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An Application Research of Just-in-Time (Jit) Production Method in Company W

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ABSTRACT. *Many chinese enterprises have recently implemented jit(just-in-time) production method to minimize their inventories and wastes. this study takes company w (an auto parts manufacturer) as an example, using field interviews and case studies to analyze in details the motivations, processes and safeguards of company w's application of jit. we also summarize and analyze the positive effects of wit 's implementation of jit. by revealing the characteristic innovations of company w in this introduction and application of jit, we aim to provide some valuable experience and practical guidance for other enterprises.*

KEYWORDS: JIT, kanban management, total quality management

1. Introduction

General Secretary Xi Jinping pointed out in the "Report of the Nineteenth National Congress of the Party" that Chinese firms must insist on de-capacity, de-stocking, deleveraging, optimize stock resources allocations, and expand high-quality incremental supply to achieve a dynamic balance between supply and demand. "Three go, one drop and one supplement" is an important content of supply-side structural reform, and "cost reduction" is the key work of supply-side structural reform. In the past, our country's industries had low costs and low added-values, but as the cost of production continues to increase, China's industrial products remain to be low added-value products. Why are enterprises' costs higher? How to make sense of this high cost? How to reduce costs and maximizes the profit? These are realistic and urgent issues many Chinese enterprises are facing.

The JIT (Just-in-Time, JIT for short) production method was created by the Toyota Motor Corporation of Japan. JIT sends the required product components to the designated production lines by estimating the required quantities at each time period. Also, by exposing the "waste points" in the production process, the firm can adjust its use of various factors production s and thus reduces costs.

This article studies the application of JIT in Company W, an auto parts production company. Our main goals include: (1) Analyze the motivation behind Company W's introduction of JIT; (2) Analyze Company W's process of implementing JIT and the method it used to safeguard JIT's implementation; (3) Summarize the experience in successfully implementing JIT.

Our study aims to contribute to the existent literature on JIT through describing in details the motivations and processes for the auto parts companies to gradually introduce JIT and summarizing the characteristics and innovations of Company W in the process of applying JIT. We also hope to provide some valuable experience and reference for other Chinese companies who are currently under a transition to the JIT production system.

2. Research Hypothesis

Lots of research has been done on whether JIT truly benefits corporate growth and boosts the production efficiency of enterprises. Some scholars believe that JIT promotes production efficiency [1] [2] [3]; others assert that JIT has many defectives [5]. However, scholars do agree on the benefits of JIT for corporate growth. We hypothesize that JIT improves the production and management efficiencies of the enterprise, thus achieving cost minimization and profit maximization.

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3. Research Methods and Data Sources

3.1 Research Methods

Case study is one of the important methods of management theory research and has been widely applied in management accounting research in China. The case study method analyzes a large amount of unstructured material data without controlling the process, and since its evidence comes directly from practice, it is sometimes more realistic and effective than many theory-based methods.

3.2 Our Case

The materials used for the research are in two categories:

(1) Documentation: We have collected and sorted out a variety of literature materials inside and outside Company W, including news reports, internal work meeting reports, project implementation plans, business reports, financial information, etc. (including media reports about 5,000 words The company's internal information is around 30,000 words, and the portal information is about 5,000 words).

(2) Interview materials: We visited to Company W multiple times to conduct in-depth interviews with the head of the company's finance department, the head of the JIT project, and the deputy general manager of the company. Through these interviews, we understood the motivations, processes and safeguards of WIT's implementation of JIT, and analyzes and summarizes the key points and experience of the company's successful implementation of JIT with relevant persons in charge. The interviews obtained a total of 3.6 hours of effective recording materials and converted about 16,000 words. We collated all the obtained materials into electronic manuscripts and got a total of 56,000 words of materials.

4. Application Analysis of Jit in Company W

4.1 A Brief Introduction of Company W

Founded in 1988, Company W is a company specializes in the production of sophisticated automotive parts within the Wanxiang Group industrial system. Company W is the main designer and producer of “WGC” and “WANXIANG” brand automobile wheel bearing units (first, second, and third generations with ABS electronic speed sensor), automotive wheel bearings and other automotive bearings, automotive anti-lock brake systems (ABS), automotive electronic handbrake (EPB) and other automotive electronic products.

