack of materials
- Engineering changes in the production process

As with all variances, identifying the underlying sources and causes is critical for proper responsibility assignment in performance evaluation. Additionally, in labor intensive processes, understanding the causes of labor usage variances is vital for productivity improvement.

8.22 A high-quality SCAS possesses at least three characteristics:

- For operational control, it is important that the SCAS captures input data about the sources and causes of cost variances.
- In assigning responsibility for cost variances, this source and cause data are critical. The SCAS needs to report cost variance sources and causes, and

whether corrective actions have been taken, for proper performance evaluation. Employees must perceive that the SCAS provides legitimate evaluation information so that they receive appropriate rewards. This linkage is necessary for proper employee motivation.

- Cost variances can be related; they are not necessarily financial measures of independent problems. One underlying production problem can create multiple cost variances in different departments. Summing cost variances by cause (the underlying problem) provides necessary information for prioritizing continuous improvement programs.

8.23 The variable overhead efficiency variance is a measure of the excess VOH used solely because the actual direct labor hours worked differed from the standard hours allowed (or other cost driver basis used to allocate VOH). The assumption is that if more direct labor hours are worked, then more VOH items are used (VOH is a variable cost).

The usage of VOH is not independently captured in this variance, as it is with direct variable costs. Usage is confounded with spending in the VOH spending variance. This is discussed in Review Question 8.17.

8.24 The fixed overhead budget variance is the difference between the budgeted fixed overhead costs and the actual fixed overhead costs incurred. It measures whether expenditures on FOH items were within budget. Thus, it is a spending variance.

The fixed overhead volume variance is a usage variance in that it measures how well the factory as a whole was used. Since the costs of the having the factory available for production are FOH costs, this is a FOH usage variance.

8.25 The usefulness and interpretation of the FOH volume variance depends on the volume used in calculating the FOH standard cost. Expected, normal, practical, or theoretical capacity could be used.

For example, WCM proponents might use theoretical capacity in determining the FOH standard cost. The difference between this maximum productive capacity and the actual output measures how much of the plant is idle. While this may be by design, a continuous improvement philosophy means that the volume variance should get smaller over the years. Here is yet another example of how a high-quality SCAS should report long-run trends in variances.

When expected capacity is used to set the FOH standard cost, an unfavorable volume variance is due to lower than budgeted production. This is often caused by a lack of sales orders. Lack of sales orders may be caused by one or a combination of the following:

- High prices for the product
- Low quality of the product
- Inadequate advertising and lack of aggressive sales campaigns
- Inability to deliver when customers want the product
- Economic recession

Other causes of unfavorable volume variances that *are* controllable by plant management include:

- Poor job scheduling
- Excessive employee absenteeism
- Shortage of direct materials and supplies due to poor planning
- Breakdown of machines due to poor preventive maintenance
- Inadequate supervision of workers

Review Question 7.50 and Problem 7.58 also discuss the different capacity measures and their effects on product costs.

8.26 Exhibit 8-5 relates two-way, three-way, and four-way overhead variance analysis. In two-way analysis, the two variances are the FOH volume variance and the "everything else" variance. Relating this to four-way analysis, the everything else variance, sometimes called the TOH budget variance, includes the: VOH spending variance, VOH efficiency variance, and the FOH budget variance.

In three-way analysis, the three overhead cost variances are the FOH volume variance, the VOH efficiency variance, and the "everything else" variance. This last variance is sometimes called the TOH spending variance. It includes the VOH spending variance and the FOH budget variance from the four-way analysis method.

8.27 B (see the discussion in the previous question)

8.28 There are two basic differences between SCAS and normal JOCAS or PCAS journal entries:

- In an SCAS, the cost amounts used are not the same as in a PCAS or JOCAS. Instead of recording the actual direct materials and labor costs, and applied overhead (multiplying a POR by the actual cost driver basis volume), all inputs' costs are recorded at their standard cost allowed (SCA).

- Since all input costs are journalized at their SCA, each cost variance (the difference between SCA and actual cost) is journalized into its own subsidiary account.

8.29 The cost variances are journalized into separate WIP subsidiary ledger accounts. These accounts are organized by responsibility center to promote operational control, performance evaluation, and future budgeting.

8.30 The two SCAS journal entry differences in a JOCAS and PCAS are in the general ledger account titles:

- The WIP subsidiary accounts for product costs are organized by jobs in a JOCAS, and by departments in a PCAS.
- The departmental cost variance accounts have posting references for cost variances caused by specific jobs in a standard JOCAS.

Why are posting references needed for the cost variance subsidiary accounts in a JOCAS? Consider the dilemma faced by a department manager. Seven different jobs are worked on during a month. There were a number of different sources and causes for the direct labor usage variances. In attempting to understand which jobs created which labor usage variances, the manager needs to know cost variance information by job. A high quality SCAS captures this information. This is the role of the job posting references. Either through accessing a screen display, or through a hard copy report, the departmental direct labor efficiency variance account can provide this information efficiently. An example of the departmental report for direct materials usage variances by job is presented in Exhibit 8-9.

8.31 B. This treatment is consistent with the disposition of over- or underapplied overhead as presented in Chapter 4. Over- and underapplied overhead is the sum of the four overhead cost variances (i.e., the difference between the TOH applied and the actual TOH costs incurred).

8.32 Cost variances need to be reported on a per unit basis, in total dollars, and as a percentage of standard because:

- Shop floor personnel often think on a per unit basis. Presenting variances in this way increases the usability of the SCAS output. This is a characteristic of a high-quality management accounting system.
- Upper management wants information on total costs and profits, and the effect of these variances on total profits. The basic cost variance formulas yield the effect on planned profits from the problems within the activities they represent.
- Both users need information on the significance of the cost variances. The "Variance percentage" column in the SCAS report illustrated in Exhibit 8-12 provides that information.

8.33
- The direct materials mix variance is the result of mixing direct materials in a ratio different from the standard direct materials formula.
- The direct materials yield variance is the result of obtaining an output different from the one expected based on the total quantities of direct materials input.
- Together, these variances make up the direct materials usage variance. This is demonstrated in Exhibit 8-13.

8.34
- The direct labor mix variance shows the economic results associated with changing the combination of higher and lower paid workers in production.
- The direct labor yield variance presents the economic results of using more or fewer total direct labor hours than the standard allowed.
- These variances sum to the direct labor efficiency variance, as demonstrated in Exhibit 8-14.

8.35 All the cost systems previously developed, from the basic CAS in Chapter 4 through the standard PCAS and JOCAS in this chapter, track input costs throughout the production process. A backflush CAS (BCAS) does not. There is no WIP account within this system's general ledger. WIP is replaced with a raw-in-process (RIP) general ledger account. RIP, however, includes only the raw materials purchased. Direct labor and overhead costs are journalized into a "conversion costs" account. Costs are not taken out of these accounts until the product is completed (the COGM journal entry 8 in a JOCAS, or journal entry 9 in a PCAS). In this way, costs are "flushed out of the general ledger" when production is completed.

Exhibit 8-15 illustrates the four basic differences between an SCAS and a BCAS:

- Raw materials are debited to RIP instead of RMI.
- Direct labor and overhead are debited to Conversion Costs instead of Gross Wages and WIP-Overhead.
- Input usage journal entries as production takes place are not made. The use of materials, labor, and overhead are recorded "after-the-fact" in the COGM journal entry.
- Cost variances are not journalized in the BCAS.

BCASs simplify cost accounting by eliminating many nonvalue-added activities, such as:

- Maintaining RMI accounts
- Preparing and accounting for materials requisitions
- Filling out labor time tickets and direct labor reporting
- Recording work orders and maintaining WIP accounts, including the journal entries to record input usage, transfers between departments (or cells), and cost variances.

While BCASs can reduce paperwork, and SCAS cost, there can be a number of disadvantages with these systems:

- They may only work well in production processes with extremely low levels of inventories. When significant RMI and WIP exist, GAAP (for financial reporting) requires that these inventories be valued and their ending balances reported as current assets.
- By not tracking the use of manufacturing input costs and the movement of WIP through the manufacturing process, certain audit trails are lost.
- The reconciliation process can be further complicated if there are not separate subsidiary ledger accounts in RIP and Conversion Costs for the different products.
- There is still a need for information about production problems and potentially the cost variances they create.
- Since only the good output is debited to FGI and credited to RIP and Conversion Costs, there has to be separate accounting for spoilage and the cost variances it creates.

In summary, BCASs may provide a simpler, less costly, CAS. The benefits in terms of the cost savings from these systems must be considered in light of the information needs of the enterprise, however.

8.36 A production activity-based SCAS formally tracks and journalizes cost variances by their underlying sources and causes. Production activities and their costs form the basis for organizing the standard cost card, as well as for reporting activity-based cost variances. This system can be considered as being on the other end of the CAS design continuum from a BCAS.

A production activity-based SCAS provides many advantages over a more traditionally designed SCAS:

- The standard cost card is organized in terms of the production activities required to make a product or provide a service. The costs of each activity (e.g., machine tasks in the Newmount Engine Company example used in the text) are now known.
- The costs of direct technology (the costs of operating the machines) are treated as direct costs of each activity.
- This information can be used to measure the costs of scrap and rework, as well as providing benchmarks for productivity improvement over time (i.e., these are nonvalue-added activities).
- As a problem occurs, workers code it by activity for input into the SCAS. Having workers code the sources and causes (and whether the problem has been corrected) facilitates problem identification and correction. Through reporting this information to the real sources of the problem, the SCAS promotes the communication and coordination needed for global production control.
- The activity-based standard costs are the basis for computing cost variances, and reconciling the actual costs incurred within a department, process, or cell. Information about the total costs of production problems, gained from these input coding activities, aids in prioritizing continuous improvement projects.

8.37 Cost variances reported in terms of the cost elements involved (i.e., direct materials versus direct labor versus VOH), and for aggregated periods of time, do not provide managers and workers with the information they need to control operations, evaluate performance, revise standards in future budgeting, or to identify areas for continuous improvement. For example, the direct labor usage variance for a department during the month is the result of many underlying causes. Some of these causes may be the responsibility of the department workers, but others may be caused by problems occurring in previous departments and transported through WIP into this department.

In addition to one cost variance having multiple sources and causes, one production problem can create multiple cost variances. For example, rework results in unfavorable direct materials, direct labor, and VOH usage variances. To understand the real cost of this problem, cost variances need to be summed across cost elements for each underlying cause.

