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Indirect Costs Directly Applied

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By W. R. Galt Duane

The necessity for close and accurate computation of the cost of production in manufacturing concerns is becoming more pressing every day. Keen competition, uncertain market conditions both for raw materials and finished products, labor unrest and unusual political situations make careful cost analysis of paramount importance and this of course brings up the old problem of the proper distribution of indirect expense or overhead.

The various methods now employed for computing cost of production contemplate: (1) the direct application of prime costs (material and labor) to individual contracts or jobs; (2) the prorating of indirect costs to the various jobs on some basis such as:

1. A percentage of direct labor cost.
2. A percentage of direct labor time.
3. A percentage of material cost or quantity.
4. A percentage of prime costs.
5. A percentage of machine costs or time.

Each of the first four bases has proved unsatisfactory and inaccurate in various situations involving, in the case of different jobs, conditions that are not similar in respect to type of labor, bulk or cost of materials, time, proportion of factory facilities used, etc.

The machine method, which distributes indirect expenses on the basis of the time each individual machine contributes toward a given product, including such items as the depreciation of the machine, rental for the space it occupies, etc., gives a more accurate picture and fairer estimate of the indirect costs involved, but even this method is not entirely satisfactory. Its chief advantage results from the translation of many of the indirect costs into direct charges applicable to the job in question. It is often unsatisfactory because, even under the best conditions, it leaves certain overhead expenses not distributed, and because it is not appropriate in cases where a substantial portion of the work of production is done by hand. Under the latter condition it puts too much of the indirect cost burden on machines when a

certain proportion should be based on labor, on the small tools used and on the bench space occupied.

The method hereafter described seeks to apply all indirect costs as direct charges to the several production jobs. In order to accomplish this it is necessary to find some common denominator to be used in dividing the total indirect costs into appropriate detailed charges. Since all indirect costs, whether they relate to original outlay, consumption of power, wear and tear of equipment, etc., may be computed in terms of time, the most convenient and practical basis of calculation is rental. In other words, every production job is considered as a consumer, renting certain factory space and the use of certain machinery and facilities for definite periods of time.

I. CALCULATION OF COST FOR OPERATING UNITS

The first step in carrying out this conception is to divide the factory into artificial units, each of which represents a definite step in the process of manufacture. A unit may consist of: one machine with its equipment and operators; a number of similar machines; or a homogeneous group of hand workers with their benches, tools etc.—in short a single entity in the factory that can not be subdivided into smaller units of different classification.

Each of these units is charged with a portion of the factory floor space that it occupies measured in square feet. This space includes, not only the actual area covered by the machine, benches etc., but the necessary surrounding floor space for the workers. The remaining idle area and aisle space in the factory is assigned to the various units pro rata. The cost of operation of the different units is then computed as follows:

1. Cost of Space Occupied by Units

Each unit is charged a regular rental for the number of square feet of floor space that it includes on the above basis. The amount of this rental is based on the total operating cost of the building reduced to a rate per hour per square foot. Depreciation and maintenance of the building, taxes, interest on the mortgage, general charges for light and heat, wages of the superintendent and watchmen and all other charges directly applicable to the building per se are considered in determining the hourly rental per square foot. In practice, the rental rate is found by dividing the aggre-

gate of the costs of the building per annum by the number of working hours per annum at full-time production.

2. Cost of Contents of Units

Everything of value contained in and contributing to a certain unit is charged to that unit at a regular rate of rental per hour. Like the rental of space, this rental of facilities includes various specific charges for depreciation, maintenance and replacement, power, supplies, wages of operators of machines, and all other charges directly applicable to the equipment contained in the unit, and it is likewise based on the number of working hours per annum at full-time production.

3. Cost of Specific Labor in Units

A further charge is made for all labor that is habitually and exclusively employed in a particular unit and can therefore be consistently applied as a cost of operation of that unit. This may include, for example, the foreman's wages or that proportion of his time regularly devoted to the unit in question.

The sum of these factors for a given unit, namely, rental of space, rental of facilities and specific labor, is the rate-per-hour cost of operating that unit.

II. APPLICATION OF RATES FOR INDIRECT COSTS

Every contract or job order is routed through the factory and is charged for the number of hours that it requires from each unit through which it passes, on the basis of the rate per hour for that unit. The sum of these charges added to the prime costs of (1) materials and (2) direct labor (not already specifically applied and charged for in individual units as described above) should total the cost of production for that order.

Idle time is considered to be part of an unproductive job called "idle job," and it is calculated in the same way as any other job, being the sum of the idle hours of the various units during the month multiplied by their respective rates; it is then added to the idle-labor charge for the month. The rates for this account in the various units are slightly different from those for productive jobs on account of the necessity for different rates of depreciation, power consumption etc. when machinery is not running.

In the idle time computations, allowance should be made for the fact that certain machines may be designed for use only a few hours a day under full-time working conditions. Since, however,

the rate of rental of the units is based on the number of working hours per year, each working day contains fewer hours, the rest of the day being considered as coming under the same category as hours during nights or holidays.

