MATERIALS MANAGEMENT: THE TECHNOLOGIST'S ROLE IN CONTROLLING MATERIALS COSTS.

David Little, *Department of Industrial Studies, Faculty of Engineering, University of Liverpool,*

Ian Barclay, *Department of Industrial Studies, Faculty of Engineering, University of Liverpool, formerly Technical Manager, Dunlop Ltd.*

Submitted by the IPS/BPICS Joint Materials Management Committee

INTRODUCTION

The importance of effective materials management in cost control is well established. For most manufacturing companies direct material costs outweigh direct labour costs by a ratio of at least five to one(1). Any reduction in purchase and use of materials will have an immediate effect upon company profitability.

Whilst most managers pay lip-service to this importance, a very large number of companies still do not have fully effective materials management policies; two facts which are difficult to reconcile. This was illustrated by B. Small of Ingersoll Engineers (2) when he identified "The Cost Problem". Materials constitute some 50-60% of product cost yet less than 20% of our effort is spent in attacking these costs. See figure 1.

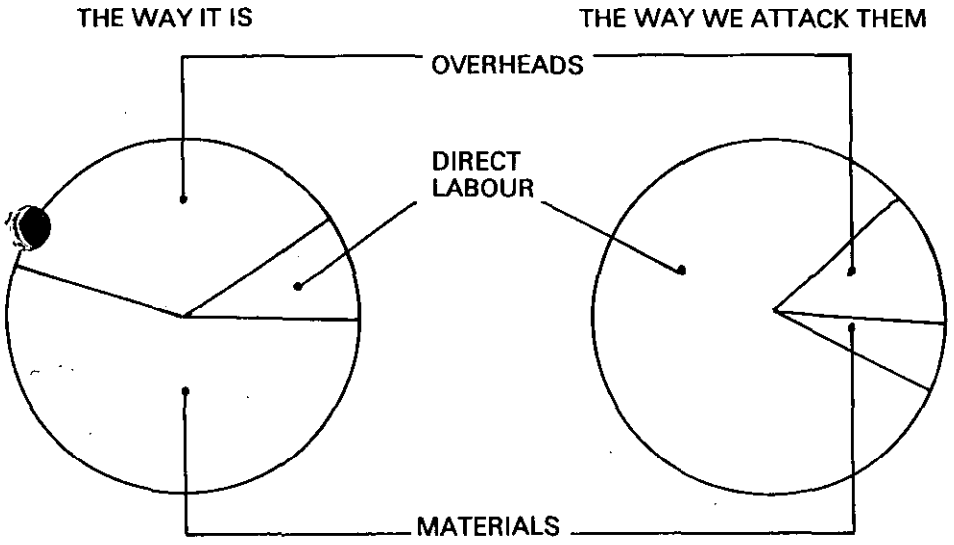


Figure 1: The Cost Problem

Conventionally cost reductions in this area are a management function involving such techniques as inventory control, vendor rating and material requirements planning. It is the writers' opinion that, effective though these approaches may be, they commonly suffer from a lack of technical content. A prime example of this is the contrast between Japanese and Western approaches to batch engineering. The Western approach is to devise sophisticated management systems - such as MRP - to control the complexity of the factory. The Japanese approach is a technological one which tries to reduce the complexity of the problem - effective production engineering drastically reducing set-up times.

The inclusion of a technological element can have a major impact, often eliminating the root cause of the problem.

Technologists are uniquely placed to make beneficial changes throughout the materials process cycle, each one of which will have its impact upon the bottom line of the profit and loss account. His involvement in the design of cost control programmes will assist the development of a rational approach to materials cost management. The feedback which the technologist obtains, in turn, should lead to more easily manufactured components and products. Generating further cost savings.

THE TECHNOLOGIST'S AREAS OF INFLUENCE:

Using a blend of common sense, experience, costing data and technological skill, a programme can be drawn up which will examine the effectiveness of material usage at every stage from supplier evaluation prior to purchase right through to the packing and despatch of finished goods. It will be useful to summarise how material passes through the productive process:

From this flow key process areas become apparent where the expertise of the technologist can be of value to a company:

PURCHASING	- selection and testing of raw materials, components and packaging.
STORAGE & HANDLING	- or raw materials components and packaging at all process stages including receipt and despatch.
QUALITY	- quality assurance and control at all stages in the manufacturing cycle.