CHAPTER-SPECIFIC PROBLEMS:

8.38 *Direct materials purchases (journal entry 1):*

RMI (SP x AQp = $4.00/sq. ft. x 130 sq. ft. purchased)	$ 520	
RMI - DM Price Variance (AQp x [SP - AP] = 130 sq. ft. x [$4.00/sq. ft. - $5.00/sq. ft.])	$ 130	
Accounts Payable (AP x AQp = $5.00/sq. ft. x 130 sq. ft.)		$ 650

Direct materials usage (journal entry 5):

WIP - Project #738A (DM) (SP x SQA = $4.00/sq. ft. x 900 sq. ft.)	$3,600	
WIP - DM Usage Variance (Project #738A) (SP x [SQA - AQu] = $4.00/sq. ft. x [900 sq. ft. - 1,000 sq. ft.])	$ 400	
RMI (SP x AQu = $4.00/sq. ft. x 1,000 sq. ft.)		$4,000

8.39 *Direct labor distribution (journal entry 6):*

WIP - Project #738A (DL) (SP x SQA = $12.00/ DLhr x 45 DLhr)	$540	
WIP - Direct Labor Rate Variance (Project #738A) (AQ x [SP - AP] = 50 DLhr x [$12.00/DLhr - $10.00/DLhr])		$100
WIP - Direct Labor Usage Variance (Project #738A) (SP x [SQA - AQ] = $12.00/DLhr x [45 DLhr - 50 DLhr])	$ 60	
Gross Wages (Actual cost = AP x AQ = $10.00/DLhr x 50 DLhr)		$500

8.40 DM price variance = Actual quantity purchased x (Standard price - Actual price)
= AQp(SP - AP)

$240F = 1,600 x ($3.60 - AP)

AP = $3.60 - ($240 ÷ 1,600)

= $3.45

Proof:

DM price variance = AQp(SP - AP)

= 1,600 x ($3.60 - $3.45)

= $240 favorable

8.41 *Direct labor rate variance:*

DL rate variance = Actual hours worked x (Standard rate - Actual rate)

$5,800F = 29,000 DLhr x (SP - AP)

b. *Solve for direct labor actual rate first:*

Actual rate x Actual hours = Actual cost

AP x 29,000 DLhr = $110,200

Actual rate = $3.80 per DLhr

a. *Solve for standard rate:*

DL rate variance = Actual hours worked x (Standard rate - Actual rate)

$5,800F = 29,000 DLhr x (SP - $3.80/DLhr)

Standard DL rate = ($5,800 ÷ 29,000 DLhr) + $3.80

= $4.00 per DLhr

Proof:

DL rate variance = AQp(SP - AP)

= 29,000 DLhr x ($4.00/DLhr - $3.80/DLhr)

= $5,800 favorable

8.42 a. DM price variance = Actual pounds purchased x (Standard price - Actual price)
= AQp(SP - AP)
= 160,000 lb. x [$1.80/lb. - ($304,000 ÷ 160,000 lb.)]
= 160,000 lb. x ($1.80/lb. - $1.90/lb.)
= <$16,000> unfavorable

b. DM usage variance = Standard DM price x (Standard pounds allowed - Actual pounds used)
= SP(SQA - AQu)
= $1.80/lb. x [(8 lb./bow x 19,000 bows) - 142,500 lb.]
= $17,100 favorable

c. DL rate variance = Actual hours worked x (Standard rate - Actual rate)
= AQp(SP - AP)
= 5,000 DLhr x {$8.00/DLhr - [($42,000 x .9) ÷ 5,000 DLhr]}
= 5,000 DLhr x ($8.00/DLhr - $7.56/DLhr)
= $2,200 favorable

d. DL usage variance = Standard DL rate x (Standard DLhr allowed - Actual DLhr used)
= SP(SQA - AQu)
= $8.00/DLhr x [(.25 DLhr/bow x 19,000 bows) - 5,000 DLhr]
= <$2,000> unfavorable

8.43 b. *Solve for direct labor rate variances first:*

Labor class III = Actual hours worked x (Standard rate - Actual rate)
= AQp(SP - AP)

= 550 DLhr x ($8.00/DLhr - $8.50/DLhr)

= <$275> unfavorable

Labor class II = 650 DLhr x ($7.00/DLhr - $7.50/DLhr)

= <$325> unfavorable

Labor class I = 375 DLhr x ($5.00/DLhr - $5.40/DLhr)

= <$150> unfavorable

DL rate variance = <$750> unfavorable

c. *Solve for direct labor usage variances:*

Labor Type	*SP*	*x*	*(SQA*	*-*	*AQu)*	=	*Usage CV*	
III	$8/DLhr	x	(500 DLhr	-	550 DLhr)	=	<$400>	U
II	$7/DLhr	x	(500 DLhr	-	650 DLhr)	=	<$1,050>	U
I	$5/DLhr	x	(500 DLhr	-	375 DLhr)	=	$625	F
TOTALS:			1,500 DLhr		1,575 DLhr		<$825>	U

a. *Solve for total direct labor variance:*

Total direct labor variance = DL rate variance + DL usage variance

= <$750> unfavorable + <$825> unfavorable

= <$1,575> unfavorable

e. *Solve for direct labor mix variance:*
Direct labor mix variance = AQ x (SP - WAP)

Where: SP = Weighted-average standard price

$$= \frac{\$8/\text{DLhr} + \$7/\text{DLhr} + \$5/\text{DLhr}}{3}$$

= $6.6667 per average DLhr

WAP = Weighted-average standard price for the hours worked

$$= \frac{(\$8 \times 550\ \text{DLhr}) + (\$7 \times 650\ \text{DLhr}) + (\$5 \times 375\ \text{DLhr})}{550\ \text{DLhr} + 650\ \text{DLhr} + 375\ \text{DLhr}}$$

= $6.8730 per average DLhr

Direct labor mix variance = AQ x (SP - WAP)

= 1,575 DLhr x ($6.6667/DLhr - $6.8730/DLhr)

= <$325> unfavorable

d. *Solve for direct labor yield variance:*
Direct labor yield variance = SP x (SQA - AQu)

= $6.6667/DLhr x (1,500 DLhr - 1,575 DLhr)

= <$500> unfavorable

8.44 a. Applied TOH = TOH POR x Standard DLhr allowed

= ($1/DLhr + $4/DLhr) x 39,000 DLhr

= $195,000

b. VOH usage variance = VOH POR x (Standard DLhr allowed - Actual DLhr used)
= SP(SQA - AQu)

= $4.00/DLhr x (39,000 DLhr - 39,500 DLhr)

= <$2,000> unfavorable

c. FOH volume variance = FOH POR x (Standard DLhr allowed - Budgeted DLhr)

= $1/DLhr x (39,000 DLhr - 40,000 DLhr)

= <$1,000> unfavorable

8.45 *First calculate actual VOH costs and VOH spending variance:*

Actual VOH costs = Actual TOH costs - Actual FOH costs

= $15,000 - $7,200

= $7,800

VOH spending variance = Actual quantity of the allocation basis x (VOH POR - Average VOH cost per unit of the basis)
= AQp(SP - AP)
= (AQp x VOH POR) - Actual VOH costs

= (3,500 DLhr x $2.50/DLhr) - $7,800

= $950 favorable

(**Note:** The VOH spending variance is calculated using the unfactored formula to avoid a rounding error. See footnote 2 in the chapter.)

Calculate FOH budget variance:

FOH budget variance = Budgeted FOH cost - Actual FOH cost

= $7,000 - $7,200

= <$200> unfavorable

TOH spending variance = VOH spending variance + FOH budget variance

= $950 favorable + <$200> unfavorable

= $750 favorable

8.46 FOH volume variance = FOH POR x (Standard DLhr allowed - Budgeted DLhr)
= (FOH POR x Standard DLhr allowed) - Budgeted FOH

= ($3.00/DLhr x 24,000 DLhrs) - $75,000

= <$3,000> unfavorable

(**Note:** The FOH volume variance is calculated using the unfactored formula because of the information presented. The budgeted direct labor hours can be determined by dividing the budgeted FOH cost by the FOH POR: $75,000 ÷ $3.00 per DLhr = 25,000 DLhr.)

The FOH volume variance is calculated as one of the variances in each of the TOH variance analysis methods (i.e., two-way, three-way, and four-way).

8.47 Two-way overhead variance analysis includes the TOH budget variance and the FOH volume variance. Three steps are involved in this method:

Calculate the TOH variance:

TOH variance = TOH applied - Actual TOH cost

= ($6.50/DLhr x 21,000 DLhr) - $147,000

= <u><$10,500> unfavorable</u>

Calculate the FOH volume variance:

FOH volume variance = FOH POR x (Standard DLhr allowed - Budgeted DLhr)

= $4.50/DLhr x (21,000 DLhr - 24,000 DLhr)

= <u><$13,500> unfavorable</u>

Note: The FOH POR is the difference between the TOH POR and the VOH POR:

FOH POR = $6.50/DLhr - ($48,000 ÷ 24,000 DLhr = $2.00/DLhr)

= <u>$4.50/DLhr</u>

Calculate the TOH budget variance (the everything else variance):

TOH budget variance = TOH variance - FOH volume variance

= <$10,500> - <$13,500>

= <u>$3,000 favorable</u>

8.48

Let's Talk

Students will have to read this problem carefully, and you may wish to mention this as a hint before assigning the problem. The VOH and FOH standard costs are given, not the standard prices. If students do not read this carefully, they will use the standard costs instead of the standard prices in the cost variance formulas.

The standard cost card lines for VOH and FOH are:

	Std. price	Std. quantity	Standard cost
VOH:	$3.00/DLhr	2 DLhr per unit	$6.00 per unit
FOH:	$4.00/DLhr	2 DLhr per unit	$8.00 per unit

(The standard direct labor hours = 100,000 DLhr ÷ 50,000 units.)

a. VOH spending variance
= Actual quantity of the allocation basis x (VOH POR - Average VOH cost per unit of the basis)
= AQp(SP - AP)
= 80,000 DLhr x [$3.00/DLhr - ($250,000 ÷ 80,000 DLhr)]
= <$10,000> unfavorable

b. VOH usage variance
= VOH POR x (Standard DLhr allowed - Actual DLhr used)
= SP(SQA - AQu)
= $3.00/DLhr x [(2 DLhr/unit x 38,000 units) - 80,000 DLhr]
= <$12,000> unfavorable

c. FOH budget variance
= Budgeted FOH cost - Actual FOH cost
= ($8.00 per unit x 50,000 units) - $384,000
= $16,000 favorable

d. FOH volume variance = FOH standard cost x (Actual output - Production quota)

= $8.00/unit x (38,000 units - 50,000 units)

= <$96,000> unfavorable

e. *VOH Allocation (journal entry 7a):*

WIP - Department A (VOH Applied) (SP x SQA = $3.00/DLhr x 76,000 DLhr)	$228,000	
WIP - Department A VOH Spending Variance	$ 10,000	
WIP - Department A VOH Efficiency Variance	$ 12,000	
WIP - VOH (Actual cost)		$250,000

FOH Allocation (journal entry 7b):

WIP - Department A (FOH Applied) (SP x SQA = $4.00/DLhr x 76,000 DLhr)	$304,000	
WIP - Department A FOH Budget Variance		$ 16,000
WIP - Department A FOH Volume Variance	$ 96,000	
WIP - FOH (Actual cost)		$384,000

8.49 *The standard cost card lines for VOH and FOH are:*

	Budgeted costs	÷	Production quota	=	Standard cost
VOH:	$135,000 x 80%	=	$108,000	9,000 units	$12.00 per unit
FOH:	$135,000 x 20%	=	$ 27,000	9,000 units	$ 3.00 per unit

	Std. price	Std. quantity	Standard cost
VOH:	$6.00/DLhr	2 DLhr per unit	$12.00 per unit
FOH:	$1.50/DLhr	2 DLhr per unit	$ 3.00 per unit

a. VOH spending variance
= Actual quantity of the allocation basis x (VOH POR - Average VOH cost per unit of the basis)
= AQp(SP - AP)
= (AQp x VOH POR) - Actual VOH costs

= (17,200 DLhr x $6.00/DLhr) - $108,500

= <$5,300> unfavorable

(**Note:** The VOH spending variance is calculated using the unfactored formula to avoid a rounding error. See footnote 2 in the chapter.)

b. VOH usage variance = VOH POR x (Standard DLhr allowed - Actual DLhr used)
= SP(SQA - AQu)

= $6.00/DLhr x [(2 DLhr/unit x 8,500 units) - 17,200 DLhr]

= <$1,200> unfavorable

c. FOH budget variance
= Budgeted FOH cost - Actual FOH cost

= $27,000 - $28,000

= <$1,000> unfavorable

d. FOH volume variance
= FOH standard cost x (Actual output - Production quota)

= $3.00/unit x (8,500 units - 9,000 units)

= <$1,500> unfavorable

e. *VOH Allocation (journal entry 7a):*

WIP - Department B (VOH Applied) (SP x SQA = $6.00/DLhr x 17,000 DLhr)	$102,000	
WIP - Department B VOH Spending Variance	$ 5,300	
WIP - Department B VOH Efficiency Variance	$ 1,200	
WIP - VOH (Actual cost)		$108,500

FOH Allocation (journal entry 7b):

WIP - Department B (FOH Applied) (SP x SQA = $1.50/DLhr x 17,000 DLhr)	$ 25,500	
WIP - Department B FOH Budget Variance	$ 1,000	
WIP - Department B FOH Volume Variance	$ 1,500	
WIP - FOH (Actual cost)		$ 28,000

8.50 *The standard cost card lines for VOH and FOH are:*

Budgeted costs	÷ Production quota	= Standard cost
TOH: $900,000	÷ 200,000 units	= $4.50 per unit
Less FOH:		$3.00 per unit
VOH:		$1.50 per unit

