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Manufacturing Accounts*

By G. H. NEWLOVE

NATURE AND FUNCTION OF COST ACCOUNTING

Cost accounting is that specialized application of the principles of accounting that results in the collection of the data to determine the cost of producing a unit of production in a factory. It is possible to obtain from the general books certain ideas as to the manufacturing costs, but it is quite impossible to obtain from the general accounts the cost of a particular unit of product in case more than one kind of article is turned out.

Cost finding, the method used in determining in advance what the cost of an article should be under existing conditions, must not be confused with cost accounting, the method of determining costs while the article is being produced.

The purposes of cost accounting are: (a) to determine the cost or the profit on each unit of product, (b) to determine the profitable lines for manufacture, (c) to secure accurate and perpetual inventories and (d) to secure information necessary to lay down wise managerial policies.

COMPONENTS OF COST DATA

The ordinary manufacturing concern naturally divides itself into three parts: a fabricating section, an administrative section and a selling section. Each of these sections has its own charges to contribute to the final cost of the product placed in the hands of the purchaser. The fabricating section, however, has three kinds of charges quite different in nature, namely, material, direct labor and overhead. Upon the addition of each of these various classes of expenses to the value charged against the product, a new kind of cost is secured, as shown in the following chart:

Material	Direct labor	Fac. overh'd	Selling exp.	General exp.
.....Prime cost.....				
.....Factory cost.....				
.....Selling cost.....				
.....Total cost.....				

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The outlays with which cost accounting is concerned include the charges necessary to put the product through the factory. The analysis of factory expenses demands an understanding of the terms "direct" and "indirect" as applied to labor. The cost of direct or productive labor is the charge for services rendered directly at the tool-point in the fabricating process. The cost of indirect labor is the outlay necessary to the conduct of plant, but is not directly chargeable to certain specific units of product, as the salaries of foremen, of timekeepers and of repairmen.

The usually accepted cost of raw materials is the invoice price plus in-freight. This cost, added to the cost of direct labor, makes up the prime cost. Manufacturing expense, or factory overhead, includes such charges as taxes, insurance, maintenance and depreciation of factory buildings and machinery, power, heat, light, superintendence and other indirect labor and miscellaneous supplies.

RELATION OF COST TO GENERAL ACCOUNTING

General accounting is the record of facts involving the economic relationship of the manufacturer to the world at large, while cost accounting is the record of facts involving the internal relationship of the various cost elements and production departments. General accounting is fiscal in its nature, while cost accounting is statistical.

Cost accounting is not a system per se to be set aside and distinguished, as we distinguish single-entry and double-entry as bookkeeping systems; it is rather the application of double-entry principles for the purpose of determining unit cost in manufacturing.

Manufacturing accounts are controlled by certain accounts in the financial books. This control may be accomplished by either of two general methods. Under the first, one account, termed "factory ledger," is used in the general ledger. This account is debited with all charges against manufacturing operation and credited with all products coming from the factory. A similar account in the factory ledger is used, bearing the name "general ledger," the entries to which are contra to those in the factory ledger account in the general books. The second method is to carry in the general ledger several accounts by means of which the cost accounts are controlled. Such general ledger accounts

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would be "productive labor," "raw materials," "factory expense," "goods in process" and "cost of sales."

Wherever practicable, the factories are divided into departments, and departmental accounts are set up. The advantage of having separate departmental accounts for rent, depreciation, power, etc., can readily be seen from the fact that one department may have little machinery and a large amount of floor space, while another department may have very little floor space and very costly machinery.

COMPARISON OF COST AND NON-COST SYSTEMS

In order to illustrate the difference in the operation of the accounts under cost and non-cost systems, journal entries covering the various classes of transactions under the two systems will be tabulated and posted to the accounts given in a starting balance-sheet, which is the same under both systems, and then trial balances and financial statements will be drawn up for the accounts under each system.

JOHN KAY MANUFACTURING COMPANY

INITIAL BALANCE-SHEET

<i>Assets</i>		<i>Liabilities and capital</i>	
Cash	\$ 3,000.00	Accounts payable.....	\$ 4,000.00
Accounts receivable.....	2,000.00	Bonds payable.....	30,000.00
Raw materials.....	6,000.00	Capital stock.....	50,000.00
Finished goods.....	7,000.00	Surplus	12,000.00
Goods in process.....	3,000.00		
Plant and equipment.....	75,000.00		
	\$96,000.00		\$96,000.00

