Quality Control Analysis of Palentong Genteng Product Production Process Using Lean Six Sigma Method Approach In PG. Mulia Jatiwangi

Gio Patria Mulia[1], Julian Robecca[2]
Industrial Engineering Program, University Computer Indonesia, Bandung
Dipati Ukur Street No 112-116 40132, Telp (022) 2504119, Fax (022) 2533754
Email:1. gio250395@gmail.com
2. julian.robecca@email.unikom.ac.id

ABSTRACT

The quality of a product is an important criterion that becomes a success factor in a business and customer considerations in choosing a product. The Lean Six Sigma method is an approach method for identifying and eliminating waste or non value-added activities to achieve six sigma performance. Lean is a method of approach that focuses on waste. Six sigma focuses on improving quality through the DMAIC cycle of Define, measure, analyze, improve and control. The object of research is tile palentong, research done in PG. Mulia Jatiwangi. Problems that occur in the company that the amount of production is not in accordance with the desired. The lean six sigma method is divided into 4 stages: define, measure, analyze and improve. In the define phase using CTQ to identify factors affecting customer satisfaction on tile and histogram diagram to determine the most dominant defect of tile, measure phase is done determination of tile defect, calculation of six sigma level to measure kegalan in tile production, and making v alue stream mapping to know flow information and physical in the manufacture of tile. In the analyze stage to find the root cause of defects and waste in tile by using fishbone, waste identification table and sub waste tile, and at the improve stage do the improvement for the problems that have been elaborated with the analysis of 5 why to provide solutions in improving the tile by using 5W + 1H. The results of the research note that the palentong tile product has five types of defect that is gopel, broken, porous, cracked, and burnt. The type of defect that often occurs in the period 2016 is the type of defect gopel. Factors causing the occurrence of disability that is human and methods that result in waste transportation and waste motion in the production process. The proposal is given by researchers to minimize defects in the product and minimize waste by increasing awareness of the operator to do the job, providing training, and making operational standard procedures in doing the job.

Kata Kunci : *Deffect, DMAIC, Lean Six Sigma, Quality*

1 Introduciton

In the clay industry, especially tile factory is very rapid and a lot of competition. Based on the fact that each tile factory must provide quality products to consumers. Product quality is one of the guarantees that must be provided and fulfilled by every company kepasda its customers, including quality.

Quality control of products is very important in order to suppress the number of defects that occur in the production process and reduce the amount of production costs. Quality control is needed by a company that aims to reduce the number of defects, and can correct the occurrence of irregularities in its production.

PG.Mulia Jatiwangi is located in the village of Burujul Wetan, Jatiwangi district, Majalengka district. Tile Industry in Burujul Wetan Village is one of the leading MSMEs. The tile from Burujul Wetan village has a market share covering the local area of Majalengka and regional areas such as Sumedang regency, Cirebon regency, and Tegal regency. PG.Mulia Jatiwangi only produce palentong tile type.

In the production process of palentong tile is known there is a disability caused by the waste (waste) on the production process that occurred. The defects that occur are broken, cracked, gopel, porous, and burned. This resulted in unstable palentong tile production due to defects. In 2016 the number of defects that occurred for 35210, the occurrence of such defects due to quality control is still emphasized in the final production process. To maintain the quality of the product from the initial process to the end of the process of making palentong tile. PG.MULIA JATIWANGI is expected to apply lean six sigma method to identify and eliminate existing waste in production process, thus reducing the number of defects in tile production. The lean six sigma method is a combination of lean and six sigma methods. Lean is a systematic approach to identify and eliminate waste or unnecessary activity. Six sigma is a complete refinement to solve a problem and process improvement through DMAIC stage that is define, measure, analyze, improve, control. Lean six sigma method for monitoring a production process and identifying waste in the production process with continuous improvement to achieve six sigma performance levels and to minimize product defects.

1.2 Aim

The purpose of this study is:

1. Identify the types of defective defects in palentong tile products.
2. Identify the types of waste that occur on palentong tile.
3. Proposed quality improvement of tile palentong products using Lean Six Sigma method to minimize product defects.

1.3 Restricting the problem

Based on the above problems and objectives, the researcher limits his research only to examine the quality control on palentong tile production, not to discuss the cost problem in this research.

2 Study of Literatur

2.1 *Quality*

Quality is very important for the consumer to make decisions in the competition between the provider of products and services desired. There is an enormous benefit to be gained from improving the quality and success of using quality as an integrated part of a business strategy [1].

2.2 *Lean*

Lean is an ongoing effort to eliminate waste and increase the value added of products (goods and / or services) to deliver value to customers [2]. Lean can also be defined as a systematic and systematic approach to identify and eliminate existing waste or non value -added activities [2].

value stream is a process for creating, producing, and delivering goods or services to the market. In the process of making goods (good), value stream includes raw material suppliers, manufacturing and assembling of goods and distribution to consumer goods [2]. In Giri Value stream mapping (VSM) is a method to explain the flow of materials and information. Value stream mapping methods are performed to help identify waste in the system [3].