If we examine each stage briefly and consider some examples where technology has had an impact, the importance of the involvement of a technologist will become more apparent. We shall then see the need for a planned, coordinated approach to materials cost management:

PURCHASING:

The range and importance of purchasing activities within manufacturing companies is often underestimated. The function may be involved in the purchase of such widely different items as raw materials, components, consumables, packaging, stationary and cleaning materials. It is understandable that, in such circumstances, the professional buyer cannot have technical expertise in all

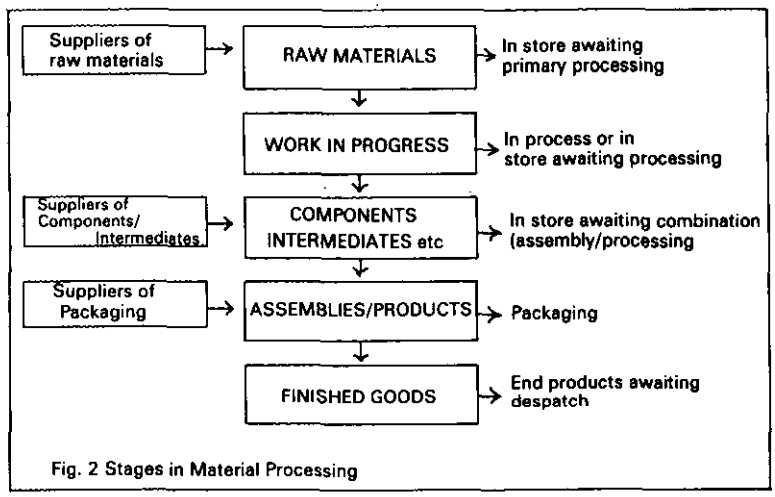


Fig. 2 Stages in Material Processing

areas.

Frequently materials are bought which do not exactly match requirements. This is rarely the fault of the buyer. In our experience, material specifications are often loose and, where an appropriate specification does exist, the appropriate material may not be commercially available within a standard range. This usually results in purchasing at a premium (within the remit of the buyer) rather than consideration of the design giving rise to the specification (not within the remit of the buyer). This problem may be resolved by liason between the buyer and the designer or some other technically qualified person.

In a nationally known company in the South of England, a particular electronic component was specified for a volume produced control board. This necessitated the importation of the component from the sole foreign supplier at a comparatively high unit cost. It was only under the pressure of severe supply limitations from this single source that purchasing requested an alternative from the designers. This was soon specified and found to be available in the UK at considerably lower unit cost.

The specification of requirements, evaluation of suppliers and development of alternatives to strategic or expensive materials, components and consumables are all areas where major cost savings may be generated by involvement of technologists.

Another purchasing-related area of involvement of the technologist is the quality assurance of incoming goods and evaluation of supplier plant performance. These functions are of high relevance to companies considering the implementation of "just in time" (JIT) systems. JIT systems are very much on the increase in the UK and quality assurance is essential to their effectiveness. They are used in the car industry by such companies as Toyota and Volvo (3).

Such activities require close cooperation between purchasing and technical functions. For optimum results, this cooperation should be seen as two-way, not as a mere technical suppport function for purchasing. The use of multi-discipline project teams for new product design may be seen as expensive, but experience in A Reyrolle and Co (now part of the NEI Group) showed that the benefits were out of all proportion to the costs and that the buyer was one of the key team members.

When considering product costs, we must bear in mind that a 10% reduction in raw material costs through more effective purchasing, lower rejection rates and close specification of material requirements can yield a saving of some 6% of total works cost. The importance of effective purchasing is emphasised by the dramatic increase in status of the buying function in such companies as STC, Plessey & Lucas.

STORAGE & HANDLING

Comparatively high inventory costs within the UK when compared to other industrial nations would suggest that we have too much in store. This reinforces the need to maintain that which we do store in good condition since it is likely to remain in there longer.

