5 Characterizing production processes

An attempt will be made in this chapter to describe as fundamentally as possible the various aspects of a production process relating to the management of stocks and the regulation of production.

A classification of processes results from answering:

1. Has the production process one single operating stage or are there more?

   An example of a single-stage production process is found in a works stamping small metal parts, using purchased tin sheets as a primary material and delivering its products to third parties. An example of a multi-stage production process is found, e.g. in a machine shop, where a product may be turned, milled and drilled successively. When several operations are coupled together in a balanced ‘production line’ or belt, without, in principle, any stocks intervening between operations, it will be described in this book as a single-stage process.

   The aspects dealt with from now on, will be studied stage by stage. The most important question which must be put first is:

2. Can a product manufactured at this stage be, in principle, made or not made for stock as distinct from the question whether this is desirable from an economic point of view?

   There are numerous possible reasons which lead one to infer that a product cannot, in principle, be made from stock:

   - the product has not been sufficiently described before work is carried out (many cases of repair work)
   - the product keeps for a very short time only (perishable goods).

   The following points also play a part:

3. The relationship between

   - the rate of production \( P \) of a single production unit
   - the rate of consumption \( d \).

R. N. van Hees et al., An Introduction to Production and Inventory Control
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This relationship determines whether continuous production or discontinuous production (batch production) is applicable. The following examples may serve to elucidate this point.

A machine producing electric lamps delivers some 6 to 10 million lamps p.a. if work is carried out in two shifts. If for a particular type of lamp the annual turnover is 2 million lamps, a single machine working on that type is far from fully occupied. This type of lamp, will, therefore, never be produced continuously, but discontinuously. The same machine will in between times produce other types of lamp. One of the problems therefore is to decide on the best production batch quantity.

A girl assembling electronic tubes makes from 25,000 to 100,000 p.a. If for a certain type of tube the annual turnover is one million, a number of girls could then be continuously occupied on the production of this type. The problem is not then to determine the production batch quantity but to establish the production level from month to month.

4. Does a certain desired production sequence exist or is it preferable to keep the products together in certain main groups?

A desired sequence of production frequently exists with processes like:
- sintering processes, in which it is preferred that the temperature is allowed to rise or fall gradually
- the manufacture of paper where one proceeds from the finer to the coarser grades
- painting processes in which it is preferred to proceed gradually from light to dark tints and then commence from light tints again.

Planning with a definite cycle will frequently be found in this kind of process where, e.g. once a week or once a month, it is again the turn of a specific product.

A grouping into main categories is desirable when e.g., some products are manufactured which can be packed in many different ways. Certain fruit juices, for example, are made and delivered in tins of 3, 2, 1 and ½ litre capacity. Naturally, it would be advantageous if one particular fruit juice could be produced so as to complete the order for all sizes of tins, and only then to proceed to the next variety of juice. The situation mentioned can be characterized by a change-over cost matrix, that is, a table from which can be read the cost of changing-over a machine from product A to product B, from A to C and from A to D etc.