The identification and optimization of bottleneck of the production system based on TOC
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Abstract. According to TOC, there is at least one constraint on any system, or it may have unlimited output. Therefore, in order to improve the output of a system, the constraint of the system must be broken down. In this paper, the production process of M company is analyzed by means of Method and Time study. We find the problems in the production process of M company based on TOC, then proposed improvement and optimization scheme.

1. Introduction

The theory of constraints is first proposed by Israeli physicist Goldratt, after continuous development, it has achieved the achievement and attracted people's attention, a new way of organizing production after MRP and JIT.[1] TOC is about how to improve and best to implement a set of management ideas and management principles, can help enterprises to quickly identify the constraints in the process of achieving the objectives, and further pointed out how to implement the necessary improvements to eliminate these constraints, so as to achieve the goal of the enterprise.[2]

The implementation steps of TOC management can be summarized as follow: ①construction of the production flow chart; ②defining indexes and determine the constraint index; ③identification of the bottleneck; ④determining how to make full use of resource of bottleneck;⑤taking necessary measures to improve the bottleneck; ⑥after eliminating the bottleneck, if the system gets a balance, otherwise it returns step ③ to recognize system bottleneck.[3]

2. Capacity and Index

The first step is to construct the production flow chart of TOC management, this paper mainly studies the production process of a new product of M company (As shown in Figure 1 and Figure 2 ).

Figure1. Production flow chart
Figure 2. Production flow chart

The second step is to define the index and determine the bottleneck station of the product process. This paper measures time of each station by stop watch, record the actual average operating time of each station (As shown in Table 1 and Table 2).

Table 1. Standard time of each station
3. Standard Time of each station

The company's production line is straight line, the operator is located at both sides of the production line, each time the product flows through an operator, the operator takes the product off the assembly line, then puts it on the table and assembles it, then puts it back on the pipeline. After the completion of assembling, flowing to the next station. In order to ensure large-scale production and make sure the process of trial production capacity, requesting human constant production line to ensure the hourly capacity of not less than 25, so that the relevant technical personnel and engineers to verify that the product performance.

The third step is identification of the bottleneck. By analyzing the standard time of each station of the process of the product, it is found that the bottleneck station of the process is FA25. Considering there is sufficient Terminal Block for charging in products, so as to exclude this station as bottleneck station. By analyzing further, it is found that both station FA3 and FA8 are bottleneck stations.

The fourth and fifth step is determining how to make full use of resource of bottleneck and taking measures to improve the production process bottlenecks stations: (1) change the production of straight lines into U-shaped layout[4], arrange logistics counterclockwise direction; (2) change the way of offering material instead of placing mass material next to production line, using" water spider"; (3) combine 3rd and 12th station , combine 8th and 19th station.

According to the improvement program, carried out "5S" activities of the production line, and to develop the station standard documents and PFMEA, especially the bottleneck station.

4. Summary

Through constraint theory, there are often a few constraints having a significant impact on the system, maybe there are a number of factors, but at least one. Therefore, in the actual improvement, we should consider toward system problems overall, and consider and deal with the problem from the overall benefit, then take measures to relax the constraint and solve the constraints, so as to achieve the goal.
References