The care of perishable stored items such as rubber or food is a field of technological expertise which extends over many years. Industries have been built upon just this. It is in the use of technology in the manufacture and packaging of foodstuffs that, perhaps, the greatest influence is apparent in the area.

Not only is foodstuff much safer than in earlier days but it is much more stable giving greatly improved shelf-life. This makes it easier to store in shop or at home. The impact upon materials cost is extremely high. We would not wish to comment upon food value or flavour, however.

Whilst major change has taken place in storage methods, as evidenced by high rise stores accessed by stacker cranes, the revolutionary changes have taken place in the manufacture and handling of goods.

In the last ten years we have seen the introduction of many revolutionary manufacturing methods - robotic welding, numerically controlled machine tools and flexible manufacturing systems (FMS), for example - all linked together by the use of computer and communications technology to control and perhaps schedule their activities. The Department of Trade and Industry views these developments as critical to national economic performance and offers support under its "Advanced Manufacturing Technology" programme. To emphasise the nature of the change during this ten year period, it would not be unreasonable to say that we have seen more changes in the last ten years than in the preceding one hundred years.

It is important that the technologist has been equally active utilising the same computer-based technologies in the handling of goods at all stages in the manufacture and distribution of goods.

Perhaps the major cause of the comparatively high UK inventory costs, mentioned earlier, is inefficiency in our handling of items between work-centres on the shop floor. This is supported by N. Dudley's classic study (3) which showed that 70% of the materials throughput time of a typical batch is spent waiting, while another 20% of the total time is spent in the handling process itself.

It is extremely difficult to arrive at a figure for the cost of handling, particularly when much of the handling cost may be absorbed as part of direct operations. We may be sure, however, that it is significant. One large organisation has computed materials handling cost at 25% of total production cost.

To arrive at some estimate of this cost is important. Without such a figure the high capital cost of non-productive automated handling systems is difficult to justify.

That this justification has been made in a number of organisations is proven by the implementation of automated warehouses and stores within these organisations (5). The service industries appear to be leading manufacturing in these implementations, yet it is difficult to envisage a fully automated FMS without the support of an automated workpiece and tool delivery system.

The role of the technologist in

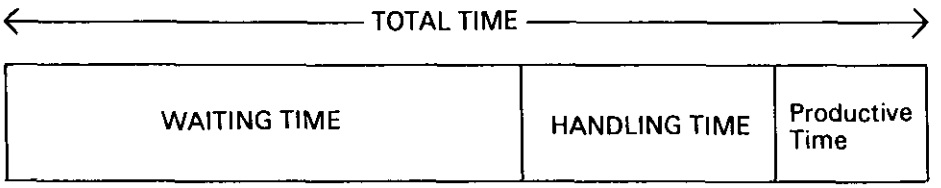


Figure 3: Typical Materials Throughput Time.

materials handling is not limited to total automation. There are many intermediate stages, perhaps using low cost mechanised handling equipment, which can reduce overall materials handling costs in the majority of organisations.

QUALITY:

There is a clear inter-relationship between the three areas of technologist's influence highlighted in this paper. Quality is perhaps the key.

If the quality of goods received from supplier is improved on a permanent basis, this will result in less materials handling in both the receiving area - where items may be returned to supplier as defective - and on the shop floor - where undiscovered defectives require rejection and replacement. In the second area we must also add the cost of disruption of production. The improved incoming quality level may mean that we can employ less rigorous (and cheaper) methods of inspection of materials, sampling for example.

The overall improvement of supplier performance can effect materials cost at all stages in manufacture. This improvement should be a major corporate objective.

An analysis of purchases by a large company engaged in the distribution of goods on a national scale showed that 80% of a very wide range of purchases were sourced from only 20% of suppliers (another example of the validity of Pareto Analysis). Further investigation showed that one supplier, in particular, was very important to the company. It may be of no surprise to you to learn that this supplier was not among the most reliable in terms of quality, but it was to the company.

Quality assurance at the supplier would seem to be the next logical step. This is nothing new. Marks and Spencer have been employing this approach for years.

