

# **ICEAS-3805**

## **Defects Reduction in the Production Tires**

**Punyisa Kuendee**

Department of Industrial Engineering, Faculty of Engineering, Siam University,  
38 Petkasem Road, Phasicharoen, Bangkok 10160, Thailand  
E-mail address: poonpoon99@hotmail.com

### **ABSTRACT**

The problems of waste (Defects) that occurred during the process of motorcycle outer-tire production currently affecting to the case study company very much. Due to the higher cost of production issue, so the analysis of the causes of problem and the solution finding are important to take the advantages from the competition among the same business competitors. The purpose of this project is to reduce the waste from the production and also to increase the efficiency of the process.

The result of study showed the department that generated highest amount of waste and used highest cost of raw material is The Nylon Coating & Cutting Department. Therefore, the researchers took that trouble to analyze the causes and to find the solutions by using The 7 Quality Control Tools (7 QC Tools) in order to reduce waste generated. The Pareto Chart was used to help ordering the important of waste data according to actual problem occurred that is for initial rectification urgently. Fishbone diagram is a tool that helps finding the causes of waste generated and defect parts in order to bring all causes to rectify the process and take the graph into the comparison analyze process of monthly waste.

After rectification, the waste from the process of coating and cutting nylon was decreased from 3.21% into 0.80% (reduced 2.41% representing 75% off). The value of waste after rectification downed from 1,824,000 Baht to 456,000 Baht (reduced 1,368,000 Baht representing 75% off) that indicated the percentage after rectification (75%) is absolutely higher than the set goal (50%) and also be able to create the document of work process and the standard waste record paper for employees as well.

**Keywords:** defect, production, process of coating and cutting nylon, 7 QC Tools

### **1. INTRODUCTION**

From present situation, manufacture industry is getting more competitive in both terms of price and quality of goods. That causes the needs of improving working process in order to produce quality product that meet customers' satisfaction. According to the study of production process in a factory of outer tire for motorcycle, they are using two methods; humanity & machinery; to cooperate together. Those might make some mistakes during

production process. Therefore, researchers intended to study the production section of outer tire (motorcycle) that there are several steps in the process before structure assembly and oven dry process to finish the final product. Preliminary studies have shown that some working steps created some errors during operation. The product has been inefficient due to improper working procedures. Moreover, the record of waste, which is not recorded by type of waste, made it impossible to identify the actual causes of waste occurred. The factory required the improvement of production in order to increase the productivity, to reduce waste and costs, and also to cope with market competition in the future.

## **2. OBJECTIVE AND SCOPING**

1. To study the problems of waste that generated from the production line of motorcycle outer-tire factory.
2. To reduce waste in the production process and improve the steps of working by using 7 quality control tools. (7 QC Tools)

## **3. APPROACHES**

Study the working steps and the processes in the production line of FG (Finish Goods): outer-tire of motorcycle, since the start of production until the end of the process. The practical work focuses on the movement of both personnel and machine, finding where common waste occurred, looking for the cause of waste in the production process. The ways of work need to determine working methods and trial any improvement to seek any point that could rectify the waste issue. In order to make it work correctly and appropriately - to reduce waste in production process ,to decrease waiting time ,to be able to supply customers on time, we use 7 QC Tools. (1) Pareto Chart helps to sort the waste's data by priority actual problem that is necessary to be fixed urgently. (2) Fishbone diagram is a tool that helps finding the causes of waste occurred and defect parts, then bring those causes into rectification process.

### **3.1 The basis of the production process**

The study of problems derived from collecting the causes of product defects in motorcycle outer-tire manufacturing at each step of entire manufacturing processes (12 steps)

Step 1 : Inspection of raw materials



**Fig. 1: Inspection of raw materials**

Step 2 : To get raw materials from materials store



**Fig. 2: To get raw materials from materials store**

Step 3 : Preparation of raw materials



**Fig. 3: Preparation of raw materials**

Step 4 : Mixing the rubber in section BM3



**Fig. 4: Mixing the rubber in section BM3**

Step 5 : Production of outer rubber sheets for motorcycle tires



**Fig. 5: Production of outer rubber sheets for motorcycle tires**

Step 6 : Production of wire frame for motorcycle tires



**Fig. 6: Production of wire frame for motorcycle tires**

Step 7 : Coating and cutting of Nylon



**Fig. 7: Coating and cutting of Nylon**

Step 8 : Framing the structure



**Fig. 8: Framing the structure**

Step 9 : Spraying the chemical solution



**Fig. 9: Spraying the chemical solution**

Step 10 : Rolling the tacks



**Fig. 10: Rolling the tacks**

Step 11 : Oven drying the rubber



**Fig. 11: Oven drying the rubber**

Step 12 : Packaging



**Fig. 12: Packaging**

## 4. RESULTS

### 4.1 Information of waste or defects

From monitoring the statistic of waste that occurred in process of FG as shown in Table 1

**Table1: Information of waste from the production process of FG (Finish Goods) : motorcycle outer-tire, before the improvement of April 2014 to late June 2014.**