JOURNAL ENTRIES

Under non-cost system		Under cost system	
When purchases of raw materials are made:			
Raw materials.....	\$50,000	Raw materials.....	\$50,000
Accounts payable.....	\$50,000	Accounts payable.....	\$50,000
When raw materials are requisitioned:			
(No entry)		Goods in process....	\$45,000
		Raw materials....	\$45,000
When productive labor is paid:			
Productive labor....	\$30,000	Goods in process...	\$30,000
Cash	\$30,000	Cash	\$30,000
When factory expense is incurred:			
Factory expense....	\$10,000	Factory expense...	\$10,000
Cash	\$10,000	Cash	\$10,000
When factory expense is prorated over jobs:			
(Not done)		Goods in process...	\$10,000
		Factory expense.....	\$10,000

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Under non-cost system	Under cost system
When operating expenses are incurred:	
Salesmen's salaries. \$2,500	Salesmen's salaries. \$2,500
Advertising 1,000	Advertising 1,000
Office expense..... 3,000	Office expense..... 3,000
Legal expense..... 500	Legal expense..... 500
Cash \$7,000	Cash \$7,000
When non-operating expenses are incurred:	
Interest expense... \$2,000	Interest expense... \$2,000
Cash \$2,000	Cash \$2,000
When work in process is completed:	
(No entry)	Finished goods.... \$80,000
	Goods in process.. \$80,000
When sales are made:	
Accounts receivable.\$125,000	Accounts receivable.\$125,000
Sales \$125,000	Sales \$125,000
When non-operating profits are made:	
Cash \$1,000	Cash \$1,000
Interest earned.. \$1,000	Interest earned.. \$1,000
When creditors are paid:	
Accounts payable.. \$45,000	Accounts payable.. \$45,000
Discount on purchases \$2,000	Discount on purchases \$2,000
Cash 43,000	Cash 43,000
When customers settle their accounts:	
Cash\$105,000	Cash\$105,000
Acc'ts receivable. \$105,000	Acc'ts receivable. \$105,000
When cost of sales for period is determined:	
(No entry)	Cost of sales..... \$75,000
	Finished goods... \$75,000

TRIAL BALANCES			
	Non-cost		Cost
Cash	\$ 17,000.00		\$ 17,000.00
Accounts receivable...	22,000.00		22,000.00
Raw materials.....	56,000.00		11,000.00
Goods in process.....	3,000.00		8,000.00
Finished goods.....	7,000.00		12,000.00
Plant and equipment..	75,000.00		75,000.00
Productive labor.....	30,000.00		nil
Factory expense.....	10,000.00		nil
Cost of sales.....	nil		75,000.00
Salesmen's salaries...	2,500.00		2,500.00
Advertising	1,000.00		1,000.00
Office expense.....	3,000.00		3,000.00
Legal expense.....	500.00		500.00
Interest expense.....	2,000.00		2,000.00
Accounts payable.....		\$ 9,000.00	\$ 9,000.00
Bonds payable.....		30,000.00	30,000.00
Capital stock.....		50,000.00	50,000.00
Surplus		12,000.00	12,000.00
Sales		125,000.00	125,000.00
Interest earned.....		1,000.00	1,000.00
Discount on purchases		2,000.00	2,000.00
	\$229,000.00	\$229,000.00	\$229,000.00

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From the above it can be seen that the non-cost trial balance can be turned into the cost system trial balance by the following journal entry:

Goods in process.....	\$ 5,000.00	
Finished goods.....	5,000.00	
Cost of sales.....	75,000.00	
Raw materials.....		\$45,000.00
Productive labor.....		30,000.00
Factory expense.....		10,000.00

The above credit items, totaling \$85,000, represent the total manufacturing cost charged to goods in process. Of this, \$80,000 represents the production costs of goods in process completed during the period and transferred to the finished goods account, and the remaining \$5,000 represents the amount added to the inventory of the goods in process. Of the \$80,000 charged to the finished goods account, \$75,000 represents the production cost of the goods sold that was transferred from the finished goods account to the cost of sales account, and the remainder represents the amount added to the finished goods inventory.

Before a financial statement can be made from the non-cost trial balance, the inventories must be ascertained. The inventories are: raw materials \$11,000, goods in process \$8,000, and finished goods \$12,000. It will be noted that these inventories are the balances of the respective accounts in the cost system trial balance.

The balance-sheet is the same for both systems of accounting, so the following statement is the balance-sheet that would be obtained from both trial balances:

JOHN KAY MANUFACTURING COMPANY

FINAL BALANCE-SHEET

<i>Assets</i>		<i>Liabilities and capital</i>	
Cash	\$ 17,000.00	Accounts payable.....	\$ 9,000.00
Accounts receivable.....	22,000.00	Bonds payable.....	30,000.00
Raw materials.....	11,000.00	Capital stock.....	50,000.00
Goods in process.....	8,000.00	Surplus	56,000.00
Finished goods.....	12,000.00		
Plant and equipment....	75,000.00		
	\$145,000.00		\$145,000.00

As cost accounting is merely an addition to financial accounting, which by internal adjustments shows the cost of the goods manufactured, the following profit and loss statements show that the statements obtained from the cost and non-cost trial bal-

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ances are identical, after the gross profit on sales has been obtained.

