

Production Planning and Control of the Pipeline Assembly Enterprise under SCM

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Abstract: It is vital for pipeline assembly enterprise to respond to changing market needs quickly and keep its cost advantage. A production planning and control (PPC) model under supply chain management combining with operation characteristics of pipeline assembly enterprise was proposed. The present model can realize synchronization in real-time response in production by establishing a win-win corporate model , classified regulation between strategic parts and non-strategic parts , postponing the production of special modules and guaranteeing production at the bottleneck.

Key words: SCM; production plan and control; postponement; bottleneck

1 Introduction

With the development of supply chain management , call of core competence and the popularity of sourcing , companies are increasingly keen to contract out peripheral activities (production of parts and assemblies of components) ^[1]. Moreover , some companies even produce no parts but order them according to market needs and then assemble them according to customers' requirement. In this way , businesses will be largely reduced , thus enterprises can focus on their core parts such as assembly , R&D and marketing so they can best accommodate the market changes ^[2,3]. The pipeline assembly enterprise is such an efficient organization which focuses on product specialization. A traditional production plan starts from martial requirement of a enterprise , ignoring the actual facts of other enterprises on the supply chain , thus out-of-stock or slow-moving issues happen now and then. As a result , the overlong lead time and slow reaction problem remains to be solved ^[4]. Research on the production planning and control of a pipeline assembly enterprise from the perspective of SCM can solve the above-mentioned questions ^[5].

2 The management features of a pipeline assembly enterprise

The pipeline assembly enterprises are located downstream of the supply chain and the main management features of them are in the following:

1) Order-driven production

All business activities of pipeline assembly enterprise are centering on the following three kinds of orders: demand order , production order and purchase order. Customers make a demand order on the sales department. Then , the sales department makes a production order on the production department accordingly. Finally the production department organizes production based on the production order and makes for the parts demand order on the purchasing department so that the purchasing department can make a purchase order on suppliers (Figure 1) . All business activities are focused on dealing with these orders from this perspective ^[6]. Theoretically , the proposition of integrated systems may be a great contribution to all supply chain enterprises ^[7]. However , as a result of lack of trust and willing to compromise , those enterprises can hardly obtain the initial goal , making the integrated system less effective than it should be.

