11 Decision rules in intermittent production

If a system of production control and stock management were considered in practice it would be apparent that two sorts of decisions have to be taken:

- Decisions regarding production level.
- Decisions for each type of product.

In a good system, decisions are taken in the order mentioned above but to explain the inter-relationship better, the decision rules affecting the product will be discussed first. These will be considered first for the case where the product is not produced for stock and therefore certainly not delivered from stock. Thereafter we shall consider the situation where production is for stock.

11.1 Production to order

As the problems are now to be treated in rather more detail, it is wise to leave the sphere of the earlier examples of gas and electricity supply altogether and to give some thought to, for example, the coal scuttle factory of para. 8.1.

Firstly, it is necessary to decide whether there is to be a fixed planning interval; if so, a plan is drawn up periodically for the workshop. At the commencement of each period it is decided whether the orders received for each product go into the production or not. Such a decision depends on:

- the total capacity available and the orders received for other products
- the delivery time required by the customers
- the possible wish of the manufacturer to save up customers' orders until a larger batch can be turned out.

As a border-line case of the fixed planning interval method consider the continual transmission of orders to the workshop; in this case the method can be considered as having a very short planning interval.

A particular problem which arises when working to order is as follows.

Rejects occur in most production processes. The percentage of such rejects is not, however, always the same but it is one of the factors which display random fluctuations (see discussion in para. 3.1). Assume that a certain process
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has an average of 10 per cent rejects. Of every 100 articles to be made, 10, on average, will be rejected and 90 delivered. On average, therefore, 100/90 times as many articles as have been ordered must be made. If an order is now received for 900 articles of type X and the manufacture of $100/90 \times 900 = 1000$ articles is carried out, one of the following cases will, in practice, arise:

1. Rejects are less than 10 per cent and therefore more than 900 satisfactory articles are made. If the customer desires 900 pieces exactly, the surplus must be thrown on the scrap heap or kept until someone asks for product X once again. In the latter case, a stock is created of a product which, in principle, was never made for stock. If, however, a customer's order for product X does subsequently arrive, the stock left over from the previous occasion could, as 'free stock', be deducted from the quantity required.

2. Rejects are more than 10 per cent, consequently there are too few satisfactory products. If the customer, in fact, desires 900 pieces exactly, a small additional batch must be manufactured to make good the deficit.

If the costs of the additional manufacture of a small batch are high, and if the risk mentioned under 1 does not involve high costs, one would, in determining the number to be produced, have to apply a larger factor than the average value $100/90$.

The method of calculation leading to an optimum choice is not discussed further in this book. Relevant consideration of this topic are, however, to be found in the literature.†

But attention must be drawn to the fact that the objective is not always to keep the total expected cost of having a surplus or of having to make an additional supply, as low as possible. With the required delivery time in mind, it may sometimes, be necessary to keep the risk of necessity for an additional batch below, for example, 5 per cent.

The example of the coal scuttles is an over-simplified situation particularly because component parts need not be manufactured.

We now turn to the situation where the production of parts must, indeed, be taken into consideration, and direct ourselves to the question of how the parts can be produced no matter whether the finished product itself is manufactured to order or for stock.

By the description 'production to order of the parts' is therefore meant that the parts are only ordered when the final assembly programme is known. This assembly programme must accordingly be drawn up as far in advance as to allow that part having the longest delivery time to be manufactured; for this reason