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Effective Manufacturing Logistics

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Feature

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"Logistics is the time-related positioning of resources."

This is the definition by Dr. Ian C. Canadine, the Institute's Director-General. Within manufacturing businesses the need for improvement with respect to time-based resource management is receiving increasing recognition. Recent research indicates that it is not uncommon for the average time spent actually 'adding value' within a manufacturing environment to be as little as five per cent of the total process time. In effect, this means that 'time-related positioning' is not achieved, in such a situation, for 95% of the time!

Introduction

In this article some of the approaches currently being used within the manufacturing environment for improving the management of resources are outlined. From a logistics point of view, time-based performance measures can be used to monitor the effectiveness of such approaches.

Logistics and Manufacturing Resources

Recent evidence indicates that improvement is taking place; but much more needs to be done if manufacturing competitiveness is to be further enhanced. An approach to effective logistics management derived at Warwick Manufacturing Group, working in partnership with leading U.K. and overseas companies, involves recognising what the key resources of a manufacturing business are and establishing 'best practice' in relation to their management. This must be done with time compression as a major focus in the case of all resources. This approach should not be viewed as a magic solution. It is a logical and systematic approach aimed at developing a clear understanding of a company's strengths and weaknesses and formulating solutions which tackle the 'root causes' of current problems and not the symptoms of the problems.

Examining manufacturing resources enables a clear picture of a business to be constructed and a plan developed which establishes the most effective means of using these resources to meet customer demand in the market place. The degree of change which results from this process may be radical. This is a reflection of the fact that effective logistics management can only be achieved by improving all aspects of the business – not by tinkering or fiddling with existing approaches nor by creating ill-defined 'logistics' functions with unclear terms of reference and little authority. The management of manufacturing resources must be carried out in the context of the impact which decisions have on business activities such as purchasing and distribution.

In simple terms, the key objective of a manufacturing business is to turn raw materials into a product which a customer wants, at a profit. The resources of a business are used to achieve this objective. Management of a manufacturing business can be thought of in terms of this central activity of deciding how best to use a company's resources to meet demand. This question is addressed over a relatively long-term time horizon by way of strategic thinking and manufacturing strategy formulation. The question is addressed in the more medium and short-term by the operational planning and control activity.

The key resources are materials, people and facilities – sometimes referred to as the primary resources. Experience indicates that the major business benefits can be derived by focusing on the effective management of these resources with a strong emphasis on time related issues. Of course, these are not the only resources but they are the key ones in relation to time-based positioning. Other resources which allow production to happen ('enablers') include money, energy, information and, indeed, time itself. (See Figure 1).

The key to success involves understanding what constitutes best practice in management of these resources and how this can be applied, given the unique characteristics of a particular business. Some of the main approaches being used to improve management of the primary resources are:

1. Materials

Material usually represents the single biggest cost to manufacturers. It is not uncommon to find, for example, that 70% to 80% of an engineering company's turnover is spent on materials. Effective use of this resource is, therefore, of critical importance and the vigour with which many companies have pursued new and innovative approaches to materials management in recent years demonstrates this. In essence, materials management is concerned with ensuring that the right material is in the right place at the right time without excessive inventory holding costs being incurred.

Approaches such as MRP and Kanban are geared to ensuring that these objectives are met but should not be viewed as magic solutions or

