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Distributing Overhead

Nelson J. Browne

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**NATIONAL ASSOCIATION
of
COST ACCOUNTANTS**

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Distributing the Overhead

**BUSH TERMINAL BUILDING
130 WEST 42nd STREET, NEW YORK**

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Vol. VI, No. 4

October 15, 1924.

Distributing the Overhead

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Poughkeepsie, N. Y.

BUSH TERMINAL BUILDING
130 WEST 42nd STREET, NEW YORK CITY

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PUBLICATION DEPARTMENT NOTE

The author of this article has had a wide experience in industrial plants commencing in the cost departments of the De Laval Separator Company and the Blake & Knowles plant of the International Steam Pump Company. He was later Assistant Traveling Auditor for the Franklin Automobile Company; Assistant Works Accountant for the H. H. Franklin Manufacturing Company; Factory Accountant of the Meriden-Britannia plant of the International Silver Company; Cost Accountant with Lybrand, Ross Bros., & Montgomery; Works Accountant of the National Conduit & Cable Company; at present General Cost Accountant of the De Laval Separator Company—the firm with which he started his industrial accounting career.

Owing to the limited scope of this publication, the subject can not be dealt with in very much detail. Mr. Bowne's article was originally presented as a paper before the New York Chapter at a meeting which was held one month after the meeting that dealt with the subject of "Accumulating the Overhead." At the former meeting a paper was presented by Mr. Bristol, which was issued as Official Publication, Vol. V, No. 12.

Mr. Bowne's article is a simple and easily understood description of the complicated subject of Machine Hour Rates. The system which he outlines is practical and in use by a large manufacturing company. It deserves careful study. The arrangement of the information on the two charts of the article is considered especially good.

DISTRIBUTING THE OVERHEAD

After the proper Accumulation of the Overhead, the chief problem is to ascertain the amount to be added to the prime cost of each product. This amount should represent a fair charge for the portion of the factory facilities employed in manufacturing the particular item, keeping in mind the expense entailed in making the distribution. It is manifestly impractical, if not impossibles, to analyze each overhead item with respect to its exact relation to each manufactured product; but it is possible to analyze it for certain groups of products. This may be done sufficiently to formulate rules by which practical approximations may be made as to the share of expense to be borne by each group, or item of product.

Although Mr. Bristol in his paper presented before the New York Chapter¹, carried the cost procedure to the point where all charges were accumulated in the individual departments, I am going to back track a bit and cover briefly the initial distributions to each department, both direct and indirect; then proceed with the distributions of the Indirect to the Direct Departments, and finally to Production Centers; getting to the meat of the subject, as soon as possible, and will try to bring out controversial points.

* This paper was issued as the Official Publication. Vol. V, No. 12

INITIAL DISTRIBUTIONS TO INDIVIDUAL DEPARTMENTS

It need hardly be stated that departmentization is an important factor in cost accounting. The greater the extent to which a plant has had its activities divided, with the direct expenses charged to the activity affected, the easier subsequent distributions can be made. Assuming that the plant has been thoroughly departmentized from the Power Plant through the various Productive, Maintenance and Control Departments, the overhead items may be distributed, for practical purposes, in accordance with a simple, almost elemental, chart (see page 10). The numerous and minor complications in this distribution, some of which arise in every plant, have not been noted on the chart.

It is assumed further that the accumulation has taken care of all indirect labor and supply charges through the indirect labor and supply distributions; that special charges have been handled through the Voucher Register; and that maintenance work has been transferred to the departments served.

FIXED CHARGES

(Items No. 1 to No. 4 and No. 6 to No. 9 on Chart page 10)

The details necessary for properly distributing most of the fixed charges are:

1. Schedules of valuations of the various classes of buildings, machines and equipment by departments and by classifications.

2. Schedules of depreciation for the various classes of plant items.

3. Cubic feet of each department, or floor area (sq. ft.), if the distance between floors is uniform.

With this data it is merely an arithmetical problem to make up standard schedules for the fixed charges which vary little from month to month, and monthly distributions for building maintenance unless maintenance charges are carried as budgeted items.