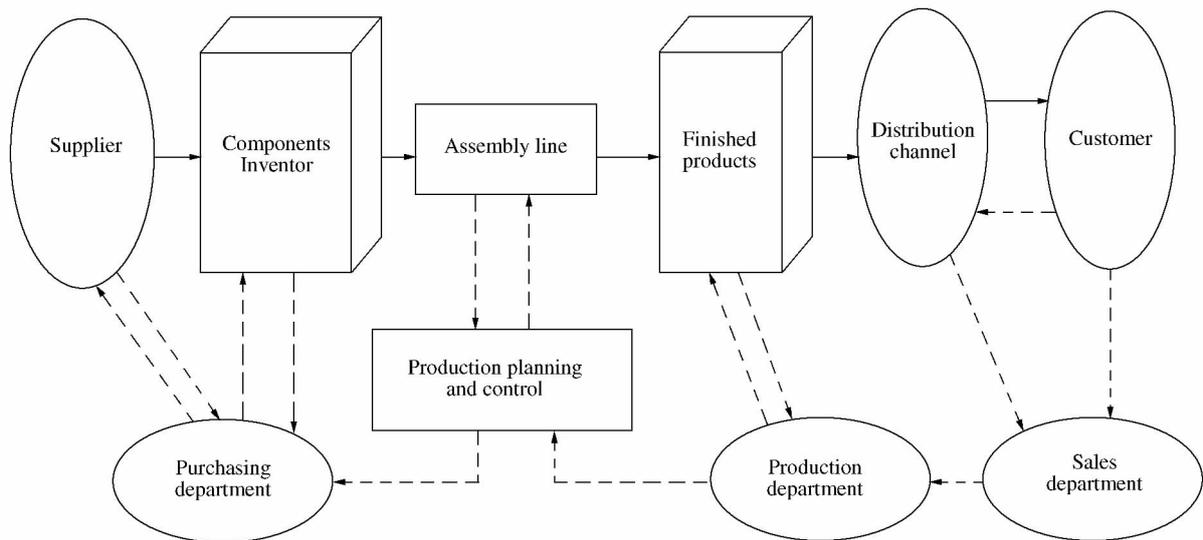


Figure 1 Operation of the Pipeline Enterprise under SCM

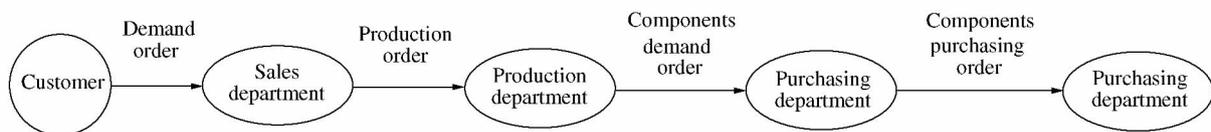


Figure 2 Order process of the Pipeline Enterprise under SCM

2) Enterprises just conduct assembling

Most of the components of the finished products come from their suppliers. Usually they are standard pieces or have component commonality. The pipeline makes various kinds of products through assembly of different components^[8]. Every workplace finish in some certain steps; when products change, workers moderate the equipment or steps but without big changes. The production process cycle is closed and its tact is kept by automatic transmission. In this way, the pipeline produces different kinds of products.

3) Keeping a long term win-win cooperation relationship with suppliers

The pipeline assembly enterprise and suppliers are at a certain point of the supply chain, which are point-enterprise at the value network. By cooperative com-

petition, they are able to obtain a competitive edge of the supply chain as a whole, strengthen their own core competitiveness, share risks and reach a win-win situation^[9]. As with the supply of components, the stable relationship with suppliers makes it possible to shorten the lead time. In fact, the pipeline assembly enterprise analyzes and predicts the market demand together with the suppliers, which makes it possible for those suppliers to organize correctly in advance so that the components that the pipeline assembly enterprise needs could be in the right place on time.

4) Vendor managed inventory

Inventory is inevitable for every company. However, it is vitally important to reduce inventory as much as possible and secure its good operation as well^[10]. The pipeline assembly enterprise sets some departments,

including component warehouse and finished goods warehouse for storing components and finished goods^[11]. The new inventory managed model that is vendor managed inventory can largely reduce the stock level. In this model, assembly enterprises manage components together with suppliers or by component suppliers alone.

3 Production Planning and control of the pipeline enterprise

We can see from the management feature that a pipeline enterprise encounters the following opportunity and challenge:

1) The relationship between a pipeline enterprise and component suppliers

According to the life-cycle of a customer, customer behaviors include: order processing, product producing, product selling, after-sale service and customer management.

The component cost makes up the biggest part of the whole cost system, so the purchasing department is the key to the company's future. The integrated system may build a great picture of an information sharing cooperative mechanism among the enterprises in the supply chain. However, it is much harder to coordinate resources among enterprises than in a single enterprise and every company acts in their own interest, which usually resulted in that cost is just shifted on to one and another. Two questions need to be considered when cooperating: how to build an effective information sharing mechanism to ensure timely supply, and to decrease the bullwhip effect.

2) Pipeline assembly enterprise located downward of the supply chain and products are for the ultimate consumers

As the heating up of the competing among enterpri-

ses, consumers' needs transform from unfold and stable ones to variable and unstable ones. Thus the uncertainty the pipeline enterprises face up with is much bigger. There are two kinds of uncertainty: one is quantity and the other is variety, which make it difficult for their ordering and assembling.

3) To get a right balance between lead time reduction and inventory fall is the key to success for the pipeline assembly enterprise.

As the pace of life continues to increase, consumers become stricter with lead time. To satisfy their demand, enterprises need to increase stock so as to convey to customers in time when ordered. But cost may grow up instead. So the enterprise needs to balance between these two goals.

4) After demand analysis and prediction, the pipeline assembly enterprise needs to make the right term and quality plan to obtain the maxim profits

Traditional production planning and control focus on the inter resources and constrains but ignores their suppliers' condition. Cost and profit analysis is usually done before or after production. The matter is how to build a real-time control system to allocate limited resources and optimize production.

