

CHAPTER I

INTRODUCTION



1.1 Background

1.1.1 Make-To-Order Manufacturing

In make-to-order manufacturing, a product is produced only after an order for it is received. The manufacturing process begins after the customer specifies the product requirements with terms such as price and delivery time. Then, raw materials or components are procured and production operations are performed according to the customer specifications.

Generally, products are produced in small batches, sometimes just one, with high varieties. Moreover, most of them are unique. The products in this kind of business include furniture, transformers, dynamos, hand-made shoes and clothing, control boards and so on.

An order of make-to-order manufacturing with long lead time may be viewed as a project. Therefore, it should be managed with project management techniques. Typically, a project is unique either in total or in parts. It contains many interdependent activities and has definable start and definable completion. Managing a project involves controlling project durations, costs and resource utilization.

1.1.2 Case Study

Precise Electric Manufacturing Co., Ltd. (PEM) manufactures a variety of electrical transmission equipment, which include distribution transformers, instrument transformers, controls and automation systems, capacitors and lighting

arresters. Each product line is produced by different departments. Its turnover in 1996 was around one billion baths with an annual growth of 20% in the previous three years. The company has both oversea and domestic customers, from state enterprises to private sectors. Customers in the private sectors and from oversea directly launch orders to the company. While, orders from state enterprises are obtained through bidding. Operations for each order will start only after the company has received it. Therefore, PEM classifies its products as make-to-order.

The distribution transformer line is the company's cash cow. It contributes about 30% of the total revenue and its business is doing well. Orders for distribution transformers may be obtained either directly from customers or from bidding as mentioned earlier. Thus, lead times depend on specifications and order sizes, which may vary from one to 250 units. In general, they take around two to four months.

Operations on an order of distribution transformers commence only after it is received. It starts with designing the transformers according to the specifications. Then, purchasing orders for required materials are issued.

A transformer consists mainly of a core and a coil, or coils, both in an oil-filled tank, and other accessories. Production begins with cutting silicon steel slits, which come in rolls, into small plates. Then, the plates are stacked on a wooden support to make the core.

A coil is prepared by wrapping copper conductor with insulation paper. Large copper wires are wound around the insulated core to be low voltage coil. After which, smaller wires are wound over to form high voltage coil.

Next, the core and the coil are assembled together. Assemblies are then heated in an oven in a batch of between one and 24 units, depending on their sizes.

After heating, an assembly is placed into a vacuum tank which is later filled with oil. The last process is fitting the assembly with accessories. Final testing is done before packing. The product is then ready for shipping.

Currently, PEM is not satisfied with its production planning and control system. It needs a better procedure and supporting tools.

1.2 Statement of the Problems

In businesses of make-to-order manufacturing with long lead time, there are always problems with keeping promises on deliveries which lead to high costs. The major causes of the problems lie in the planning, scheduling, and controlling of the activities and the resources.

In many cases, when there are a lot of activities to be done, they are usually not thoroughly planned. Some activities may be neglected, others may not be adequately planned for their resources requirements. Neglected activities or resources can result in delays and unnecessary costs to accomplish them.

Scheduling of activities are usually made under an assumption that there will be sufficient resources such as raw materials, machine or labour capacities, money, etc; when they are needed. Frequently, this is not the case. Raw materials, especially ones with long lead time, do not arrive when they are required, due to purchasing orders being issued too late. Capacities of machine and labour are overloaded because they are allocated to too many activities which are scheduled to perform

simultaneously. All of these events often lead to delays in deliveries and high costs in attempts to expedite them.

In order to cover up for incompetencies in task scheduling, typically company builds up inventories and excess capacities. This approach, too, leads to unnecessary costs.

During manufacturing process, it is difficult to monitor the progresses of activities and control their schedules and costs because too many activities are undertaken at the same time.

PEM has been suffering from the above mentioned problems. Due to PEM's recent astronomical growth, these problems are becoming much more serious. Insufficient capacities and material shortages, especially imported ones, always lead to delivery delays. Hence, it is necessary for PEM to have a more effective system to manage its operations.

1.3 Objective of the Study

To develop a project-based production planning and control system for the company in the case study.

1.4 Scopes of the Study

1) The study will be conducted in the distribution transformer division of Precise Electric Manufacturing Co., Ltd. It will include operations from design, to procurement, production, testing and shipping.

2) The study will establish procedure and tools for planning, scheduling, monitoring and controlling of schedule for activities and resources involved in 1.

3) This study will emphasize on three basic resources namely labour, equipment and materials.

4) The criterion for evaluating the system is delivery. Although, in general, there are other performances such as quality and cost that should be evaluated for project management. However, delivery will have positive effects on these measures. Resources which are more effectively managed will lower costs. Activities need be rushed to compensate for delays, which always lead to errors.

1.5 Benefits of the Study

The results of the study will directly benefit the company in the case study. However, its methodology, procedure and tools may be adopted by other divisions of PEM or other manufacturers whose operations are suitable for project-based management. Benefits include:

- 1) Project can be planned, monitored and controlled systematically.
- 2) Delivery lead time will be improved.
- 3) Completion time for each activity will be more precisely estimated.
- 4) Material shortage will be decreased.
- 5) Resources will be more effectively utilized.