White Paper

Plastics Industry Positioning Paper

Introduction

Despite the fact that the use of plastics is increasing worldwide, the plastics industry is still a highly competitive industry that is experiencing serious challenges. For many companies, a major challenge has been to deal with the effects of globalisation, which has led to lower industry growth as manufacturing flowed to lower-cost locations. The response has been to diversify into other products and markets, or identify niche areas such as producing higher quality goods.

Changes in customer demand and behaviour are forcing plastics manufacturers to change their way of doing business. This requires changes in product development, raw materials, manufacturing processes, and customer interaction. But while companies have invested in manufacturing and assembly plants, there has been less investment in other areas of technology that can improve customer service, increase manufacturing efficiency and reduce costs further.

Many plastics companies are mid-size organizations, where cash flow has a significant impact on purchasing power. This creates a mindset of “making do” with existing resources as well as maximising investment value. At the mid-size level, many companies operate in an entrepreneurial mode, management is focused on core business initiatives and IT resources are limited. Consequently, technology programs need to assist business during transitional times and to move the business forward by aligning technical and business goals.

The plastics industry falls under the “process industry” domain. Process industry operations are generally more complex than those in the “discrete industry” domain (the origin of ERP software), and the terminology is different.

Table 1: Terminology differences

Process manufacturing	Discrete manufacturing
Ingredients, materials	Parts, components
Recipe, formula, specification	Bill of material
Specification, batch sheet	Routing
Lot numbers	Serial numbers
Processing	Assembling
Bulk, intermediaries	Semi-finished product, sub-assembly
Yields	Scrap rates

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Other differences are:

- Different units of measure in process manufacturing – litres, pounds, packets, boxes – which are all applicable but in different stages of the production and distribution chain. Discrete manufacturing measures single items and does not change the unit of measure.
- Process materials are more difficult to measure accurately, the quality can be inconsistent, and they can change over time.
- Once through production, the finished process goods cannot be broken back down to their basic ingredients, unlike discrete manufacturing.

Transferring terminology, procedures and application knowledge from discrete to process manufacturing is not straightforward, and the differences between the two should not be simplified when dealing with companies in this space.

Key business issues for the plastics industry are

- Increase manufacturing efficiency
- Better cost management
- Improve customer service

Manufacturing efficiency

Improving productivity and efficiency of manufacturing operations is a key business issue. The major constraint in many companies is manufacturing capacity, not raw material availability. Therefore, optimising the usage of available capacity is a prime driver of business. In order to do this, companies need to be able to plan and schedule work before allocating input materials.

Production planning in process industries, however, has to be dynamic. A prime reason is that the standards of ingredients can vary from batch to batch – termed variability – which has an impact on the manufacturing process. Lot control is needed to segregate batches of input material, and the manufacturer must be able to record numerous attributes about each batch, so that appropriate decisions can be made regarding the production process for the batch; this would include:

- formulas used,
- processing routes and timing to select,
- end-products that can be made.

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In process manufacturing, if available input quantities are not exactly as planned, it is possible to scale production by making what you can with what you currently have. So production scheduling must be able to accommodate changes to ingredients, formulas, routings and end products. For ingredients in inventory, scheduling needs to manage the complexities of volume-constrained resources like tanks and silos.

Unlike discrete industries, where there is only one Bill of Materials (BOM) and one production process, in process industries like plastics, it is common to have numerous combinations of inputs, formulas and production processes because the materials and requirements are so dynamic. Furthermore, one input material may be used to produce multiple end products (so-called “inverted” BOM), whereas in discrete industries several input items produce only one end product. A further complication is that there can be more end products than just those that a customer requires – these are by-products and waste.

While capacity management enables more efficient use of existing manufacturing plant, companies also need to manage yield – the amount of usable output from a process – so that material inputs and processing capabilities are optimised, and by-products and waste are minimised. For example, manufacturers that cut material to specific sizes (e.g., sheets or tubes) need to know how to best to cut so use of the material is optimised and waste is minimised.

Production and scheduling therefore needs to be flexible and agile to handle variable raw material conditions, different options for processing and routing, as well as variable objectives, such as, number of end products, quantity and quality of inputs, and yields required.

