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of Automobile and Motorcycle Electrical Wire
Assembly

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The Process Improvement in the Production Line of Automobile and Motorcycle Electrical Wire Assembly

*T. Maneepen, S. Kaewkuekool, P. Thongchuea, and P. Lueamnat
King Mongkut's University of Technology Thonburi,
Faculty of Industrial Education and Technology,
126 Pracha U-thit Road, Bang Mod, Thung Khru, Bangkok 10140, Thailand
E-mail: theerapong.man@mail.kmutt.ac.th*

Abstract

The objective of this project is to study the problems of the production of automotive and motorcycle electrical wiring harnesses in order to improve the production process to be more efficient. The results from studying indicated many problems that were some procedure, which was not finished in time, so it could not absolutely satisfy for customer demand to solve the problem by using 7 principles of qualitative instrument, ECRS. These problems could be fixed by rearranging procedure of procession and setting seating chart of employees. The overall operation was found that every process was controlled by customer requirement, which was 14.4 seconds could totally reduce the time from 115.3 seconds/piece to 104.7 seconds/piece accounting for 9.19 % increased production efficiency from 84.77 % to 91.52 %.

Keywords: Process improvement/process/
Automotive parts accessories

1. Introduction

This case study is a company that produces automotive parts It produces automotive and motorcycle wiring harness assemblies. There is a problem in the production process of a production line employee, that is, the time period in which the production exceeds the required requirements at certain stages. Each employee has different production cycles. It was also found that during the production, there was a pile of work, causing a problem to wait for work. Causing the work to be inconsistent and not follow the steps Causing the loss of waiting Therefore want to improve in the production process to reduce time in the production process. Therefore, the production process has been improved in order to reduce manufacturing defects. And make

products of the highest quality and accuracy to meet the highest standards [5]

The objective to study the factors affecting the automotive parts production process in the cable assembly production line. Cars and Motorcycles. And to improve efficiency in the production process. Model: 650A-LED HL CORD F.

2. Methodology

In this study for methodology of research following:

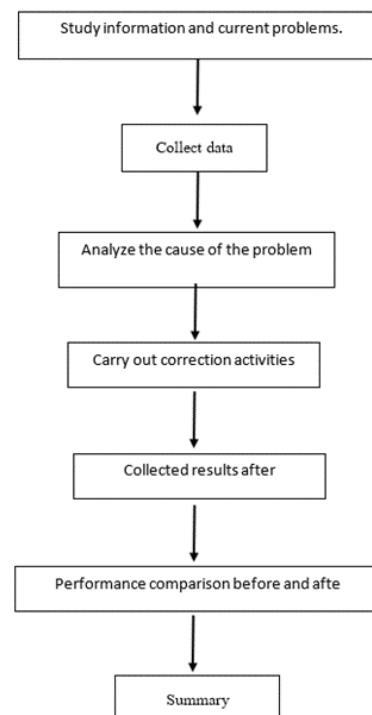


Fig. 1 Research Methodology

3. Improvement

3.1 Study general information and work processes of the company.

The work process was start from 1.wire assembly, 2.insert tube (B) Kurabe ID6, 3.insert(B) Kurabe ID4, Insert BEAMEXSS-ER500 0.3 R, W wire, 4.Insert BEAMEXSS-ER500 0.3 R, W, 5.insert BEAMEXSS-ER500 0.3 R, W with Tube(B) Kurabe ID4, Input BEAMEXSS-ER500 0.3 Y, L, B, G, GR with Connector and Lock, 7. Roll tape(B) Nitto at Stem of st, and 8.Roll tape(B) Nitto at end of set.

กระบวนการไหลของขั้นตอนการทำงาน				
บริษัท: ไทยคาร์โรอโรโตโมทิว โปรดัคส์ จำกัด			<input checked="" type="radio"/> ปัจจุบัน	<input type="radio"/> ปรับปรุง
วันที่: 11 พฤศจิกายน 2562	สัญลักษณ์	เวลา	เวลา	
ลักษณะผลิตภัณฑ์: ชุดประกอบสายไฟรถยนต์และจักรยานยนต์	การปฏิบัติงาน	115.3		
	การเคลื่อนย้าย	10		
	การรอคอย	-		
	การตรวจสอบ	-		
	การเก็บรักษา	-		
รวม		125.3		