	Std. price	Std. quantity	Standard cost
VOH:	$0.75/DLhr	2 DLhr per unit	$1.50 per unit
FOH:	$1.50/DLhr	2 DLhr per unit	$3.00 per unit

a. SQA = 2 DLhr per unit x 198,000 units = 396,000 DLhr

b. VOH usage variance = VOH POR x (Standard DLhr allowed - Actual DLhr used)
= SP(SQA - AQu)

= $0.75/DLhr x [(2 DLhr/unit x 198,000 units)
- 440,000 DLhr]

= <$33,000> unfavorable

c. VOH spending variance = Actual quantity of the allocation basis x
(VOH POR - Average VOH cost per unit of the basis)
= AQp(SP - AP)

= 440,000 DLhr x [$0.75/DLhr - ($352,000 ÷ 440,000 DLhr)]

= <$22,000> unfavorable

d. FOH budget variance = Budgeted FOH cost - Actual FOH cost

= ($3.00 per unit x 200,000 units) - $575,000

= $25,000 favorable

e. Applied FOH = FOH standard cost x Actual output

= $3.00 per unit x 198,000 units

= $594,000

f. FOH volume variance = FOH standard cost x (Actual output - Production quota)

= $3.00/unit x (198,000 units - 200,000 units)

= <$6,000> unfavorable

g. *VOH Allocation (journal entry 7a):*

WIP - Department C (VOH Applied) (SP x SQA = $0.75/DLhr x 396,000 DLhr)	$297,000	
WIP - Department C VOH Spending Variance	$ 22,000	
WIP - Department C VOH Efficiency Variance	$ 33,000	
WIP - VOH (Actual cost)		$352,000

FOH Allocation (journal entry 7b):

WIP - Department C (FOH Applied) (SP x SQA = $1.50/DLhr x 396,000 DLhr)	$594,000	
WIP - Department C FOH Budget Variance		$ 25,000
WIP - Department C FOH Volume Variance	$ 6,000	
WIP - FOH (Actual cost)		$575,000

8.51 a. Echol price variance = Actual liters purchased x (Standard price - Actual price)
= AQp(SP - AP)
= (AQp x SP) - Actual cost

= (25,000 liters x $0.20/liter) - $5,365

= <u><$365> unfavorable</u>

(**Note:** The DM price variance is calculated using the unfactored formula to avoid a rounding error. See footnote 2 in the chapter.)

b. Protex price variance = (AQp x SP) - Actual cost

= (13,000 liters x $0.425/liter) - $6,240

= <u><$715> unfavorable</u>

c. Benz price variance = (AQp x SP) - Actual cost

= (40,000 liters x $0.15/liter) - $5,840

= <u>$160 favorable</u>

d. CT-40 price variance = (AQp x SP) - Actual cost

= (7,500 liters x $0.30/liter) - $2,220

= $30 favorable

e - j. Direct materials usage, mix, and yield variances:

SQA calculations:

Echol:	200 liters	x	140 batches	=	28,000 liters
Protex:	100 liters	x	140 batches	=	14,000 liters
Benz:	250 liters	x	140 batches	=	35,000 liters
CT-40:	50 liters	x	140 batches	=	7,000 liters

Material	*Std. Price*	*x*	*(SQA*	*-*	*AQu)*	*=*	*Usage CV*
e. Echol	$0.200/liter	x	(28,000 liters	-	26,600 liters)	=	$280 F
f. Protex	$0.425/liter	x	(14,000 liters	-	12,880 liters)	=	$476 F
g. Benz	$0.150/liter	x	(35,000 liters	-	37,800 liters)	=	<$420> U
h. CT-40	$0.300/liter	x	(7,000 liters	-	7,140 liters)	=	<$ 42> U
TOTALS:			84,000 liters		84,420 liters		$294 F

i. Direct materials mix variance = AQ x (SP - WAP)

SP = Weighted-average standard price

$$= \frac{(\$0.20 \times 28{,}000) + (\$0.425 \times 14{,}000) + (\$0.15 \times 35{,}000) + (\$0.30 \times 7{,}000)}{84{,}000 \text{ liters}}$$

= $0.225 per average liter

WAP = Weighted-average standard price for the liters actually used

$$= \frac{(\$0.20 \times 26{,}600) + (\$0.425 \times 12{,}880) + (\$0.15 \times 37{,}800) + (\$0.30 \times 7{,}140)}{84{,}420 \text{ liters}}$$

= $0.220398 per average ~~DLhr~~

Direct materials mix variance = AQ x (SP - WAP)

= 84,420 liters x ($0.225/liter - $0.220398/liter)

= $388.50 favorable

j. Direct materials yield variance = SP x (SQA - AQu)

= $0.225/liter x (84,000 liters - 84,420 liters)

= <$94.50> unfavorable

8.52 a(2). *Solve for direct labor rate variances first:*

RNs = Actual hours worked x (Standard rate - Actual rate)
= AQp(SP - AP)

= 8,150 DLhr x ($12.00/DLhr - $12.30/DLhr)

= <$2,445> unfavorable

LPNs = 4,300 DLhr x ($8.00/DLhr - $8.20/DLhr)

= <$860> unfavorable

Aides = 4,400 DLhr x ($6.00/DLhr - $5.75/DLhr)

= $1,100 favorable

DL rate variance = <$2,205> unfavorable

a(1). *Solve for direct labor usage variances:*

Labor Type	*SP*	x	(*SQA* - *AQu*)	=	*Usage CV*
RN	$12/DLhr	x	(7,920 DLhr - 8,150 DLhr)	=	<$2,760> U
LPN	$ 8/DLhr	x	(4,620 DLhr - 4,300 DLhr)	=	$2,560 F
Aide	$ 6/DLhr	x	(4,510 DLhr - 4,400 DLhr)	=	$660 F
TOTALS:			17,050 DLhr 16,850 DLhr		$460 F

Solve for total direct labor variance:

Total direct labor variance = DL rate variance + DL usage variance

= <$2,205> unfavorable + $460 favorable

= <$1,745> unfavorable

b(1). *Solve for direct labor mix variance:*

Direct labor mix variance = AQ x (SP - WAP)

Where: SP = Weighted-average standard price

$$= \frac{(\$12/\text{DLhr} \times 7{,}920) + (\$8/\text{DLhr} \times 4{,}620) + (\$6/\text{DLhr} \times 4{,}510)}{17{,}050 \text{ DLhr}}$$

= $9.33 per average DLhr

WAP = Weighted-average standard price for the hours worked

$$= \frac{(\$12 \times 8{,}150 \text{ DLhr}) + (\$8 \times 4{,}300 \text{ DLhr}) + (\$6 \times 4{,}400 \text{ DLhr})}{16{,}850 \text{ DLhr}}$$

= $9.41 per average DLhr

Direct labor mix variance = AQ x (SP - WAP)

= 16,850 DLhr x ($9.33/DLhr - $9.41/DLhr)

= <$1,348> unfavorable

c(1). *Solve for direct labor yield variance:*

Direct labor yield variance = SP x (SQA - AQu)

= $9.33/DLhr x (17,050 DLhr - 16,850 DLhr)

= $1,866 favorable

(**Note:** The direct labor mix and yield variances should sum to the total direct labor usage variance. <$1,348> + $1,866 = $518, not $460. The use of a rounded SP and WAP introduced a $58 rounding error in the mix and yield calculations. The mix variance is actually <$1,405.81> U, and the yield variance is $1,865.81 F.)

b(2) and c(2). Discussion of mix and yield variance:

The total direct labor usage variance is insignificantly favorable ($460 ÷ $159,060 standard cost allowed = 0.3%). The mix variance indicates that the average standard price for the actual hours worked was $0.08 per hour greater than budgeted. This occurred because of the unfavorable RN usage variance. RNs are paid significantly more than LPNs and aides.

The yield variance shows that the higher average wage rate from using more RN hours (mix variance) was overcome by the favorable usage variances for LPNs and aides. In other words, the total hours saved through using less LPNs and aides produced a slightly greater cost savings than the extra cost associated with working more RN hours.

8.53

Let's Talk

This problem requires students to calculate equivalent units of production (EUP). While most texts do not complicate SCAS coverage by introducing this topic, it appeared on the CMA exam. Thus, we briefly introduced the effect of EUP on the SQA calculations within the text, and included this problem in the end-of-chapter materials.

You may wish to use this problem as an integrating vehicle with Chapter 6 on PCASs. This will provide a more realistic perspective for your students. It goes beyond the chapter coverage, though, by requiring students to perform standard process cost allocations to completed production (part e) and ending WIP (part f).

To facilitate this integration, we have modified the PCAS spreadsheet program for an SCAS. Your students can then use their templates or self-created programs in solving this problem.

You may also wish to advise your students of these complications prior to assigning this problem. As an alternative, we have found that handing out the solution and using this problem for discussion (versus making the students perform the calculations) serves as a good concluding problem to SCAS coverage in process systems.

a. DL usage variance = Standard DL rate x
(Standard DLhr allowed - Actual DLhr used)
= SP(SQA - AQu)

= $8.20/DLhr x [(6 DLhr/unit x 6,200 EUP) - 36,500 DLhr]

= $5,740 favorable

b. DL rate variance = Actual hours worked x (Standard rate - Actual rate)
= AQp(SP - AP)

= 36,500 DLhr x [$8.20/DLhr - ($300,760 ÷ 36,500 DLhr)]

= <$1,460> unfavorable

c. DM usage variance = Standard DM price x
(Standard kg. allowed - Actual kg. used)
= SP(SQA - AQu)

<$1,500> = $5.00/kg. x [(8 kg./unit x 6,400 units) - AQu]

AQu = 51,500 kg.

d. DM price variance = Total DM variance - DM usage variance

= <$750> - <$1,500>

= $750 favorable

DM price variance = Actual kg. purchased x (Standard price - Actual price)
= AQp(SP - AP)

$750 = 50,000 kg. x ($5.00/kg - AP)

AP = $4.985 per kg.

e. $499,520 shown in the standard process cost report on the next page.

f. $61,520 shown in the standard process cost report on the next page.

PROBLEM 8.53

DASH COMPANY
WORK-IN-PROCESS COST REPORT
November, 19XX

EQUIVALENT UNITS	Units	DM Added	DL Added	Totals	
UNITS COMPLETED	5,600	5,600	5,600		
LESS: BEG WIP	0				
ADD: ENDING WIP	800	800	600		
ADD: OUTPUT LOSS	0	0	0		
UNITS STARTED	6,400				
EQUIVALENT UNITS		6,400	6,200		
STANDARD COST/EUP		$40.00	$49.20	$89.20	
COST ALLOCATIONS:					
UNITS COMPLETED:	5,600	$224,000	$275,520	$499,520	
BEG WIP COSTS					
COSTS TO COMPLETE					
STARTED THIS MONTH					
COSTS TRANSFERRED-OUT		$224,000	$275,520	$499,520	(e)
ENDING WIP INVENTORY	800	32,000	29,520	61,520	(f)
OUTPUT LOSS	0	0	0	0	
STANDARD COST ALLOWED		$256,000	$305,040	$561,040	

8.54 a. The most appropriate time to record the DM price variance is with journal entry 1 recording DM purchases. In an SCAS, direct materials are debited to RMI at their standard prices. To properly reflect the actual current liability, accounts payable is credited at actual cost owed the supplier. The difference between the cost debited to RMI at standard and the actual cost credited to accounts payable is the DM price variance. Thus, recording the price variance within journal entry 1 balances the entry. More importantly, though, the price variance is created by the purchase activity. Thus, recording it within this event is appropriate.

b. Total actual DL cost = (2,000 DLhr x $7.00/DLhr) + (1,400 DLhr x $7.20/DLhr)

= $24,080

DL rate variance = Actual hours worked x (Standard rate - Actual rate)
= AQp(SP - AP)
= (AQp x SP) - Actual cost

= (3,400 DLhr x $7.00/DLhr) - $24,080

= <$280> unfavorable

c. DM usage variance = Standard DM price x
(Standard sheets allowed - Actual sheets used)
= SP(SQA - AQu)

