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## Price, Profits and Production

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**Official Publications**

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Vol. IV

Jan. 15, 1923

No. 9

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**Prices, Profits and  
Production**

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

# NATIONAL ASSOCIATION OF COST ACCOUNTANTS

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Vol. IV, No. 9

January 15, 1923

## Prices, Profits and Production

(How to Determine the Effect of Manufacturing Effort and Volume on Costs,  
Selling Prices and Profits)

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and

M. B. GORDON

Lybrand, Ross Bros. and Montgomery,  
New York City.

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

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# National Association of Cost Accountants

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## PRICES, PROFITS AND PRODUCTION

(How to Determine the Effect of Manufacturing Effort and Volume on Costs, Selling Prices and Profits)

While commercial and industrial enterprises are carried on for the purpose of making profits, yet often the importance of using a suitable basis for computing the profit factor included in selling prices is unappreciated. It is true that many manufacturers, and particularly those who produce a standard line of product, can do but little toward setting their selling prices, because in these industries selling prices are set generally by competition. On the other hand, there are a number of so-called jobbing industries that must determine the selling prices for each one of their orders, or products. Even industries which manufacture standard competitive lines of products must have a definite basis for determining the original selling prices for these products at some time. It is true also that some selling prices are set on the old rule of "charging whatever the traffic will bear." While the principles submitted in this article cannot be adopted entirely by all concerns or even in part by some of them, the question of determination of profits is of such vital importance in most manufacturing concerns that the subject is well worth study and consideration. The successful merchandise executive is constantly considering the volume of sales, but the manufacturer often pays too little attention to the "volume" basis of doing business.

### GENERAL ASPECTS OF THE PROFIT PROBLEM

With the merchandise executive the establishment of a selling price involves primarily the determination of the percentage of "mark-up" to be added to the cost of the goods purchased in order to take care of the operating expenses and to give a desired profit percentage upon the anticipated volume of sales. In certain industrial enterprises it is not unusual to find that the estimating or cost departments calculate the selling prices of the individual articles produced irrespective of their relation to the total month's business or the needed volume for that particular concern. Some manufacturers have decided that a 20 or 25 per cent. profit should be realized over and above factory costs, plus the selling and administrative costs. This 20 or 25 per cent. is applied to every bid or estimate for future work. The "volume" idea and its relation to the monthly profit and loss statement is ignored. Such executives fail to consider the probability of a greater profit being earned if some large orders are secured at prices yielding little or no profit in

order to create a greater volume. Under certain conditions, more total profit would be gained by this policy, considering all orders even though the percentage of profit on each particular order might be lower than customary.

#### "OVERALL" PERCENTAGE BASIS VERSUS "EFFORT" BASIS

Another feature of the problem of setting manufacturing selling prices is the use of the "overall" percentage basis of determining profit on all articles produced. Many manufacturers apply the same percentage of profit on an article that may consist of 90 per cent. of material as they would on an article that consists of only 10 per cent. material. In the former case, the profit is approaching close to a merchandising basis, when actually he is a manufacturer and should only expect his profits on the efforts of manufacture.

It has been conceded by some authorities that a manufacturer should make the major part of his profits on the "*effort of manufacture.*" The more effort one particular product requires over another, the more profit that particular article should bring. The whole theory of manufacture is to purchase material and then apply labor and the expense of co-ordinating labor and material (which is burden), in such manner as to bring about a profit. This theory means effort. The manufacturer who adopts this theory does not consider so much the buying and selling of the raw materials as he does the *effort* put on the materials.

The above description briefly outlines the two general aspects of the profit problem which will now be discussed in more detail. These may be briefly described as: (a) The necessity for considering the volume when determining the profit for any individual order or product in order to arrive at a selling price; and (b) wherever possible, manufacturing profit should be based on the "effort to manufacture" rather than on a flat percentage over total costs.