ผู้บันทึก: นักศึกษาฝึกงาน				
รายการ	จำนวนคน	เวลา (วินาที)	สัญลักษณ์	
1. ใส่สายไฟ (จุด Joint) เข้ากับ Connector	1	17.0	●	➔
ใส่ Tube สั้น 2 ชิ้น Lock Connector (JIG)	1	17.0	●	➔
3. ใส่ Tube เข้ากับ Connector (JIG)	1	16.0	●	➔
4. ใส่สายไฟขั้วรวมกับ Connector + ใส่ Retainer + Tube	1	13.9	●	➔
5. ใส่ Tube ในสายไฟทั้งหมด - เสียบ Connector 3P	1	13.2	●	➔
6. เสียบสายไฟเข้า Connector ที่บนโครงรถ GP + ติด Retainer + ใส่ Cap	1	13.4	●	➔
7. พันเทป (หัว)	1	11.0	●	➔
8. พันเทป (ท้าย) - มาร์คสี - บรรจุกล่อง	1	13.8	●	➔
9. ส่งไป QC		10	●	➔
รวม	8	125.3	S	1 0 0 0

*หมายเหตุ มีการจับเวลาการทำงานของพนักงาน เป็นจำนวน 10 ครั้ง จากนั้นจึงนำมาเฉลี่ยเพื่อให้ได้ค่าเฉลี่ยของแต่ละขั้นตอน

Fig. 2 Show before business flow process chart.

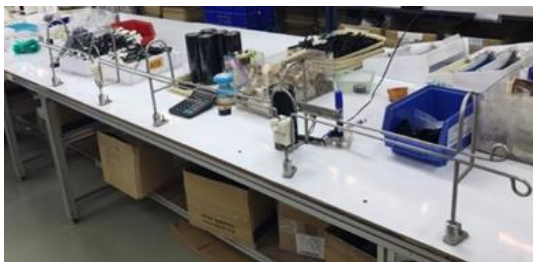


Fig. 3 Jig & Fixture

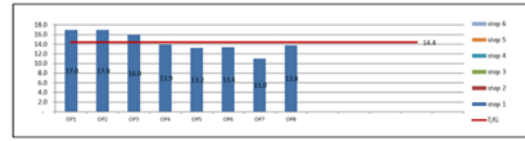


Fig. 4 Show operation time of 8 operator in line.

3.2 Analyze data to find causes and problems from work processes.

3.2.1 Analyze problems from the work process of the company.

The company's information current working conditions found that the company has various problems as follows:

The production process of automotive and motorcycle wiring harness, saw the importance and saw that the fishbone chart should be used to help analyze the cause of the problem and what the problem is. By finding cause and effect by using fishbone diagrams to analyze solutions and improvement methods, the main cause is not produced in time to demand and it takes too much production time, causing bottlenecks in some stages. It was also found that there were unnecessary physical movements and disordered work. May come from an improper working area Therefore, we analyzed to find a solution that is most suitable for working conditions. That is, it will improve the production process by modifying the work process in some steps, as well as reducing unnecessary steps. And provide proper working conditions so that there is minimal movement.

3.2.2 Analyze the cause of the problem.

When analyzing the problem, it was found that the problem occurred in the process as follows.

There is a cause and effect diagram for Why-Why-Why to help find the cause of the problem.

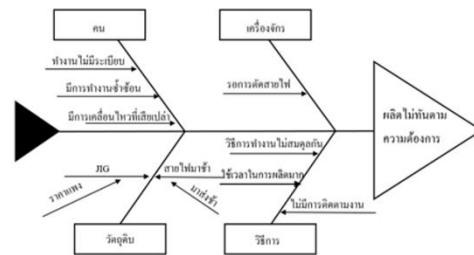


Fig. 5 Cause and effect diagram.

3.3 Conduct an analysis, find solutions

3.3.1 Improve the operation plan of the company

From the analysis of the problems found that to the factory. And consult the factory engineers to make adjust by applying the relevant theory to fix. The

revision activity plan is to modify the new production process (reverse process) in 6 steps, namely steps 2-7, since all processes are all important, they cannot be reduced or cut down. And improve the working area to reduce waste and increase the efficiency of employees.