Iron usage = $2.00/sheet x [(5 sheets/unit x 800 units) - 3,900 sheets]

= $200 favorable

Copper usage = SP(SQA - AQu)

= $3.00/spool x [(3 spools/unit x 800 units) - 2,600 spools]

= <$600> unfavorable

Total DM usage variance = $200 + <$600>

= <$400> unfavorable

d. VOH spending variance

= Actual quantity of the allocation basis x (VOH POR - Average VOH cost per unit of the basis)
= AQp(SP - AP)
= (AQp x VOH POR) - Actual VOH cost

= (3,400 DLhr x $3.00/DLhr) - $10,000

= $200 favorable

(**Note:** The VOH spending variance is calculated using the unfactored formula to avoid a rounding error. See footnote 2 in the chapter.)

e. Two direct labor quantities are used in the VOH efficiency variance formula:

- Standard DLhr allowed = 4 DLhr/transformer x 800 transformers
  = 3,200 DLhr
- Actual DLhr worked = 3,400 DLhr

f. FOH budget variance

= Budgeted FOH cost - Actual FOH cost

= ($2/DLhr x 4,000 DLhr) - $8,800

= <$800> unfavorable

g. FOH volume variance

= FOH POR x (Standard DLhr allowed - Budgeted DLhr)

= $2.00/DLhr x (3,200 DLhrs - 4,000 DLhrs)

= <$1,600> unfavorable

8.55 a. Given the ratio of VOH to FOH (2:1), and the TOH standard cost of $30/unit:
- The VOH standard cost = $20/unit
- The FOH standard cost = $10/unit

VOH POR x Direct labor SQ = VOH standard cost

VOH POR x 4 DLhr/unit = $20/unit

VOH POR = $5.00 per DLhr

b. FOH standard cost = $\frac{\text{Budgeted FOH cost}}{\text{Production quota}}$

$10/unit = $\frac{\text{Budgeted FOH cost}}{600 \text{ units}}$

Budgeted FOH cost = $6,000 per month

c. DM price variance = Actual yards purchased x (Standard price - Actual price)
= AQp(SP - AP)

= 18,000 yards x ($1.35/yard - $1.38/yard)

= <$540> unfavorable

d. DM usage variance = Standard DM price x
(Standard yards allowed - Actual yards used)
= SP(SQA - AQu)

= $1.35/yard x [(20 yards/unit x 500 units) - 9,500 yards]

= $675 favorable

e. DL rate variance = Actual hours worked x (Standard rate - Actual rate)
= AQp(SP - AP)

= 2,100 DLhr x ($9.00/DLhr - $9.15/DLhr)

= <$315> unfavorable

f. DL usage variance = Standard DL rate x
(Standard DLhr allowed - Actual DLhr used)
= SP(SQA - AQu)

= $9.00/DLhr x [(4 DLhr/unit x 500 units) - 2,100 DLhr]

= <$900> unfavorable

g. Budgeted TOH cost = TOH standard cost x Production quota

= $30 per unit x 600 units

= $18,000 per month

h. Applied TOH cost = TOH standard cost x Actual output

= $30 per unit x 500 units

= $15,000

i. FOH volume variance = FOH standard cost x (Actual output - Production quota)

= $10/unit x (500 units - 600 units)

= <$1,000> unfavorable

8.56 a. Actual DM cost/unit = Actual DM cost ÷ Actual output

= ($270,000 + $83,000) ÷ 6,200 units

= $56.94 per unit (rounded)

b. Any of the three methods for quantitatively determining cost behavior patterns that were presented in Chapter 7 can be used (scattergraph, high-low, regression). Simply dividing the budgeted direct materials cost by budgeted machine hours at all three volumes, however, yields the same DM cost per Mhr. Using the original profit plan volume:

$$\text{Budgeted DM cost per Mhr} = \frac{\text{Budgeted DM costs}}{\text{Budgeted Mhr}}$$

$$= \frac{\$252,000 + \$78,000}{30,000 \text{ Mhr}}$$

= $11.00 per Mhr

c. As is true for direct materials, direct labor is a variable cost. Dividing the budgeted direct labor cost into budgeted production volume at each level yields the same DL cost per unit. Using the profit plan volume:

$$\text{Direct labor standard cost} = \frac{\text{Budgeted DL costs}}{\text{Budgeted output}}$$

$$= \frac{\$273,000 + \$234,000}{6,000 \text{ units}}$$

= $84.50 per unit

d. Visually inspecting the overhead items, maintenance, supplies, supervision, and inspector costs vary in total with volume. These are either variable or mixed costs. Summing the four cost elements and dividing by machine hour volume at each level shows that the cost per Mhr is not stable ($12.57, $12.49, and $12.41 respectively). Thus, these overhead items are a mixed cost. The most accurate quantitative technique is linear (least-squares) regression. The output from the regression analysis yields the following equation for these four costs:

Maintenance + Supplies + Supervision + Inspection = $74,000 per year + $10.10 per Mhr

The slope of this equation is the VOH POR.

VOH POR = $10.10 per Mhr

e. The budgeted FOH cost equals the intercept of the above equation plus insurance and depreciation.

Budgeted FOH = $74,000 + $50,000 + $200,000

= $324,000 per year

The FOH standard cost = Budgeted FOH ÷ Production quota

= $324,000 ÷ 6,000 units

= $54.00 per unit

FOH volume variance = FOH standard cost x (Actual output - Production quota)

= $54/unit x (6,200 units - 6,000 units)

= $10,800 favorable

f. Cain Company uses the three-way method for analyzing overhead variances. The TOH spending variance equals the VOH spending variance + FOH budget variance.

VOH spending variance = Actual quantity of the allocation basis x (VOH POR - Average VOH cost per unit of the basis)
= AQp(SP - AP)
= (AQp x VOH POR) - Actual VOH cost

FOH budget variance = Budgeted FOH cost - Actual FOH cost

Combining these formulas:

TOH spending variance = [(AQp x VOH POR) + Budgeted FOH] - Actual TOH

= (32,000 Mhr x $10.10/Mhr) + $324,000 - $633,000

= $14,200 favorable

g. VOH usage variance = VOH POR x (Standard Mhr allowed - Actual Mhr used)
= SP(SQA - AQu)

= $10.10/Mhr x [(5 Mhr/unit x 6,200 units) - 32,000 Mhr]

= <$10,100> unfavorable

h. VOH applied = VOH POR x Standard Mhrs Allowed

= $10.10/Mhr x (5 Mhr/unit x 6,200 units)

= $313,100

FOH applied = FOH standard cost x Actual output

= $54/unit x 6,200 units

= $334,800

TOH applied = VOH applied + FOH applied

= $313,100 + $334,800

= $647,900

i. TOH variance = TOH applied - Actual TOH cost

= $647,900 - $633,000

= $14,900 favorable

j.

DM standard cost	= $11/Mhr x 5 Mhr/unit	=	$ 55.00/unit
DL standard cost		=	$ 84.50/unit
VOH standard cost	= $10.10/Mhr x 5 Mhr/unit	=	$ 50.50/unit
Total standard variable costs			$190.00/unit

Annual production costs = $324,000 + $190.00 per unit

For 6,050 units per year = $1,473,500

THINK-TANK PROBLEMS:

8.57 a. RMI should be debited with the standard price of DM item 1 multiplied by the actual quantity purchased:

SP x AQp = $0.75 per foot x 100,000 feet purchased

= $75,000

b. WIP should be debited for the standard cost allowed (SCA) for direct labor:

SCA = SP x SQA

= $3.50/DLhr x (4 DLhr/unit x 8,000 units)

= $112,000

c. DM usage variance = Standard DM price x (Standard feet allowed - Actual feet used)

= SP(SQA - AQu)

= $1.00/ft. x [(3 ft./unit x 8,000 units) - 26,000 ft.]

= <$2,000> unfavorable

Unfavorable cost variances are debited to the cost variance subsidiary ledger account because they represent cost overruns. A cost overrun means more cash is spent (credit cash), therefore it is a debit to the cost variance account.

d. The units of product A that **used** item 2 are in ending FGI inventory (2,000 units) and COGS (6,000 units). There is no ending WIP inventory. Thus, the DM item 2 usage variance should be prorated between ending FGI and COGS. None of the usage variance should be prorated to the ending RMI account.

e. 100,000 feet of DM item 1 were purchased and 78,000 feet were requisitioned into WIP. The ending balance in the RMI-DM item 1 account is 22,000 feet.

DM item 1 price variance per foot = SP - AP

= $0.75 - $0.78

= <$0.03> per foot

DM item 1 price variance allocated to ending RMI = $0.03 per foot x 22,000 feet

= $660

Unfavorable variances are debits. Consequently, $660 is debited to the ending RMI balance.

8.58

Let's Talk

Students have experienced difficulty with this problem in four areas:

- Students need to perform a flexible budget reconciliation, as presented in part a. Some will not see this and become upset when they cannot obtain the cost variances shown in the SkinKlear report. You may wish to warn them of this before assigning the problem.
- The standard cost card does not breakdown compounding labor between manual and mechanized operations. Students will have to read the problem carefully to obtain the needed information.
- No information was given in the problem concerning the direct material quantities purchased. Therefore, we assumed that the quantity purchased equalled the quantity used.
- Some students may complain that the standard prices were mislabeled as "standard costs." This is a CMA exam problem, so we did not correct this. Students have to expect this at times, and should know that these amounts are standard prices.

Even though this problem refers to the contribution margin variance and presents information allowing the calculation of sales variances, students are not asked to do these analyses. Reading the problem carefully, only the variable cost variances are required. You may wish, however, to assign this problem again after covering Chapter 20, which presents sales variance analysis. This can then serve as an integrating vehicle for cost and sales variance analysis (i.e., profit variance analysis).

a. Cost variance analysis for direct materials, direct labor, and VOH:

DM price variance = Actual ounces purchased x (Standard price - Actual price)
= AQp(SP - AP)
= (AQp x SP) - Actual cost

Cream base = (84,000 oz. x $0.05/oz.) - $4,200

= $0

Moisturizer = (60,000 oz. x $0.10/oz.) - $7,200

= <$1,200> unfavorable

Fragrance = (4,800 oz. x $1.00/oz.) - $4,800

= $0

DL rate variance = Actual hours worked x (Standard rate - Actual rate)
= AQp(SP - AP)
= (AQp x SP) - Actual cost

Mixing = (4,500 DLhr x $4.00/DLhr) - $18,000

= $0

Compounding-
Manual labor = (5,300 DLhr x $5.00/DLhr) - $26,500

= $0

Compounding-
Mechanized labor = (2,700 DLhr x $5.00/DLhr) - $13,500

= $0

Compounding-
Idle time = (900 DLhr x $5.00/DLhr) - $4,500

= $0

VOH spending variance = Actual quantity of the allocation base x (VOH POR - Average VOH cost per unit of the base)
= AQp(SP - AP)
= (AQp x VOH POR) - Actual VOH cost

= (13,400 DLhr x $2.10/DLhr) - $30,900

= <u><$2,760> unfavorable</u>

DM usage variance = Standard DM price x (Standard ounces allowed - Actual ounces used)
= SP(SQA - AQu)

Cream base = $0.05/oz. x [(9 oz./lb. x 9,000 lb.) - 84,000 oz.]

= <u><$150> unfavorable</u>

Moisturizer = $0.10/oz. x [(6.5 oz./lb. x 9,000 lb.) - 60,000 oz.]

= <u><$150> unfavorable</u>

Fragrance = $1.00/oz. x [(0.5 oz./lb. x 9,000 lb.) - 4,800 oz.]

= <u><$300> unfavorable</u>

(**Note:** 60% of the compounding time represents manual operations and 40% represents mechanized operations. Thus, the DL SQ for manual operations should be 0.6 DLhr/lb., and for mechanized operations 0.4 DLhr/lb.)