#### EFFECT OF VOLUME ON SELLING PRICES AND PROFITS

Every industrial concern operates with a certain fixed expense which will fluctuate very little whether the volume of sales is \$500,000 per year or \$2,000,000. This fixed expense in any plant usually consists of fixed administration salaries, office expenses and a fixed selling expense. The selling expense includes the salaries of the sales department and the usual advertising expenses to keep the product known, but excludes the commissions paid salesmen which naturally vary in proportion to volume and hence are not a fixed expense. It will also include a certain proportion of the indirect pay-roll of the factory, namely, that of the superintendent, the foremen who would be employed regardless of volume, the production department, a certain number of storekeepers to keep the storerooms in condition, tool-room keepers, checkers, inspectors, pensions, taxes, insurance, fire protection, a proportion

of the engineering department, a proportion of the factory fuel which is needed to keep the plant on a going basis, telephone charges, water, depreciation, etc.

Most of these expenses will remain practically constant regardless of the volume of business done by any particular concern. It is obvious that the higher any sales volume is above this line of fixed expense, the more chances there are for earning profits. There is a certain point in the volume of any business beyond which the fixed expenses no longer count, as the volume up to that point has already covered them.

A manufacturer's cost includes the fixed expenses previously mentioned and also the so-called "variable expenses." The variable expenses usually include the productive labor on the parts, the direct material used on all the orders, and a certain proportion of the factory overhead which naturally varies in proportion to the amount of work done, such as the expenditures for supplies used in manufacturing (the more machinery in operation the more supplies used), indirect workers who assist the direct workers, and various items of like nature. It can be assumed that this variable expense will have a definite relation to the volume of business and will vary almost in the same proportion.

The basic theory that might be advanced then is that the manufacturer should try to obtain, at least, such a volume of business as would pay the fixed expense of operating his plant, and also the variable expense which rises in proportion to the volume of production. Expressed in other words, each concern has what is known as its "point of profit" or the sales volume needed to operate without loss and from which profits would commence to accrue.

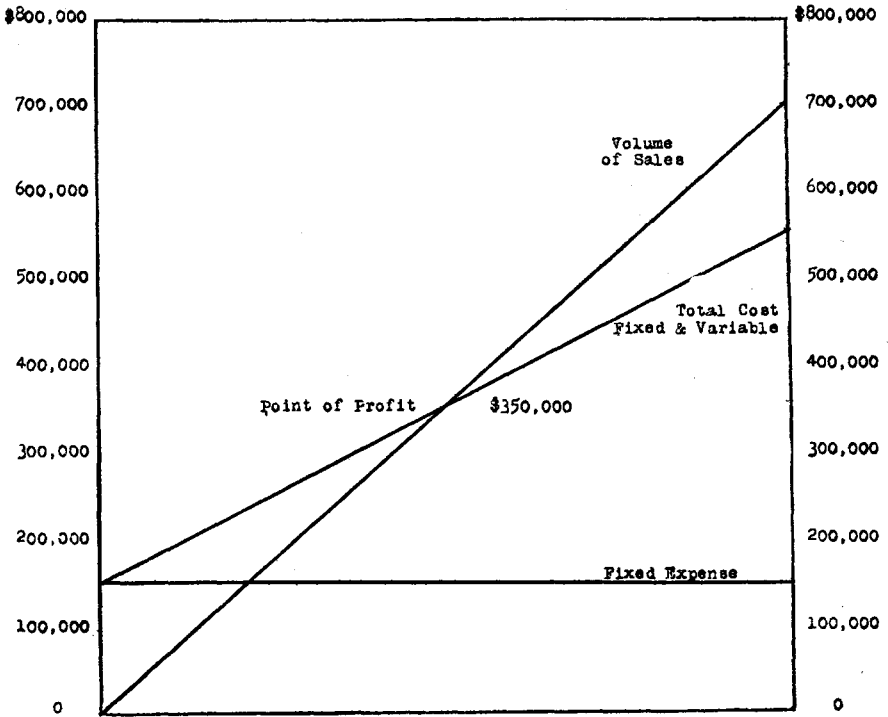
#### FIXED EXPENSES

It would be a good plan for every factory manager to have before him a general table or chart showing the fixed expenses in his particular plant and the relation of the variable expenses to sales during a normal period. To illustrate by a simple example, assume that in a given plant the previous year's business was considered a fairly normal year. The sales volume average per month was shown to be \$700,000. The fixed expense in this plant was \$150,000 per month, whereas the average variable expense per month was \$400,000. The following simple chart can then be drawn showing these conditions.