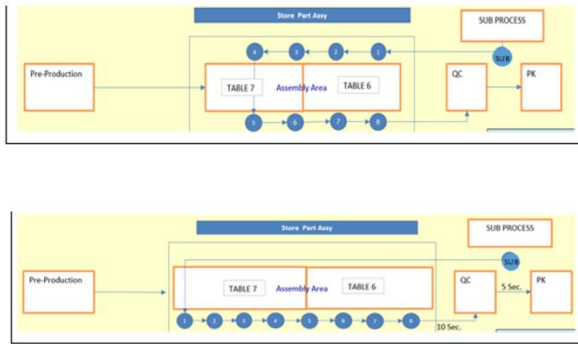


Fig. 6 Show before and after business flow process.

3.3.2 Design documents to control operations

From the analysis of the problems found in many operations There are many parties who do not know the work that the customer ordered. Therefore, the design and development of documents by using the principles of design control documents.

Table 1: Show after socket body process time record.

กระบวนการไหลของขั้นตอนการทำงาน			
บริษัท : ไทยครีโรว์ ออโตโมทีฟ โปรดักส์ จำกัด		<input type="radio"/> ปัจจุบัน	<input checked="" type="radio"/> ปรับปรุง
วันที่ : 22 กุมภาพันธ์ 2563	สัญลักษณ์	เวลา	เวลา
ลักษณะผลิตภัณฑ์: ชุดประกอบสายไฟรถยนต์และจักรยานยนต์	การปฏิบัติงาน	-	104.7
	การเคลื่อนย้าย	-	10
	การรอคอย	-	-
	การตรวจสอบ	-	-
	การเก็บรักษา	-	-
	รวม	-	-
ผู้บันทึก : นักศึกษาฝึกงาน			
รายการ	จำนวนคน	เวลา (วินาที)	สัญลักษณ์
1. ใส่สายไฟ (จุด Joint) เข้ากับ Connector (B) 6P	1	14.1	● → ●
2. ใส่ Tube + Retainer + CAP	1	11.2	● → ●
3. ใส่ Tube เข้ากับ Connector (JIG) 6P LOCK	1	13.2	● → ●
4. ใส่ Tube ลื่น + Tube ๑1๖	1	14.2	● → ●
5. ใส่ Tube + เสียบสายไฟเข้า Connector 2P + RE	1	14.3	● → ●
6. เสียบสายไฟเข้า Connector 6P + ๓ LOCK	1	14.2	● → ●
7. พันเทป (หิว)	1	11.5	● → ●
8. พันเทป (หิว) + บรรจุกล่อง	1	12.0	● → ●
9. ส่งไป QC		10	● → ●
รวม	8	114.7	● → ●

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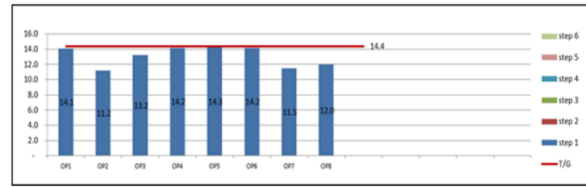


Fig. 7 Show after time process improvement.

Improve the correction of the production process to balance the Cycle Time of each step under the Takt Time value of 14.4 seconds, it also reduces the movement of the body and helps to reduce the bottleneck causing the workpiece to flow continuously. And the total production time is reduced and can produce to meet the needs of customers. This is a good result without reducing the number of employees. And get more productivity. After studying the work processes of Company, we found two problems: the drawing and evaluation and the occurrence of waiting in the process, the results of the study are as follows. The results of both pre- and post-production adjustments were compared to distinguish from the improvement using the ECRS principle and balance the production line. To improve the way this production line works. It will organize a new sequence of tasks to be more appropriate. It also integrates work processes to be more efficient. This can be measured due to reduced working time and increased productivity, resulting in the production to meet customer requirements.

4. Result and Discussion

This research found the summary follow:

4.1 Operating results

Improving work process efficiency by studying the current working conditions, it was found that in the work process, there is a problem in the design part. After studying the work processes of Company, we found two problems: the drawing and evaluation and the occurrence of waiting in the process, the results of the study are as follows.

- 1 Results of the current working conditions of the factory.
- 2 Data analysis of drawing and price evaluation with production process.
- 3 Result of improvement.