DL usage variance = Standard DL rate x (Standard DLhr allowed - Actual DLhr used)
= SP(SQA - AQu)

Mixing = $4.00/DLhr x [(0.5 DLhr/lb. x 9,000 lb.) - 4,500 DLhr]

= <u>$0</u>

Compounding-Manual labor = $5.00/DLhr x [(0.6 DLhr/lb. x 9,000 lb.) - 5,300 DLhr]

= <u>$500 favorable</u>

Compounding-Mechanized labor = $5.00/DLhr x [(0.4 DLhr/lb. x 9,000 lb.) - 2,700 DLhr]

= <u>$4,500 favorable</u>

Compounding-Idle time = $5.00/DLhr x [(0 DLhr/lb. x 9,000 lb.) - 900 DLhr]

= <$4,500> unfavorable

VOH usage variance = VOH POR x (Standard DLhr allowed - Actual DLhr used)
= SP(SQA - AQu)

= $2.10/DLhr x [(1.5 DLhr x 9,000 lb.) - 13,400 DLhr]

= $210 favorable

a(1). DM total price variance	=	<$1,200>
a(2). DM total usage variance	=	<600>
a(3). DL total usage variance	=	500
a(4). VOH efficiency variance	=	210
a(5). VOH spending variance	=	<2,760>
VARIABLE COSTS VARIANCES		<$3,850>

Flexible budget for variable costs when 9,000 pounds of SkinKlear are produced:

$11.75 per pound x 9,000 pounds	=	$105,750
Actual variable costs	=	<109,600>
VARIABLE COSTS VARIANCES		<$3,850>

b. Expected variable cost savings from mechanization:
- Mechanized labor operations yielded a $4,500 favorable labor usage variance, even though the workers were inexperienced. As learning takes place, this variance should increase over time. The direct labor SQ should be revised to reflect the new efficiency now present, and revised periodically as learning further increases efficiency.
- The VOH efficiency variance was based on the total 13,400 DLhr which included 900 hours of idle time. Depending on the VOH items involved, it may not be appropriate to expect that idle workers use VOH items. If not, the VOH efficiency variance should have been based on only 12,500 DLhrs. At $2.10/DLhr, these 900 hours represent $1,890. If idle workers do not use VOH items, the VOH efficiency variance should be $2,100 favorable:

VOH efficiency variance = $2.10/DLhr x
[(1.5 DLhr/lb. x 9,000 lb.) - 12,500 DLhr]

= $2,100 favorable

- The VOH spending variance also should be adjusted if idle time does not use VOH items:

  VOH spending variance = (12,500 DLhr x $2.10/DLhr) - $30,900

  = <u><$4,650> unfavorable</u>

  The total VOH variance then becomes:

  Total VOH variance = <u>$<2,550> unfavorable</u>

- It is not clear, however, how much of the VOH variance pertains to the mixing, manual compounding, and mechanized compounding processes. Each process is allocated an equal amount of VOH based on direct labor usage. Thus, any potential increased VOH costs from mechanization cannot be determined based on the current SCAS. A high quality SCAS will allocate VOH based on an analysis of the activities that cause its costs (see Chapter 10 on activity-based costing), and establish multiple PORs for the different subsets (cost pools) of VOH caused by these activities (see Chapter 9 on multiple overhead accounts and allocations). Some of the activities may be labor-based, such as the manual compounding process. Some may be direct materials-based, such as the mixing operation. Some may be machine-based, such as the new mechanization process in compounding (see Chapter 7 on the different bases for VOH allocations).

- Brian Jackson has performed an analysis of the VOH, though, concluding that the entire variance is attributable to the mechanization process. In is not clear whether the unfavorable variance is temporary (due to the newness of the process), or whether it represents a permanent change in VOH cost. Assuming Brain Jackson's analysis is accurate (see the above points) and represents a permanent change, the expected cost savings from mechanization is:

Direct labor savings	$4,500
Less increased VOH	<2,550>
Total	$1,950

- This cost savings is for a month in which 9,000 pounds of SkinKlear is produced. Since this represents a variable cost savings, it should be adjusted to the normal volume of 8,000 pounds per month, i.e., to $1,733 for a normal month's operations. This savings should increase as learning improves productivity.

8.59 Motivations engendered by the current SCAS:

- Too much emphasis is placed on unfavorable cost variances in performance evaluation, especially in relation to other evaluation criteria that measure positive outcomes and long-run continuous improvement achievements. Management-by-exception, when implemented through only reporting unfavorable cost variances, can lead to counter-productive behaviors focusing on short-run, within department cost minimization efforts at the expense of long-run continuous improvement and global productivity. This does not appear to be a serious problem **yet**, as evidenced by Travers and Christensen's willingness to incur unfavorable variances during the supplier strike in order to keep production going.
- Travers and Christensen spend too much time analyzing untimely reports, checking for accuracy and controllability (the real sources and causes of cost variances reported to them). This keeps them from planning and operational control activities. As current problems happen, they may not be available to correct them.
- The reports do not appear to present information in a usable format, further increasing the time needed to analyze them.
- The reports do not identify underlying sources and causes of the cost variances. Nor is information shared across departments. This does not promote an attitude of team membership necessary for global production control and problem solving.
- The attitude of the accountant also does not foster an attitude of teamwork.
- The lack of top management recognition of good performance, coupled with the above problems, further frustrates these managers.

b(1). SCAS benefits:

> ***Let's Talk***
>
> Please review the "Let's Talk" boxes in Review Question 8.4. Think-Tank problems 7.74 through 7.76 are especially relevant to this question.

- *Budgeting:*
  - Variances are the difference between standard costs and actual costs. Setting standards requires group decision making, communication, and coordination, between management and workers, and between workers in different departments. This can build a feeling of team membership and assure that organizational goals are captured within the standards.
  - Participation of the workers and line managers in setting standards assures that the people possessing the knowledge about specific operations influence the standards and variances that result. This should increase the accuracy and legitimacy of the standards and cost variances.
  - The setting of activity-based standards and the reporting of activity-based cost variances can provide information for future budgeting.

- *Operational control:*
  - Standards allow employees to understand more clearly what is expected of them. In this way, standards serve an educational role nurturing cost consciousness.
  - Reporting cost variances to the shop floor in real-time allows workers to see the results (both good and bad) of their production and control activities.
  - Reasons for cost variances can be captured and reported if workers are required to input the sources and causes of cost variances as they happen. A history of problems, corrective actions, and their costs can provide information needed for TQM and reengineering activities as part of an activity-based management (ABM) system (Chapter 11 covers ABM and Chapter 12 presents TQM).
  - By requiring input coding activities concerning the sources and causes of cost variances, communication and coordination is promoted as management attention is focused on interdepartmental cause-effect chains. If the source of a cost variance is in another department or production cell, those workers need to be concurrently notified. To properly assign responsibility, correct the problem, and prevent it from re-occurring, workers in these other departments need to be aware of the problem as soon as possible. By using a visual factory control system, this type of information can be displayed in real time on various production LAN workstation terminals.

- *Performance evaluation:*
  - Standards provide benchmarks for evaluating whether the organization's goals are being accomplished.
  - Through real time worker input of cost variance sources and causes, whether corrective actions have already been taken, and if the cost variances were preplanned as a least-cost corrective action (such as the rush order of plastic materials last month), responsibility can be legitimately assigned.
  - The SCAS should report the total cost variance of production problems summing across direct materials, direct labor, and overhead, as well as across departments.
  - In short-run performance evaluation, cost variances from practical standards signal abnormal operating conditions that should be investigated if they have not been corrected already.
  - In long-run evaluation, the difference between ideal and current (practical) standards measures the "room for improvement." Continuous improvement is evidenced by this difference decreasing over time.

b(2). Improvements in Aurora's SCAS:

- Managers and workers should participate in setting the standards. Travers' comments imply that top management imposes standards that may not be accepted as legitimate.
- Standards may need to be revised periodically to reflect operating conditions. A continuous budgeting process (discussed in Chapter 17) may be appropriate.
- Both favorable and unfavorable variances should be reported. Workers and managers need to know what is going right as well as what is going wrong.
- The ex-post analysis required by workers and managers inhibits daily operational control activities. The SCAS should report information in real time.
- Rather than separate departmental reports, variances should be reported in terms of their underlying sources and causes summed across cost elements and departments.
- Cost variances should not solely be reported in total dollars. Shop floor personnel need per unit and percentage information.
- Top management needs to provide positive reinforcement. This attitude change might take the following form:

  "O.K. Terry Travers, your performance looks pretty good this month (or week). Your machine uptime ratio is 95%. That is excellent. But, what caused the 5% machine downtime? Is there anything I can do to help you correct that as part of our commitment to continuous improvement?"

8.60 a. The standard cost card is presented on the next page.

b(1). Direct materials price variances can be caused by a change (from standard) in:

- Vendor
- Lot size
- Price
- Product specifications
- Freight carrier

Responsibility is usually assigned to the purchasing department. This assumes that current, practical standards are used in the SCAS. If standards are outdated, or based on ideal operating conditions, responsibility assignment may not be possible.

b(2). An unfavorable direct labor usage variance can result from:

- Faulty equipment or materials
- Machine breakdowns
- Lack of materials
- Engineering changes in the production process
- Worker inefficiencies
- A change in the mix (from standard) of laborers used in the various operations

The production department managers are usually responsible for the direct labor usage variance within their departments. At times, though, the underlying source and cause of a direct labor usage variance may be outside the department. As with all variances, identifying the underlying sources and causes is critical for proper responsibility assignment in performance evaluation. Additionally, in labor intensive processes, understanding the causes of labor usage variances is vital for productivity improvement.

PROBLEM 8.60

DATA SECTION: STANDARD COSTS

Manufacturing Inputs	Price	Output qty.	Loss%	
Raspberries	$0.80	6.00	20.00%	(1 of 5 quarts)
Other ingredients	$0.45	10.00	0.00%	
Sorting Labor	$9.00	0.30	0.00%	(3 minutes
Blending labor	$9.00	0.20	0.00%	x 6 quarts)
Packaging	$0.38	40.00	0.00%	(40 qts/batch)

SOLUTION SECTION: STANDARD COST CARD

ColdKing Company
10 gallon batch of Raspberry Sherbet
STANDARD COST CARD

MANUFACTURING INPUTS	STD. PRICES	STANDARD QUANTITIES	STANDARD COSTS
Raspberries	$0.80 /quart	7.50 quarts/batch	$6.00 /batch
Other ingredients	$0.45 /gallon	10.00 gallons/batch	$4.50 /batch
Sorting Labor	$9.00 /DLhr	0.30 DLhr/batch	$2.70 /batch
Blending labor	$9.00 /DLhr	0.20 DLhr/batch	$1.80 /batch
Packaging	$0.38 /quart	40.00 quarts/batch	$15.20 /batch
PARTIAL STANDARD MANUFACTURING COST			$30.20 /batch

STANDARD QUANTITY CALCULATIONS:

	Raspberries
$\frac{\text{Output specification}}{(1 - \text{Loss\%})}$	$= \frac{6.00}{0.80} =$ 7.50 quarts per 10 gallon batch

8.61 The following ethical issues are important in SCAS design. Of the four components of ethical behavior, competency is the most critical for the operation of an SCAS.

Competency:

- Assure adequate participation by all those involved or influenced by standards and cost variances.
  - Management needs to be involved to assure that the standards embody organizational goals, both short run and long run. Managers can provide the communication and coordination across functional boundaries necessary for global quality control.
  - The workers who will be evaluated by the standards also need to be involved. Participative budgeting is necessary to assure that all the production and control tasks are included in the standard quantities, and that employees understand what is expected. Participation can identify any gaps in worker training and knowledge required for proper operational control. Through participation, workers are more likely to internalize the standards.
  - Support personnel possessing needed information also should be involved in standard setting. For example, human resource management personnel possess information about labor rates, payroll taxes, and fringe benefits. Property management personnel possess information about the costs of many fixed overhead costs. Management accountants can access the cost accounting system's database for relevant information, and can format and present this information in usable ways.
- Report cost variances in an understandable manner.
  - Shop floor personnel often think in per unit amounts. Spending variances should be reported per pound, ounce, liter, foot, hour, and the like. Usage variances should be reported per unit of product, e.g., pounds of materials used per cubic yard of concrete or direct labor hours (or minutes) per machine operation in a JIT cell.
  - Upper management is primarily concerned with the achievement of profit goals. Aggregated cost variance information in total dollars measuring the difference between planned and actual profits provides this summary information.
  - All levels of management are concerned with the significance of cost variances. Thus, cost variances should also be reported as a percentage of the standards on which they are based.
- SCAS reports should distinguish between controllable and uncontrollable cost variances. For this to result, the underlying sources and causes of cost variances need to be input into the SCAS. Cost variances should be reported in terms of the total costs of the production problems that caused them.
- As cost variances occur, workers should input the sources and causes into the SCAS via workstation terminals. This information promotes concurrent control and problem identification. It also provides a history of cause-effect linkages for continuous improvement and TQM programs.
- Detailed cost variance feedback, presented in usable forms, should be available to the shop floor in real time to support operational control activities. This information includes standard prices and quantities for the individual cost elements and tasks workers must control on a daily basis. Normal scrap rates, control activities and allowed time for them, and freight costs for direct materials, are examples of the detailed information needed to control these costs.

