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Elements of Cost Accounting

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The Elements of Cost Accounting

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In presenting the subject of cost accounting to a class of students it is desirable to reduce it to the simplest possible form, and it is quite astonishing how concisely the general principles can be stated. The statement that cost accounting is merely the extension of the well-known principles of double-entry bookkeeping to the recording of factory transactions serves to remove much of the difficulty for one who already has a fair knowledge of accounts. All systems of accounting are "cost systems" in the sense that they attempt to record the cost of doing business under headings suitable for the particular class of enterprise. To record manufacturing costs means merely to open appropriate accounts for each branch of activities in the factory.

The first requisite in laying out a cost system is to divide the factory into producing departments, and to provide accounts to record the expense of operating each of these departments. Every item of expense must be allocated finally to one or other of these producing departments. Certain expenses are incurred which cannot be applied at once to any particular department, and for such items intermediate accounts termed "service accounts" may be kept, the total of such expenses being later distributed over the producing departments in proportion to the service rendered. Thus, all expenses entering into the generation of power should be gathered together into one account, and at the end of the month or other fiscal period the entire power expense distributed on the basis of the horse-power consumed in each department. In a similar manner, other services such as heating, lighting, factory

transport, etc. may be provided for. Expenses applying generally to the entire factory, such as general superintendent, watchmen, etc. should be gathered into one general factory expense account, which must then be prorated over the operating departments on a more or less arbitrary basis, such as the relative number of men employed.

In general, therefore, the expense accounts may be divided into "service accounts" and "department operating accounts," the object being to get all expense classified eventually under the latter heading, the former being used as a convenient intermediate step.

Accounts must also be kept to record the stocks of materials on hand, including raw materials, goods in progress, finished goods, supplies, etc. For bulk commodities such as pig iron, steel, scrap, coal and coke, etc., it is usually practicable to keep individual accounts on the general ledger, in both quantity and value. For other commodities, controlling accounts on the general ledger, with underlying details in the stock records, are usually more convenient. The underlying details need be kept in quantities only, the unit cost of each lot received being noted, and all outgoing goods being priced at these unit costs. The balances drawn off periodically, and priced at the unit costs, will then agree in total with the controlling accounts, subject only to minor differences due to dropping of fractions when making extensions.

Where several successive lots at different costs are received, care must be taken to price the outgoing materials at the oldest cost until the quantity at that cost is exhausted, when the next cost is used, and so on.

When the factory cost accounting assumes large proportions, it is desirable to keep all such records in a separate set of books, which may then be controlled by one account on the general ledger of the company.

The method of allocating the costs to the products themselves will necessarily vary with the conditions of manufacture and production, but there are only three basic systems, viz.:

- I. Predetermined estimates.
- II. Process costs.
- III. Order costs.

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Under the first system, estimates are prepared in advance for every article manufactured. The articles produced are then valued at these estimated costs, the total value so determined being compared with the actual expenses of operation. The degree of accuracy with which the estimates have been prepared may then be judged as a whole by the extent to which the total estimated cost of all goods manufactured during the period varies from the total actual cost of operating the factory during the same period.

Under the process cost system, the entire production operations are divided into stages or processes. The cost of each process is then apportioned over the product secured from that process, and the unit cost thus determined.

Under the order costs system, each lot of goods manufactured is given an order number, the materials and labor employed directly on each lot being charged to the order, and the proportionate part of the indirect operating expenses of each department through which the order passes being added thereto as a burden or overhead charge.

Any kind of manufacture or production can be accurately recorded under one or other of these three systems. The "machine hour system," "department hour system," "percentage on labor system," etc., are not to be classed as systems at all; they are merely different methods of distributing the burden or indirect operating expenses over the orders passing through an operating department. The proper method in each case must of course be selected and determined with care, but treating these as basic systems of costs has a tendency to complicate the subject and render it extremely confusing to the student.