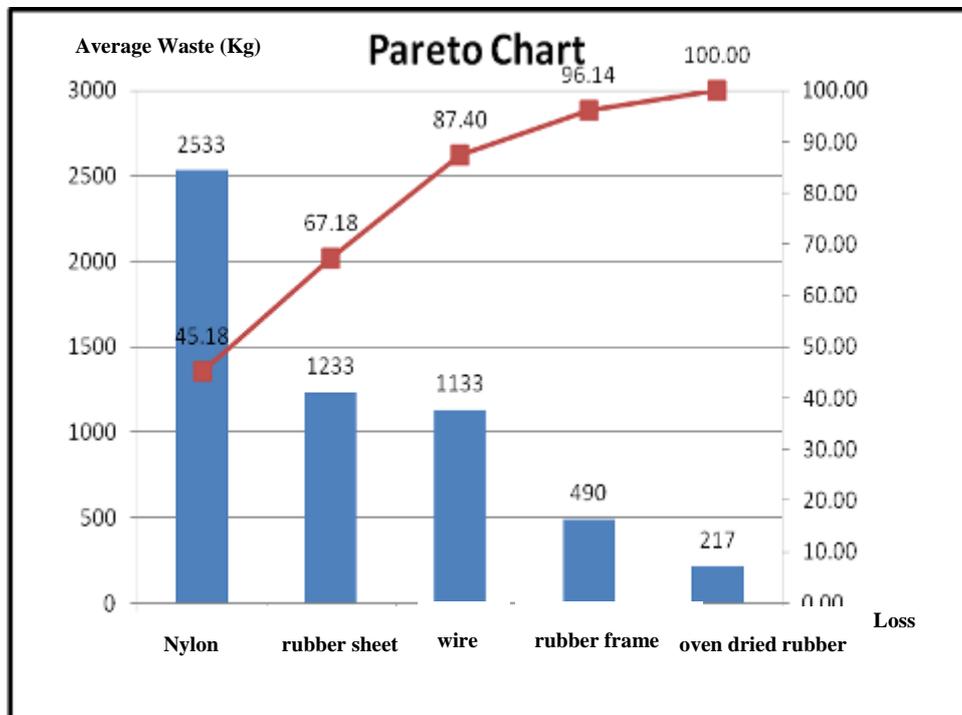
Type of Waste	Volume of Inspected Waste in Kilogram (Kg)				
	April 14	May 14	June 14	Average	Waste by %
Production/month	78,800	78,800	78,800	78,800	
Loss of Nylon	2,100	3,000	2,500	2,533	3.21%
Loss of rubber sheet	1,200	1,000	1,500	1,233	1.56%
Loss of wire	1,000	1,100	1,300	1,133	1.44%
Loss of rubber frame	500	460	510	490	0.62%
Loss of oven dried rubber	200	150	300	216	0.27%

### 4.2 Analyze the causes of the problem

From collecting data of work methods that chose studying how to reduce waste and defects. The data collection used recording from waste check list in order to know the amount of waste generated at each stage, which is a monitoring tool that is important in the study process of waste reducing in motorcycle outer-tire production.

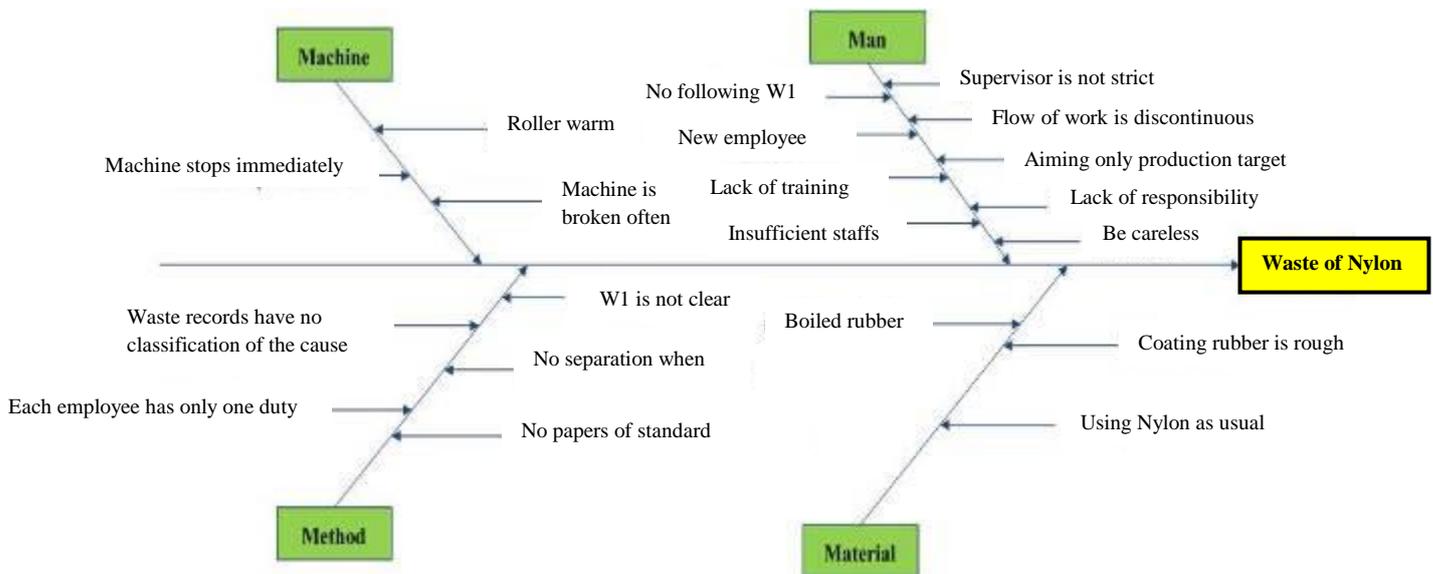
#### 4.2.1 Tool for analyzing the causes