Confidentiality:

- SCAS information is highly confidential. The standards and cost variances provide detailed information about the operating conditions and plans of an enterprise. If disclosed to competitors, for example, the ability of the firm to survive could be jeopardized.
- Within the organization, some level of confidentiality must also be maintained. This, however, is a balancing act. Information sharing is critical to global productivity improvement and operational control across departments. Information needs to be available to all those who need it when they need it. This is one justification for visual factory control systems in WCM enterprises. This information can be used in unethical ways, however. Some workers or line managers may use unfavorable information about others for their personal gain. The management accountant must understand the information needs and motivations of those within the firm.

Integrity:

- Integrity is a critical component in a high quality SCAS. The need to input source and cause information requires honesty and acceptance by all involved on the shop floor. Real time coding and communication can facilitate agreement for interdepartmental causes of cost variances. It is much more difficult to "pass-the-buck" in real time, than it is when cost variances are reported a month after the fact. For this real time source and cause identification to be successful, everyone must feel they are a member of the team.
- The integrity of the SCAS can be enhanced if cost variances are primarily used to identify, correct, and prevent problems, rather than as the sole means for rewarding performance. Performance evaluation should emphasize long-term goals, evaluating and rewarding preventive maintenance activities, suggestions for improved operations, reductions in standards over time (movement toward the ideal standards), and positive attributes of job performance (such as machine uptime, production of high quality products, and the like).
- The modern management accountant must also maintain an image of integrity. In the identification of cost variance cause-effect linkages, considerable pressures may occur to manipulate the costs associated with a problem. The management accountant will have to assume the role of a facilitator and mediator.

Objectivity:

- The SCAS must report fair and objective information. These characteristics are perceptions by the users of the SCAS. In source-cause reporting of cost variances, if there is consensus among workers and management as to the accuracy of the information, the SCAS will be perceived as objective.
- Consensus requires real time input and communication of problems as they occur.
- Another aspect of objectivity is the fully disclosure of all relevant information. Aggregated monthly reports only identifying cost variances within each department in terms of cost elements (direct materials spending and usage, direct labor rate and efficiency) provides little relevant information for operational control, performance evaluation, or future budgeting.

8.62 Scrap, rework, and spoilage are nonvalue-added activities that should be accounted for as cost variances. Using practical standards, some scrap may be unavoidable and included within the standard direct materials quantity. Eliminating scrap may be a long-range goal involving product reengineering and materials redesigning with certified vendors. Rework and spoilage, however, may be more short-run correctable problems. Thus, rework and spoilage are not included in standard costs.

Abnormal scrap, all rework, and all spoilage are accounted for as cost variances. To illustrate the cost variances and journal entries for a process system, assume:

Scrap in the Assembly department:
Direct material A standard price: $1.00 per pound
Direct material A requisitioned above the SQA due to scrapped materials: 100 lbs.

WIP-Assembly department DM_A usage variance (scrap)	$100	
$RMI\text{-}DM_A$		$100

Rework in the Assembly department:
5 products reworked requiring:
10 pounds of direct material A
4 direct labor hours at a standard rate of $15/DLhr
VOH POR of $7.50/DLhr

WIP-Assembly department rework variance	$100	
$RMI\text{-}DM_A$		$ 10
Gross Wages		$ 60
WIP-VOH		$ 30

Spoilage in the Assembly department:
7 products rejected at the end of the process
Standard absorptive manufacturing cost is $100

WIP-Assembly department spoilage variance	$700	
WIP-Assembly department		$700

In a job order system, the journal entries will show a posting reference within the cost variance accounts for the jobs that incurred these costs. To illustrate, assume the same information used above and all the scrap, rework, and spoilage was in Job 12:

Scrap in the Assembly department:
Direct material A standard price: $1.00 per pound
Direct material A requisitioned above the SQA due to scrapped materials: 100 lbs.

WIP-Assembly department DM_A usage variance (Job 12 scrap)	$100	
$RMI\text{-}DM_A$		$100

Rework in the Assembly department:
5 products reworked requiring:
10 pounds of direct material A
4 direct labor hours at a standard rate of $15/DLhr
VOH POR of $7.50/DLhr

WIP-Assembly department rework variance (Job 12)	$100	
RMI-DM_A		$ 10
Gross Wages		$ 60
WIP-VOH		$ 30

Spoilage in the Assembly department:
7 products rejected at the end of the process
Standard absorptive manufacturing cost is $100

WIP-Assembly department spoilage variance (Job 12)	$700	
WIP-Assembly department		$700

8.63 A high-quality SCAS possesses five attributes:

- *Accuracy:*
  - The more people that participate in setting standards, the more accurate and fair they will be perceived to be. Upper management needs to participate to assure the organization's goals are captured within the standards. Purchasing, production, and marketing personnel need to be involved in setting standard material prices. Workers and production management jointly set labor and VOH standard quantities. Line managers must work with the personnel department in determining the labor rate standards based on the different classes of workers needed and the payroll taxes and fringe benefits involved.
  - Accurate performance measurement in operational control and performance evaluation requires accurate standards. Standards that are outdated, for example, will not provide accurate results when used to calculate cost variances.
  - Accurate recording of materials prices, quantities purchased and requisitioned, labor hours by job or department, indirect labor, the correct classification of VOH and FOH costs, scrap, rework, and spoilage, are necessary for accurate cost variance calculations.
  - Data entry screens and programs should provide verification routines so that data can be easily checked for correctness. For example, when a JIT cell worker inputs a source-cause code for an activity that creates a cost variance, the input program displays the code in words for visual verification.

- *Relevancy:*
  - When budgeting (group decision making), information about the change in standards and cost variances over time is useful in setting new standards for continuous improvement. Relevant information includes the reduction in scrap included in the direct materials standard quantities. Similarly, the reduction in the direct labor output specification from learning, and in nonvalue-added activities in downtime, are relevant to setting new labor standard quantities.

- In monitoring and controlling operations, cost variances from ideal standards may not be relevant. Variances from practical standards provide information about deviations from currently expected performance.
- Both favorable and unfavorable variances should be reported to those performing operational tasks as they complete them. Workers are then required to input reasons for performance different from the standard. By capturing this source-cause information at the source in real time, a database of the costs of correcting internal failures is available for identifying areas to the reengineered in a continuous improvement program. When cost variances are reported by cause, summed across departments and cost elements, these problem causes can then be prioritized in terms of their "dollars and cents" impact on planned profits.
- Very few processes contain independent operations in that poor quality materials and subassemblies leaving one operation affect the operations of subsequent departments or JIT cells. Visual factory control systems provide readily available and easily understood information for the entire shop floor in recognition of the need for coordinated, synchronized activities. This is the feedforward role of a high-quality SCAS in operational control.
- Quality control is predominately considered as a within-operation activity. In other words, the worker performing an operation also checks the quality of its output before passing it to the next operation. In some situations, though, least-cost corrective actions may exist at different points. If a cause-based cost variance database exists, when a problem occurs the manager can access a look-up table for this problem and obtain information on previous corrective actions and costs.
- For performance evaluation, cost variances are reported by source and cause, summed across cost elements and departments, to the people responsible. In addition, the cost variance reports identify whether a cost variance was preplanned, and if not, whether corrective actions have been taken already.

- *Timeliness:*
  - In setting standards, groups and individuals cannot wait to obtain current standard cost information. Users in different LANs need to access the cost accounting LAN through an ICBIS.
  - In operational control activities, real-time information should be available at production workstations. The standard cost card files need to contain detailed information about individual standard quantities, budgeted scrap and downtime, expected learning, and the like. As activities take place that create cost variances, workers identify the reasons and input them into the SCAS through workstation terminals. In this way, timely information is obtained for the understanding and explanation of both favorable and unfavorable cost variances.
  - Management needs timely feedback for performance evaluation. Receiving cost variance reports weeks late inhibits learning about production problems and the corrective actions taken (or not taken). On the other hand, having this information available in real time allows management to monitor operations, discuss corrective action possibilities, and evaluate performance in a way that may be perceived by those evaluated as more accurate, fair, and legitimate.

- *Fairness:*
  - Participative budgeting promotes the perception of fair standards by those evaluated against the standards. Imposed standards "from the top" may not be accepted as fair if proper allowances are not made for individual control tasks.
  - When inputting cost variance causes, if the source is a previous operation, those workers are notified through the ICBIS and must verify the source-cause code. In this way, responsibility is agreed to in a real-time mode, increasing the perception of a fair SCAS.
  - In performance evaluation, only those previously unidentified and unexplained cost variances need to be investigated. Most cost variance responsibilities have been agreed to already.
- *Usability:*
  - In group planning, as well as in individual standard setting, graphical information about the changes in specific standards over time is useful in measuring continuous improvement. The standard cost card file should be accessible to various LANs and contain this historical information.
  - Information such as standard prices, quantities, and cost variances should be available to use in real time for operational control. Presenting this information in per unit and percentage amounts facilitates the usability criterion.
  - Cost variance information reported only in terms of direct materials, labor, and overhead within each department, does not facilitate understanding the underlying sources and causes of the variances. Cost variances need to be reported in terms of the production problems that created them.

See the "Let's Talk" box on the next page for a discussion of the problems in requiring concurrent source-cause input coding activities and their effects on responsibility assignment and performance evaluation.

Let's Talk

Some students, especially those currently working in accounting departments, may argue that the current coding activities required will promote infighting and buck-passing as responsibility for unfavorable variances in one department must be accepted by those in another department (for quality problems that are passed through the system). This argument has some merit and may be difficult to respond to. You might ask these students to consider two points:

- What's the alternative? Traditional SCASs require an ex-post identification of the problems that created the cost variances, and the assignment of responsibility. As was highlighted in Problem 8-59, this is an even more difficult process. It is much easier to pass-the-buck well after the fact than it is in real time.

  Further, how does the process of identifying problems and assigning responsibility work in a traditional SCAS? A department manager must try to recall what happened in a previous time period, often disrupting current operations in the attempt to recall this information. If a problem is interdepartmental (i.e., caused in another department and transported into this one), then the manager will have to appeal the variance to upper management. They will have to inquire of the other managers who will have to go through the same investigation-interruption-recall procedures. This process will continue up-and-down, back-and-forth, throughout the formal chain of command. This has to be a much less optimal method of responsibility assignment than concurrent investigation through the real time input coding activities proposed here.

- As quality control procedures are incorporated into the standards, and workers trained and motivated to take quality control actions concurrent with their production operations, less interdepartmental variances will result. With a properly designed and controlled production process, this should not be a significant problem (as it is in traditional nonworld-class operations).

8.64 *Is cost variance information needed in a JIT SCAS?*

Source and cause information about cost variances is needed for the following reasons:

- By identifying and inputting the causes of cost variances, workers gain a greater understanding of the causes and effects of production problems. This may enhance their motivations to control operations at the source.
- By reporting cost variances in terms of their sources and causes, management gains a better perspective of where continuous improvement projects are needed. By quantifying these problems in terms of "dollars and cents," management can prioritize these projects in terms of the ones that hold the greatest promise of increasing profits.
- Many enterprises have a history of "managing by the numbers." Cost variance information is considered very important from this perspective. Providing information about the total costs of production problems increases the usefulness of the SCAS.
- Participation by cell workers in setting standards, improving operations, and controlling the cell activities (including maintaining the equipment), are key elements in implementing JITs. Having information about the costs of production problems that have previously occurred, helps workers set future standards and identify areas for improvement.