POWER, HEAT AND LIGHT

(Items No. 5 and No. 11 on Chart page 10)

The next step is the distribution of the power, heat and light items to each department (Direct and Indirect). Power Cost per kilowatt or horse-power hour is assumed to have already been obtained and the distribution is based upon meter readings, if possible, but more often upon rated horse-power and operating time of the motors.

Light and heat is distributed upon the basis of lighting requirements and cubic feet or floor area (sq. ft.) giving due consideration to departments requiring more or less of this service than the average.

For practical purposes none of the expense of the General

Overhead Departments is distributed to the Power and Maintenance Departments.

SUPERVISION AND OPERATING CHARGES

(Items No. 10 and No. 12 to 16 on Chart, page 10)

Supervision and Operating charges from machinery maintenance to scrap loss are charged directly, not only to the producing but to the maintenance and control departments. Maintenance work is charged to the departments served through standing or special repair and maintenance orders. This work, when charged to the power and to the direct producing departments, carries a man-hour overhead rate sufficient to cover the approximate expense of the maintenance department in question. No overhead is charged on maintenance work done for other indirect departments.

At this point all departments (except the Maintenance Departments) show direct charges, fixed charges, and maintenance charges. The maintenance departments, having charged the departments served with both labor and overhead, theoretically, should be clear, but they will probably show a balance either over—or under—distributed which is carried to the General Overhead account.

DISTRIBUTING GENERAL OVERHEAD TO DIRECT PRODUCING DEPTS.

(Items No. 17 to No. 28 on Chart, page 10)

After the power and maintenance departments have been taken care of, it is then necessary to distribute the expenses of the General Overhead Departments. No *practical* purpose is served in attempting to distribute the cost of running any of these departments to any other department in the classification.

The cost of many of these departments or subdivisions of them may be charged direct to some one producing department which it serves, or distributed to two or more departments served. A specific instance is a subdivision of stores separated from the general stores and maintained for the service of one or more specific departments, although under the supervision of the general storekeeper. There is no reason for not charging directly the departments served, providing the departmentization of the storerooms has been carried to an extent permitting such direct charging. After these specific cases have been cared for, there remains the balance of the expenses of the General Overhead Departments, and the Over—or Under—Distributed Expense of the Maintenance Departments. One of the most perplexing questions now arises, namely, "What is the best method to follow so that each manufactured item will bear its fair share of these general charges?"

A familiar and probably the most overworked basis of any is the Productive Man-Hour. This is referred to as an "over-

worked" basis because it is readily ascertained and too frequently used, when a more scientific method would be the distribution of each department or account in the General Overhead group, based on a careful study of each item and its relation to the Direct Departments. For example, salaries of the plant manager and other general plant executives are not fairly spread on a Productive Man-Hour basis to such departments as an Automatic Screw Machine Department, where very few men but much valuable equipment is utilized—and an Assembly Department where the number of man-hours is very high, but the value of equipment is comparatively low. For the item mentioned, production center hours would be better.

These complications have to be worked out in each individual case, but in the absence of a better base, Productive Man-Hours may be used. If this basis be accepted, let us assume all Overhead charges have been allocated to the Producing Departments. The next step is to decide on the plan of applying the overhead to productive work.

APPLYING THE OVERHEAD TO THE PRODUCT

It will not be possible to go into detail of the many methods by which overhead may be applied, most of which are sound in certain lines of manufacture.

The principal methods are:

1. Percentage on Prime Cost
2. Percentage on Productive Labor
3. Rate per Unit of Product
4. Rate per Productive Man-Hour
5. Rate per Machine or Production Center-Hour.

1. *Percentage of Prime Cost.* This method is satisfactory where the materials handled are similar, and the labor cost and equipment used are uniform.

The principal objection to this method, however, is that most manufacturing operations cover products containing material and labor of different values, this value having no relation to the overhead; and in other instances different kinds of equipment is used in processing the materials. In such cases it is obvious that this plan would be merely a means of getting rid of the amount of the overhead without regard to each product bearing its fair share.

2. *Percentage of Productive Labor.* This method is acceptable in plan where the earnings are uniform and where the workers use similar tools or machines.

This plan, like the percentage of prime-cost method, falls down where earnings vary and equipment differs.

