Research on Optimization of Production Process and Warehouse Management System

Yanxiong Han, Xu Zhu

School of Economics and Management, Shaanxi Fashion Engineering University, Xi’an 712046, China

Abstract

According to the influence factors of the production process, a plan for the optimization of the production process in A Company was designed. It focuses on the control of the production line modularity and product flow process, as well as the design of quality improvement plan. Based on the analysis of the current situation of production and logistics system of large power generation equipment manufacturing enterprises, this paper focuses on the existing problems and improvement methods of the logistics and storage system. The logistics system of A company is analyzed from three aspects, including the operation mode, system structure, organization structure and performance appraisal. Based on that, the logistics warehousing system is analyzed in detail and the existing problems of the existing logistics warehousing system in A company are put forward. The paper summarizes the optimization design of logistics and warehousing system of A company, and then details the organizational structure, storage information system, resource integration and implementation steps, and finally establishes the performance evaluation system of logistics and warehousing system.

Keywords: Production Process, Process Optimization, Logistics System, Warehouse Management.

1. INTRODUCTION

Over the past 30 years of reform and opening up, both China's economic capability and people's living standards have been tremendously improved. Many multinational corporations have set up factories in China to transfer their manufacturing operations, and which promoted the prosperity and development of China's manufacturing industry (Ruiz et al., 2011). According to official statistics, foreign-owned enterprises are now fully involved in a large industrial category in China, with manufacturing accounting for about 66% of the total. However, today, due to the appreciation of the CNY and the rising cost of labor, the pressure on the survival of enterprises has increased dramatically. For the manufacturing industry, measuring a company's competitiveness is mainly from 3t aspects: the cost of production, product quality, and the production delivery period (Cagliano et al., 2011; Nur 2013). These three factors are concentrated in the company's production process.

Due to the long-time agricultural and living style in our country, as well as the state-led agricultural policy during the very long period after the founding of New China, our commercial activities have been suppressed for long time, which made it difficult to achieve development and expansion of the environment (Atieh et al., 2016). Flexible management is a kind of management thought which has appeared more frequently in China in recent years. Some researchers pointed out: flexibility was the ability of a system to quickly and economically adapt to environmental changes or environmental uncertainties (Zeng et al., 2002). Specifically, the company flexibility can be understood as a flexible ability to respond quickly and effectively to changes in market environment and customer demand, including the ability of responding to the timely adjustment capability and the ability of accommodating itself to respond to changes, that is the capacity change (Kim et al., 2016). Some researchers also earlier proposed that the enterprise should be used as a whole to examine the flexibility of the enterprise system. Industry internal logistics information system research is mainly based on the application of e-commerce and computer network technology.

In this paper, taking a company as the research background, and taking logistics and warehousing system of a company as the research object its logistics warehousing system was analyzed and optimized. The logistics of large-scale equipment manufacturing company A is first studied and analyzed, and a set of logistics solutions that are in line with the actual situation of the enterprise is proposed, which lays a solid foundation for the improvement of the logistics management of the enterprise. At the same time, it also provides reference for the improvement of logistics management of this large-scale equipment manufacturing enterprise. It also hopes to
attract more experts and scholars to pay attention to the logistics problems of the large-scale equipment manufacturing enterprises in our country.

2. PRODUCTION PROCESS MANAGEMENT THEORY

2.1 Lean production management

Lean production is developed on the basis of Toyota's production methods, and its basic idea is to eliminate all unnecessary waste and to improve continuously. Lean production is based on the understanding of customer needs, through continuous efforts, to eliminate unnecessary waste for every aspect of the process, and to minimize non-value-added activities. So as to continuously improve efficiency, reduce costs, improve quality and delivery, so that enterprises get the maximum benefit and sustainable competitive advantage of a production and operation mode.

![Figure 1. Lean production model](image)

In the production process, employees only act as some supplementary factors of machines. They are busy with the mechanical handling of materials or rework parts, instead giving full play to the skills and ideas of employees. They cannot actively participate in the improvement and creation, resulting in a waste of staff capacity (Lee et al., 2018). In this way, the two waste phenomena, such as overproduction and under-utilization of staff capacity, have led to a decrease in production fluidity, which in turn has affected the stability of the production process and the output of production capacity. Therefore, the company must carry out lean management reform according to its own management defects, so that the value flow of the company can be rotated.

2.2 A company production process optimization design

2.2.1 The basic elements of the production process

Production process optimization goals: target production process optimization includes the following three aspects: first, to meet the needs of market changes, improve the flexibility to adjust production process; second, improve product flow in the production process; third, reduce company production costs and inventory costs. Influencing factors of production process and their logical relationships: according to the optimization goal of the company, the factors of production process optimization were selected based on the field investigation, including the following five aspects: organizational structure flexibility, production planning and finished product inventory, bottleneck management, product quality improvement and staff self-management culture. Production process optimization content: from the above logic relationship, we know that the key to determining the ability of the production process is the organizational flexibility and product mobility, and both of these key factors are run on the basis of the production process.
2.2.2 Modular design of production line

The purpose of the modular transformation of the production line is to improve the company's responsiveness to the market and improve the efficiency of the company's comprehensive utilization of the company resources. Therefore, the optimization of the organizational structure of production should take into account the stability and the variability. And at the same time, the relationship between the existing production tasks and emerging tasks should be balanced. First of all, the production and processing process is standardized, so that all parts of the processing process are functional allowable, and are unified reference processing route. After the merger and analysis of the processing technology, according to the spirit of lean management, the non-value-added links were removed. Retain the links in the production process that can increase the added value of parts and essential auxiliary links. The main processing paths are summarized as follows:

![Diagram of production line](image)

**Figure 2.** Process flow after part merging process

The advantages of route standardization are as follows. First, the two-way flow of parts is avoided in the process, and the overlap of the upper and lower processes at the same work station is prevented, thereby a part repeatedly processed accident is avoided. Second, to facilitate the production management, managers only need to seize the main processing and promote the progress. We can ensure the normal operation of production, and reduce the minutiae, thereby enhance the efficiency of the management of production control. Thirdly, it lays the foundation for the further realization of the visual management of the value stream in the workshop.