Arguments against cost variance information:

- Input coding activities are nonvalue-added activities. The JIT goal is not to have problems. Preventive controls are designed into the cell operations. Corrective and detective controls should not be needed. Any activities involved with problem identification and correction are nonvalue-added activities and candidates for elimination. This includes SCAS coding activities for cost variance reporting.
- The assumption in JITs is that operations are under control. Everyone works together as part of a team to prevent jidoka (the shutting down of the line). Workers are trained in preventive maintenance and quality control. If operations are under control, no cost variance information is needed.
- Cost variances should not be the sole, or primary, source of information for performance evaluation. Workers should be evaluated on long-run performance measures, such as the movement toward ideal standards (continuous improvement), suggestions for changes in equipment and procedures, new skills learned and applied, and the like.

Design the WIP general ledger system:

The following design in based on the last example (Newmount Engine Manufacturing) presented in the chapter. The numerical codes are internally generated by the SCAS LAN upon input of problems by cell workers through their workstation terminals. The coding system is based on Exhibit 8-20. The general ledger coding system consists of 15 characters. The format is: xxx-xxx-xxxx-x.xxxx.

151-xxx-xxxx-x.xxxx

The first three characters represent the general ledger major account number corresponding to assets, liabilities, equity, revenues and expenses. General ledger account 151 is Work-In-Process Inventory.

xxx-018-xxxx-x.xxxx

The second set of three characters represent products and their major components part numbers. 018 is the part number for the cylinder.

xxx-xxx-1000-x.xxxx

The next set of four characters represents the cylinder's level 1 subassemblies. The level 1 subassemblies are inventoriable parts used in cylinder production, and can be separately shipped to dealers for on-site repairs. Since a subassembly is produced within a dedicated JIT production cell, these general ledger accounts also represent the costs of the cells. The part number for the cylinder's barrel subassembly is 151-018-1000, as shown in Exhibit 8-20.

xxx-xxx-x01x-x.xxxx

The middle two characters of this set represent steps in the production process. For example, step 1 within the barrel subassembly process is "Delivery (of barrel stock) from Raw Materials" (coded as 151-018-101x-x.xxxx). The process steps' codes are used to trace production variances and their resulting cost variances to the step in the process where they occurred. Being able to sum cost variances by step provides important control information for on-going system improvement. If it is discovered that a significant number of cost variances occur within a particular step, then that step would be a prime candidate for future reengineering as part of Newmount's TQM program.

xxx-xxx-xxx0-x.xxxx

The step codes also allow the accounting system to relate direct materials, cell labor, machinery, and overhead costs to the steps where they are used. These step costs are represented with the last character in this set using the following format:

xxx0	direct materials
xxx1	direct labor
xxx2	machinery use
xxx3	machinery power
xxx4	indirect materials (tooling)

Being able to subtotal cost variances by the type of cost involved allows Newmount to reconcile the differences between the actual use (cost) of these resources and the budgeted cost. For example, during a week 10 barrels were reworked. The amount of electricity used that week will be greater than the standard kilowatts hours allowed for actual barrel production. Subtotalling across steps by the machinery power code number reconciles this difference. Breaking-down this sub-total by step shows were the excess power was used. Analysis of the production variance codes (discussed next) will provide the explanations about why these cost variances happened.

xxx-xxx-xxxx-1.xxxx

The last set of five characters identifies the sources and causes of cost variances. The coding system can be created by the workers during the redesign of the factory into a JIT process. During this process, they identify production problems that can occur throughout the process, and which problems create other problems down-the-line (i.e., a cause-effect chain). As reengineering projects eliminate some problems, and as workers learn to control operations, or new problems are identified, this chain can be modified as part of the budgeting and standard setting process.

The first character represents which variance occurred. For example, a barrel is re-cut (step 2 in Exhibit 8-20) due to a misalignment problem (variance 3 in step 2). The cell worker inputs "re-cut barrel" at his terminal and the SCAS automatically generates charges to three accounts:

151-018-1022-3 WIP, cylinder, barrel subassembly, step 2, (excess) machinery use (because of) variance 3: $3.00

151-018-1023-3 WIP, cylinder, barrel subassembly, step 2, (excess) power used by the machine (due to) variance 3: $0.50

151-018-1021-3 WIP, cylinder, barrel subassembly, step 2, (excess) labor use (because of) variance 3: $0.20 + $0.20 = $0.40

Being able to sub-total by step and variance identifies problem areas (steps) and specific reasons for those problems (the production process variances). Over time it may be discovered that there are a number of different variances occurring within a particular step, or that the same variance may be re-occurring. Not only does Newmount know the cost of a particular production variance, this cost can be itemized into how much was labor, materials, and direct technology costs.

xxx-xxx-xxxx-x.1072

The last four characters in the general ledger coding system represent the cause of a cost variance. The major reason for converting the cylinder line at Newmount was that number of interacting problems existed; problems created in one department, but not discovered until they resulted in other problems down the line. Knowing where a variance occurs does not necessarily identify its real underlying reason (cause).

To illustrate this, assume during cylinder testing (step 23 in the process) an assembly cell worker discovers that a barrel leaks hydraulic fluid. A leaking fitting is variance 4 that could occur in this operation. After some investigation, she locates the cause. When welding one of the fittings onto the barrel, the weld was too hot which shrank the fitting opening (barrel subassembly step 7, variance 2). The direct labor usage variance occurs in the assembly cell, but was really caused by a problem in the barrel cell. To provide the correct information on this variance, it needs to be coded to general ledger account #151-018-6231-4.1072 (it was a direct labor usage cost variance resulting in assembly cell step 23 variance 4, caused by variance 2 of step 7 in the barrel cell). Using this example to summarize the internally generated general ledger code from the assembly worker inputting code 23, variance 4, from step 7, variance 2, in response to her terminal screen prompts:

A WIP Inventory cost occurred:	151-xxx-xxxx-x.xxxx
In the cylinder assembly process:	xxx-018-xxxx-x.xxxx
Within the assembly cell:	xxx-xxx-6xxx-x.xxxx
During cylinder testing (step 23):	xxx-xxx-x23x-x.xxxx
It was a direct labor cost variance:	xxx-xxx-xxx1-x.xxxx
Resulting from a leaking fitting variance:	xxx-xxx-xxxx-4.xxxx
Which was caused by a barrel process variance:	xxx-xxx-xxxx-x.1xxx
When welding fittings (step 7):	xxx-xxx-xxxx-x.x07x
Specifically, the weld was too hot (variance 2):	xxx-xxx-xxxx-x.xxx2

One of the goals of JIT is to avoid problems moving down the line. The concept of TQM and the philosophy of JIT both require identification and correction of production variances at the source. When this happens, the source and cause of the cost variance is the same (coded as -x.0000). Movement toward this goal can be measured by the reduction in the amount of cost variances with different source and cause codes.

8.65 *The SCAS design continuum:*
The backflush system (BCAS) is based on the assumption that the production process is under control. Thus, cost variance information is not needed. The SCAS is designed primary for financial reporting purposes, journalizing cost elements acquired and COGM.

The production activity-based SCAS, on the other hand, requires cell workers to input the sources and causes of production problems as they occur, and using a general ledger coding system with the standard cost card information, produces cost variance information by production activity. The general ledger coding system is illustrated in the previous Think-Tank problem. The standard cost card is shown in Exhibit 8-20, and the cost variance report in Exhibit 8-21.

BCAS Advantages:
BCASs simplify the SCAS by eliminating many nonvalue-added activities such as:

- Maintaining RMI accounts.
- Preparing and accounting for materials requisitions.
- Filling out labor time tickets and direct labor reporting.
- Recording work orders and maintaining WIP accounts, including the journal entries to record input usage, transfers between departments (or cells), and cost variances.
- For short production lead time products, JIT manufacturing results in a very high-velocity level of output. The short lead times make tracking each piece moving through the process difficult without an ICBIS and automated operations. So, under backflush costing, no tracking is made of product cost accumulation as products move through successive work cells.

BCAS disadvantages:

- They may only work well in production processes with extremely low levels of inventories. When significant RMI and WIP exist, GAAP (for financial reporting) requires that these inventories be valued and their ending balances reported as current assets.
- By not tracking the use of manufacturing input costs and the movement of WIP through the manufacturing process, certain audit trails are lost. Other information systems need to be in place to provide information for reconciling the RIP and Conversion Costs accounts. Cost elements are debited to these accounts using their actual costs, but removed from these accounts (credited) at standard.
- The reconciliation process can be further complicated if there are not separate subsidiary ledger accounts in RIP and Conversion Costs for the different products.
- There still may be a need for information about production problems and potentially the cost variances they create. While a visual factory may provide some of this information, other information systems may be needed to identify the priority areas for continuous improvements.
- Since only the good output is debited to FGI and credited to RIP and Conversion Costs, there has to be separate accounting for spoilage and the cost variances it creates.

Production activity-based SCAS advantages:

- By identifying and inputting the causes of cost variances, workers gain a greater understanding of the causes and effects of production problems. This may enhance their motivations to control operations at the source.
- By reporting cost variances in terms of their sources and causes, management gains a better perspective of where continuous improvement projects are needed. By quantifying these problems in terms of "dollars and cents," management can prioritize these projects in terms of the ones that hold the greatest promise of increasing profits.
- Many enterprises have a history of "managing by the numbers." Cost variance information is considered very important from this perspective. Providing information about the total costs of production problems increases the usefulness of the SCAS.
- Participation by cell workers in setting standards, improving operations, and controlling the cell activities (including maintaining the equipment), are key elements in implementing JITs. Having information about the costs of production problems that have previously occurred, helps workers set future standards and identify areas for improvement.

Arguments against production activity-based SCASs:

- Input coding activities are nonvalue-added activities. The JIT goal is not to have problems. Preventive controls are designed into the cell operations. Corrective and detective controls should not be needed. Any activities involved with problem identification and correction are nonvalue-added activities and candidates for elimination. This includes SCAS coding activities for cost variance reporting.
- The assumption in JITs is that operations are under control. Everyone works together as part of a team to prevent jidoka (the shutting down of the line). Workers are trained in preventive maintenance and quality control. If operations are under control, no cost variance information is needed.
- Cost variances should not be the sole, or primary, source of information for performance evaluation. Workers should be evaluated on long-run performance measures, such as the movement toward ideal standards (continuous improvement), suggestions for changes in equipment and procedures, new skills learned and applied, and the like.

8.66 The standard cost card information is presented below for use in the cost variance calculations and journal entries:

PROBLEM 8.66 and 8.67

Armando Corporation
Turntable Department
STANDARD COST CARD

MANUFACTURING INPUTS	STD. PRICES	STANDARD QUANTITIES	STANDARD COSTS
Direct Materials	$3.00	4.00 /unit	$12.00 /unit
Direct Labor	$9.00 /DLhr	2.00 DLhr/unit	$18.00 /unit
Variable Overhead	$2.00 /DLhr	2.00 DLhr/unit	$4.00 /unit
Fixed Overhead	$5.00 /DLhr	2.00 DLhr/unit	$10.00 /unit
STANDARD ABSORPTIVE MANUFACTURING COST			$44.00 /unit

Monthly turntable manufacturing costs = $120,000 per month + $34.00 /unit

STANDARD QUANTITY CALCULATIONS:

		Direct materials		Direct labor
Output specification / (1 - Loss%)	= 3.80 / 0.95 =	4.00	1.80 / 0.90 =	2.00

PRODUCTION QUOTA CALCULATION:

Once the standard variable costs are calculated, solve for the FOH SC:

FOH SC = (SAMC = $44.00/unit) - (Standard variable costs = $34.00/unit)
FOH SC = $10.00/unit

Production quota = Budgeted FOH costs/FOH SC
Production quota = 12,000 units per month

a. and b.

The cost variance calculations and journal entries are combined below. The total cost variance is the sum of the eight individual cost variances as shown on the report in part c.