With the joint efforts of all employees, Company W achieved excellent results and continuously improved its overall product quality. Company W has made remarkable achievements in the development of bearing manufacturing. Through years of exploration, it has created a talented team with reasonable structure, proficient business, superb technology, courage to innovate, and high loyalty, which has made the company grow from a trivial component producer to a “small giant” in the industry.

4.2 Motivation Analysis of Wit's Implementation of Jit

In recent years, China's auto industry experienced a period of rapid development, and W's product sales and market share have grown significantly. Since 2009, the company's production and sales have soared, reaching new highs every year. However, with the rapid growth of W's business, the company has also been troubled by its weak production site management capabilities. In 2011, the management of Company W cooperated with relevant experts at home and abroad to observe, investigate, analyze and prove the production site, and believed that the company had the following problems:

(1) Production scheduling is not coordinated enough. Due to the failure to share information in real time, the weekly production plan formulated by the planning department lacked data support, causing a lack of workshop capacity and raw materials during the production, which then resulted in lost time and out-of-stock losses. These problems have deeply hurt Company W’s credibility amid buyers.

(2) Serious production waste. Company W did not have a complete production management system, nor did it regularly carry out publicity and education activities on advanced production management concepts, which caused Company W to have a variety of waste phenomena such as long production cycles, a high rework rate,

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a high maintenance cost, a high machine equipment idle rate, invalid frequent handlings, and a lack of working enthusiasm amid employees, etc.

(3) High production costs. Company W's product defect rate was high, and its inventory rate was also high, resulting in a rising cost expenditure (including material cost). Although the total sales revenue continued to increase, the final profit obtained did not increase but instead decreased, thus the profit rate of Company W continued to decline.

The senior management of Company W and relevant experts analyzed that the JIT production method meets the urgent need of the company. While improving the company's on-site management, JIT improves production efficiency and greatly reduces costs, therefore JIT was considered as the most reasonable and feasible method for future development of the company. Road. Manager Wang of the JIT project said: “From the perspective of the development of the manufacturing industry, the implementation of the JIT production management method is inevitable for the times and the direction of the industry's development. The implementation of JIT is imperative.” Since January 2012, W The company's senior executives decided to introduce JIT production methods in the company. According to the principle of practicability, they chose the point-to-face introduction mode, which was gradually promoted and continuously improved.

4.3 Implementation Process Analysis

4.3.1 Standardized Operation and Operation Processes

To smoothly introduce the JIT production method, Company W first standardized the operations and operation procedures, as follows:

(1) Determine the operating cycle time

The operation cycle time refers to the actual operation time of the fastest one cycle when the operator performs standard work alone. Company W needs to count the time spent in each manual process, and then identify the necessary and unnecessary actions and remove those unnecessary actions.

(2) Determine the production cycle

Production cycle time of production line = exact working time per day / quantity required per day

(3) Determine the number of operators on each production line

After the time of production cycle is determined, the number of employees needed is calculated from the workshop hours except for the takt time:

Number of personnel required = workshop hours / beat duration

(4) Determine the operation order

Operation order is also called operation sequence, which is the sequence of production operations in which operators can produce qualified products most efficiently. The number of operators is determined, and then the work process that each operator is responsible for is determined in this process.

(5) Work out operation instructions

By combining the production cycle and operation process procedures and operation scope, together with product quality requirements and relevant precautions in the operation, the operation standardization document in the complete process, that is, the operation instruction book, is formed. Every employee must strictly abide by all contents of the instruction book.

Company W standardizes on strict operations and operation procedures. During specific implementation, it not only requires recording the steps of each operation, but also constantly checks the status of execution, checks its effectiveness, and summarizes, improves and improves on this basis. , Thereby improving the quality and efficiency of operations.

4.3.2 Integration of Production Lines and Adjustment of Production Site

After the introduction of JIT, Company W readjusted and arranged its production line and production site, as follows:

(1) Integrated production line

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Taking the four production lines of Company Was an example, the process analysis of the four production lines found that the repetition rate of the four production lines was as high as 60%. Reintegration of overlapping production processes largely reduced mechanical equipment and labor costs. The production process before adjustment is shown in Figure 1, and the adjusted production process is shown in Figure 2.

