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FACTORY

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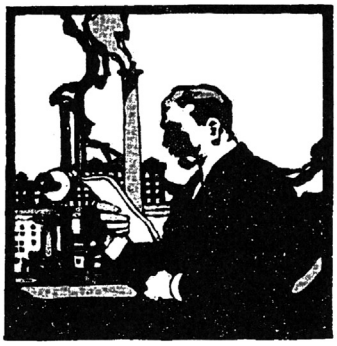

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POLICIES THAT CONTROL, USABLE PLANS AND METHODS OUT OF THE DAY'S WORK OF TWENTY-NINE MANAGERS

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HOW MANY PARTS TO MAKE AT ONCE

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Production Engineer

Interest on capital tied up in wages, material and overhead sets a maximum limit to the quantity of parts which can be profitably manufactured at one time; "set-up" costs on the job fix the minimum. Experience has shown one manager a way to determine the economical size of lots

EVERY manufacturer is confronted with the problem of finding the most economical quantity to manufacture in putting through an order. This is a general problem and admits of a general solution, and, however much it may be advisable to exercise judgment in a particular case, such exercise of judgment will be assisted by a knowledge of the general solution.

The writer has seen the practical workings of a first-class stock system and does not wish to be understood as claiming that any mere mathematical formula should be depended upon entirely for determining the amount of stock that should be carried or put through on an order. This is a matter that calls, in each case, for a trained judgment, for which there is no substitute. There are many other factors of even more importance than those given in this discussion.

But in deciding on the best size of order, the man responsible should consider all the factors that are mentioned. While it is perfectly possible to estimate closely enough what effect these factors will have, the chances are many mistakes costing money will be made. Hence, using the formula as a check, is at least warranted. Given the theoretically correct result, it is easy to apply such correction factors as may be deemed necessary.

In determining the economical size of lot the following factors are involved:—

Unit Cost (C). This is the cost in dollars per unit of output under continuous production, without considering the set-up or getting-ready expense, or the cost of carrying the stock after it is made.

Set-up Cost (S). This involves more than the cost of getting the materials and tools ready to start work on an order. It involves also, the cost of handling the order in the office and throughout the factory. This cost is often neglected in considering the question. Most managers, indeed, have a rather hazy idea as to just what this cost amounts to. If such is the case an investigation will show that the cost of handling, checking, indexing and superintending an order in the offices and shops is a considerable item and may, in a large factory, exceed *one dollar* per order.

The set-up cost proper is generally understood. Indeed, shop foremen in general appreciate only too well what the cost of set-up means on small orders, and so, if left to themselves, will almost invariably put their work through in large quantities to keep down this item. So doing, however, affects unfavorably the next factor:—

Interest and Depreciation on Stock (I). Large orders in the shop mean large deliveries to the storeroom, and large deliveries mean carrying a large stock. Carrying a large stock means a lot of money tied up and a heavy depreciation. It will here be assumed that a charge of ten per cent on stock is a fair one to cover both interest and depreciation. It is probable that double this would be fairer in many instances.

Movement (M). It is evident that the greater the movement of the stock the larger can be the quantities manufactured on an order. This, then, is a *vital* factor.

Manufacturing Interval (T). This is the time required to make up and deliver to the storeroom an order, and, while it seldom is a vital factor, it is of value in the discussion.

There is another factor, X, the *unknown* size of order which will be most economical. Thus summarizing, there are the following factors in the problem:

M equals the number of units used per month (movement).

C equals the quantity cost of a unit in dollars or the *unit* cost.

S equals the set-up cost of an order in dollars.

T equals the manufacturing interval in months.

I equals the unit charge for interest and depreciation on stock.

X equals the *unknown* size of order, or lot size, which is most economical.

The manufacturing interval is useful only in that it enables us to find the safe stock minimum, or smallest quantity the storekeeper may allow his stock to fall to before he must enter an order for more.

At first sight this minimum quantity would seem to influence the amount of stock and therefore the interest charges. It does nothing of the kind, however, and it will be found that the stock consists of additions in lots of X and a gradual exhaustion of the stock to nothing. The stock minimum simply serves to notify the storekeeper when to enter an order for new stock, so that he will use up his stock clean before deliveries on the new order are made and, at the same time, never be without stock for any considerable interval.

The average stock, if the movement is regular, it will be evident, is one-half of X. If the movement is irregular, and it generally is, there is introduced an additional complication. This, however, can generally be neglected or applied as a correction factor to the final result. The average stock being

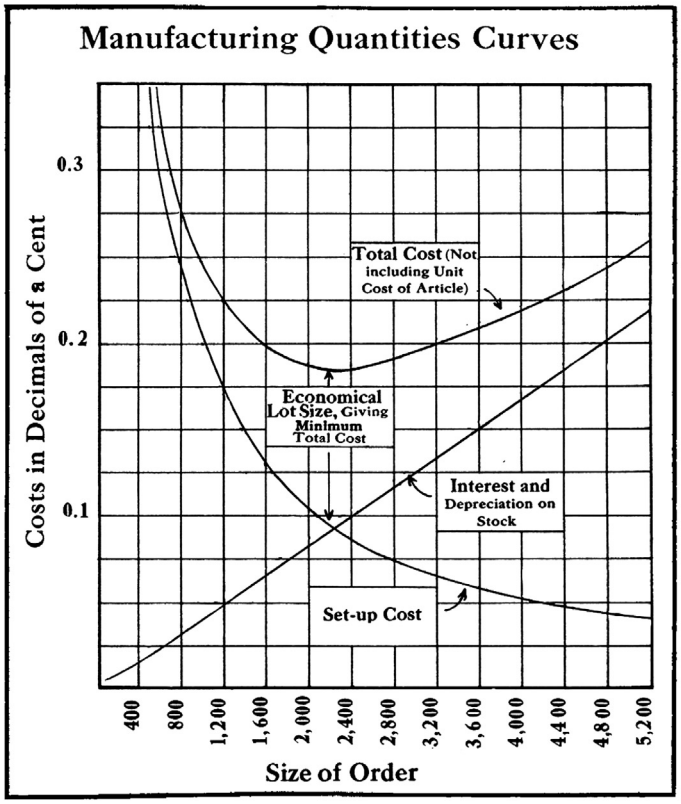

Figure 1: An increase in the size of the order results in an increased interest charge and a decreased set-up cost. The curves show this graphically and indicate a minimum total cost in this case at 2,200 units

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