In plastics manufacturing, the production process can be long and complex. To do proper planning and scheduling, as well as to manage work-in-progress, accurate data is needed from the shop floor. This requires integration between plant process control systems and the business system that provides the management, planning and scheduling functions.

Greater manufacturing efficiency can be achieved by adopting new practices such as lean manufacturing – this is an approach that emphasises issues such as shorter lead times and faster cycle times, and focuses on simplifying operations, reducing inventory and eliminating waste throughout the entire production system. Manufacturers that have used this approach have found they can improve inventory management and increase output without expanding capacity.

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Another practice, Six Sigma, is aimed at better understanding and improving a company's operational performance, practices and systems by identifying and reducing "defects" in business processes and product quality. In order to implement practices like these successfully, companies need to have systems that enable them to gather, organise and analyse information using metrics such as balanced scorecards.

Many plastics manufacturers use computer-aided design (CAD) systems to design new products and store engineering design information. However, managing and organising product-related data from various sources – both internally and externally with suppliers – can become complex. Change control mechanisms are required when product designs are changed because appropriate sign-offs and authorisations are needed to ensure that information is passed to suppliers, costs are acceptable, formula and production process modifications are approved, and inventory requirements are updated.

Cost management

Traditional cost accounting practices do not align well with the complex production processes of industries like plastics, because the practices were developed around discrete manufacturing where production processes are static and inputs like raw materials are fairly stable.

In process industries, however, formulations and production processes are dynamic because the quality of raw materials fluctuates. Consequently, product costing and pricing can vary between batches. Standard job costing may not appropriate in process industries, but back flushing (recording transactions based on what was shipped rather than material used) can be a better way of costing production.

To manage costs better, companies need to get more detailed information on production processes, formulations and material quality. For example, more in-depth cost analysis of products entails defining cost elements at a greater level of precision in order to understand how items such as direct labour, ingredients, by-products and maintenance contribute to costs.

Increasingly, companies are collaborating with partners in various areas of manufacturing. To do this effectively, companies need systems to enable sharing of information and synchronising of processes between them.

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Another avenue for cost efficiency is better management of product design and the hand-over from design to manufacturing. Managing the design process to ensure least cost formulations, better usage of materials, and lower inventory investment can only be done if there is communication and information sharing between product development on the one hand, and production and inventory management on the other. This can also increase the return on manufacturing assets by creating better understanding of the production needs of the product, the production capability of the plant and an intelligent matching of these two.

Customer service

Like other industries, plastics companies are finding their customers more demanding and knowledgeable. This can mean delivering products quicker, with more customer-specific features, and at stable or even reduced prices.

Keeping a history not only of sales data but also individual customer and product activities allows companies to identify trends and seasonal components of demand. To make better business decisions about expected customer, product and market activity, companies need to have information in appropriate formats, and at different levels of detail, so that analysis can carried out.

Where customers are large organisations with whom prices are negotiated on a contract or volume basis, more complex pricing is required. Contract pricing and trade management allow companies to provide acceptable pricing terms and delivery targets to large customers without sacrificing profitability. These large customers are also the ones who require their suppliers to work via their electronic order and supply chain systems. This requires that those suppliers also have adequate systems that can monitor and track orders as they arrive. If product design and manufacturing information is available and integrated with internal applications, such as finance and inventory, the data could be used to analyse how contract orders can be fulfilled more quickly or more cost effectively.

Effective customer management is more than handling just current customer orders or analysing history about it. If companies have a system that provides an overview of production, inventory, and order status, they can also improve customer service by offering capabilities, such as an “Available to Promise”.

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Summary

The plastics industry faces numerous challenges, but ones that many other industries have already learnt how to handle. Addressing these challenges requires a blend of new practices and straight-forward technology solutions, which can enable plastics companies to become more efficient, improve customer management, and manage costs better. For those companies in the mid-size sector, technology investment is often perceived as a risk unless it is shown that comparable investments in other industries with similar challenges have produced results, and that the technology adopted is already in the mainstream as far as adoption is concerned.