Production Line 1. Flow 1 → Flow 2 → … → Flow 18 → Flow 19 → Flow 20
Production Line 2. Flow 1 → Flow 2 → … → Flow 18 → Flow 19 → Flow 20
Production Line 3. Flow 1 → Flow 2 → … → Flow 18 → Flow 19 → Flow 20
Production Line 4. Flow 1 → Flow 2 → … → Flow 18 → Flow 19 → Flow 20

Fig.1 Schematic Diagram Before the Reorganization of the Production Line

Flow 1 → Flow 19 → Flow 20
Production Line 1. Flow 2 → … → Flow 18 →
Flow 1 → Flow 19 → Flow 20
Flow 1 → Flow 19 → Flow 20
Production Line 2. Flow 2 → … → Flow 18 →
Flow 1 → Flow 19 → Flow 20

Fig.2 Schematic Diagram after the Reorganization of the Production Line

Through the transformation and reorganization of production lines, the original four production lines were reduced to two, the number of machinery and equipment was reduced from 470 to 240, and the number of operating staff was reduced from more than 800 to around 400. Thus, this new system not only reduced the cost of labor but also cut down machine maintenance costs.

In 2018, Company W introduced an intelligent production line, the production cycle time was shortened from 35 seconds to 20 seconds, the production cycle was shortened from 25 days to 4 days, and the overall production efficiency was increased by more than 2 times.

(2) Arrange and arrange production sites

After the reorganization of the production line, the overall structure of the company's production site also needs to be reorganized. The original production site used the “U” type production framework to coordinate the production of these four production lines, as shown in Figure 3:

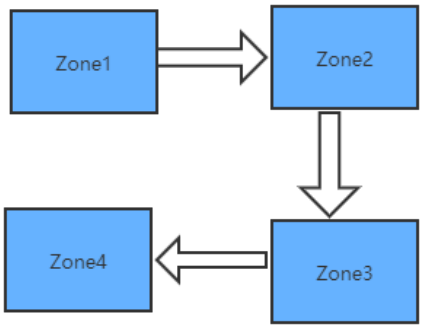

Fig.3 The Layout of the Original Production Site

The first area is the parts area, the second area is divided into production lines, the third area is the assembly production line, and the fourth area is the finished product warehouse. But because of the integration of the production line, the structure of the production site should also be updated and adjusted. The idea of adjusting the production organization structure is that, according to the requirements of JIT, all the production lines are laid out in a straight line, so that the transmission interval within the production site becomes shorter. As shown in Figure 4.

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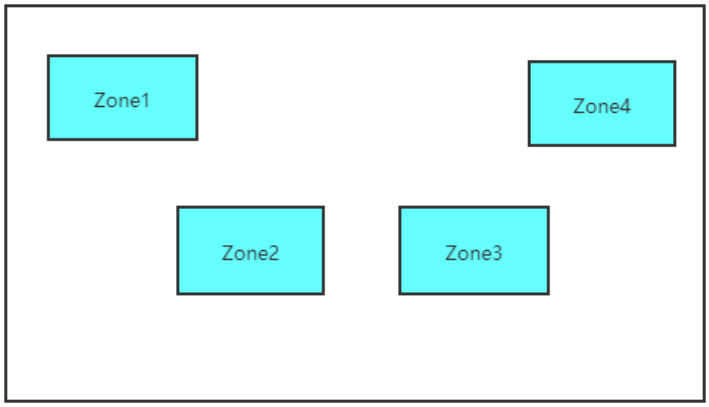

Fig.4 The Layout of the Production Site after the Introduction of Jit

Although the adjusted production site layout is not a 100% linear structure, it basically guarantees that raw materials and parts are directly sent to the sub-assembly production line, then to the final assembly production line, and finally into the warehouse. The regulated production site generally meets the condition of the shortest linear distance, and abides by the JIT shortest conveying route concept, which effectively prevents the cost of transportation in the work site.