4.1.1 Improve the process before and after process

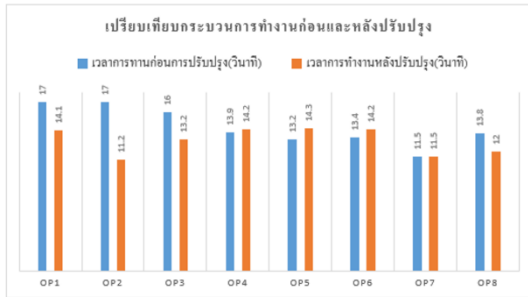


Fig. 8 Show a comparison chart of the process before and after.

Table 2: Show A time of the process before and after

กระบวนการ	เวลาก่อนปรับปรุง (วินาที)	เวลาหลังปรับปรุง (วินาที)	เวลาการทำงานที่ต่างกัน	
			ลดลง (วินาที)	เพิ่มขึ้น (วินาที)
OP1	17.0	14.1	2.9	-
OP2	17.0	11.2	5.8	-
OP3	16.0	13.2	2.8	-
OP4	13.9	14.2	-	0.3
OP5	13.2	14.3	-	1.1
OP6	13.4	14.2	-	0.8
OP7	11.0	11.5	-	0.5
OP8	13.8	12.0	0	0
เวลาการทำงานรวม (วินาที)	115.3	104.7	11.5	2.7
สามารถลดเวลาการทำงานรวมได้ 1 ชุดได้ 9.19%				

The result of the improvement of the activity map when comparing before and after the improvement, with the following details: Analysis of the results of the data showed that when the process improvement, before adjustment and after adjustment, the total production time is reduced. Improving working methods by reversing the process resulted in a reduction of 2.9 seconds for 1st employee, 5.8 seconds for 2nd employee, 2.8 decreased for 3rd worker 2.8, reducing working time under working time. Do the work that the customer wants and reduced waiting problems due to improving work methods by prioritizing work sequences in addition, each step will be found to work more balanced.

4.1.2 Design documents to control operations

From using various documents to work with the company. The results can be summarized as follows: There is a clear difference in production rates before and after adjustment. After improving the production process in each step down. By improving the way, it works And improve the working area It does not cause

waiting problems or bottlenecks. This reduced the production time corresponding to customer demand from 17.0 seconds to 14.3 seconds, which can account for 15.88%, resulting in a decrease in the total production time of a single harness from 115.3 seconds / piece to 104.7 seconds / piece, or The total production time is reduced by 9.19%. It can be seen that when the production process is improved, the production rate can be increased, which before the improvement can produce 1,623 pieces / day. The production rate increased to 1,930 pcs / day, a noticeable increase from the original 307 pcs / day. And in line with the daily demand of 18.91%, we see that there is an increase in productivity resulting in increased work efficiency. The efficiency of this production line before process improvement is 84.77%, after process improvement has been increased to 91.52%, as well as significantly reduced production time. It is also possible to produce workpieces during regular intervals without having to turn on overtime. This makes it possible to reduce the additional cost of opening overtime to reduce unnecessary costs. By being able to produce work in time during normal working hours

5. Conclusion

The result of improving the work process efficiency in the construction industry causing the wait in the production process to decrease and improved the work plan according to Project Time Management principles.

From the study of the company's problems Then bring the results studied to collect the problem condition. This makes it important to work conditions that are complicated, complicated and time consuming processes. This is a major problem in the production of wiring harnesses not keeping up with customer requirements. The study has proposed solutions to the problem. By improving the production process as a result, there is an efficient process that meets the standards and increases productivity. And make it worth Takt Time and Cycle Time at the level that the customer wants. Therefore, studied the theory and related research Let's solve problems and apply them to suit the work. This is in line with the research of Amonrat Pinchai Mun and his team [2018] conducted research on the improvement of the auto parts production line. A case study of A-Plat No. 1 core energy using a problem analysis using a fish bone diagram ECRS principle, it was found that the process time continued to decrease from 17.27 to 14.93 seconds per slice, 13.55% percent for station 1 and process time at station. 2, decreased from 19.21 to 15.70 seconds per piece, 18.27% percentage, process productivity increased from 187 to



220 parts per hour and 84.73 to 90.89% for backorder balancing process decreased from 16.50 to 13.22%, and in line with theparit research. Nateerai Thaiwa [2005] - Conducted research on the development of methods for reducing the lead time of production in lace tape factories. Used in the analysis is Collecting the seven wastes, the 16 major losses, and applying the ECRS technique after applying the improvement approach, it was found that Production lead time decreased from 25.11 days to 19 days, proportion of reduced production lead time accounted for 24.33%.

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