The Discussion on the Application of Modapts About Improving the Pipeline of Plastic Enterprise

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Abstract This paper mainly focuses on the production of bicycle inner tube of a pipeline process operating conditions. It has used the program analysis method and Modapts (MOD) to analyze the pipeline process procedures and operations scheduled operating time, clear their balance relations and job bottleneck, put forward to improve the operating balance measures and basically eliminate the bottleneck process. It obviously shortens the production time through the operating balance improvement.

Keywords Bottleneck step • Modapts • Operating step • Production

1 Introduction

The central issue of pipeline is how to maintain the balance of production line output of each unit of work, as an efficient organization of mass production. It makes each operator or unit of work keep a state of tension in the work cycle to complete most of the workload and turns into the least idle time of each operation or unit of work. It realizes the assembly line process synchronization and makes production process to maintain a high continuity balance, thereby obtains a desired output (Shuping Yi 2005). At present, the environmental protection equipment assembly lines exists obvious drawbacks: Some employees are busy coming home from work very late, while another part of the employees are very carefree, can return home

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from work early. It will not be able to fully mobilize the enthusiasm of all the staff if always like this, and curb the enthusiasm for the work of practitioners (Genbao Zhang 1996). Once the connecting out of touch, extra backlog will appear in the products for the production of the tube is divided into a number of processes. It will increase production costs and occupancy of productive resources unplanned. These problems will be bad to promote the enterprise team cohesion, make full use of productive resources and increase the efficiency of enterprises. Therefore, it must be solved timely and properly. Under the premise of less input and quick effect, it should use the existing production conditions and Modapts to analyze predetermined motion time of each operation, clear their balance relations and the assembly line bottlenecks, improve the assembly line bottlenecks and increase its balance rate. As a result, it will explore the potential, reduce costs and improve efficiency and will help enterprises to win the competition in the market (Hongwei Guo and Shengsan Qian 2003; Donghua Wang and Tianyi Gao 2007).

2 The Process Flow of Pipeline

Process flow diagram to describe the whole process of production mainly reflects the situation of overall production system. It is sequentially drew the various components of the object according to the order processing or assembly sequence. Thus, we can visually observe the tube production process and understand the steps of tube production (Qingming Cai 2005). Tube production process flow diagram is shown in Fig. 1.

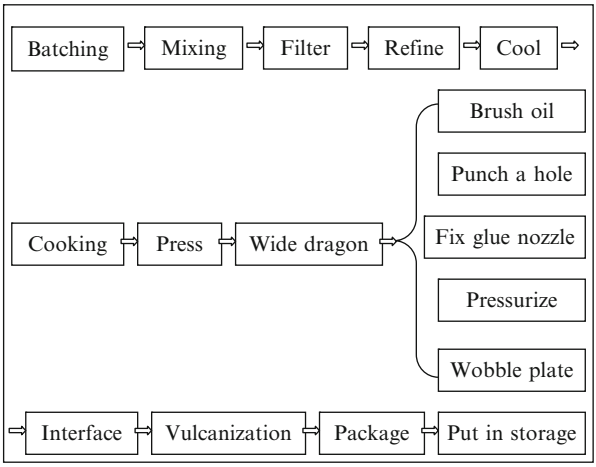


Fig. 1 Tube production process flow diagram

3 The Process Beat of Pipeline

The stopwatch test method is the method that is repeatedly observed operating elements of process and determined working hour consumption with processes operating time as research subjects (Ping Zhuang 2005). Through the stopwatch test method, it should determine of the event of the pipeline operating processes, find the bottleneck process and improve it with Modapts in order to achieve the purpose of optimization of pipeline.

From the analysis of the situation, the L location in the compression process in production stages is bottleneck of the production workshop, the beat is long and the productivity is low. According to the human capacity in each process configuration, it will lead to the L station in-process inventory and affect the balance and production of the pipeline due to by capacity constraints and beat impact of the bottleneck station L. Therefore, it should optimize the compression process (Ershi Qi 2007; Yingluo Wang and Zhiping Yuan 2001). The beat of each operation process is shown in Table 1.

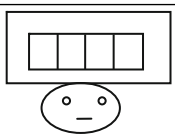
4 The Description of the Station Action of Pressing Process

The pressure is chosen different types of pressure hoop according to the tire production model and different types of pressure hoop cannot been mixed (Quanqing Li and Li Zhang 2003). When you operate, you should hold a tire strip and put the glue nozzle on the hit pad machine. At the same time, you should put pressure hoop

Table 1 The beat of each operation process

Section	Process	Station	Beat	UPH
Fore section	Batching	A	3.8	1000
	Mixing	B	4.0	900
	Filter	C	8.2	810
	Refine	D	8.2	810
	Cool	E	3.9	950
	Cooking	F	3.8	1000
The middle section	Press	G	8.2	810
	Wide dragon	H	8.2	810
	Brush oil	I	7.0	830
Back section	Punch a hole	J	4.2	880
	Fix glue nozzle	K	3.8	1000
	Pressurize	L	9.159	800
	Wobble plate	M	8.0	840
	Interface	N	4.5	850
	Vulcanization	O	3.9	950
	Package	P	3.95	930
	Put in storage	Q	4.4	870