From Table 1 Collecting the information of waste that occurred in the production process of motorcycle outer-tire. The average percentage is analyzed by using quality control tool. Pareto Chart as in Figure 13.



**Fig. 13: Pareto diagram of the generated waste problem during production, before the improvement period of April 2014 to late June 2014.**

Data from the nylon waste during the production process of motorcycle outer-tire shows the average waste is at 3.21 percent, the amount of 607,920 baht per month (Nylon's cost is 240 baht per kg), which is high value of money. Therefore, researcher analyzed the exact causes of waste generated in order to find the right solutions by fishbone diagram as in Figure 14. The methods are the classification of waste and record it in order to find the real cause of the problems, then set the initial solutions and set the goal of reducing this nylon waste into 50 percent of the waste before rectification.



**Fig. 14: Fishbone diagram indicating the causes of the nylon waste problem.**

## 5. CONCLUSION

According to the action of improvement process to reduce nylon waste in coating & cutting section. Nylon that is a department of the process in motorcycle outer-tire production, can achieve the goals. Refer from all the results of the research, it shows the advantages that are consistent with the purpose of decreasing waste in the process and can show the real cause of the variability that occurred by adapting related theories and also need to study many researches that are about the solutions in production. From studying those researches, it shows that the techniques of 7 QC Tools are the efficient tools in the process of seeking the causes of process faults. As showing in the result of the research and we can classify the cause of the problems as below:-

### 5.1.1 The cause of the variability that occurs in the process

From the results of the research, it shows some factors that affect to the production process and cause the variance. There are the raw materials that used in the production process, and working papers of the production section, including the production process results from improving it. They can eliminate the cause of the waste generated as the achievement of the objectives.

### 5.1.2 The comparison result of goods after improving the process

As a result of process improvements demonstrate the development of the production efficiency that increasing nearly 100 percent after the improvement. The performance of the operations can achieve the target that is 50 percent, and can reduce waste by up to 75 percent. The all effects after improvement are from new factors, but the characters of the effects are

particularly useful in improving and also can establish the safeguards to prevent the issue come up again in the next production.

Comparing the amount of waste from collecting data before and after the improvement that be calculated in percentage of waste as in Table 2.

**Table 2: Comparison table of the percentage of waste before and after the improvement**

Data	April – June 2013		July – September 2013		Percentage of Reduction (%)
Waste	Before development		After development		
	Quantity (Kg)	Waste (%)	Quantity (Kg)	Waste (%)	
Waste of Nylon	2533	3.21	633	0.80	2.41

### 5.1.3 Comparison of the cost impact

From the loss of manufacturing with variance, the researcher has raised the issue of the loss of cost from disposing nylon waste generated during the test in order to emphasis the loss occurred. But this is just only the about the effects of cost of raw materials as in Table 3.

**Table 3: Comparison Table of the impact from raw material costs.**

Expenses Waste	April – June 2013 Before development (Baht)	July – September 2013 After development (Baht)	Amount of decreasing expenses (Baht)
Waste of Nylon	1,824,000	456,000	1,368,000

## 6. RECOMMENDATION

This project can be applied to the other production departments such as rubber components. For example, we can bring the recording methods of waste to be applied in wire section, rubber sheet section, and framing section, but need to improve some working steps to receive the real potential factors.

We should give priority to developing the performance of employees, such as creating awareness on various aspects that employees are aware of what is happening. If cooperate in an appropriate way, incentives to employees or training new knowledge should be set in order to be applied to benefit the organization.

## 7. REFERENCES

- Chutima Rachapitak. (2009). *Reducing waste in machining processes*. Bangkok: King Mongkut's University of Technology Thonburi.
- Naga Yoshitomo Nagashima. (1998). *To reduce waste to zero*. Nonthaburi: InPost Express.
- Nuanri Kamol. (2002). *Defects Reduction of dessert cases in packaging process*. Bangkok: King Mongkut's University of Technology Thonburi.
- Pichit Sukchareanpong. (1998). *Engineering Quality Control*. Bangkok : Se-education Public.
- SupaPat Pingta. (2014). *Implementing 7 QC Tools applications in industry*. Retrieved April 2, 2015, from [http://www.eng.mut.ac.th/article\\_detail.php?id=50](http://www.eng.mut.ac.th/article_detail.php?id=50)