It will be seen that if the present business is taken on the same basis as shown on the chart, namely, if the same relation exists between the established sales prices and the cost of getting out those sales, then the particular plant in question must do a sales volume of approximately \$350,000 before it reaches its "point of profit" or the point at which the plant begins to make money.

In the chart illustrated, the horizontal scale has no significance as the data is charted for only one given set of conditions. The width of the chart does not effect the proportion. However, it is

"POINT OF PROFIT" CHART



obvious that the horizontal scale could be made a time scale if it was desired to plot the sales and costs as they accrue. No effort will be made at this time to enter into the technicalities of the chart as it is thought best to adhere to the simple form (plotting only one set of given conditions on one chart) for clearness and simplicity.

The chart is shown only as a simple illustration of what is meant by determining a point of profit in any given industry. It must be realized that as soon as the relation between the sales price on a certain article and the cost of production of the article changes, the whole relation shown on the above chart must also change accordingly.

It must be realized also that the line in this chart representing the total cost, which is the addition of the fixed and variable cost, will not necessarily be a straight line as shown. It is obvious that the variable cost will probably be somewhat higher on a lesser volume in proportion to the sales than it will be on a greater volume. A greater volume of sales will usually mean longer runs on orders and hence a reduction in the direct labor charges, where-



as on the chart shown, the unit "variable costs" do not change. However, the \$350,000 point of profit is theoretically close enough to aid the management in determining approximately the volume of business required before profits can be expected.

One of the main reasons for preparing a chart or table of this kind is to point out clearly the line of fixed expense. It is the fixed expense of \$150,000 in the above illustration which would force that business to do a volume of \$350,000 in sales before making money. Beyond this point, the profits begin to build up because the fixed expense has already been taken care of in the previous volume. It is the consideration of this feature that has enabled a good many manufacturing concerns to obtain the volume which has made them successful.

### DECREASED COST BEYOND POINT OF PROFIT

By examining the chart, it will be noted that business can be solicited above the \$350,000 sales volume mark at less than the usual sales price by eliminating the consideration of fixed expense entirely. While it is admitted that having two sales prices on the same article is not a very good practice, still, in some large companies outlets are frequently found to sell the same article at a reduced price and thus give the industry a filler which increases the total volume and reduces the percentage of the various expenses accordingly. Many manufacturers produce the same article under two different names, the one being sold to the regular trade, and the other going to some of the larger mail order houses. The so-called "dumping" process adopted by some manufacturers in selling their goods to foreign countries at a lower price than in the domestic market also brings out this consideration of fixed expenses versus volume. The main point is that the fixed expenses must be met anyway and the larger the volume the smaller the percentage of fixed expenses to total costs.

In a large contract which was recently let, one manufacturer put in a bid in which he eliminated most of his fixed expenses from his cost calculation because he felt that the contract, if received, would provide a so-called "filler" and increase his volume. He realized that he had the fixed expense anyway whether he received the large contract or not, whereas the increased business to his company would increase his profits in amount, even though his percentage of profit per unit would be considerably less.

In considering volume, careful attention should be paid to the adding of administrative and selling expenses to total factory costs. Most concerns divide the total administrative and selling expenses by the total factory cost for the previous year to get the percentage which the former bear to the factory cost. This percentage will then be used for the next year without any regard to volume.

Assume in the illustration given above that of the total fixed expense of \$150,000 per month, \$75,000 is for fixed sales and administrative expenses alone. On the basis of \$700,000 per month

of sales, this means that the fixed selling and administrative expense is almost 11 per cent. Now assume that the sales volume were doubled. This means that the fixed selling and administrative expense percentage would only be about  $5\frac{1}{2}$  per cent. instead of 11, and still manufacturers, although they desire this double volume, continue to use the same percentage of selling and administrative expense above their total factory cost in arriving at their selling prices. It is very important to have some idea of the volume of business which a manufacturer expects to do before deciding upon the percentage to add to factory cost for the selling and administrative expenses.