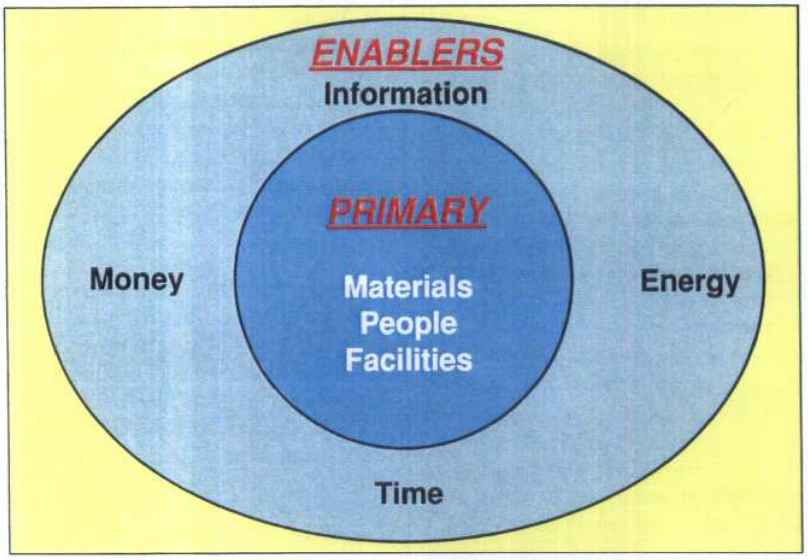

Figure 1 – Manufacturing Resources

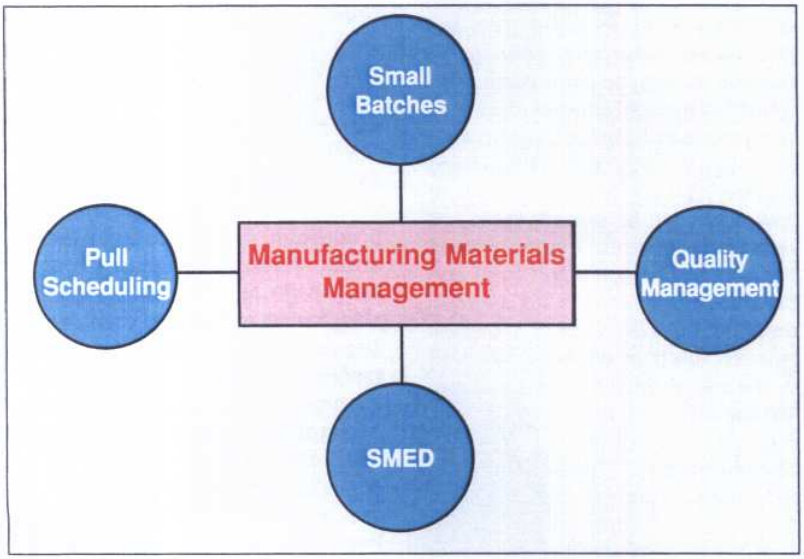

Figure 2 – Approaches to Manufacturing Materials Management

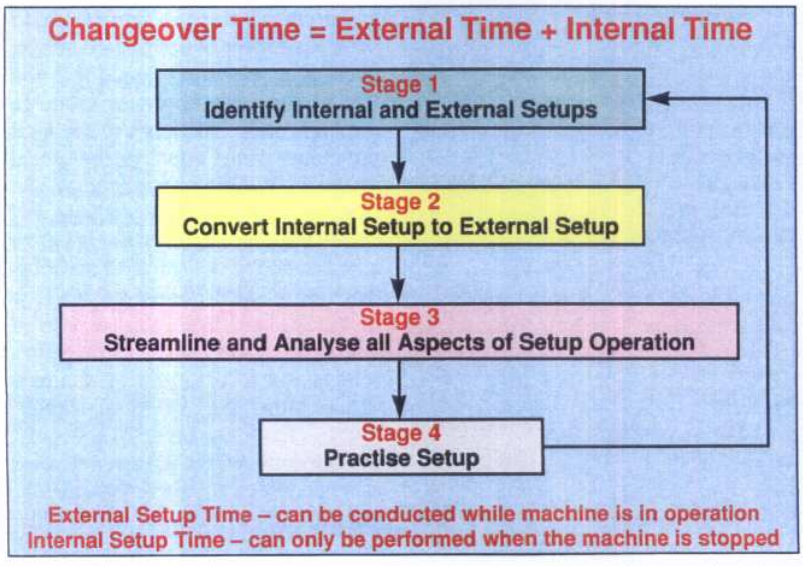

Figure 3 – Single Minute Exchange of Die Methodology

panaceas. The position of a firm in the supply network ('Demand Web') should not be overlooked in the context of materials management. As the old adage puts it: "One man's finished goods stock is another's new raw material stock". Increasing emphasis on supply-chain management is the result of this recognition that companies can not exist in isolation. The creation of partnerships based on shared objectives throughout the supply network is central to this approach. Inventory, with the advent of Just-in-time philosophy, has come to be seen as an evil. Its costs include tangible costs but also the intangible costs such as the 'clogging effect' inventory has within a manufacturing facility which reduces responsiveness, and increases the complexity of the manufacturing system which makes it more difficult to manage. Figure 2 shows some of the main approaches currently being adopted by manufacturers to support better management of the materials resource.