KINDS OF COST SYSTEMS

The particular cost system established, the method of control and the accounts used must depend upon the type of business. The collection of costs is dependent upon the manner in which articles proceed through the processes of manufacture. Where a practically steady flow of material is put into operation and goes uninterruptedly through the plant to turn out a uniform product, one lot of material following another without relation to a particular order or article, the "product system" of calculating costs is used; and where unlike orders are put through the plant, each having its own special list of material and method of processing, costs are collected upon each order or job, under the "special order system."

There are also two general methods of applying costs over the product, known as the "productive labor method" and the "process method." Under the first named, the costs of labor (figured by hours or by wages) and of material are charged against the product or order direct, and to this total is added a pro rata share of the indirect expenses, determined by the amount or the time of the productive labor used to produce that product or order, the grand total being manufacturing cost. Under the "process method," all charges are made against the various processes or operations, and the total cost so ascertained is then distributed over the product on a convenient basis, weight, number or measure, according to the nature of the product.

A specialized form of the "process method" of distributing expenses, applicable where the greater part of the processing is done by machines, is called the "machine cost method." All indirect expenses having been calculated for a given period, each element of the total is charged against various machines or groups of machines, according to the floor space or some other equitable basis, so that the grand total of manufacturing expense for the period is charged to all the machines in the plant. Then, as a machine or group of machines is used to work upon product, the machine is credited at a predetermined rate with the work done. Thus the product is charged with a certain amount which represents practically all indirect charges of a certain operation, the factory being credited at the same time through the machine for

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PROFIT AND LOSS STATEMENT (DATE)

	Under non-cost system \$125,000.00	Under cost system \$125,000.00
Sales		
Cost of sales:		
Raw materials:		
Initial inventory and purchases.....	\$56,000.00	
Final inventory.....	<u>11,000.00</u>	
Productive labor.....	30,000.00	
Factory expense.....	<u>10,000.00</u>	
	\$85,000.00	
Goods in process:		
Final inventory.....	\$ 8,000.00	
Initial inventory.....	<u>3,000.00</u>	
	\$80,000.00	
Finished goods:		
Final inventory.....	\$12,000.00	
Initial inventory.....	<u>7,000.00</u>	
	5,000.00	75,000.00
Gross profit on sales.....	<u>50,000.00</u>	<u>\$50,000.00</u>
Operating expenses:		
Selling expenses:		
Salesmen's salaries.....	\$ 2,500.00	\$2,500.00
Advertising	<u>1,000.00</u>	<u>1,000.00</u>
	\$ 3,500.00	\$3,500.00
General expenses:		
Office expenses.....	\$ 3,000.00	\$3,000.00
Legal expense.....	<u>500.00</u>	<u>500.00</u>
	3,500.00	3,500.00
Net profit on sales.....	<u>7,000.00</u>	<u>7,000.00</u>
Non-operating items:		
Income:		
Discount on purchases.....	\$ 2,000.00	\$2,000.00
Interest earned.....	<u>1,000.00</u>	<u>1,000.00</u>
Expense:		
Interest expense.....	2,000.00	2,000.00
Net profit for period.....	<u>\$44,000.00</u>	<u>\$44,000.00</u>
Appropriation of profits: surplus.....	<u>44,000.00</u>	<u>44,000.00</u>

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a like amount. If at the end of a given period all machine charges have been balanced by credits representing work done upon product, the entire indirect expenses have been absorbed by product. Any amount remaining represents charges incurred, which must be spread over product in some other way. Usually the unit of measurement taken is the "machine hour"; that is, the total charge against a machine is divided by the number of hours of running time of the factory over the period considered. Product is then charged and the machine credited with the machine's hourly burden rate multiplied by the number of hours the machine works. If the machine fails to run full time it will have a debit standing against it at the end of the period. This debit is due principally to idle time, and is ordinarily absorbed by a "supplementary rate" added to the product sufficient in size to cover the deficiency.

Combinations of the two systems of collecting costs and the two methods of distributing them produce the four general types of cost accounting systems: (a) special order system, distributing indirect expense by the productive labor method; (b) special order system, distributing by the process or machine cost method; (c) product system, distributing by the productive labor method; (d) product system, distributing by the process or machine cost method.

One or other of these types can be used in any factory. The choice between the special order and the product systems depends on the nature of the product, uniformity being required for successful operation of the product system. The method of distributing factory burden should be chosen according to the importance of labor and machinery in production. Factories where labor is the predominating element should use the direct labor method as the basis of prorating burden, while those where expensive and complicated machinery predominates should use the process or machine cost method.