Direct materials purchases (journal entry 1):		
RMI	$150,000	
(SP x AQp = $3.00 x 50,000 purchased)		
RMI - DM Price Variance		$ 1,000
(AQp x [SP - AP] = 50,000 x [$3.00 - $2.98])		
Accounts Payable		$149,000
(AP x AQp = $2.98 x 50,000)		
Direct materials usage (journal entry 5):		
WIP - Turntable department (DM)	$120,000	
(SP x SQA = $3.00 x 40,000)		
WIP - Turntable department DM Usage Variance	$ 4,500	
(SP x [SQA - AQu] = $3.00 x [40,000 - 41,500])		
RMI		$124,500
(SP x AQu = $3.00 x 41,500)		
Direct labor distribution (journal entry 6):		
WIP - Turntable department (DL)	$180,000	
(SP x SQA = $9.00/DLhr x 20,000 DLhr)		
WIP - Turntable department DL Rate Variance	$ 7,560	
(AQ x [SP - AP] = 21,000 DLhr x [$9.00/DLhr - $9.36/DLhr])		
WIP - Turntable department DL Usage Variance	$ 9,000	
(SP x [SQA - AQ] = $9.00/DLhr x [20,000 DLhr - 21,000 DLhr])		
Gross Wages		$196,560
(Actual cost = AP x AQ = $9.36/DLhr x 21,000 DLhr)		

VOH Allocation (journal entry 7a):		
WIP - Turntable department (VOH Applied)	$ 40,000	
(VOH POR x SQA_{DL} = $2.00/DLhr x 20,000 DLhr)		
WIP - Turntable department VOH Spending Variance		$ 1,000
([AQu x VOH POR] - Actual VOH =		
[21,000 DLhr x $2.00/DLhr] - $41,000)		
WIP - Turntable department VOH Efficiency Variance	$ 2,000	
(VOH POR x [SQA_{DL} - AQu] =		
$2.00/DLhr x [20,000 DLhr - 21,000 DLhr])		
WIP - VOH		$ 41,000
(Actual cost)		
FOH Allocation (journal entry #7b):		
WIP - Turntable department (FOH Applied)	$100,000	
(SC x Actual output = $10.00/unit x 10,000 units)		
WIP - Turntable department FOH Budget Variance		$ 3,000
(Budgeted FOH - Actual FOH = $120,000 - $117,000)		
WIP - Turntable department FOH Volume Variance	$ 20,000	
(FOH SC x [Actual output - Production quota] =		
$10/unit x [10,000 units - 12,000 units])		
WIP - FOH		$117,000
(Actual cost)		
Cost of goods manufactured (journal entry 9):		
Finished goods inventory - Turntables	$440,000	
(SCA x Actual output = $44/unit x 10,000 units)		
WIP - Turntable department		$440,000
(SCA x Actual output)		

c. The cost variance report is presented on the next page.

8.67 The spreadsheet program was used to create the standard cost card shown on page 66. The cost variance report is presented on the next page.

8.66 (c) and 8.67

ARMANDO CORPORATION: TURNTABLE DEPARTMENT
COST VARIANCES REPORT: May, 19XX

MFG INPUTS:		PER UNIT	UNITS	TOTAL COSTS	VARIANCE %AGE
DIRECT MATERIALS:	STANDARD PRICE	$3.00		$150,000	
	-ACTUAL PRICE	($2.98)		($149,000)	
	PRICE VARIANCE	$0.02	50,000	$1,000	0.67%
	STANDARD QTY	4.00	40,000	$120,000	
	-ACTUAL QTY	(4.15)	(41,500)	($124,500)	
	USAGE VARIANCE	(0.15)	(1,500)	($4,500)	-3.75%
DIRECT LABOR:	STANDARD RATE	$9.00		$189,000	
	-ACTUAL RATE	($9.36)		($196,560)	
	RATE VARIANCE	($0.36)	21,000	($7,560)	-4.00%
	STANDARD QTY	2.00	20,000	$180,000	
	-ACTUAL QTY	(2.10)	(21,000)	($189,000)	
	USAGE VARIANCE	(0.10)	(1,000)	($9,000)	-5.00%
VARIABLE OVERHEAD:	STANDARD RATE	$2.00		$42,000	
	-ACTUAL RATE	($1.95)		($41,000)	
	RATE VARIANCE	$0.05	21,000	$1,000	2.38%
	STANDARD QTY	2.00	20,000	$40,000	
	-ACTUAL QTY	(2.10)	(21,000)	($42,000)	
	USAGE VARIANCE	(0.10)	(1,000)	($2,000)	-5.00%
FIXED OVERHEAD:	BUDGETED COSTS			$120,000	
	ACTUAL COSTS	($11.70)		($117,000)	
	BUDGET VARIANCE	$0.30	10,000	$3,000	2.50%
	APPLIED	$10.00	10,000	$100,000	
	BUDGETED	$10.00	(12,000)	($120,000)	
	VOLUME VARIANCE	($2.00)	(2,000)	($20,000)	-16.67%
COST VARIANCE TOTALS:	APPLIED	$44.00		$440,000	
	-ACTUAL	($47.81)		($478,060)	
	COST VARIANCE	($3.81)	10,000	($38,060)	-8.65%

NOTES: POSITIVE COST VARIANCES are FAVORABLE (negative = unfavorable).
Per unit usage, fixed overhead, and total cost variances are per unit of output.

8.68 The standard cost card information is presented below for use in the cost variance calculations and journal entries:

PROBLEM 8.68 and 8.69

Ben Logan Golf Club Corp.
Logan Boris Metal Woods Dept.
STANDARD COST CARD

MANUFACTURING INPUTS	STD. PRICES	STANDARD QUANTITIES	STANDARD COSTS
Direct Materials	$2.00 /pound	3.00 lbs./unit	$6.00 /unit
Direct Labor	$8.00 /DLhr	2.00 DLhr/unit	$16.00 /unit
Variable Overhead	$3.00 /DLhr	2.00 DLhr/unit	$6.00 /unit
Fixed Overhead	$2.00 /DLhr	2.00 DLhr/unit	$4.00 /unit
STANDARD ABSORPTIVE MANUFACTURING COST			$32.00 /unit
Annual Metal Woods Mfg. Costs =		$40,000 per year +	$28.00 /unit

STANDARD QUANTITY CALCULATIONS:

		Direct materials		Direct labor
$\frac{\text{Output specification}}{(1 - \text{Loss\%})}$	$= \frac{2.50}{0.83} =$	3.00	$\frac{1.60}{0.80} =$	2.00

BUDGETED FOH CALCULATION:

FOH SC = Budgeted FOH costs/Production quota
Budgeted FOH = FOH SC x Production quota
= $40,000 per year

a. and b.

The cost variance calculations and journal entries are combined below. The total cost variance is the sum of the eight individual cost variances.

Direct materials purchases (journal entry 1):		
RMI (SP x AQp = $2.00/lb. x 50,000 lbs. purchased)	$100,000	
RMI - DM Price Variance (AQp x [SP - AP] = 50,000 lbs. x [$2.00/lb. - $1.90/lb.])		$ 5,000
Accounts Payable (AP x AQp = $1.90/lb. x 50,000 lbs.)		$ 95,000
Direct materials usage (journal entry 5):		
WIP - Metal woods department (DM) (SP x SQA = $2.00/lb. x 33,000 lbs.)	$ 66,000	
WIP - Metal woods department DM Usage Variance (SP x [SQA - AQu] = $2.00/lb. x [33,000 lbs. - 35,000 lbs.])	$ 4,000	
RMI (SP x AQu = $2.00/lb. x 35,000 lbs.)		$ 70,000
Direct labor distribution (journal entry 6):		
WIP - Metal woods department (DL) (SP x SQA = $8.00/DLhr x 22,000 DLhr)	$176,000	
WIP - Metal woods department DL Rate Variance (AQ x [SP - AP] = 23,000 DLhr x [$8.00/DLhr - $8.40/DLhr])	$ 9,200	
WIP - Metal woods department DL Usage Variance (SP x [SQA - AQ] = $8.00/DLhr x [22,000 DLhr - 23,000 DLhr])	$ 8,000	
Gross Wages (Actual cost)		$193,200

VOH Allocation (journal entry 7a):

WIP - Metal woods department (VOH Applied) (VOH POR x SQA_{DL} = $3.00/DLhr x 22,000 DLhr)	$ 66,000	
WIP - Metal woods department VOH Spending Variance ([AQu x VOH POR] - Actual VOH = [23,000 DLhr x $3.00/DLhr] - $62,000)		$ 7,000
WIP - Metal woods department VOH Efficiency Variance (VOH POR x [SQA_{DL} - AQu] = $3.00/DLhr x [22,000 DLhr - 23,000 DLhr])	$ 3,000	
WIP - VOH (Actual cost)		$ 62,000

FOH Allocation (journal entry #7b):

WIP - Metal woods department (FOH Applied) (SC x Actual output = $4.00/unit x 11,000 units)	$ 44,000	
WIP - Metal woods department FOH Budget Variance (Budgeted FOH - Actual FOH = $40,000 - $41,000)	$ 1,000	
WIP - Metal woods department FOH Volume Variance (FOH SC x [Actual output - Production quota] = $4/unit x [11,000 units - 10,000 units])		$ 4,000
WIP - FOH (Actual cost)		$ 41,000

Cost of goods manufactured (journal entry 9):

Finished goods inventory - Metal woods (SCA x Actual output = $32/unit x 11,000 units)	$352,000	
WIP - Metal woods department (SCA x Actual output)		$352,000

c. The cost variance report is presented on the next page.

8.69 The spreadsheet program was used to create the standard cost card shown on page 70. The cost variance report is presented on the next page.

8.68 (c) and 8.~~00~~

BEN LOGAN GOLF CLUB CORP. LOGAN BORIS METAL WOODS
COST VARIANCES REPORT: For the Year 19XX

MFG INPUTS:		PER UNIT	UNITS	TOTAL COSTS	VARIANCE %AGE
DIRECT MATERIALS:	STANDARD PRICE	$2.00		$100,000	
	-ACTUAL PRICE	($1.90)		($95,000)	
	PRICE VARIANCE	$0.10	50,000	$5,000	5.00%
	STANDARD QTY	3.00	33,000	$66,000	
	-ACTUAL QTY	(3.18)	(35,000)	($70,000)	
	USAGE VARIANCE	(0.18)	(2,000)	($4,000)	-6.06%
DIRECT LABOR:	STANDARD RATE	$8.00		$184,000	
	-ACTUAL RATE	($8.40)		($193,200)	
	RATE VARIANCE	($0.40)	23,000	($9,200)	-5.00%
	STANDARD QTY	8.00	22,000	$176,000	
	-ACTUAL QTY	(8.09)	(23,000)	($184,000)	
	USAGE VARIANCE	(0.09)	(1,000)	($8,000)	-4.55%
VARIABLE OVERHEAD:	STANDARD RATE	$3.00		$69,000	
	-ACTUAL RATE	($2.70)		($62,000)	
	RATE VARIANCE	$0.30	23,000	$7,000	10.14%
	STANDARD QTY	3.00	22,000	$66,000	
	-ACTUAL QTY	(2.09)	(23,000)	($69,000)	
	USAGE VARIANCE	(0.09)	(1,000)	($3,000)	-4.55%
FIXED OVERHEAD:	BUDGETED COSTS			$40,000	
	ACTUAL COSTS	($3.73)		($41,000)	
	BUDGET VARIANCE	($0.09)	11,000	($1,000)	-2.50%
	APPLIED	$4.00	11,000	$44,000	
	BUDGETED	$4.00	(10,000)	($40,000)	
	VOLUME VARIANCE	$0.36	1,000	$4,000	10.00%
COST VARIANCE TOTALS:	APPLIED	$32.00		$352,000	
	-ACTUAL	($32.84)		($361,200)	
	COST VARIANCE	($0.84)	11,000	($9,200)	-2.61%

NOTES: POSITIVE COST VARIANCES are FAVORABLE (negative = unfavorable).
Per unit usage, fixed overhead, and total cost variances are per unit of output.