4.3.3 Production Planning and Kanban Management

(1) Development of production plan

Company W can generally know the customer demand in the next 3 months, and the planning department can make a plan for the next 3 months, that is, formulate n + 1, n + 2, and n + 3 in n months. Among them, n + 1 month is a fixed manufacturing plan, and n + 2 and n + 3 are all plans to be adjusted. Every production line in the company is to make the plan for the next month in the current month and adjust the plan for the next month according to the actual situation in the middle of the month. This ensures that the company responds quickly in an emergency and reduces losses.

(2) Implementation of Kanban management

1) Use of Company W kanban

Company W's production site mainly includes production kanban and logistics kanban.

The production kanban is used to indicate production on the production line. The production plan is made into a kanban the day before production, and the employees on each production line are retrieved in order on the next day and placed on their respective production lines to prepare the required materials according to the production plan of the day.

The function of the logistics kanban is to guide workers to allocate and receive items. Logistics workers use the information indicated on the kanban to verify with the goods and distribute the goods to the suppliers.

2) Quantity management of Company W kanban

In order to both ensure production and reduce inventory, the company has strict requirements on the number of kanbans. The calculation formula for the number of kanbans is as follows:

Kanban quantity = production kanban quantity + logistics kanban quantity

Number of production kanban = demand on the day * production time of the process / number of parts in stock

Number of logistics kanbans = demand on the day * time of parts in stock / number of parts in stock

After the introduction of Kanban management in Company W, information transmission was timelier and work efficiency was greatly improved. Confirm the recorded information of the day through the kanban to avoid the occurrence of major problems.

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4.4 Guarantee Measures for the Successful Implementation of Jit

4.4.1 Establish a Security System

In the past, when Company W's machine malfunctioned, it was first handed over to the reparation employees, and then put back into production after the repair was completed. However, this kind of security method is contrary to the basic idea of JIT. Company W improved the security system immediately after the introduction of JIT, as follows:

(1) Establish equipment failure history

First of all, it is required that the security staff understand and be familiar with the types, root causes and solutions of problems that may occur in each production line, and adopt effective means in advance to prevent similar failures from recurring or when the failures are generated, they can be immediately handled well; The equipment failure history records the problems, root causes and repair methods of each machine on the machine obstacle history. When similar problems occur again, the maintenance personnel's diagnosis and repair time will be greatly reduced, thereby improving overall efficiency.

(2) Personnel training

Company W requires the security personnel to master relevant professional skills. Company W has always valued the cultivation of talents, and adopted the OJT (On Job Training) production method: first, on the job site, senior technical personnel train and educate the knowledge, skills and working methods required by ordinary employees; The maintenance staff with working experience and local staff work together to formulate a talent cultivation plan according to local conditions; finally, select a group of outstanding staff from the current working staff to study in Japan.

(3) From after-care to before-care

After the failed history of machinery and equipment was known to the employees of the company, the company's maintenance tasks begin to gradually shift to pre-events. The core point of the maintenance task is to ensure that the machine does not appear obstacles, the following measures can be taken: First, select the important machineries of each assembly line. These machineries are selected based on the criteria that they must directly affects production and cannot be replaced by other equipment. Second, reparation staff need to find out the relevant usage information and replaceable repair parts of important equipment and invite relevant technical staff to overhaul on time. Third, after the important machine equipment reaches the standard of pre-preservation, the staff should gradually review each assembly line to achieve pre-preservation and ensure the barrier-free production of the assembly line.

4.4.2 Implement Total Quality Management

A core skill pillar in the JIT production method is Total Quality Management (TQM). The implementation of total quality management in Company W is embodied in the following aspects:

(1) Quality management in the development and research stage

Total quality management has been playing an important role since the beginning of the product's initial research and development. Company W often conducts shopping mall inspections on similar items on the market to check whether the products are flawed in development research. It is not only the R & D department, but also the marketing department, production department and quality department that approve the research plan, and the quality department will finally confirm the feasibility of the R & D plan.

(2) Quality control in the production process

Whether the quality control is appropriate in the production process will directly affect the quality of the goods. Therefore, in the steps of the production process, Company W conducts regular inspections, checks and analyzes where the defects are, and formulates countermeasures for timely implementation.