3. *Rate per Unit of Product.* In a flour mill, a cement mill, or in fact, any plant where the product is extremely uniform, a simple base is the product itself. This rate is ascertained by

dividing the total expense by the number of units produced in a given period.

4. *Rate per Productive Man-Hour.* This method would be satisfactory where all workers use the same class of tools or machines, even though wage rates or earnings vary. While this plan eliminates the objection of the percentage of prime cost and the percentage of productive labor methods as to the variations in costs of material and labor, it falls short where the equipment differs. This difference is often quite marked.

5. *Rate per Machine or Production Center Hour.* This method will cover a situation where the product or the tools and equipment differ or the earnings vary, regardless of the extent of such difference or variance.

For either of the first four above mentioned methods no further distributions are needed than those described on pages 4 to 6. The only other element needed to obtain the overhead rate is the prime cost of the product for Method No. 1 and the value of Productive Labor for Method No. 2. These values applied to the total overhead will give the percentage to be added to the prime cost and productive labor cost.

For method No. 3, as mentioned under its description, the total quantity of units produced is used as the divisor and a value per unit obtained which will absorb the necessary amount of Overhead.

For method No. 4 the Productive Man-Hours is the other element which, divided into the total overhead will give the rate per productive hour to be applied.

In all cases "Standards" or "Normals" are much to be preferred—that is "standard" prime or labor costs, or the "normal" number of productive hours, or units of product.

DISTRIBUTING FOR THE PRODUCTION CENTER RATE

For the Production Center-Hour plan (method No. 5) a further distribution is necessary. As a matter of fact, this plan involves carrying the idea of departmentization to the fullest extent, so that in no one department or center will there be two production units of different values, space or power requirements. In other words, a production center is a unit of production (or group of identical units), ranging from a bench to the most expensive machine in the plant, together with its auxiliary tools and other equipment.

The chart on page 10 will help to explain the basis for distributing the overhead to Production Centers.

Fixed charges, items No. 1 to No. 9 on the chart, are carried to the production center on the same basis as to the department.

Supervision (item No. 10) is charged to the production center on the basis of normal production center hours; Power (item No. 11) on the basis of horse power hours.

Maintenance (items Nos. 12 and 13) can largely be charged directly to the center affected. Miscellaneous maintenance charges collected on standing orders may be distributed on the basis of the direct maintenance charges.

Supplies (item No. 14) in some cases can be allocated to the center affected, such as fuel oil for furnaces, hardening compounds, etc.; items not so chargeable may be distributed on the basis of normal productive man hours for items used largely in proportion to the number of men, or machine hours for items used in proportion to the machine time.

Indirect Labor, Scrap Loss and General Overhead (items Nos. 15 to 28) are distributed upon a basis of normal production center hours.

At this point all expenses in the several groups have been allocated to the Production Centers.

The next step is the determination of the normal operating time of centers. "Normals" scientifically arrived at are, of course, to be preferred. As a beginning, however, the normal capacity of each center should be compared with past records of operating time (during normal periods). With the information, and a reasonable amount of common sense, figures may be established representing the normal operating time of each center when the plant is running under normal conditions. Applying this normal operating time to the fixed charges, and that portion of the General Burden which may be classified as fixed, we obtain the "fixed rate" for the center. This is also the "idle" time rate or the rate per hour for the machine ready to begin an operation.

The operating charges and that portion of the General Overhead which may be classed as variable or fluctuating with production, applied to the *estimated* operating time (this may be more or less than normal) of the centers during the same period, will give the "variable rate." The combination of the fixed and variable rates equals the operating rate for the center. Rates so established are entered on machine time cards, calculated and distributed to Work in Process through the production orders exactly as labor rates are handled, and finally to the finished product in amounts "fairly proportionate to the use of the facilities employed by such product."

OVER—OR UNDER—DISTRIBUTED OVERHEAD

Since the rate for the fixed charges is based upon normal time, operating *less* than normal will leave the correct portion of these items unearned which is carried to the Profit and Loss Account. Operating *more* than normal will cause a greater amount of overhead to be applied than incurred, which is also carried to the Profit and Loss account as a credit.

Since the rate for the operating or variable charges is based upon *actual* or estimated operating time, these charges will be en-

tirely absorbed (with the usual variations) if they are checked with reasonable frequency.