2.3 *Six sigma*

Customers will be satisfied if they receive the products they expect. Thus, six sigma can be used as a target measure of industrial process performance on how well a product transaction process between supplier (industry) and customer (market). The higher the sigma target achieved the better the performance of the production process. So the 6-sigma is better than 4-sigma or 3-sigma. Six sigma can also be regarded as a breakthrough strategy that enables the company to perform exceptional (dramatic) down-grading and as control of customer-focused industrial processes with due regard to process capability [2]. To achieve a good Six Sigma level required a number of stages can be abbreviated DMAIC (Define, Measure, Analyze, Improve, and Control)

2.4 Method *Lean six sigma*

The lean six sigma combination of Lean and Six sigma can be defined as a business philosophy, systemic and systematic approach to identify and eliminate waste or non value -added activities through a radical continuous approach to achieving six sigma performance levels, deliver products and information using pull systems from internal and external customers to pursue excellence and excellence in the form of producing only 3.4 defects for every one million occasions or operations 3.4 DPMO (Defects Per Million Oppurtunities) [2].

Define at this stage the researchers define and strengthen the product to be studied, the second stage is Measure at this stage the researchers determine the product under study, determine the sigma value, determine the defects to be studied, and the mapping of Value Stream Mapping. The third stage is Analyze where at this stage the researchers to analyze the product and defects that have been determined in the previous stage with the fishbone diagram (cause of effect), and finally identify waste (waste). In the last stage of Improve at this stage include improving the quality of the tile from the result 5 why is by using the method 5W + 1H.

2.5 *5W+1H*

Method 5 W + 1 H is a good action plan to improve a process or identify an ongoing problem and solve the problem[2].

2.6 5 *Why*

Why-Why Analysis is a root cause analysis tool for problem solving. This tool helps identify the root cause or cause of a discrepancy in the process or product. Why-Why Analysis or 5 Why's Analysis is commonly used in conjunction with Fishbone Diagram and uses iteration techniques by asking WHY (Why) and repeated several times until it finds the root of the problem [4].

3 Research result

In the research results are divided into several stages, among others, as follows:

1. *Define*

In the define stage, the determination of the selected product has been chosen to perform the next process based on the highest average defects. It then identifies the product issues. In the production of tile is known that there are 5 types of defects in the tile of Gopel, Broken, porous, Cracked, and charcoal.

Before knowing what type of product / defect will be the focus of research the next step is to identify CTQ tile variables. From the results of CTQ is known that the tile has 5 types of factors that affect customer satisfaction of the resulting products are Gopel, Pecah, Porous, Cracked, and charcoal.

2. *Measure*

At this stage the determination of defects, calculation of six sigma level, and making Value Stream Mapping from Palentong Genteng products to know the flow of production process. Next do the calculation of six sigma level of tile product. In the determination of the defect can be seen in figure 1 using the pareto diagram

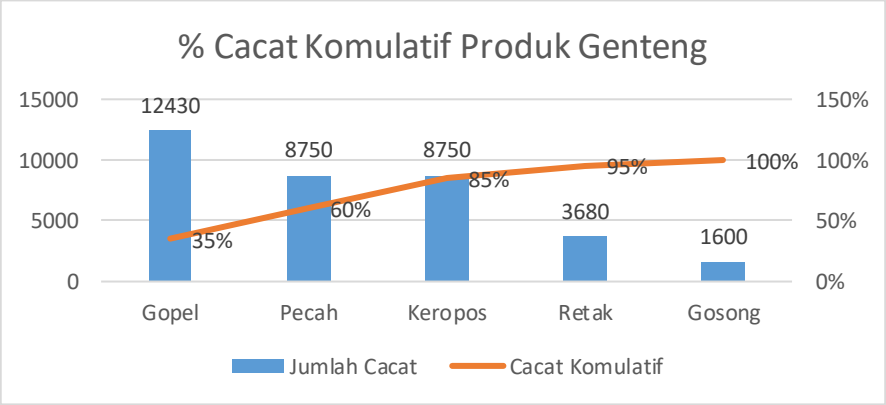


Figure 1 Pareto Diagram Number of Cumulative Defects on Roofing Products

From Figure 1 it is known that on the tile product of the most dominant defect type is Gopel defect. Researchers determine to examine gopel defects, broken, porous, cracked, and scorched. From the calculation of six sigma level seen that the value of sigma in tile product is 3.55. Here is a picture of VSM from tile product can be seen in picture 2.

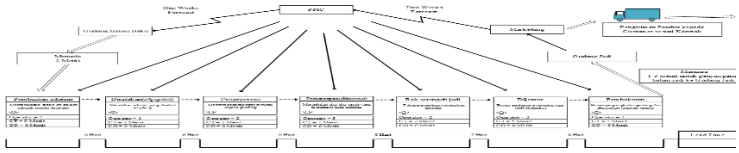


Figure 2 Value Stream Mapping

3. *Analyze*

At this stage look for causes of defects and waste using a cause and effect diagram. In addition to making a fishbone diagram will identify the type of waste and subwaste that occur in the fishbone diagram. In making causal digram there are several factors causing the defect that is human, machine, method, material, and environment. In 5 tile defect classification it is known that factors causing the occurrence of disability are caused by humans, and methods.
While in the identification of waste known that waste transportation and motions that often occur during the production of tile.