This important step must involve the technologist. The step may be taken at two levels; the design and validation of an inspection or sampling programme for outgoing goods or the appraisal of the complete supplier plant (then the step becomes a stride). Since quality is a function of both plant and operator performance on a continual basis, the appraisal of a complete plant seems appropriate with a sampling programme undertaken by the supplier and validated by the customer.

An initiative of such proportions relies upon the existence of trust and mutual goodwill between the two companies. The technologist can foster this by reducing supply problems from a subjective issue to a technical one. Facts are not so tractable as opinions. Once this goodwill is established, both parties benefit - the fundamental tenet of JIT.

Further developments may then take place, once satisfactory quality levels are assured, aimed at reduced handling costs. The application of bar codes to products, packages and documentation at the suppliers reduces material handling costs at the customer. In turn, a "fast lane" may be created in receiving for reliable suppliers which will reduce inventory costs in both companies and tighten up on cash flow.

The possibilities for improved material quality performance created by close relationships between major suppliers and customers are great, but they must have a sound technological foundation. This technological foundation is summarised in figure 4.

THE DESIGN OF A MATERIALS COST CONTROL PROGRAMME:

A number of avenues for materials cost reduction have been explored in this paper. For an organisation to obtain the maximum benefit in reduced materials cost, an integrated strategy should be established leading to a company wide materials cost control programme (MCCP).

The main stages of such a programme would be:

STAGE 1 DETERMINE STRATEGY FOR MCCP

- define company areas involved
- give quantified aims for programme
- select members of MCCP team and appoint team leader

STAGE 2 ESTABLISH MCCP TEAM

- allocate time and resources available to team leader
- allocate time available to each team member
- provide venue for meetings
- provide target completion date

STAGE 3 REVIEW OF EXISTING MATERIALS MANAGEMENT SYSTEMS & COST

- establish materials costs at all stages possible
- identify existing problem areas
- identify areas of potential cost reduction
- initiate discussions with major suppliers
- appraise effectiveness of existing quality procedures

STAGE 4 DETERMINE DETAILED SHORT & LONG TERM QUANTIFIED OBJECTIVES FOR MCCP

- identify areas for immediate action which will yield quick returns
- identify areas for longer term action likely to yield substantial returns
- identify any resource needs over & above those currently available to team
- agree a two year plan based on cost/benefit analysis
- publish plan for management approval