In any particular plant or factory it is usually necessary to employ more than one of the basic systems mentioned—that is to say, for one stage of the manufacture one system is appropriate, while for the next stage a different system is necessary. Thus, in a foundry and machine shop, the castings produced might be sufficiently similar in design to warrant the use of the process costs system and determining the cost per pound of castings, while the cost of machining these castings would have to be determined separately for each lot, thus necessitating the use of the order costs system.

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To show how concisely the various accounting steps required under each system may be exhibited, and at the same time to illustrate the essential double-entry nature of the factory accounts, each of the three systems in turn is set out below in the form of a limited number of journal entries. These entries may be considered as classes of entries, for, while the entries made each month are much greater in number, they can be divided into a relatively few classes.

PREDETERMINED ESTIMATES

This system is not to be commended in any case where either of the other two systems can be applied. In many instances it is, however, the only practicable plan, owing to the minuteness or intricacy of the operations, or because of the great variety of articles manufactured which vary but slightly from each other, or for some other reason. In many cases where piece-work rates are in force, the cost of each individual operation can be very closely estimated, and it remains only to prove that no element of cost has been omitted and that the estimated cost in total is approximately correct.

To compare the total estimated cost of all the product with the total actual cost of operations is hardly sufficient, as this does not reveal in what element of the costs the variations occur. It is therefore necessary to prepare the estimated costs with convenient subdivisions, and to keep a corresponding operating account on the books for each subdivision. Thus the divisions might be material, labor and overhead; or the subdivisions might be by departments, as for instance—in the manufacture of shoes—upper leather, sole leather, findings, cutting, lasting, finishing, packing, etc. Whatever the subdivisions in the estimates, exactly corresponding accounts must be kept on the books, and it is essential that each particular item of expense be treated in the same way in both places.

The processes of the system are then as follows, assuming

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that the subdivisions are by departments as mentioned above in the case of shoe manufacturing:

- | | | | |
|------|---|----------|--|
| I. | Inventories of raw materials.. | \$ | |
| | Inventories of supplies..... | ..... |  |
| | Sundry service accounts..... | ..... |  |
| | Sundry operating departments | ..... |  |
| | To audited vouchers..... | \$ | |
| | To record the purchase of raw materials and supplies and to take up on the books the liabilities for all expenses incurred during the month. | | |
| | NOTE:—It is understood that expenses covering several months, such as taxes, insurance, etc., will be taken up in monthly instalments as accrued taxes, insurance unexpired, etc. | | |
| II. | Sundry service accounts..... | \$ | |
| | Sundry operating departments | ..... |  |
| | To inventories of supplies.. | \$ | |
| | To record the value of all supplies taken from stores during the month. | | |
| III. | Materials consumed, subdivision | \$ | |
| | Materials consumed, subdivision ..... | ..... |  |
| | To inventories of raw materials | \$ | |
| | To record the value of all raw materials taken from stores during the month, charged to the accounts representing the subdivisions of the estimated costs. | | |

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IV.	Sundry service accounts.....	\$	
	Sundry operating departments		
	To accrued wages.....		\$
	To distribute to the various expense accounts and operat- ing departments the pay-rolls for the month.		
V.	Sundry operating departments.	\$	
	To sundry service accounts.		\$
	To charge each operating department with its due pro- portion of each service account such as power, heat, general factory expenses, etc.		
VI.	Inventories of finished goods.	\$	
	To materials consumed:		
	Subdivision		\$
	Subdivision .....		.....
	Sundry operating depart- ments .....		.....
	To transfer to inventory ac- count the estimated cost of all goods produced and placed in stores during the month, priced at the predetermined estimated costs, separately for each sub- division of such estimate.		

At this point, assuming the estimated costs to have been exact, the balances in the various accounts would represent:

- Inventories of raw materials;
- Inventories of supplies;
- Stocks on hand; to be verified periodically by physical inventories.

- Sundry service accounts;
- These will have no balances, having been distributed to the operating departments in each fiscal period, unless for some special reason it is considered proper to defer a portion of the expenses to a future period.

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Materials consumed, (by subdivisions);

The value of all materials still in process of manufacture; to be verified by physical inventory of goods in process.