A key approach to improving the management of our material resource is the use of small batch sizes. Single Minute Exchange of Die (SMED) helps achieve the above objective by compressing process change over times from days, or hours, to single minutes. Figure 3 shows the main stages needed in adopting this approach..

One Touch Exchange of Die (OTED) and No Touch Exchange of Die (NTED) are further developments of this principle. The use of pull scheduling systems where the customer 'pulls' material through the system is also of potential importance. This contrasts with traditional 'push' systems pushing the material in at the front-end with the hope that products that satisfy the customer demand emerge at the end of the manufacturing cycle. The approach adopted to quality management also impacts on materials management. As improved quality results in less rework and subsequently less inventory, it enables the manufacturer to further 'lean' the manufacturing process. The benefits which can be realised from better materials management include reduced costs, less complexity, higher productivity, better morale and, perhaps most importantly, shorter lead times i.e. less non value adding time. Thus, effective materials management is concerned with improving time-related positioning of the material resource.

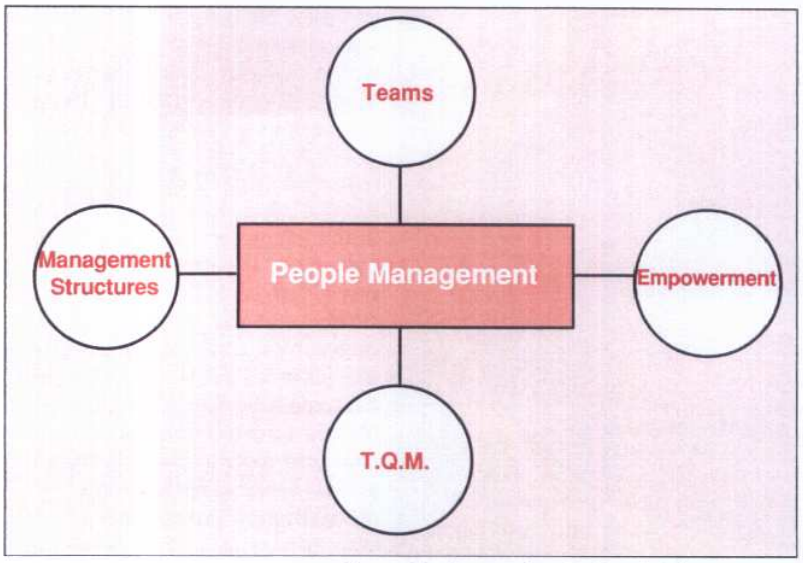

Figure 4 – Approaches to People Management

2. People

Significant changes have taken place over the years which have affected the way in which human resource is viewed within companies. Figure 4 depicts some of the emerging approaches.

More use of multi-functional teams and small group problem solving, management structures with fewer layers and management leadership oriented towards quality improvement, in the context of Total Quality Management, are practical examples of how this change has manifested itself. The most important changes must be seen in the context of moves towards greater empowerment of people. Empowerment is about equipping people with the necessary knowledge and skills in the tools and techniques which enable good decision making to take place. This results in not only better decisions being made but also decision making time being reduced. Concurrent engineering is an excellent example of how teams can be utilised. Instead of working by sequential means involving the passing of information from one department, or function, to another, the 'Over the Wall' approach, barriers between functions are being removed by the use of multi-disciplinary teams. The benefits of this approach in product development are well documented. 'Time-to-market' reductions of greater than 50% are not uncommon; lower manufacturing costs due to better product design are achieved and a greater understanding of those involved in the team of how their decisions impact on colleagues in different functions is developed. In this way best practice in relation to people management can compress time and thus contribute to improved time-relief positioning of human resources.