2.3 Design of lean control program for product flow process design

The production volume is a complex issue that involves many factors such as the type of product that the customer needs, the quantity, the date, the production capacity of the company, the lead time of the supplier, and so on. In general, there are three major types of production volume: first, mass production, that is, a dress will be the kind of product orders for all the orders completed. Second is the production of single-piece flow, that is, each dress up only produce a product, and then dress-up to produce another product. Third, small-batch production is a part of the production order tasks dress up products, and then dress up to produce another product. For example, we received customer requests for three models of the 30 products of each order, and the processing hours is shown in Table 1.

<table>
<thead>
<tr>
<th>Working procedure</th>
<th>OP200 (min/product)</th>
<th>OP300 (min/product)</th>
<th>OP320 (min/product)</th>
<th>Total working time (h)</th>
<th>Process preparation time (h)</th>
<th>Outsourced time (d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8695 working time</td>
<td>70</td>
<td>130</td>
<td>80</td>
<td>15</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5523 working time</td>
<td>120</td>
<td>80</td>
<td>160</td>
<td>24</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>working time</td>
<td>80</td>
<td>130</td>
<td>80</td>
<td>18</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 1 Production hours
In order to improve the efficiency of the entire production line, we make the following adjustments to the production volume. The principle of adjustments is: first, meet the bottleneck production capacity of the largest production equipment. Second, reduce queuing time. Third, try to reduce the time of dress up. To this end, we set up an improvement group to conduct research and ultimately use the principle of the greatest common divisor to guide the planning of production batches.

3. OPTIMIZATION OF ENTERPRISE LOGISTICS STORAGE SYSTEM

3.1 Optimization model of A company logistics storage system

Based on the above analysis, a logistics and warehousing system that can adapt to the development of A company is constructed. The basic model is shown in Figure 3.

![Figure 3. Optimization model of Enterprise logistics and warehousing system](image)

As can be seen from Figure 3, the redesigned logistics and warehousing system is consistent with the original system through the integration of warehouse management. Manufacturing process of semi-finished products and other transport management are integrated, to achieve efficient and concise purpose. Procurement centers and customer service centers are responsible for the back-end and front-end of the supply chain logistics, that is, purchasing logistics and finished product logistics.

3.2 Implementation of logistics and warehousing system optimization program

Company A is divided into a large number of manufacturing units according to the production process and functions, as well as functional departments (such as purchasing department) related to the logistics business. Because the manufacturing unit and the functional department of the specific situation are not same, and the internal organizational structure and mode of operation are also different, so the enterprise logistics and warehousing management can only be divided into the manufacturing unit and some functional departments within the enterprise level. Logistics management is only implemented macro-extensive management, which leads to waste of resources and inefficiency. Warehouse management center is the center of enterprise warehouse management system. What needs to be explained is that the warehouse management center is not a simple addition of warehouses. In addition, it has the basic storage and distribution functions of warehousing in the logistics functions, and it also has management functions such as auxiliary examination and coordination of internal logistics.
When enterprises design the center functions of the storehouse, the establishment of various functions need to be gradual, and functional improvement needs to be from top to bottom. The scope of logistics center should be taken into account. Core functions of storage management center and supporting functions should be made clear. In the process of designing and perfecting the functions of the warehouse management center, we need to bring forth new ideas in combination with the actual conditions of the enterprises and the characteristics of logistics.

3.3 Establish logistics warehousing management information system

As the relationship between logistics and information flow is inseparable, the next step is to optimize the design of the information system for logistics and storage management. All logistics activities should be supported by logistics information and services. The logistics business activities such as transportation, storage, processing, assembly, loading and unloading in the production process should be efficiently managed and coordinated by logistics information, so as to improve the overall operation efficiency of production logistics system. Logistics management informatization is the foundation of modern logistics management.
The establishment of logistics warehousing management information system can not only standardize the logistics and warehousing management of enterprises, improve the efficiency of logistics management, reduce the labor intensity of staff, but also strengthen the coordination among various departments of enterprises, so as to reduce the logistics and production costs. After the material resources integration, it not only simplifies the project material management complexity, but also streamlines the project material management, and solves the problem of material confusion. Material resource integration also provides the material basis for the next material distribution.

4. CONCLUSIONS

In this paper, the relationship between production structure and production process is studied. In the process of analysis and implementation of process optimization, production structure is used as a specific carrier to improve the flexibility and wide applicability of organizational structure according to the company's strategic mission. This article discusses the optimization design and implementation of the logistics system. First, the basic steps, goals and optimization models of an enterprise logistics and warehousing system are summarized. Secondly, the optimization of logistics and warehousing system is discussed in detail from the aspects of integration and optimization of agency personnel, business process reengineering, design of warehouse management information system, warehouse business, resource integration and optimization of warehouse management.

ACKNOWLEDGEMENTS

This work is supported by the scientific research project of Education department of Shaanxi province: Research on Optimization of Production Process and Warehouse Management System in Shaanxi province (No. 17JK0921).

REFERENCES