The cost of the "idle job" account, carried as a separate item for comparison from month to month, is an extremely useful index of inefficiency in the management and operation of the company, and it may prove invaluable in determining future policies.

Overtime work necessitates the application of slightly different rates for the various units in respect to depreciation, etc. For instance, the depreciation for twenty-four hours on the building proper has already been accounted for by the full-time working day. Special depreciation resulting from vibration of machinery normally idle in the overtime period and for such items as electric light bulbs, whose life is shortened by overtime use, must be considered in calculating the overtime rate. Careful analysis of all the factors used in computing the regular rate for a given unit should make it fairly easy to calculate the special rate per hour for overtime. Incidentally, overtime work generally affects the prime costs as well as the indirect costs because of higher rates for overtime labor.

In the method described above, provision has been made for the distribution of indirect or "overhead" costs by applying them as direct charges to various artificial departments or units. It has been shown how this application would be effected in the case of a factory. The system is similarly employed in the more indirect phases of manufacture, for example in the power plant. As in the case of the factory, the power plant is divided into artificial units, each with a cost of operation at a certain rate per hour. The different buildings, machines, etc., to whose functioning the power plant contributes, are charged with these costs in the same manner as that in which the job orders are charged with the factory costs. In like manner the system is applied to store rooms, handling facilities (cranes, conveyors, trucks etc.), wrapping or packing departments and all other elements that contribute to the process of manufacture. In this way all costs of production are applied as direct charges in determining the cost of goods produced.

In practice, the total actual indirect costs may be found to aggregate slightly more than the sum of the charges to the various

jobs, including the "idle job." If careful analysis fails to reveal the cause of this shortage, and the difference is small, the amount may be prorated among the various jobs as a supplementary charge on the basis of the percentage of the known charges already applied to those jobs under this method.

In practical application, the method is quite simple. Once the composition of the various units and the rate of cost of their operation has been carefully and accurately determined, the system should work automatically. I suggest the following procedure:

For each job, an individual cost sheet is prepared. The upper part of this cost sheet is a requisition for materials needed and is made in duplicate. The carbon copy of this requisition is detached and sent to the storeroom as long before the materials are required as possible in order that the storekeeper may be prepared to supply them when needed. As work on the job begins and progresses through the various phases of production, the cost sheet is stamped with the times, in and out, for each unit through which the order passes. The time is similarly stamped for labor charges by the foreman or other designated person. At the end of each day, the individual cost sheets are turned in at the factory office so that progress may be checked, if necessary, and the following morning they are redistributed to the proper units. Upon completion of a job, the cost sheet is delivered to the cost-accounting department where the various rates are filled in, the costs extended and footed, and the totals posted to the cost ledger.

Each unit also has its own cost sheet. On this, the times in and out for each job are stamped in the appropriate column each day, as is the idle time. In addition the times in and out for the workmen regularly attached to that unit (cost of specific labor), the number of hours machinery is in use (which affects power consumption) and any special comments are filled in by the foreman. The amount of detail entered on the sheet depends upon the operations of the company in question.

This suggested system of cost sheets, accompanying and recording the jobs as they progress through the various units of the factory, is based upon the assumption that the jobs proceed from one process to the next in regular steps until their final completion. In some classes of manufacture, however, different processes in a certain job are carried on simultaneously. In this case it may be

necessary to have several cost sheets, each recording one of the processes up to the point where they can be combined in one total.

Under some conditions it may be possible to simplify the procedure. When certain portions of the indirect costs, computed as above, are known to remain constant, they may be applied to subsequent jobs by direct computation in the cost-accounting department, eliminating certain steps in the job-order cost-sheet or even dispensing with its use entirely. For example, in a factory manufacturing candies, the cost of one product, such as chocolate peppermints, is determined by analysis through the use of job-order cost-sheets as outlined. Thereafter, the cost per pound, as far as indirect expenses are concerned, is a constant, to be charged to all future orders as long as general conditions in the plant remain the same, the only variable quantity being the prime costs of materials and labor. The cost per pound of other products, such as caramels, in whose manufacture different machines or processes are used, may be similarly determined. Combination, in the proper proportion, of the cost of manufacture for different types of candy gives the cost per pound for assorted bonbons. All these costs, if accurately computed, will remain constant as long as conditions of manufacture are unchanged and need not be recalculated for individual job orders. In many other types of manufacture this situation will obtain, either wholly or in part, but even in the classes of production that necessitate separate calculations for every job, the system will prove both a simple and efficient method of obtaining accurate cost figures, with the result that manufacturers who use it may readily determine in what cases production may be profitably undertaken and continued in their particular plant and what items may be more economically purchased elsewhere.

In a short article of this type it is impossible to give more than a brief outline showing the general theory of this method of simplifying the difficult problem of indirect cost application. It may be readily seen, however, that the system has many advantages over methods commonly employed.