

The Flow of Manufacturing Costs

Following is a summary of how product costs are accumulated and accounted for in a manufacturing company. Product costs include direct materials, direct labor, and manufacturing overhead.

Typical general ledger accounts used for manufacturing costs are called:

- Materials Inventory or Materials Control
- Payroll
- Factory Overhead Control
- Work-in-Process Inventory
- Finished Goods Inventory
- Cost of Goods Sold

A certain amount of direct materials, direct labor, and overhead costs are "attached" to each unit as it is in production. The direct materials, direct labor, and overhead costs flow to work-in-process inventory and from there to finished goods and, when the unit is sold, to cost of goods sold. This flow of costs is called **sequential tracking** of costs because the journal entries are recorded in sequence as the units progress through the production process and to final sale.

Following is a very broad outline of how production costs flow. Different costing systems introduce variations, and the following explanation should be considered an introduction only. It is not specific enough to enable numerical examples.

1. Materials Inventory

Materials inventory is an inventory account in the **asset section of the balance sheet**. It contains the cost of raw materials purchased for use in manufacturing.

- When raw materials are purchased on account and received, their cost is debited to Materials Inventory and credited to Accounts Payable. Raw materials may include direct materials as well as indirect materials. When the invoices for the raw materials are paid, Accounts Payable is debited and Cash is credited.
- When **direct** materials are placed into production, the cost of the direct materials placed in production is debited to Work-in-Process Inventory. The cost is credited to Materials Inventory to reduce it by the cost of the materials removed from Materials Inventory.
- The cost of **indirect** materials is an overhead cost. When indirect materials are placed into production, the cost of the indirect materials placed in production is debited to Factory Overhead Control. The cost is credited to Materials Inventory to reduce it by the cost of the materials removed from Materials Inventory.

Thus, the cost of direct materials put into production is moved from Materials Inventory to Work-In-Process Inventory and the cost of indirect materials put into production is moved from Materials Inventory to Factory Overhead Control.

2. Payroll

The Payroll account is a control account. When manufacturing salaries and wages are earned, the total amount of the salaries and wages is debited to Payroll and credited to Accrued Payroll, a liability account.

- Direct labor includes the wages of the workers who are directly involved in the manufacturing
 process, such as those who operate machinery. Indirect labor includes salaries of plant
 supervisors and other plant employees not directly engaged in manufacturing, such as the
 janitor who keeps the plant clean.
- After being debited to Payroll, the manufacturing portion of the payroll costs is distributed in the accounting system according to whether it is for direct labor or indirect labor. Work-in-Process Inventory is debited for the amount of **direct** labor used, Factory Overhead Control is debited for the amount of **indirect** labor used, and Payroll is credited for the total.
- When the payroll is paid, the total amount paid is debited to Accrued Payroll and credited to Cash.

Note: The above is an extremely simplified version of what takes place. Recording the payroll in the accounting system involves accounting for taxes withheld and other withholdings as well as for employer's payroll taxes. Those details are ignored in the above simplified explanation.

Payroll will also include selling and administrative payroll. Selling and administrative costs are period costs that are expensed as incurred and thus are not discussed here because they are not product costs.

3. Factory Overhead Control

Manufacturing overhead includes costs for the physical manufacturing facilities as well as indirect materials used, indirect labor used, and overtime premiums paid if not the result of a specific job or customer request.

- When depreciation on factory facilities is recorded, the amount of the depreciation is debited to Factory Overhead Control and credited to Accumulated Depreciation. Note that the depreciation is **not** expensed as Depreciation Expense at this point.
- When other factory overhead costs such as utilities are recorded, the amount is debited to Factory Overhead Control and credited to Accounts Payable. When payment is made, Accounts Payable is debited and Cash is credited. If any factory overhead costs are paid immediately in cash, the amount is debited to Factory Overhead Control and credited to Cash.
- As production takes place, accumulated costs in the Factory Overhead Control account are applied to production using a predetermined overhead application rate by debiting Work-in-Process Inventory and crediting Factory Overhead Control.

Usually, a separate account called Factory Overhead Applied is used for the credits. Factory Overhead Applied should follow Factory Overhead Control in the chart of accounts and will carry a credit balance. The two accounts netted together (the debit balance in Factory Overhead Control and the credit balance in Factory Overhead Applied) represent the difference between the amount of overhead costs incurred and the amount applied to production. If the difference is a net debit balance, overhead was under-applied. If the difference is a net credit balance, overhead was over-applied. Under- or over-applied factory overhead is closed out at the end of the period.

4. Work-in-Process Inventory

Costs are accumulated in the Work-in-Process Inventory account as work progresses on the units being manufactured.

