INVENTORY MANAGEMENT

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INTRODUCTION

During the period January 1996 to December 1997, Caradon MK Cable Management Division reduced Inventory by 45% (in excess of £1.5 million) whilst increasing complete and on time deliveries by over 10%. This article explores the events behind this achievement.

THE COMPANY

The Cable Management division of Caradon MK Electric Limited was engaged in the manufacture and supply of products employed in the distribution of power, telecommunications and data in domestic, industrial and commercial buildings. At its most sophisticated it includes busbar trunking systems that integrate wiring devices, circuit protection devices, cables and trunking within one system. At its simplest, it consists of conduit systems for enclosing and protecting cables.

The Cable Management Plant is located at St. Asaph in North Wales and incorporates some of the most up-to-date PVC processing equipment in the country converting annually approximately 7,000 tonnes of PVC and other materials including polypropylene, polycarbonate, acetals, nylon, ABS and Noryl each year.

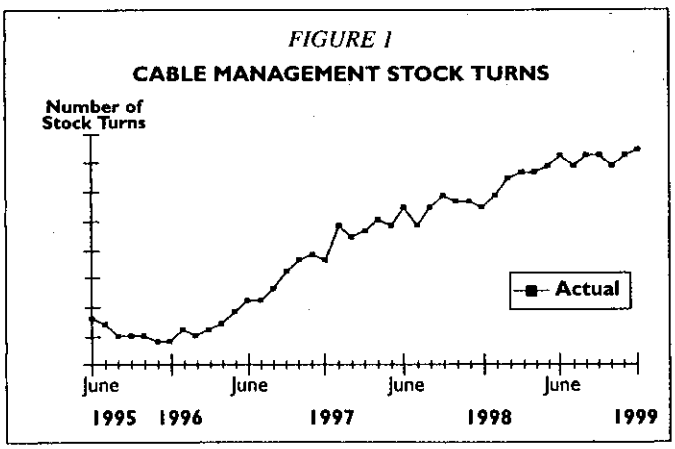
The core processes include material blending, with a fully automated conveying system, extrusion, with 35 high speed, state-of-the-art extruders, injection moulding on more than 45 moulding machines of a wide range of capacities and manual assembly.

With an annual turnover in excess of £30m, from a range of over 3,500 different product lines, we manufacture typically 20,000 miles of extrusion and mould a total of over 150 million parts each year.

The factory site covers an area of 560,000 sq.ft. including manufacturing, assembly and warehousing facilities, and employing over 300 people.

Through our First in Service TQ programme we have achieved breakthroughs in manufacturing efficiencies with a strong team oriented approach. In 1996 we were awarded the Investors in People award and in May 1998 achieved IBM World Class status.

FIGURE 1



THE CHALLENGE

In the autumn of 1995, Caradon issued group targets which included the objective for each operating company to achieve stock turns of at least 10 by the year 2000. As our stock turn at St. Asaph was less than 3 at this time, this initiative was the basis of much debate amongst the local management team. Were stock turns of 10 possible? If 'Yes' then how would we achieve it? If 'No' then we must be able to show the logic leading to that conclusion.

THE BEGINNING

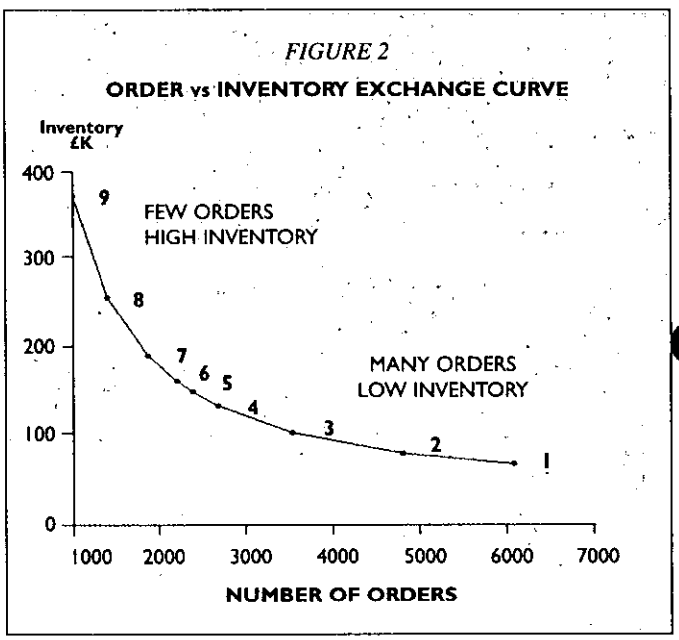
At that time the St. Asaph plant was taking part in the IBM Made in Europe Benchmarking Exercise. This suggested that our stock turns were relatively low when compared to an industry average. Geoff Relph, the IBM Consultant involved, suggested that we evaluate an Inventory Management Package (The K-Curve) with which he had been involved. This would potentially help us to manage our finished goods stock profile. The package (supplied by Epsim Limited) was evaluated and a project proposal put forward by the IBM Consulting Group during December 1995. The project was approved by the company's main board and sponsored by the si[illegible] Director/General Manager.