#### PROFIT VARIATION FOR DIFFERENT CONDITIONS

What really should be done in connection with the study as to what effect a certain volume will have on the final profit is to construct a different chart using various bases for the variable expense. In other words, the management should ask itself this question: "Supposing we reduce our sales price (on an article) 10 per cent. and we think by so doing that we could increase our volume 25 per cent., what would be the result in profit?" In answer to this question a new chart can be drawn showing a new line for the variable expense as well as the sales volume, above the fixed expense, thereby arriving at a new point of profit. Knowing whether or not the market exists for that volume, a managerial decision could be laid down accordingly.

It is unfair to continually burden each expected order, in estimating, with the same percentage for selling and administrative expenses, or even in some cases with the same percentage of burden. Now and then a large order will be received which if made, will decrease all burden percentages and bring the selling and administrative expense percentage way down, because it will result in such a large volume that the fixed expenses will decrease in proportion. When an order of this kind is estimated on, this fact should be faced *before estimating* and not after the order comes into the factory, because it may never be received.

A reduction in price does not necessarily mean a decrease in percentage of profit because if the production is sufficiently increased the cost is reduced in greater proportion than the price. The cost decrease is naturally due to the lessened effect of the fixed charges. As the fixed charges are incurred irrespective of the volume it is evident that their effect becomes less and less important as the volume increases. Eventually, however, a point would be reached where further price reductions result in a lower percentage of profit but yield an increase in the total profit.

Under certain conditions it may be desirable to reduce the price to cost. For example, the volume even, on this basis, may be much less than the capacity of the plant, but it may be desirable to secure all the business possible to hold the organization together.

It is realized that this is not an exhaustive presentation of this

particular feature of profit. It is intended principally to stimulate cost accountants and manufacturers to think more along the lines of volume, rather than as some of them do, to consider each individual order on its own basis and then trust to luck that the volume will come.

#### EFFECT OF EFFORT OF MANUFACTURE ON SELLING PRICES AND PROFITS

The second important feature for determining profit is to base manufacturing profits on the "effort of manufacture" rather than a flat percentage over the total costs after having added the selling and administrative expense. How can this more scientific method for pre-determining profit be accomplished? Where the management has an opportunity of setting some of its own prices, as for example, in a jobbing industry an answer is sought to this question: "With a given investment, in plant, equipment, etc., which we have, and in order to earn a return on this investment, plus say a 10 per cent. dividend to the common stockholders, as well as a payment of 7½ per cent. to the cumulative preferred stockholders, and also so as to leave a surplus of approximately so much money at the end of a year, how much profit must we earn this year in order to do all of these things?" After determining the amount of profit which can be expected from the business, what basis is there to attach this profit to an order, to assure that the proper ratio of this profit on each order quoted on, is secured. The manager says to himself that he is a manufacturer, and for that reason expects his profit on his efforts. To represent this effort in manufacture, he considers two things, namely, direct labor expenditure, plus the burden on that direct labor. The burden as far as effort goes, is incurred because of the equipment that is used, the expense of maintaining that equipment, tools, supplies, etc., and also the expense of maintaining a productive worker at work. So considering both direct labor and burden, he really has his total effort basis, because after all, the material is merely bought and sold, and the effort in handling that material might be considered as part of the burden. Some may want to add to the material cost a definite percentage for the risks involved in carrying material on hand, plus the expense of purchasing, receiving, storage, etc. Then the manager determines how much direct labor effort and burden effort he will have in the normal year. In doing so he figures how many men he should have busy in Department 1, how many in Departments 2, 3, etc. Applying the normal amounts of burden in each particular case he arrives at his total direct labor and burden amount for his entire plant. Now, if he is satisfied to have each of his departments bring in the same return on their efforts as to profit, then all he needs to do is to divide his total labor and burden amounts into the profit which he pre-determines he should have, and he arrives at a percentage figure per dollar of labor and burden combined, which he should add in determining the price for each and every order.

After making his calculation assume that he finds that he will have to add 50 cents on every dollar of labor and burden combined in order to get out of that volume his expected profits for the year. On every order therefore on which he has any labor or burden, he applies this 50 per cent. to the total of labor and burden which is the profit on the job rather than a flat percentage on the total cost. This means that the more labor and burden any article requires, the more profit it must bring in, although the percentage of profit based on labor and burden is the same. This method seems to consider better than an other, such a factor as the time required to manufacture, because after all the amount of labor will represent very accurately this amount of time.