The balance in the account is increased by debits for:

- Costs transferred from Materials Inventory when materials are put into production
- Direct labor costs from Payroll for direct labor used
- Overhead allocated to units produced, credited to the Factory Overhead Control or Factory Overhead Applied account

A portion of all of the preceding costs is allocated to each individual unit in the process of being manufactured. The costs remain in the Work-in-Process Inventory account until the units they are attached to are completed.

When job order costing is being used, the company will have a work-in-process inventory account for each individual job.

When process costing is being used, a company with several processing departments that the units move through will have a departmental work-in-process inventory account for each department or process. The costs accumulate as they move from each departmental work-in-process account to the next departmental work-in-process account until the units they are attached to are complete. Process costing is used to determine the amount of costs to move on to the next department or to Finished Goods for units completed in each department during the period and the amount of costs attached to units still in Work-in-Process Inventory at the end of the period.

5. Finished Goods Inventory

As units are completed, the total accumulated costs attached to the completed units are moved from Work-in-Process Inventory to Finished Goods Inventory by debiting Finished Goods Inventory and crediting Work-in-Process Inventory. The costs moved are the total accumulated costs per unit multiplied by the total number of units completed. When many identical units are being manufactured, the cost per unit transferred to Finished Goods Inventory is determined by the use of process costing.

6. Cost of Goods Sold

As units are sold, their cost is debited to Cost of Goods Sold and credited to Finished Goods Inventory.

- If a perpetual inventory system is being used, as each unit is sold the total accumulated cost attached to it is debited to Cost of Goods Sold and credited to Finished Goods Inventory.
- If a periodic inventory system is being used, the amount to be debited to Cost of Goods Sold and credited to Finished Goods Inventory is calculated at the end of each accounting period and the amount for the whole period is moved in total from Finished Goods Inventory to Cost of Goods Sold as a period-end adjusting entry.

On the next page is a diagram of the manufacturing cost flows.



Accounting for Direct Manufacturing Inputs in Standard Costing

The preceding description of the way product costs are accumulated and accounted for in a manufacturing company assumed that all costs were being accounted for at their actual cost amounts. However, that is not the way it is done when standard costing is being used.

In a standard cost system, the costs applied to the products as they are being manufactured are the **standard** costs **allowed** for the **actual amount produced**. Those standard costs are based on the amount of each direct manufacturing input **allowed** for the amount produced, at the standard perunit cost **allowed** for each input.

All costs are applied to production on the basis of the amounts **allowed** for the actual production in standard costing: direct manufacturing inputs (direct materials and direct labor) as well as manufacturing overhead.

An accounting problem arises because:

- The **actual** costs per unit for the inputs used are usually not exactly the same as the standard costs per unit of input, and
- The **number of units of inputs actually used** is usually not exactly the same as the standard number allowed.

In a standard cost system, differences between actual costs and standard costs for direct materials and direct labor are accounted for using **variance accounts** in the general ledger. The differences are accumulated in the variance accounts throughout the reporting period, and at the end of the period, they are transferred out in the closing entries.

Accounting for Direct Materials

Raw materials are debited to the Raw Materials Inventory account when they are purchased. In a standard cost system, the amount debited to the Raw Materials Inventory account depends upon whether price variances are recognized 1) at the time of purchase or 2) at the time when the materials are used in production.

1) Materials Price Variances Recognized When Materials Are Purchased

If the materials price variances are recognized as soon as the materials are purchased (in other words, if the Materials Purchase Price Variance is being used as the Materials Price Variance), the amount debited to the Raw Materials Inventory account will be the extended **standard cost** of the purchased materials, regardless of whether or not that was the actual cost at which the company purchased the materials.

For example, if the standard cost for Material A is \$0.55 per unit but the actual price when 10,000 units of Material A are purchased is \$0.60 per unit, when those materials are received Raw Materials Inventory will be debited for $0.55 \times 10,000$, or 5,500 because that is the standard cost for 10,000 units. The total due to the vendor is $0.60 \times 10,000$, or 6,000. The difference, 500, will be debited to the Materials Price Variance account, and it will remain there until it is resolved at the end of the period in the closing entries.

Dr	Raw	Materials Inventory 5,500	\$0.55 × 10,000
Dr	Mate	rials Price Variance 500	(\$0.60 - \$0.55) × 10,000
	Cr	Accounts Payable6,000	\$0.60 × 10,000

After the preceding journal entry is recorded, the balance in the Raw Materials Inventory account includes the 10,000 units of Material A at its **standard** cost of \$0.55 per unit.

