

# Research on Production Line Optimization of B Company Based on Industrial Engineering and Management

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**Abstract:** Based on the basic management theories and methods of industrial engineering, this paper intends to take the assembly process of B-model automobile assembly enterprise as the research object. Through the analysis of the current situation of automobile assembly production, it uses the management thought of lean production and the four principles of ECRS, 5W1H questioning technology, 5S management and other methods to find the possible problems in the production site. And elaborated the reason of the problem, and put forward the reasonable improvement plan, to enhance the core competitiveness of the enterprise has an important significance.

**Keywords:** 5S Management; Lean Production; 5W1H Questioning Technology; The Four Principles of ECRS

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## 1. Quote

### 1.1 Research background

Nowadays, the market competition is more and more fierce, and the constantly changing market environment brings great pressure to enterprises. In order to realize the transformation from a large manufacturing country to a strong manufacturing country, we need to implement fine management to improve the competitiveness of manufacturing enterprises, so as to solve the problems of high cost, low productivity and serious waste in manufacturing enterprises. Change the status quo that relies on cheap labor and low price industrial products to participate in international competition.

### 1.2 Research content

- (1) Theoretical overview, introducing the relevant theories used in this paper.
- (2) Analyze the current situation and existing problems of the assembly line, and apply industrial engineering methods to these problems, such as method research, 5S management, four principles of motion economy, ECRS principles, etc., to analyze and improve them
- (3) Effect analysis and improvement before and after improvement

## 2. Theoretical review

### 2.1 Research on industrial engineering methods

Including program analysis, job analysis and action analysis, program analysis is the analysis of the whole operation process, is a comprehensive macro analysis process; Job analysis is the analysis of a specific process, is the study of workers in a working place in the use of machines or not the use of machines each operation activities; Action analysis is the further analysis of workers' actions in the operation process. In method research, 5S management method, four principles of action economy and ECRS principle are commonly used. These two principles are the main principles for method research.

## 2.2 ECRS principle

ECRS principles include: Cancel, merge, rearrange and simplify. The improvement point of cancellation is to reduce unnecessary processes, eliminate unnecessary equipment and eliminate unnecessary inspection. The improvement point of consolidation is to combine some processes or actions, and those processes that cannot be cancelled and must exist are concentrated together; The key points of rearrangement improvement are to rearrange the working procedure, improve the working flow and use other methods; The main improvement in simplification is to simplify working methods, standardize parts and make the machine easy to operate.

## 2.3 Four Principles of Action Economy

Including reducing the number of actions, both hands at the same time of action, shorten the distance of action, light action, reduce the number of actions of specific applications such as: avoid unnecessary actions, reduce the number of actions, complete two or more than two actions at a time, and for both hands at the same time of action, can make both hands at the same time in reverse symmetry. In terms of shortening the movement distance: try not to turn shoulders or bend over and other large movements, while light movements are not to hold or transport heavy objects with hands, and make full use of gravity to transport power.

## 2.4 Lean production

The concept of lean production was put forward by Toyota Motor Company in Japan. The core of lean production is to eliminate waste, including waste of excessive production, waste of waiting, waste of handling, waste of processing, waste of movement, waste of inventory and waste of defective products, so as to eliminate all waste of manpower, material resources, time and space. Its pursuit of "zero" waste is not absolute zero waste, but no excess waste.

## 2.5 5S management

The essence and core of 5s activity is self-cultivation. If the workers who are carrying out the activity do not have good self-cultivation, the activity will not be carried out and can not be maintained <sup>[1]</sup>.

# 3. Improvement of B enterprise model car assembly

## 3.1 Process analysis

After investigation and improvement, the process process has a total of 18 processes and 11 inspections. It is necessary to analyze various processing processes according to the ECRS principle and cannot be combined, but many repeated inspections are unnecessary. In this paper, the method of 5W1H questioning is adopted to improve the process, and some unnecessary inspections are merged or cancelled.