THE THEORY

K-Curve Methodology (KCM)

The KCM is based on a decision support software package 'The Inventory Analyser' which analyses different approaches to the ordering of purchased and manufactured parts.

FIGURE 2



The main theory behind the Inventory Analyser package is that of splitting the total number of items that have to be ordered and stocked by an organisation, into a number of groups or classes and then ordering each class on a different ordering frequency. The method of splitting up the parts is based on the familiar Pareto or ABC analysis using the annual usage value (unit cost x annual volume) of the parts as the basis for the ranking.

The Inventory Analyser allows the user to model many permutations of classes, class boundaries and ordering frequencies. The package automatically calculates class boundaries for a given number of classes and their respective ordering frequencies by using a modified Economic Order Quantity formula. This allows the user to use a cost ratio

that can be flexed instead of having to know or estimate the actual costs of holding stock and ordering and delivery costs.

The minimum inputs that are required for the package are a list of part numbers and their respective annual usage values, the length of the company's working year in days, and an initial cost ratio.

The outputs that are provided are essentially a set of ordering and classification policies, each of which give a particular combination of inventory level and number of orders (or deliveries). This then allows the user to eventually choose a particular combination for their organisation and, more importantly, to be able to determine the parameters in terms of number of classes, class boundaries and ordering frequencies that will give that combination.

In simple terms the KCM groups low value, slow moving items suggests an infrequent ordering pattern in contrast to the high value, fast moving items which should have a low stock holding but frequent replenishment. These parameters are then set up in the company's materials management system, whether it is a MRP system, a stock control system, Just-in-Time or a combination of them.

This was the theory - we however were in the 'real' world. Would this SYSTEM help us achieve our objectives of improving stock turns without adversely affecting customer service? We decided to test the hypothesis.

THE BACKGROUND

Slimstock (a forecasting and inventory control system) had been in use at St. Asaph for over seven years and provided excellent information on forecast sales and safety stock levels. These safety (buffer) stocks were dynamic and reflected any changes in sales patterns or lead times. Our manufacturing batch sizes however, were only reviewed annually and were calculated on the standard formula

$$\text{Economic Order Quantity} = \sqrt{\frac{2 \times A \times Co}{i \times Cm}}$$

where A Annual usage
Co Cost of ordering and delivering per occasion
i Annual stockholding interest rate
Cm *Item Cost*

The view taken prior to this project was that having spent a couple of hours setting up a job we should run it for at least eight hours irrespective of the amount of stock produced.

(We did have an upper limit of three years' sales!)

We commenced on the project, which included: management overviews, detailed education on K-Curve methodology and inventory/overage management, and trial analysis, in January 1996.

MIXED SHOP BATCHES

Initially we ran the K-Curve model on the complete business. However, when we began to analyse the recommendations it soon became clear that we could not mix changes in batches across different manufacturing areas. It was not practical to evaluate a variation in the number of batches in say the extrusion process against those in the mould shop. They are completely independent processes and so we had to develop a unique model for each production area.

CAPACITY ANALYSIS

At this initial stage we did not plan to increase the number of batches through the shops (just change the mix). We were not expecting any major volume increases over the previous year, but, we felt it prudent to input the results from the models into our finite scheduler to highlight any potential issues. None were apparent.

THE ANALYSIS OF FORECAST AND FINANCIAL STOCK

The project has highlighted some key differences between forecast and financial safety techniques. The use of forecast safety is recogniseed as a superior technique, when the forecast error information is available. When this was evaluated against the financial safety it was seen to produce a similar overall budget, however, there were a few parts with significant values over the financial safety. There is an opportunity to use the financial safety as a focus tool to look critically at the high value items attributes of lead time and batch size. It is also clear that if the lower value parts had higher safety there would be a service level benefit. This would create an opportunity to reduce the overall budget and increase the general service provided. The debate has caused some research into the possible scenario of using a combined strategy, which is still being developed.

OVERAGE REPORTING

The term overage refers to excess stock, eg. where actual stock is greater than maximum stock (ie. WIP + Safety + Batch). Most companies appear to ignore that between 35% to 70% of their stock will be overage. In our case it was 41% (over £1M) at the start of the exercise.