As production takes place and the materials are put into production, the **standard cost** of the raw materials **allowed** for the actual production is moved from Raw Materials Inventory to the Work-In-Process Inventory account by debiting WIP Inventory and crediting Raw Materials Inventory. The debit to WIP Inventory is for the standard cost per unit **for the amount of materials allowed** for the actual number of units produced. However, the amount of raw materials actually **used** to produce those units will probably be either greater than or less than the standard amount allowed for the number of units produced. The credit to the Raw Materials Inventory account will be for the number of units of raw materials **actually used** at the standard cost per unit.

The difference in cost due to the difference between the amount used and the amount allowed is a materials usage variance. The Materials Usage Variance account will be debited (if the amount used is greater than the amount allowed) or credited (if the amount used is less than the amount allowed) for the difference, at the **standard** cost per unit.

For this example, 4,000 units of product are produced, and each unit is allowed two units of Material A. Thus, 8,000 units of Material A at its standard cost of \$0.55 per unit were allowed for the 4,000 units of product actually produced. The cost of the raw materials in Raw Materials Inventory is \$0.55 per unit. Recall that the \$0.05 per unit price variance was debited to the Materials Price Variance account when the materials were received.

The company actually uses 8,500 units of Material A to produce 4,000 units of product. The WIP Inventory account will be debited for only 8,000 units of materials (the standard amount allowed for 4,000 units) at \$0.55 per unit (the standard cost allowed per unit), so the debit to WIP Inventory will be for \$4,400 (8,000 \times \$0.55). The credit to Raw Materials Inventory, though, will be for 8,500 units of Material A at the standard cost of \$0.55 per unit, or \$4,675. The difference, or \$275, will be debited to the Materials Usage Variance account.

Dr	Work	-In-Process Inventory 4,400	\$0.55 × 8,000
Dr	Mater	ials Usage Variance 275	\$0.55 × 500
	Cr	Raw Materials Inventory 4,675	\$0.55 × 8,500

Thus, the company will end up with the following net changes in its trial balance related to Material A:

Raw Materials Inventory	5
Materials Price Variance 500) (\$0.60 - \$0.55) × 10,000
Work-In-Process Inventory 4,400) \$0.55 × 8,000
Materials Usage Variance 27!	5 (8,500 – 8,000) × \$0.55
Accounts Payable (if vendor is still unpaid)	6,000 \$0.60 × 10,000

2) Materials Price Variances Recognized When Materials Are Used in Production

If the materials price variances are recognized when the materials are put into production instead of when they are purchased, Raw Materials Inventory will be debited and Accounts Payable will be credited for 6,000 when the materials are received (their actual cost of $0.60 \times 10,000$ units).

Dr	Raw	Materials Inventory 6,00	0	\$0.60 × 10,000
	Cr	Accounts Payable	6,000	\$0.60 × 10,000

As production takes place, the amount of raw materials used in production is accounted for. The **standard cost** per unit for the amount of materials **allowed** for the actual number of units produced is moved from the Raw Materials Inventory account to Work-In-Process Inventory by debiting WIP and crediting Raw Materials Inventory.

When Material A is used to produce 4,000 units, WIP Inventory will be debited for $0.55 \times 8,000$, or 4,400, the standard amount allowed for 4,000 units at the standard per-unit cost of 0.55. However,

the actual usage of Material A was 8,500 units, and the actual cost of Material A was \$0.60 per unit. Thus, Raw Materials Inventory will be credited for 8,500 units of Material A at \$0.60, or \$5,100, since the full cost of Material A was debited to Raw Materials Inventory when it was received. The difference, \$700, is partly a materials price variance and partly a materials usage variance. The price variance is \$0.05 \times 8,500, or \$425. The usage variance is \$0.55 \times 500, or \$275. Therefore, the Materials Price Variance account is debited for \$425, and the Materials Usage Variance account is debited for \$275.

Dr	Worl	k-In-Process Inventory 4,400	\$0.55 × 8,000
Dr	Materials Price Variance		(\$0.60 – \$0.55) × 8,500
Dr	Materials Usage Variance 275		\$0.55 × 500
	Cr	Raw Materials Inventory 5,100	\$0.60 × 8,500

The company will end up with the following net changes in its trial balance related to Material A:

Raw Materials Inventory900	\$6,000 – \$5,100, or \$0.60 × 1,500 units
Materials Price Variance 425	(\$0.60 – \$0.55) × 8,500
Work-In-Process Inventory 4,400	\$0.55 × 8,000
Materials Usage Variance	(8,500 – 8,000) × \$0.55
Accounts Payable (if vendor is still unpaid)) \$0.60 × 10,000

Because the materials price variance is not being recognized until the materials are put into production, the materials price variance for the remaining, unused 1,500 units of Material A ($$0.05 \times 1,500$ units, or \$75) remains in the Raw Materials Inventory account instead of being in the Materials Price Variance account, as it was in the preceding example. When those remaining 1,500 units of Material A are used in production, the price variance will be recognized at that time along with any usage variance.