Sundry operating departments;

The expenditure incurred in each department on goods still in process of manufacture; to be verified by physical inventory of goods in process.

Now assume that a physical inventory is taken of the goods remaining in process, and that this inventory is priced in strict accordance with the predetermined estimates and with due regard to the stage of completion which each article happens to have reached. To secure an accurate inventory of this kind is admittedly difficult, and is in practice taken at that period of the year when goods in process are at their lowest. In some industries there is a well defined season, at the end of which there is practically nothing in process. The entry to cover such inventory would be:

VII. Inventories of goods in process	\$	.....
To material consumed:		
Subdivision .....	\$	.....
Subdivision .....		.....
Sundry operating departments .....		.....
To record the estimated value of the goods remaining in process.		

The balances now remaining in the accounts for material consumed and the operating departments will measure the extent to which the actual costs vary (in the aggregate) from the estimated costs, separately for each subdivision of the estimates. The error on any particular article cannot be determined, but the information gained in this way can be used to revise the estimated costs intelligently. The differences must be written off on the books to profit and loss account as an additional cost of the goods already sold.

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The goods shipped are, of course, charged to accounts receivable and credited to a "sales account" at their selling value, and at the same time a corresponding entry for the cost of the goods sold is made on the books as follows, the information being obtained by extending each sales-invoice at cost as well as at selling price:

VIII. Cost of goods sold.....	\$
To inventories of finished goods	\$
To record the cost of all goods shipped during the month.	

The inventory of finished goods account must be verified from time to time. The difference between the "sales account" and the "cost of goods sold account" represents the gross profit on operations, from which the selling and administration expenses are deducted when preparing the monthly profit and loss statements.

PROCESS COSTS

This system is applicable to all cases where bulk commodities are produced, such as mining and smelting, manufacture of brick, brewing, etc. In such operations the processes are continuous, and one batch of product cannot be distinguished from another. It is nearly always possible to divide the operations into well defined processes, the cost of each process being accumulated in an appropriate account. The total cost of each process may then be applied to the product obtained in the corresponding period. Sometimes the entire product of one process is transferred to the next process without any intermediate storage, while in other cases the partly completed commodities are stored for some time, and when again placed in process may take entirely different routes. Take, for instance, the process of brewing. The first stage is the production of malt from barley, which is then stored until needed for the brewing operation. After brewing, the beer is stored for some time, after which a part is put in kegs and shipped, while the remainder passes through the bottling process before being sold. It is therefore convenient in practice to keep

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inventory accounts for the product of each department, and to transfer from the inventory account to the next operation when it is reported used.

It is usual in processes of this nature to obtain a number of by-products, which are either disposed of in the market, or are used later in another stage of the manufacture. These by-products are to be valued, as produced, at the fair market value thereof, allowing for all costs of preparation for sale. The remainder of the cost of manufacture is then applied to what is considered the principal product.

The various steps in such a system of accounting are then as follows:

- I. Inventories of raw materials.. \$
- Inventories of supplies.....
- Sundry service accounts.....
- Sundry operating departments
- To audited vouchers..... \$

To record the purchase of raw materials and supplies, and to take up on the books the liabilities for all expenses incurred during the month.

As previously mentioned under the head of predetermined estimates, expenses covering several months, such as taxes, insurance, etc., will be taken up in monthly instalments, as accrued taxes, insurance unexpired, etc.

- II. Sundry service accounts..... \$
- Sundry operating departments
- To inventories of supplies.. \$
- To record the value of all supplies taken from stores during the month.

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III.	Sundry operating departments	\$
	To inventories of raw materials	\$
	Inventories of by-products.
	Inventories of semi-finished materials .....	.....
	To record the value of raw materials taken from stores during the month and placed in process in the respective departments.	

NOTE:—For the purpose of this entry, there is in reality no distinction between raw materials purchased and the product or by-product of some previous stage of manufacture within the same plant.