4 Production Planning and control model of pipeline enterprise under SCM

Based on the analyze above and the production planning and control model under SCM(proposed by professor Shihua Ma), combined with operation characteristics of the pipeline assembly enterprise, applied production structure, lead time, resource constrain, classified regulation and bottleneck of the pipeline. The production planning and control model of the pipeline assembly enterprise under SCM was proposed in the following chart(Figure 3).

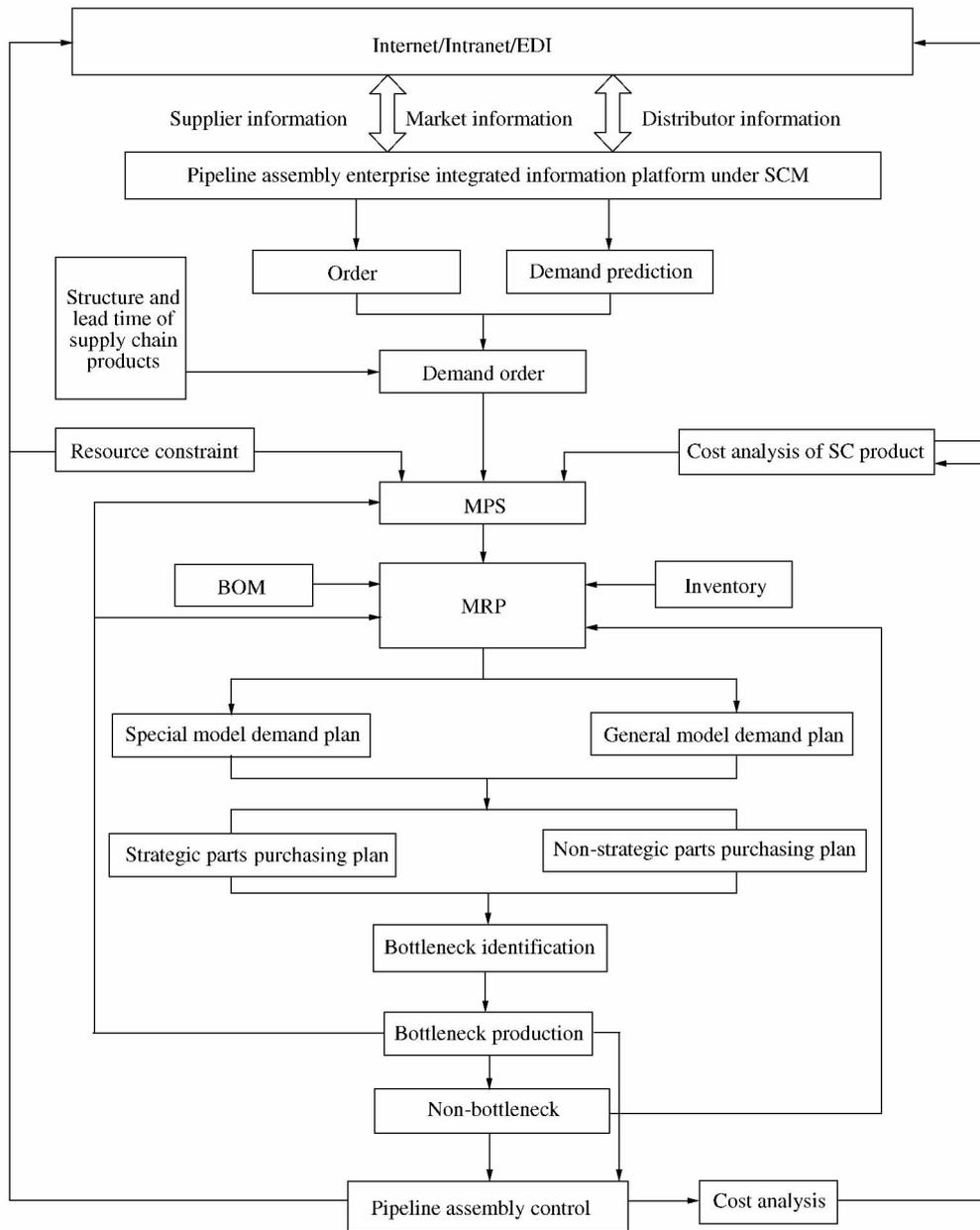


Figure 3 PPC model of the pipeline enterprise under SCM

Based on an Internet/Intranet/EDI platform , enterprises at the supply chain are sharing each other’s information , which finally comes to an information integrated platform. The pipeline assembly enterprise makes the demand plan by considering real time information on the platform and demand analysis , combining with a product’s construction and lead time. After resource constraint of every company at the supply chain , the pipeline assembly enterprise conducts a

cost and profit analysis to make the optimized main production plain. The model is applied into production , postponing the production of a special model. By telling a bottleneck and others apart , an enterprise can guarantee the production at the bottleneck. Information at very step in the system will be fed back to the platform meanwhile. In brief , the proposed system has the following advantages:

1) Supply chain management on a whole

Emphasizing supply chain management, the production planning and control of the pipeline assembly enterprise goes beyond the domain of the enterprise itself. Starting from the supply chain, after considering the component supplier's constraint and product schedule and other information sharing on the platform, the pipeline assembly enterprise is able to make a more precise demand plan and production plan, which can ensure synchronism and real time action. If this model works well, the pipeline assembly enterprise will maintain a long term partnership with some other supply chain companies.

2) Win-win cooperation management

The goal is to cut cost, but not to transfer it from one company to another in the supply chain. Some problems are likely to arise in this information sharing system. Downstream enterprises tend to overstate their demand prediction to avoid stock shortage. In this case the upstream enterprises need to build the corresponding production capacity. Thus, upstream enterprises undertake more risks and they gradually won't consider the demand prediction from downstream and the information sharing system finally becomes invalid. Under the proposed system, the right incentive mechanism cost can be cut by cooperation, for example advance purchase order. Suppliers will charge buyers part of the predicted order cost before production and charge the rest after the predicted demand is realized.

3) Postpone difference management

The proposed system divides production into a general model and a special model. General model are those parts that many kinds of product will use. It is known that collection information is much easier to predict than individual, so for the general model, we can predict demand precisely, then purchase and produce them with "push supply chain"; For the special model, with "pull supply chain" and assemble the special model and general model are according to order. This combined effort would reduce production proportion of special parts. Thus, stock will be cut and lead time

will be reduced. Furthermore, it can generate economies of scale when a general model can be produced on a large scale.

4) Components regression management

Pipeline assembly enterprises usually sign long term contracts to ensure a stable supply. However, long term contracts have some constraints, especially in transfer cost in suppliers and dynamic market price. The proposed system divided components into strategic parts and non-strategic parts. For strategic parts, core parts for production, suppliers are limited and less substitutive; the pipeline assembly enterprise should collaborate with their suppliers closely to ensure the right supply. For non-strategic parts, bulk commodity for example, it is easy to purchase from numbers of suppliers freely for their high degree of standardization and the transfer cost can be ignored considering an enterprises' market-response ability. So it is better to sign a short term contract and change suppliers when a situation changes to reduce price risks, cut inventory level, and improve market response ability.

5) Bottleneck management

Build bottleneck identify algorithms to identify core resources and non-core resources. A bottleneck is the master of yield time. Thus enterprises should give the bottleneck resource top priority and product them in a slightly larger scale to make the best of the bottleneck's product ability and cut preparation time. Meanwhile, enterprises should set a time buffer and inventory buffer to avoid influence of other steps. Following steps are non-strategy resources' production according to MRP.

6) Cost analysis and control

The proposed model involves cost analysis in production planning and decision making. In the process of assembly, cost information will be fed back to cost analysis module so as to optimize a plan and decision, which is cost-oriented.

5 Conclusions

Fierce competition makes demanding requirements on

pipeline assembly enterprises. Cutting lead time and cost or meeting market needs in time is the competition point of pipeline assembly enterprises. Based on the management characteristic of the pipeline assembly enterprise and on the ground of precedents, this paper proposed production planning and control of a pipeline assembly enterprise under SCM. The model focuses to optimize the supply chain as a whole. And building a right incentive mechanism to keep a long term win-win relationship with partners, postpone delays in the production of special parts, which meet the various needs and shorten lead time. Regression management of strategic components and non-strategic components makes a better market reaction performance and cuts inventory. Give bottleneck resources the top priority and apply cost analysis in the process of production. The model is helpful to production planning and control of the pipeline assembly enterprise.

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