Whilst everyone in the company was aware of any part that was out of stock, there was not much interest if we had too much stock. After all, stock appeared on the balance sheet as an asset of the company didn't it! The focus of this project brought home the fact that the bulk of inventory drains cash out of a business and prevents investment in profit-enhancing activities as well as masking processing inefficiencies. By December 1998 our overage had been reduced to 18% (under £225K).

Overage, as well as underage, eg. where actual stock is less that minimum (ie. WIP + Safety) continues to be reported regularly and actions taken to remedy any anomolies.

LONG TERM INVENTORY PLANNING

The K-Curve gave us the information to analyse what we had to do as a business to achieve our objective in terms of stock turns. We now had the data to negotiate with the manufacturing areas on what we needed to do in order to achieve our objective. We established the number of realistic batches we could get through each process with current resources. We could now consider ways to increase the number of batches through the shops and evaluate any investment required against the benefits in reducing the stocks.

RESULTS

During the period January 1996 to December 1998 inventory was reduced by some 50%, almost doubling stock turns. At the same time customer service in terms of complete and on-time-deliveries improved by over 10%.

In the first phase of the project the manufacturing areas were not asked to increase the number of batches being processed but rather change the mix. The products which needed to be run most frequently were identified and given priority in terms of having the most efficient tooling and processing capabilities. As we progressed, increased numbers of batches were negotiated with each area.

The project certainly focused attention on inventory. Every employee was given an overview of what we trying to achieve and how we were going about it. Regular reviews are held to ensure that we remain on target and any deviations are agreed or remedial actions taken.

FIGURE 3

CABLE MANAGEMENT INVENTORY

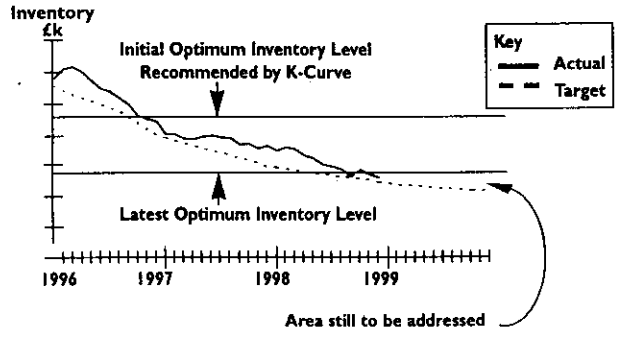
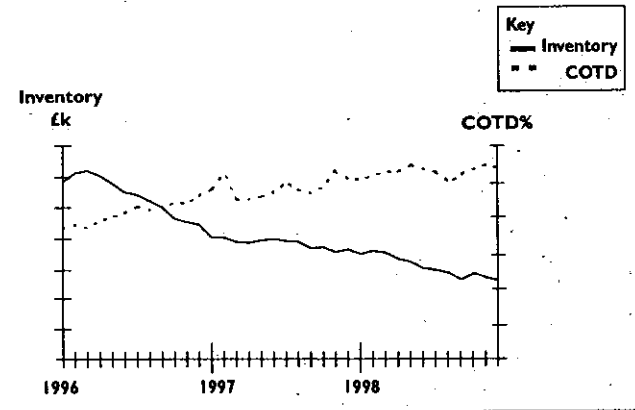


FIGURE 4

ST ASAPH SITE 1996/1998
FINISHED GOODS STOCKS AND COMPLETE AND ON TIME DELIVERIES



LESSONS LEARNT

- Get commitment to the project from the top and also from those who are going to be affected by it. Take the time to let all employees know the objectives and the importance of the project, eg gain commitment from all those involved and affected.
- Keep the accountants abreast of what is likely to happen to stocks/production - there could be a profit impact.
- Monitor progress regularly. It will be necessary to modify actions as the project moves forward.
- Form a small nucleus team with the appropriate skills to drive the project and co-opt others as they can contribute.

ACKNOWLEDGEMENTS

Although others contributed greatly to the project, our core team comprised: Roger Handley - Supply Chain Manager, Vic Gulliver - Production Planning Manager, Sue Ellis - Project Manager - Supply Chain Improvements, David Hughes-Jones - Manufacturing Manager, Geoff Relph - IBM Consulting Group.

About the author

Roger Handley, a Member of the Institute of Operations Management, is Supply Chain Manager for the Cable Management Division of Caradon MK Electric Limited. He has over 25 years experience of manufacturing with a background in Finance, IT/Systems, Production/Inventory Planning and Supply Chain Management.