IV.	Sundry service accounts.....	\$
	Sundry operating departments .....	.....
	To accrued wages.....	\$
	To distribute to the various expense accounts and operating departments the pay-rolls for the month.	
V.	Sundry operating departments	\$
	To sundry service accounts	\$
	To charge each operating department with its due proportion of each service account, such as power, light, general factory expenses, etc.	

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VI. Inventories of by-products... \$

To sundry operating departments \$

To transfer the value of by-products obtained in each department, priced at the fair market value thereof, allowing for all costs of preparation for sale.

VII. Inventories of semi-finished materials \$

Inventories of finished products

To sundry operating departments \$

To transfer the net cost of operating each department to the account for the respective commodity produced, recording both quantity and value.

NOTE:—There is frequently no distinction between semi-finished and finished products, the form of the entry here given being merely to emphasize the fact that inventory accounts are to be kept for the intermediate stages as well as for the final stage.

When apportioning the cost of a process over the product, difficulty is sometimes encountered because several grades are produced, and the account must then be carefully analyzed. Sometimes only the material used varies with the grade, and the other expenses are the same for all grades. In other cases the expenses may vary with the grade or size, but the variations cannot be determined exactly, as for instance in a rolling mill producing various sizes of bars. It is then necessary to establish a more or less arbitrary distribution. The essential point is that all the expense of the operation must be absorbed by the product.

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The commodities shipped are charged to accounts receivable and credited to "sales account" at their sales value, while at the same time an entry is made for the cost of these goods, as follows :

VIII. Cost of goods sold.....	\$
To inventories of finished product	\$
To record the cost of all goods shipped during the month.	

From the gross profits indicated by the sales account and the cost of goods sold account, there should now be deducted the selling and administration expenses, in order to obtain the net results of operation for the period.

The balances in the various accounts will now be represented by the following :

- Inventories of raw materials
- Inventories of by-products
- Inventories of semi-finished materials
- Inventories of finished product
- Stocks of the various commodities on hand ; to be
 verified by physical inventories.
- Sundry service accounts
- Sundry operating accounts

These accounts will have no balances unless, for some special reason, such as unusually heavy repairs, it is considered advisable to defer a portion of the expenses to a future period.

ORDER COSTS

Whenever the goods are placed in process of manufacture in lots which can be kept separate throughout, it is practicable to record the costs on each different order or lot. Each lot is given an order number, and all labor and material which can be allocated directly to an order is charged to that number, an account being kept on the factory books for each number. As the orders in process at any one time are likely to be very numerous, it is desirable to have one controlling account over all orders, which

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may be called "work in progress" account. The details can be kept in a subsidiary cost ledger, the total of which must be in constant agreement with the controlling account.

The expenses which cannot be allocated directly to orders, *i. e.*, the overhead expenses of the various operating departments through which the orders pass, are covered by making a charge for burden or overhead. The basis of this charge will vary with conditions of manufacture, and the basis should be chosen with care so as to obtain the most equitable distribution of the burden over the various articles. The most usual bases are:

A percentage of the direct labor:

This is a very common method, and has the merit of simplicity. Where wage rates throughout the department are uniform or nearly so, and where the equipment used by each workman is similar, it is a just basis.

A rate per hour of direct labor:

Where wage rates differ this is preferable to the former method. The amount of burden is in general more nearly proportional to the number of men employed, than to the amount of the payroll. This method also assumes that the equipment used throughout the department is the same.

A rate per machine hour:

This method takes into consideration the fact that, in certain departments, the equipment used varies greatly, and that the rate of burden charged to the orders passing through the department should vary correspondingly. This means in effect the subdivision of an operating department into a number of minor departments, a separate rate of burden per hour being obtained for each.

Sometimes the machine hour rate is made to include the labor of the machine operators, so that in such department no direct labor charge would be made to the order.