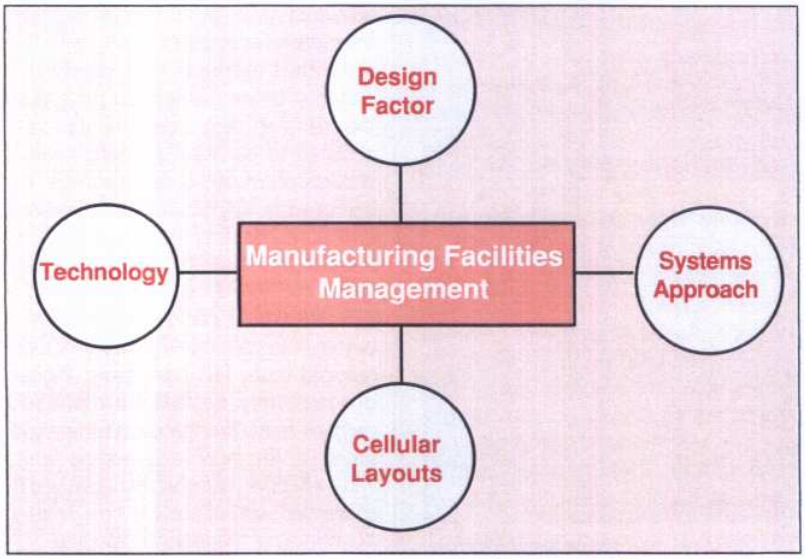

Figure 5 – Approaches to Manufacturing Facilities Management

3. Facilities

Management decision making in relation to manufacturing facilities range from strategic questions concerning which part of the value chain firms should be involved in through to detailed operational issues concerning, for example, plant and machinery layout. A number of approaches to facilities management concurrently being used is shown in Figure 5.

Cellular forms of production have been introduced in many industries with a strong emphasis on the empowering of individuals and team working mentioned earlier. Design for manufacturability can result in significant efficiency improvements. For example, this 'design factor' is considered to account for a large proportion, recent studies indicate about 40%, of the productivity advantage Japanese car producers enjoy over their Western counterparts. The role of technology in production processes is also something which is of importance in facilities management. Technological developments have facilitated the widespread use of advanced technology in manufacturing with enormous potential benefits. The key to success is to avoid being seduced by the technology for its own sake and to ensure that any investment in process technology is firmly linked to the achievement of business objectives. There is a danger of falling into the trap of sub optimisation by failing to recognise that: "The sum of the local optimums is not equal to the global optimum." This can occur at the machine level, departmental level and the supply-chain level. The effectiveness of our supply-chain could hinge on a small 20-year-old machine in a supplier three tiers away! A characteristic of 'lean' production systems is a focus on the system as a whole, rather than on its constituent parts. The 'Systems Approach' of Warwick Manufacturing Group is an approach to the re-engineering of businesses based upon this recognition that the whole is greater than the sum of the parts. It is a

logical and systematic approach to business system design with a strong emphasis on time compression throughout a company. It contributes to ensuring that time-related positioning of the physical resources, such as production facilities, is carried out in as effective a way as possible.

Conclusion

In conclusion, current best practice in the management of a company's key resources is integral to the goal of achieving more effective manufacturing logistics. Better management of these resources, combined with the use of relevant time-based performance measures, can result in major reductions in lead times throughout a company. Within manufacturing companies, time-related positioning of resources can only be undertaken more effectively by assessing current resource management and by initiating the necessary improvement – strategic, tactical or operational – throughout the business.

Further Reading:

1. **'Competing Against Time'**, By: George Stalk and Thomas Hout. Free Press, 1990. ISBN 0-02-915291-7
   A good introduction to Time Based Strategy. Full of practical examples.
2. **'The Machine that Changed the World'**, By: Womack, Jones and Roos. Rawson Associates, Macmillan, 1990. ISBN 0-89256-305-8
   Based on a five year study of the world-wide automobile industry. Introduces the concept of lean production.
3. **'The Goal'**, By: Goldratt and Cox. Gower, 1984. ISBN 0-566-02683-X
   A quasi- 'novel' which highlights the need for focusing on global goals rather than local goals.
4. **'Modern Approaches to Manufacturing Improvement'**, By: Robinson. Productivity Press, 1990. ISBN 0 915299 64 X
   The lessons and application of 'lean' manufacturing techniques such as Single Minute Exchange of Die, Kanban, Zero Quality Control and Poke-Yoke ('mistake-proofing').

About the Authors:

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Through working in a wide range of industries, he has gained a broad understanding of the requirements and implications for effective logistics management.

At Warwick he is responsible for course management and development in the area of logistics and operations management and has collaborated in industrial projects on the subject.

Edward T. Sweeney is a lecturer in the Warwick Manufacturing Group at Warwick University, where he specialises in operational and strategic management.

His research, which has been carried out in collaboration with leading UK and international manufacturing and engineering companies, has been widely published.

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