(3) Quality assurance management outside the project

The quality assurance outside the Company W's engineering includes primarily: suppliers of assembly and materials of excellent products, processing equipment, manufacturing models, production equipment without loopholes or operational defects, the full use of warehouses, non-violent logistic operations and so on. Among these requirements, parts and raw materials can be inspected at the time of receipt; tools must rely on regular repairs and adjustments; the safety of the warehouse depends on irregular inspections carried out by the management department; logistics should rely on the logistics staff to complete the processing and assistance.

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All departments are united and help each other, so that the quality of products outside the project is also guaranteed.

(4) Quality assurance of after-sale products

Company W's goal is to provide customers with 100% quality assurance products. The Company Will carry out good product recycling activities, that is to say, after the product is used for a period of time, the Company Will replace the product for the owner for free and analyze whether the product can continue to be used until the warranty expires. If there is a problem in the product, the company can indicate the defects and analyze the errors in its product design. If the problem is serious, the Company Will take the initiative to recall this product.

5. Analysis and Discussion

5.1 Implementation Effect Analysis

The gradual introduction of JIT in Company W and the implementation of related safeguard measures have greatly improved the company's operation management and production site management.

(1) Through the standardization and institutionalization of operations and operation processes and ensuring their implementations, many non-value-added operations and invalid operations are eliminated. As a result, the production process is improved, the personnel arrangement is more reasonable and effective, and the cost is greatly reduced.

(2) Through re-integration, the number of production lines has been reduced from 4 to 2, and the number of machine installations and operating staff has also been reduced by 50%, which not only greatly reduced labor costs, but also reduced equipment maintenance expenses. The introduction of intelligent production lines has also improved production efficiency.

(3) By adjusting the layout of the production site, the company can ensure that raw materials and parts are directly sent to the sub-assembly production line. The regulated production site generally meets the requirement of the shortest linear distance and the JIT shortest conveying route concept, which effectively prevents the cost of transportation in the work site.

(4) Carry out production planning according to customer needs, and adopt a rolling mode, which can increase the company's operating flexibility, enhance crisis management capabilities and avoid losses.

(5) The implementation of the kanban management method makes Company W's information transmission timelier and production scheduling coordinated, which greatly improves work efficiency and avoids the shortage of raw materials or the problem of inventory backlog.

(6) The establishment of the security system and the implementation of comprehensive quality management ensured the smooth implementation of JIT in Company W, making the company's operation management and production site management more effective.

5.2 Key Points for Successful Implementation

(1) Emphasis on employee training

To ensure the smooth operation of JIT in the Company While introducing JIT, all employees of the company are educated and trained on JIT and strive to implement the ideas and methods of JIT through a psychological path of “understand-accept-embrace.” Of course, the implementation of JIT in the company may require more employees with comprehensive technical knowledge and capabilities, thus the company should formulate regular training plans for employees to provide talent and technical guarantee for the effective implementation of JIT.

(2) Participation and commitment of senior management

The participation and commitment of senior management personnel is crucial for the introduction of JIT. It determines whether JIT can be entirely implemented in the company. Practice has proved that without the leadership of senior management, any management accounting tool cannot be implemented and applied in the company.

(3) Real-time sharing of information with suppliers and customers, coordination and cooperation

In the implementation of JIT and the company’s daily operations, whether it is information exchange or

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logistics transportation, it is inseparable from the support of suppliers and customers. It is necessary to share information with suppliers and customers in real time through the construction of information systems to provide customer needs. The goods and the company's production are integrated in an orderly manner, and the three parties coordinate and coordinate to ensure the smooth implementation of JIT.

6. Conclusion

This article gives a descriptive analysis of Company W's introduction and implementation of JIT production methods, and explains the reasons, steps and measures behind its introduction and implementation of JIT. We believes that the introduction of JIT production method by Company W has improved the company's operation management and production site management, streamlined the production process. While greatly reducing the labor, machinery maintenance, and storage costs, JIT has also improved the company's operating capacity, production efficiency, and its ability to coordinate and respond to crises. The practice of the case enterprise shows that when the company introduces management accounting tools, senior leadership and the active participation and cooperation of employees are the keys to successful applications. We also conclude that information sharing and coordination between companies, suppliers and customers are also keys for Company W’s success in implementing JIT.

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