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The amount charged to orders for burden is, of course, a corresponding credit to the operating department. Obviously the rates cannot be fixed to absorb the expense exactly each month, and it would not be desirable to do so if it were possible. As the volume of work passing through a department varies from month to month, while the expense does not vary in the same degree, the rates charged would need to be changed every month to absorb the expense exactly, thus resulting in unfairness as between different jobs, and destroying the value of the records for purposes of comparison. It is therefore preferable to determine rates which, with the normal volume of business, will approximately absorb the normal expenses over a considerable period, say a year. When the conditions are abnormal, the unabsorbed balances in the operating departments must be charged off as an extraordinary loss, in the nature of idle plant expense.

In order that completed costs on any particular article may be obtained within a reasonable time, it is necessary to place the orders in such quantities as can be completed within a month or two, even if it is necessary to place a number of successive orders for the same article to make up the total quantity required.

When a completed article is composed of a number of parts, it is usually better to issue orders for, and secure the costs on, each of the different parts, and later to issue a further order for the assembling of the parts. This is important, particularly if the parts of several articles are interchangeable, and it is in accord also with economical manufacture, the parts being made in quantities and placed in stores until needed.

The necessary steps, in the form of journal entries are:

I. Inventories of raw materials..	\$	
Inventories of supplies.....	.....
Sundry service accounts.....	.....
Sundry operating departments	.....
To audited vouchers.....		\$

To record the purchase of raw materials and supplies, and to take up on the books the liabilities for all expenses incurred during the month.

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- | | | | |
|------|--|----------|----------|
| II. | Sundry service accounts..... | \$ | |
| | Sundry operating departments | | |
| | To inventories of supplies.. | | \$ |
| | To record the value of all supplies taken from stores during the month. | | |
| III. | Work in progress account.... | \$ | |
| | To inventories of raw materials | | \$ |
| | To record the value of all raw materials taken from stores during the month and chargeable directly to orders in progress. | | |
| IV. | Sundry service accounts..... | \$ | |
| | Sundry operating departments | | |
| | Work in progress account.... | | |
| | To accrued wages..... | | \$ |
| | To distribute to the various expense accounts and operating departments the payrolls for the month, charging to work in progress account all labor which can be allocated directly to the individual orders. | | |
| V. | Sundry operating departments | \$ | |
| | To sundry service accounts | | \$ |
| | To charge each operating department with its due proportion of each service account, such as power, heat, general factory expenses, etc. | | |

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- VI. Work in progress account.... \$
- To sundry operating departments \$
- To charge each order in progress with its due proportion of the burden of each department through which it has passed, on the basis determined, and separately for each department.
- VII. Inventories of finished goods. \$
- To work in progress..... \$
- To transfer all goods completed and placed in stores during the month, closing out the corresponding orders on which these goods were manufactured.

All goods shipped will require to be priced at the costs recorded in the finished goods stock records, and after making the entry charging accounts receivable, and crediting sales with the selling value thereof, the following entry is required to record the cost of the goods sold.

- VIII. Cost of goods sold..... \$
- To inventories of finished goods \$
- To record the cost of all goods shipped during the month.

Frequently finished goods are not placed in stores, but are shipped as soon as completed in the factory. It will generally be found more convenient, however, to consider all completed goods as going into stores and all shipments as coming out of stores.

The balances on the various accounts will now stand as follows:

- Inventories of raw materials
- Inventories of supplies
- Inventories of finished goods

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Representing the respective stocks on hand and subject to verification by periodical physical inventories. Underlying stock records will usually be kept covering the details of each class of goods.

Work in progress account

Representing the unfinished orders, the details of which are recorded in the cost ledger, in which an account is kept covering each order.

Sundry service accounts

There should be no balances on these, except in special cases.

Sundry operating departments

The balances on these accounts represent the burden over-or under-absorbed, and may be carried forward to the end of the year, unless in case of abnormal operating conditions they represent the expense of idle plant.

From the gross profit indicated by the sales account and cost of goods sold account, the selling and administrative expenses should be deducted when preparing the monthly profit and loss account.

* * * * *

The foregoing are, of course, very rough outlines of the various systems of cost accounting, but the outlines are general, applying to every variety of industry. The details must be filled in to meet the conditions in any particular plant, and steps must be taken to secure from the operating departments the necessary reports of time, material used, goods produced, etc.