Q: Why check the wheels after they are installed

Answer: Check whether the assembly of chassis parts is reliable

Q: Can the cab be inspected after installation

A: The two can be merged

Q: Can you install the seat parts first

A: No, the seat parts cannot be installed unless the chassis parts are first installed

Q: Why check the wheels after they are installed

Answer: Check whether the parts are reliable

Q: Check whether you can cancel

A: You can cancel it

According to the above questions, the redundant and repeated inspections were eliminated and merged, which improved the production efficiency.

## 3.2 Process analysis

The procedures before optimization are: assembly of the cockpit, transported to the next process, assembly of the seat, check the assembly, shipped to the next process, waiting, assembly of the chassis and install the cockpit, shipped to the next process, installation of wheels, shipped to the next process, installation of the turntable, check whether the parts are loose, shipped to the next process,

waiting, installation of the lift, storage.

In the optimized flowchart process, the two waits before optimization are cancelled. It can be found that before optimization, the operating staff has two waits, and the processing time of the operating staff accounts for 80%. After optimization, the waiting time is avoided, which improves the processing time of the employees and further improves the work efficiency.

### 3.3 On-site 5s management

After field investigation, the 5s management of B company has not been effectively implemented. The existing problems are as follows:

(1) Tools are not placed in the designated position, and there is also a lack of proper and reasonable storage location, resulting in workers misplacing tools, increasing the time to find, resulting in a waste of time.

(2) Some discarded materials are not processed in time and are still placed on the production line, resulting in too small working area and affecting the working efficiency of workers.

(3) The production site is full of dust, stains and garbage. At the same time, the internal cleaning of the machine equipment is not in place

(4) Personal belongings shall be placed at will in the rest area of employees

In view of the above problems, the workshop site is analyzed and improved from the following five aspects:

#### 3.3.1 Sorting

Distinguish between necessities and non-necessities, resolutely clear out the unnecessary things on site <sup>[2]</sup>, and formulate the judgment criteria for necessary and non-essential goods, according to which employees can distinguish the goods. In addition, they should pay attention to the current use value of the goods, rather than the value at the time of purchase.

#### 3.3.2 Rectification

Rectification is an effective help to tidy up. Every item in the workplace is placed according to its nature, function and frequency of use <sup>[3]</sup>. For example, the storage location and position of materials are strictly controlled, so that the number can be known by sight, and the way of directly stacking semi-finished products is changed to orderly layering.

#### 3.3.3 Cleaning

Clean the machinery and equipment on the production site and work site in time.

#### 3.3.4 Clean

Cleaning is to organize, rectify, clean the 3s implementation and in-depth, first clear the goal of cleaning, uphold the principle of full participation, each employee should know what they should do, and then to develop a clean state standard, only to develop a clean state standard, cleaning inspection can be based on the basis of regular inspection and institutionalization, To keep the site clean and efficient, check the cleanliness of the site, whether the ICONS and signs are set in a reasonable position, whether the indicating content is correct, etc

#### 3.3.5 Literacy

Quality is the core of 5s management. If an employee has good quality, he will abide by the rules and regulations of the site and have a good habit and style. It can be said that quality is the core of each step. The implementation of other activities must be based on the high personal quality of employees, and severe punishment measures should be taken for those who do not abide by the on-site system and discipline, so as to ensure the smooth implementation of "5S" activities.

## 4. Lean production management

B enterprise has a serious waste phenomenon. For excessive production, the enterprise should timely adjust the production batch, instead of blindly producing in fixed batch, it can adopt the way of multiple production in small batch. For the waste of waiting, the enterprise should timely repair the machine, strengthen the management department's ability to deal with the problem, and eliminate the delay of the production schedule because of the problem of the machine; For the waste of handling, enterprises should improve the level of logistics management, but also reasonable layout of the production site; For processing waste, enterprises to improve the

existing processing procedures, ensure a secondary output of qualified products, reduce the number of defective products rework.

## **Concluding remarks**

With the progress of society, the requirements for enterprises are also more and more high, we only constantly uphold the awareness of industrial engineering, the use of industrial engineering methods to improve the enterprise, little by little to climb up, so that the enterprise's comprehensive ability is constantly improving, so that the enterprise in this rapid development of society is not eliminated, follow the pace of The Times, always standing in the ranks of the invincible

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