This method, if applied with a generous portion of common sense, produces cost records which correctly show the effect of transferring a piece of work from one machine to another.

A record of idle equipment is maintained and the reasons for idleness are shown. The information on this record is incorporated on a monthly comparative report to the foreman (shown on page 11).

Many short cuts and some arbitrary distributions may be made, but it is not as important to distribute with theoretical accuracy every overhead item as it is to distribute them consistently and with practical accuracy.

The most important points to observe in distributing to production centers are:

1. To get all expense to the Production Centers without endangering the whole plan by striving for theoretical accuracy.

2. To establish normal operating times.

3. To establish with the aid of the above figures normal overhead rates that will reflect, in the cost records, changes in methods and equipment rather than changes in volume of production.

OVERHEAD DISTRIBUTION CHART

BASIS OF DISTRIBUTION

OVERHEAD ITEMS	TO DEPTS.	TO PROD. CEN- TERS
Fixed Charges:		
1. Depreciation of Buildings	Space	Space
2. Fire Insurance of Buildings		
3. Taxes (Real Estate)		
4. Building Maintenance		
5. Heat & Light		
6. Depreciation of Machinery	Value	Value
7. Depreciation of Motors		
8. Depreciation of Small Tools		
9. Depreciation of Furniture & Fixtures		
10. Supervision (Departmental)	Direct	Normal Prod. Center Hrs.
Operating Charges:		
11. Power	Meter Readings	H. P. Hours
12. Machine Maintenance	Direct	Direct
13. Tool Maintenance		
14. Small Tools & Supplies	Direct	Direct & Man Hrs. or Machine Hrs.
15. Indirect Labor	Direct	Normal Prod. Center Hrs.
16. Excessive Scrap Loss		
General Overhead:		
17. Executive	Normal Productive Man Hours	Normal Productive Center Hours
18. Engineering		
19. Planning		
20. Purchasing		
21. Stores		
22. Accounting		
23. Personnel		
24. Hospital		
25. Fire Protection and Safety		
26. Shipping		
27. Unclassified		
28. Maintenance Depts. (Under- or Over-Distributed)		

COMPARATIVE OVERHEAD STATEMENT

Mr. Foreman
 Dept. No.....

	1923 Monthly Average	1924 Monthly Budget	January 1924	February 1924
Overhead items not entirely controllable				
Depreciation	\$ 4,000.00	\$ 4,200.00	\$ 4,200.00	
Fire Insurance	13.00	13.00	13.00	
Taxes (Real Estate)...	70.00	80.00	80.00	
Building Maintenance .	180.00	150.00	140.00	
Heat & Light	125.00	110.00	150.00	
General Overhead (Inc. Supervision)	4,350.00	4,000.00	4,100.00	
Total	\$ 8,738.00	\$ 8,553.00	\$ 8,683.00	
 Overhead items partially or entirely controllable				
Power	\$ 700.00	\$ 600.00	\$ 700.00	
Machine Maintenance.	1,050.00	900.00	900.00	
Tool Maintenance	3,500.00	3,100.00	3,700.00	
Perishable Tools	120.00	100.00	140.00	
Supplies	1,050.00	925.00	900.00	
Indirect Labor	930.00	800.00	900.00	
Excessive Scrap Loss..	100.00	90.00	95.00	
Total	\$ 7,450.00	\$ 6,515.00	\$ 7,335.00	
 Cost of Controllable Items per Productive				
Hour	1.05	.81	.82	
Total Overhead	\$16,188.00	\$15,068.00	\$16,018.00	
Overhead Earned	11,490.00	12,375.00	14,233.00	
Overhead Unearned ...	4,698.00	2,693.00	1,785.00	
 Hours				
Total Possible Operating Time (Prod. Center Hrs.).....	13,885	14,285	14,285	
Actual Operating Time.	7,085	8,000	9,000	
Idle Time	6,800	6,285	5,285	
Percent Idle of Total Possible operating Time	49%	44%	37%	
 Analysis of Idle Time				
Lack of Work	6,120	5,656	4,756	
Lack of Help	
Lack of Material	
Repairs	544	503	423	
Poor Planning	136	126	106	

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