Table 2 The analysis of action factor of the pressing process

Job content : pressure Station number:12 Staff : 2 Operator: MOD number:71 Hour : 9.159 Date:				Workplace layout 		
Left hand action				Right hand action		
Describe	Analysis mode	Time	Modvalue	Time	Analysis mode	Describe
Get pressure hoop from about 30 cm on the left side of the body and move to chest	M3E2D3G1M3P0	1	12	1	BD	Wait
Wait	BD	1	5	1	M4G1	Get tire strip
Take the tire strip with your right hand	M2G1	1	5	1	M4P0	Move to chest and hold
Check the tire strip	4E2	1	8	1	4E2	Check the tire strip
Take the glue nozzle from the right side of the body	M3G1M3P0	1	9	1	BD	Wait
Put the glue nozzle on hit pad machine	M2P2	1	6	1	M2A4	Auxiliary left-handed action
Hold the tire strip	M3P0	1	7	1	M2P5	Put pressure hoop on the glue nozzle
Hold the right foot switch	M3P0F3	1	6	1	M3P0F3	Hold the right foot switch
Rotate the pressure hoop for 90°	R2E2P5	1	9	1	R2E2P5	Auxiliary left-handed operation
Hold the tire strip	H	1	4	1	A4	Press
Total	52	11	71	11	49	

on the glue nozzle with the other hand and go to step switch with your right foot. It should be 1–2 s. Then, you should rotate the pressure hoop for 90° and make the glue nozzle and fetal body firmly stick together. The action factors of the pressing process are shown in Table 2 before they are improved.

4.1 The Analysis of Environmental Protection Device and Assembly Process Problem

When we analyze the environmental protection device and assembly process, we use the "5W1H" questioning techniques on the process of job content, working

methods, operator, job location and job time to ask questions and analyze (Dongzhe Bai 2004). We find the following problems:

The first, the selection of the pressure hoop is a waste of time due to different types of pressure hoop can not be mixed together. Therefore we must select the appropriate pressure hoop according to tire strip and this part of the time is a waste of time (Ershi Qi and Yanfang Huo 2004).

The second, the pressure hoop needs to be rotated 90° and make the glue nozzle and fetal body firmly stick together. So workers must reverse inner tube. However, workers spend a lot of time in operating for the overturn belongs to a complex task. As a result, it results in a waste of time and affecting the efficiency (Fanghuai Wen 2005; Jinghua Zhao 1996).

4.2 The Analysis of Improving the Balance of Operating Process

In view of the actual operating space limitations, in this paper, it adheres to the principle of motion economy and the principle of "ECRS" to improve processes. The specific content includes the following aspects:

First of all, the pressure hoop should be classification of place and eliminate search time. Thus the operator can easily get and reduce unnecessary waste (Zhongjian Fan 2001).

The second, we should increase the operating process and improve the time-consuming process. We should take out the flip steps out from the processes, make it as a separate operation process and let someone be responsible for the flip operation (Genran Zhou et al. 1997). This can not only reduce the operator's work intensity of the pressurized station and not easy to produce fatigue, but also can speed up the production schedule and improve production efficiency.

Some processes are combined and improved by the MOD method. It has eliminated redundant operation and reduced the operation time of bottleneck step. The results are shown in Table 3.

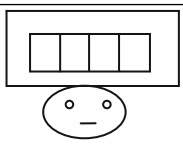
4.3 The Analysis of Improvement Effect

It has discovered that workers are basic operation skilled According to the actual situation of research production workshop. It takes the MOD value for the normal 0.129 s. At the same time, the formulation of the standard time on the need to take into account the operator to rest and pause time, We call it "liberalization". Here we consider only the fatigue liberalization and the liberalization of factor of 10 %. The calculation time is as follows:

Table 3 The analysis of action factor of the pressing process

Job content : pressure
Station number:12
Staff : 2
Operator:
MOD number:53
Hour : 6.837
Date:

Workplace layout



Left hand action				Right hand action		
Describe	Analysis mode	Time	Modvalue	Time	Analysis mode	Describe
Get pressure hoop from about 30 cm on the left side of the body and move to chest	M3G1M3P0	1	7	1	BD	Wait
Wait	BD	1	5	1	M4G1	Get tire strip
Take the tire strip with your right hand	M2G1	1	5	1	M4P0	Move to chest and hold
Check the tire strip	4E2	1	8	1	4E2	Check the tire strip
Take the glue nozzle from the right side of the body	M3G1M3P0	1	9	1	BD	Wait
Put the glue nozzle on hit pad machine	M2P2	1	6	1	M2A4	Auxiliary left-handed action
Hold the tire strip	M3P0	1	7	1	M2P5	Put pressure hoop on the glue nozzle
Hold the right foot switch	M3P0F3	1	6	1	M3P0F3	Hold the right foot switch
Total	38	8	53	8	36	

Table 4 The comparison or the pressure station mod value before and after improvement

	Left-handed MOD value	Right-handed MOD value	Comprehensive analysis of the value	Hour
Before improvement	52	49	71	9.159
After improvement	38	36	53	6.837

Normal time:
Before modification: $71 \times 0.129 = 9.159$ (s)
After improvement: $53 \times 0.129 = 6.837$ (s)
Standard time:
Before modification: $9.159 \times (1 + 0.1) = 10.0749$(s)
After improvement: $6.837 \times (1 + 0.1) = 7.5207$ (s)

The comparison for the pressure station MOD value before and after improvement is shown in Table 4.

From the Table 4, we can see that MOD value has decreased by 18 and standard time has shortened 2.5542 s. After improvement, the bottlenecks in the production process have been basically eliminated and the operation time has been shortened by 25.35 %.

5 Conclusion

The article is the case of jobs that have been identified in each station. First of all, it analyzes the work flow of enterprise of an environmental device assembly line with program analysis method. Then it uses the MOD method to improve the action, eliminates bottlenecks and improves the balance, and makes the assembly line production time reduce by up to 25.35 %. This will generate considerable economic benefits and production resource conservation. It also reflects the significant role of the predetermined operating time standard Modapts when it is used in the production.

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