IN RECENT years there has been a number of engineering company failures in Britain, for which the trade unions, high interest rates, the high (or low) value of the pound, or Mrs Thatcher could not reasonably be blamed. These were ‘crashes’ which can only be listed under ‘pilot error’.

They were liquidity failures caused by an excessive and avoidable investment in stocks and work-in-progress, financed in many cases by borrowing at very high rates of interest. It was obvious that some boards of directors had no idea how to reduce stocks, or how to design a production system which could then operate efficiently at high rates of stock turnover.

I have written this article in the hope that it will help some of our remaining companies to avoid the same fate.

In order to reduce the stock of finished products, there is a Golden Rule which must be followed:

**Rule 1** Only make products which you can quickly despatch and invoice to customers.

The best method of doing this is illustrated in Figure 1. It is known as ‘flexible programming’. Once a week, or other convenient short and regular period, there is a programme meeting. The sales manager first presents his sales programme showing the products he wants to despatch in the week starting one week from now. The production manager next presents his production programme, showing the products he proposes to make in the coming week. He will have framed this programme so that as far as possible it meets the requirements of the sales programme from accumulated stocks plus his known capacity. If he still has spare capacity he will make some additional high-demand products for stock.

Providing the capacity is maintained at approximately the mean market demand level—fine tuning by adjusting overtime—this method both quickly follows changes in market demand with the minimum investment in stocks and at the same time uses the available capacity to the best advantage. With minor modifications it can be adapted to any type of production.

Companies will still need their annual sales and production programmes for other purposes, but will rely on the short term programmes for the regulation of production.

By contrast, most companies in Britain today base production on long term sales forecasts, which are only altered at infrequent intervals. Because it is not given to human beings to foretell the future, they usually end up with a warehouse full of slow moving products, and none of the products which they could sell if they had them.

There may in some circumstances be advantages in holding small stocks of finished products, or of standard materials. There is seldom, if ever, any advantage to be gained by investing in work-in-progress. There are three Golden Rules for reducing work-in-progress:

**Rule 2** Only make in this period those components you need for assembly in the next period.

**Rule 3** Minimise the material throughput time.

**Rule 4** Use the shortest planning period (i.e. smallest run quantity) which you can manage efficiently.

Rule 2 means that parts must be made in balanced product sets, and neither capacity nor materials must be wasted making parts for stock to cover future requirements.

**Delegate**

Rule 3 requires simplification of the material flow system. The best solution of group technology or product organisation at shopfloor level takes too long to achieve to be useful in an emergency. The first stage of the change, from process organisation to product organisation at departmental level, so that each department completes all the parts it makes, can be achieved quickly, however, and is the best method for quickly reducing throughput times. See Figure 2.

With product organisation, each department completes all the parts it makes and is provided with all the facilities it needs to make them. This not only reduces throughput times, but also makes it possible to delegate responsibility to the departmental manager for cost, quality and completion of parts by due date.

The best production control system for controlling production in balanced product sets, with short programming periods (low run quantities), is ‘period batch control’ (PBC), which is illustrated in Figure 3.

It will be seen that PBC is merely an extension of flexible programming (Figure 1) in which the programme meeting is advanced by a sufficient number of periods to allow time for data processing and for making parts. PBC has been used successfully with minor variations for the control of aircraft production—Spitfires for the Battle of Britain—for the mass production of cars and tractors; for the batch production of machine tools; for electrical switch gear; for pumps, valves and other simple engineering products; for the manufacture of decorative laminates; and for small quantity jobbing production. It is in many ways the most universal of all the production control systems.

The main advantage of PBC is that it is a flexible system which can quickly follow changes in market demand, with a very small investment in stocks and work-in-progress.

The main disadvantage is that working with short periods and, therefore, small run quantities, may tend to increase setting-up time and to erode capacity on some machines. This problem is easily solved by reducing set-up times.

By contrast, most production control systems in the British engineering industry are based on stock control, or on materials requirement planning (MRP). Stock control will only work with large batches and requires a heavy investment in stocks to make it work. MRP generates excessive stocks because it is based on sales forecasts for long periods into the future, which are always inaccurate.

The Golden Rule for reducing stocks of purchased materials and parts is:

**Rule 5** Only take deliveries from suppliers in small batches, when they are needed for processing or assembly.

The best method of doing this is to call-off deliveries from suppliers against long term contracts, at period intervals, as an extension of PBC.

It is not always easy to persuade suppliers to deliver in this way. In the early stages of the change it may be necessary to schedule some of the purchases for delivery at longer intervals and to use buffer stocks to obtain the
necessary flexibility.

It is sometimes argued that the call-off method makes suppliers hold stocks for their customers. This is a false assumption, because if it is profitable for the customer to manufacture with low stocks and high batch frequency, the same must be true for the supplier.

The methods described above will be accepted by some companies as better than bankruptcy, but they will still have serious doubts about the profitability of manufacture at high rates of stock turnover.

The best proof that it is profitable to operate at high rates of stock turnover can be found in Japan. The average rate of stock turnover in Britain is 2½ times per year. In USA it is between 3 and 4 times per year. In Japan it is over 8 times per year. We have no company in the engineering industry in Britain which comes anywhere near Toyota, which turns its stocks over 72 times per year!

Two of the main reasons the Japanese can make products, ship them half-way round the world, pay our customs duties and still sell at lower prices than we can make the products, are firstly that most of their capital is invested in plant and methods of improvement and secondly they do not suffer the very heavy costs of holding high stocks and work-in-progress.

There is no possible way of avoiding the fact that production based on long term sales forecasts with large run quantities and long throughput times inevitably causes a heavy investment in stocks and work-in-progress.

It is comparatively simple to reduce the investment in stocks and work-in-progress by working with short term programmes, small run quantities and short throughput times.

This does raise new problems with setting-up times and purchasing policy, but these are both problems which it is possible to solve.

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