A little more should be said regarding a profit on material. The manufacturer, as stated before, should not attempt to earn a profit on his material, which closely approximates the merchandise man's profit, but on the other hand he is entitled to something for the risk involved in carrying material on hand, interest on the investment while being so carried, etc. Most manufacturers who adopt this plan use a profit basis of 10 per cent. on the material value to cover both interest on the investment and the risk factor involved.

#### ILLUSTRATIONS

To illustrate more clearly the above difference in determining profits, let us assume that a certain manufacturer is producing a wide variety of articles, wherein the percentage of material cost to total cost fluctuates to a wide degree. It should be stated that wherever the respective proportions of the material, labor and overhead elements remain fairly consistent for all articles, the overall percentage method of determining profits is sufficiently adequate. For this illustration, however, we are assuming the cost elements to fluctuate. Assume that the previous method was to apply a flat 25 per cent. over the total cost, for profit. Now, however, it has been determined that if this manufacturer would add but 10 per cent. to his material cost (for profit) and 50 per cent. to his total labor and burden (representing his profit on effort) that it would net him a sufficient profit return on the year's volume. He is asked to bid on an article in which the material cost is eighty-five cents, the labor six cents, and the overhead nine cents. The following example will illustrate the different sales price results. (A) represents the old method of 25 per cent. profit above costs and (B) the new method. Assume further that the Selling and Administrative expense is 25 per cent. of factory cost.

(A)	(B)
Material Cost .....\$ .85	\$ .85
Labor Cost ..... .06	.06
Overhead Cost ..... .09	.09
Total Factory Cost.....\$1.00	\$1.00
Selling and Admin. (25%) .25	.25
Total Cost .....\$1.25	\$1.25
<b>PROFIT</b>	<b>PROFIT</b>
25% of Total Cost.....\$ .31	10% of Material..... .085
	50% of Labor and Burden .075
Selling Price .....\$1.56	\$1.41

The point to emphasize here is that another article having a greater proportion of labor and expense cost would have to bring in the greater profit. So, this plan acts eventually as a levelling process showing which articles the manufacturer is best able to handle as against competition. Naturally, looking at the above illustration, the less the material cost element, the less the difference in net result, except that when the labor and expense become the greater elements, then the selling price goes up, because the manufacturer would charge 50 per cent. profit on all labor and expense. This can be illustrated by another example, in which the assumption is made that the elements of cost are Material ten cents, Labor forty cents and Overhead fifty cents. Then the Selling Price would be determined as follows:

Material Cost.....\$ .10
Labor Cost ..... .40
Overhead Cost ..... .50
Total Factory Cost.....\$1.00
Selling and Admin. (25%)..... .25
Total Cost.....\$1.25
<b>PROFIT—10% of Material.....\$ .01</b>
50% of Labor and Burden..... .45
Selling Price.....\$1.71

It will be noted from the three examples given that the varying elements of material, labor and overhead make a decided difference on the profits, according to the new method proposed, whereas under the old method, it is only the total cost which is considered.

If the manager feels that the market will not allow him to

have each one of his products earn the same profit, then after he determines about how much profit he must earn in a year, he further divides this profit amount according to respective products, and divides each of these product profit amounts by only that direct labor and burden which will be expended on those products, thereby arriving at a different percentage figure to add for profit according to the different products.

Regardless, however, of which of the above two pricing methods is used, it would seem that it certainly is a little more scientific to arrive at profit according to the "effort basis," than merely to apply a flat percentage over everything and trust that the order will come in. Every plant has a certain capacity and will employ a certain number of men, at this normal capacity. When doing so it will have a certain fixed expense, and it should earn a certain amount of profit in order to keep the stockholders and everybody satisfied. Knowing these facts, why cannot profit be pre-determined more often than it is? Furthermore why not have before you continually some sort of chart or statistical statement showing your volume at all times and whether or not this volume is coming anywhere near what your pre-determinations were.

It should be brought out again that it is realized that all concerns cannot adopt the above principles because competition, nature of product, available market, etc., all have a bearing on the determination of selling price and with these concerns it is a matter of taking what they can get and then manufacturing as economically as possible—the result being profit. If, however, some of the above principles can be adopted with advantage, they should be by all means, because after all a profit on effort basis has changed and will frequently change the entire scheme of production.

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