CONTROL OF MATERIAL

When material is received, checked and delivered into storage, record of the transaction is made both in the financial books and the cost records. In the financial books, the entry is usually made in the voucher register, debiting raw materials and crediting vouchers payable. In the cost records, the individual items are

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entered in a stores ledger, wherein an account is kept with each item of stock. The stores ledger thus carries the particulars of the materials carried in the general ledger.

The effect of the issue of materials from the store room to be put into production is a debit to the goods in process account and a credit to the materials account. It is customary for this entry to be made through a "transfer outward" journal. If any of the material so issued is later returned to stock, a reverse entry is used to cover the transaction.

The charge for materials which is to be entered against a specified unit of product is obtained by the use of a lot number or job number. The requisition ticket, bill of material or other paper, which authorizes the removal of material from store rooms, contains a space in which is placed the number against which it is to be charged. The various amounts chargeable against a certain job are later assembled on a cost sheet or in a cost journal.

The individual records of raw materials show the balances which should be on hand. The balance of the raw material account shows the money value of these materials, which the stores records usually carry both by number and value. The stores records should be compared with physical counts made independently of the materials records. In this way there are three sources from which a careful scrutiny of materials may be made, viz., the control account in the financial books, the stores ledger accounts and the physical inventory.

CONTROL OF LABOR COSTS

The purposes served by a proper accounting for labor are three: (a) the measuring of the relative efficiency of labor as to production value; (b) the discovery of means of increasing production and lowering costs; and (c) the determination of a basis for distributing overhead expenses.

The charges for labor are secured originally from a time card or time-ticket which shows the operator, the operation, the time worked and the job or lot to which the cost is chargeable, also whether the labor is to be classed as direct or indirect.

WAGE SYSTEMS

The more commonly employed plans of paying wages are as follows:

- (a) Day rate.—A flat rate per day regardless of output.

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- (b) Piece work.—A flat rate per unit of output.
- (c) Differential rate.—A rate per unit of output, which increases when output is increased.
- (e) Premium plan.—A flat rate per hour plus extra pay for time saved; the time saved equals difference between standardized and actual time.
- (f) Bonus plan.—A rate per hour which increases when output is increased.
- (g) Stint plan.—A flat day rate, with privilege of going home when the assigned day's work is completed.

The above mentioned plans contain the main points of divergence, but there are a large number of combinations of systems. For instance, Santa Fe efficiency plan has a standardized output which is regarded as 100 per cent efficiency, all other outputs being scaled as percentages of efficiency. The workmen are paid by the hour, the hourly rate consisting of a guaranteed flat amount plus an additional amount which varies according to the efficiency of the workmen. Thus the Santa Fe plan combines the day rate plan and a rather complicated bonus plan.

CONTROL OF MANUFACTURING EXPENSES

As it is not practicable to ascertain the exact amount of the manufacturing expenses that have occurred during the time a given job or order is in process, some sort of estimate is made to cover the job. Distribution of expenses over product may be made upon any number of the following bases: (a) cost of productive labor, (b) cost of direct materials, (c) prime cost, (d) hours of labor spent, (e) units of product and (f) machine hours. The use of each of these methods is indicated in the following table:

	Last year factory	This year job No. 6	— Cost of job under various methods of pro-rating burden —					
			Labor cost	Material cost	Prime cost	Labor hours	Units of product	Machine hours
Material cost.	\$10,000	\$1.00	\$1.00	\$1.00	\$1.00	\$1.00	\$1.00	\$1.00
Labor cost..	16,000	1.60	1.60	1.60	1.60	1.60	1.60	1.60
Burden cost.	14,000	(?)	1.40 ^a	1.40 ^b	1.40 ^c	1.50 ^d	1.40 ^e	1.32 ^f
Labor hours..	56,000	6						
Mach. hours..	42,000	4						
Pieces made..	10,000	1						
			\$4.00	\$4.00	\$4.00	\$4.10	\$4.00	\$3.92
<i>a</i>	(14,000 ÷ 16,000) × \$1.60.			<i>d</i> (\$16,000 ÷ 56,000) × 6.				
<i>b</i>	(14,000 ÷ 10,000) × \$1.00.			<i>e</i> (\$14,000 ÷ 10,000) × 1.				
<i>c</i>	(14,000 ÷ 28,000) × \$2.80.			<i>f</i> (\$14,000 ÷ 42,000) × 4.				

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When the estimates of indirect expenses are made at the beginning of the period, the estimated total is debited to the "manufacturing expense in goods in process" account and credited to the factory expense account (the account used to collect all such outlays). When the burden is prorated to the product the goods in process account is debited and the "manufacturing expense in goods in process" account credited. When these entries are made, failure of the factory expense account to balance at the end of the period will indicate an under or over distribution of the manufacturing expenses of the factory. A balance in the "manufacturing expense in goods in process" account shows that certain manufacturing expenses have been charged or are yet to be charged on the cost cards of the unfinished orders, jobs or contracts at the close of the period.