Accounting for Direct Labor

Direct labor is accounted for similarly to direct materials, with one difference: direct labor cannot be inventoried, so no accounting system has an inventory account specifically for direct labor costs (as for raw materials), and direct labor is accounted for as it is used. Since direct labor cannot be inventoried, differences between the actual hourly rate (price) paid and the standard hourly rate (price) can be accounted for in only one way. The variances are accounted for when the direct labor is used.

A company may use a payroll clearing account for the initial debits for salaries and wages earned, with the credits going to accrued payroll. The amount for direct labor used is then moved out of the payroll clearing account to where it belongs. Work-In-Process Inventory is debited for the **standard** direct labor cost allowed for the actual amount produced, calculated as the standard wage rate \times the standard number of direct labor hours allowed for the actual production. However, the **actual** cost of the direct labor used is credited to the payroll clearing account.

The difference between the actual cost incurred and the standard cost allowed is the total variance, and it is broken down between the Direct Labor Rate Variance and the Direct Labor Usage Variance. Those variances are accumulated in their respective variance accounts.

Of course, the preceding explanation is extremely simplified because it does not include deductions from employees' paychecks for taxes and other things such as employees' contributions to their employee benefits, nor does it include the employer's cost for payroll taxes.

Resolving the Direct Input Variances

At the end of the period, the variances in the variance accounts are closed out with adjusting entries that either transfer the full amounts of the variances to Cost of Goods Sold or that distribute the variances among the various relevant accounts as described in the following paragraphs.

Variances in the cost of materials caused by price variances and usage variances may be 100% debited or credited to Cost of Goods Sold, if the variances are immaterial (small) in relation to the total cost. If the variances are significant in relation to the total cost, they should be pro-rated among Materials Inventory, Work-in-Process Inventory, Finished Goods Inventory and Cost of Goods Sold on the basis of the amount of cost included in each account **applicable to production during the current period**, not on the basis of the balances in the inventories and cost of goods sold accounts at the end of the period.

Variances in the cost of direct labor caused by rate variances or usage variances may be 100% debited or credited to Cost of Goods Sold, if the variances are immaterial in relation to the total cost. If the variances are significant in relation to the total cost, they should be pro-rated among Work-in-Process Inventory, Finished Goods Inventory and Cost of Goods Sold on the basis of the amounts of cost included in each account **applicable to production during the current period**, not on the basis of the balances in the inventories and cost of goods sold accounts at the end of the period.

Note that the pro-ration of direct labor variances does not include Raw Materials Inventory, whereas the distribution of direct materials variances does include Raw Materials Inventory.

Resolving the Overhead Variances

If an **under-applied** amount is immaterial it can simply be debited to COGS in that period. Cost of Goods Sold is debited and the Factory Overhead Control account is credited for the amount of the debit balance in the Factory Overhead Control account to reduce the balance in the Factory Overhead Control account to zero. COGS for the period is increased, and operating income for the period is decreased.

If an **over-applied** amount is immaterial, it can be credited to COGS, reducing COGS and increasing the operating income for the period. The Factory Overhead Control account is debited for the amount of the credit balance in the account to reduce it to zero and Cost of Goods Sold is credited for the same amount.

If the amount of overhead that was over- or under-applied is **material**, it must be distributed among the **WIP Inventory**, **Finished Goods Inventory**, and **Cost of Goods Sold** accounts. The variances are pro-rated according to the amount of overhead included in each that was allocated to the current period's production, **not** according to the ending balances in each.

Note: The pro-ration of under- or over-applied overhead should be done on the basis of the overhead allocated to production during the current period only, not on the basis of the balances in the inventories and cost of goods sold accounts at year end. Information on the amount of overhead allocated to production during the current year should be available in the accounting system.

An under-applied amount will be debited to the inventories and cost of goods sold accounts while an over-applied amount will be credited to those accounts. The opposing credit or debit to the Factory Overhead Control account will bring the balance in that account to zero as of the end of the period.

Whenever the variances (under-applied or over-applied amounts) are allocated proportionately among inventories and cost of goods sold on the basis of the costs applied during the period, the cost per unit for those costs will be the same as if the actual costs per unit instead of the budgeted costs per unit had been allocated to production during the year.

Reviewing and Revising the Standard Costs Used

According to ASC 330-10-30-12, "Standard costs are acceptable if adjusted at reasonable intervals to reflect current conditions so that at the balance-sheet date the standard costs reasonably approximate costs computed under one of the recognized bases." Thus, the standard costs should be reviewed regularly and, if the variances between actual costs and the standard costs are too great, the standards should be revised to minimize the size of future variances.