STAGE 5 IMPLEMENTATION OF MCCP IN TWO PHASES

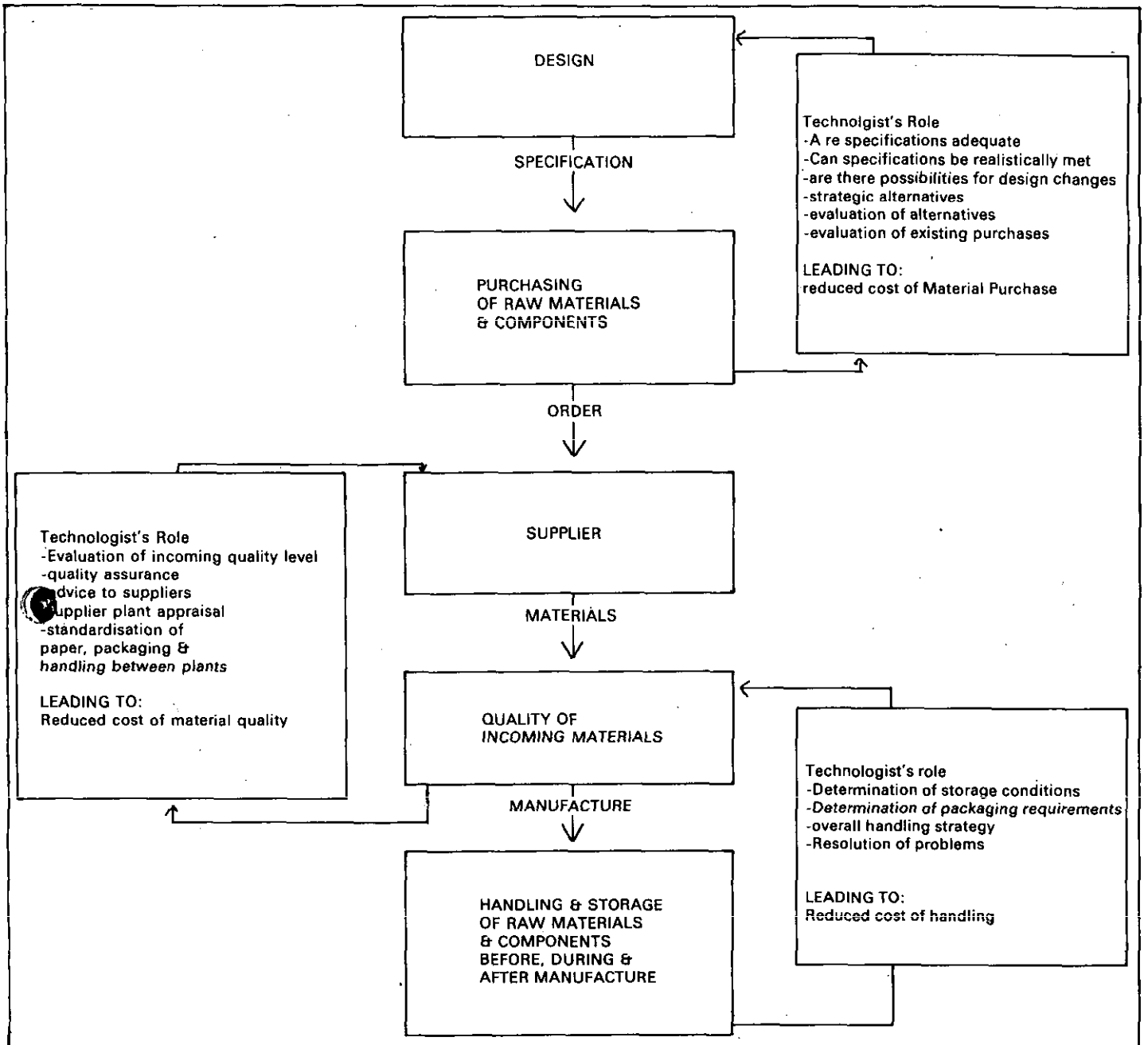
- **Phase 1:** implement short term benefits over 6 month period and report
- **Phase 2:** implement long term benefits over sixteen months and report

STAGE 6 REVIEW

- review achievements over last 24 months
- recommend new avenues for future MCCP for existing or different team

Note the time-scale is envisaged as less than two years:

	Duration	Elapsed Time (months)
Stages 1-3	6	6
Stage 4	1	7
Stage 5		
Phase I	6	13
Phase II	16	23
Stage 6	1	24



ure 4 The Technologists role in Materials Management

The short time-scale is important to maintain the initiative and motivation of the MCCP team and to ensure the accountability of the team-leader for the resources used in the exercise. The programme should be viewed as a "one-off" initiative and should not become an integral part of the organisation. Projects with time-scales or resource requirements beyond the team should be passed on to the functional areas, perhaps with the appropriate MCCP team member acting as project leader.

There is much to be said for extending the exercise by establishing a new project team with their fresh approach; although it may be wise to retain the experience of the team leader. Ensuring that new teams are created with a cross-functional background is a useful way of breaking down the inter-functional barriers which are so often a limiting factor to corporate effectiveness.

In the writers' experience, the requirements of coordination and control of projects arising during the MCCP are sufficient to warrant a team leader seconded on a full-time basis. Other team members should play a full role in departmental activities and one half-day per week is usually sufficient for them.

The most critical factor, however, is to ensure that the technologist is encouraged to have a full role in the programme.

References:

1. Akins J. R., "The Contribution of Purchasing to Materials Economy". Conference on Effective Inventory Management, P.E.R.A., March 1972.
2. Small B., "Factories of the Future - What Will They Look Like?" *The Production Engineer*. Nov. 1983
3. Monden Y., "Smoothed Production Lets Toyota Adapt to Demand Changes & Reduced Inventory". Industrial Engineer, August 1981.
4. Dudley N. "Midlands Tomorrow" West Midlands Economic Planning Council No.8, 1975.
5. Robinson R., "Handling The Recovery" Purchasing & Supply Management, Feb 1985.