4. *Improve*
   This stage is the stage of quality improvement of tile that will be described on 5 why to know the root of waste that happened and give solution on method 5w +1 H

Table 1 5 *Why* Gopel Disabled Classification

Causative factor	*Waste*	Sub *Waste*	*Why* 1	*Why* 2	*Why* 3	*Why* 4	*Why* 5
Man	*Transportation*	Lack of caution in moving the tile	The operator is in a hurry to do the work	Absence of training in doing work			
	Motion	Lack of caution when lifting tile	Lack of understanding of tile roofing	Absence of training in doing work			
	Motion	Lack of caution when putting tile	Lack of understanding in laying tile	Absence of training in doing work			

Table 2 5 *Why* Classification of Broken Flaws

Causative factor	*Waste*	Sub *Waste*	*Why* 1	*Why* 2	*Why* 3	*Why* 4	*Why* 5

Man	*Motion*	Lack of understanding of tile burning	Operators pay less attention to temperature tempratur during combustion	It takes time to give an understanding of the operator	Absence of training		
Method	*Motion*	One chose firewood	The wrong operator picks firewood	Lack of knowledge in choosing firewood	Absence of training		

Table 3 5 *Why* Classification of Porous Disabilities

Causative factor	*Waste*	Sub *Waste*	*Why* 1	*Why* 2	*Why* 3	*Why* 4	*Why* 5
Method	*Motion*	Falsely select the raw materials of the soil	The operator mistakenly selected the raw materials of the land	Less careful in buying raw materials	There is no training in choosing the raw materials of the land		

Table 4 5 *Why* Classification of Cracked Disabilities

Causative factor	*Waste*	Sub *Waste*	*Why* 1	*Why* 2	*Why* 3	*Why* 4	*Why* 5
Method	*Motion*	Falsely select the raw materials of the soil	The operator mistakenly selected the raw materials of the land	The lack of understanding chooses the raw materials of the soil	Absence of training		

Table 5 5 *Why* Classification of Burned Disabilities

Causative factor	*Waste*	Sub *Waste*	*Why* 1	*Why* 2	*Why* 3	*Why* 4	*Why* 5
Man	*Motion*	Lack of understanding of tile burning	Less operators pay attention when burning is done	It takes time to give an understanding of the operator	Absence of training		
Method	*Motion*	The temperature of the fire is uneven	Operator less constration in tile burning	Absence of training			

a. Analysis 5W + 1H Gopel Disabled classification

The classification of gopel defects is caused by the proposed improvement of the identification result of the gopel defect classification using the 5 Why method, in order for the operator to be more careful in lifting and laying the tile, not in a hurry while doing the training in doing the work

b. Analysis 5W + 1H Classification of Broken Flaws

In the classification of defects broken because of the proposed improvement of the identification results classification of defects broken using the Why 5 method, so that operators pay more attention to the fire temperature during the combustion process and the holding of training in doing the work.

c. Analysis 5W + 1H Classification of Porous Disabilities

In the classification of defect porous as for the proposed improvement of the identification of the classification of porous defects using the 5 Why method for more careful operator in the purchase of raw materials of the land and held his training in choosing raw materials of soil

d. Analysis 5W + 1H classification of cracked disabilites

In the classification of crack defects as for the proposed improvement of the identification of the classification of gopel defects using the 5 Why method for more careful operator in the purchase of raw materials of the land and the holding of training in choosing raw materials of soil

e. Analysis 5W + 1H Classification of Burned Disabilities

In the classification of burnt defects as for the proposed improvement of the identification of the classification of burnt defects using the Why 5 method, in order for the operator to pay more attention to the fire temperature during the combustion process and conduct training.

4 Conclusion

After analyzing the previous chapter, we get the following conclusion:

1. The identified palentong tile products have five types of defects such as Gopel, Broken, Porous, Cracked and Burnt during the period 2016
2. In the process of tile palentong production is still a lot of occurrence of disability that will harm the tile factory. Disability that occurs caused by various factors that cause human and methods. From the research results also known what kind of waste that occurs in the production process of palentong tile is waste transportation and waste motions that result in disability
3. To improve the quality of palentong tile products the genteng factory is expected to apply lean six sigma method that aims to reduce the waste that occurs so as to achieve the long-term target of zero defect. Here is a suggestion that can be given by researche rs for the quality of palentong tile products:
    a. In the type of classification of defects gopel known to have a factor causing disability that is human caused waste transportation. Proposed by the researcher by conducting

training to the operator in doing the work. In the waste motions suggestions given by researchers by providing training in lifting and putting tile.

b. In the type of classification of defects broken out known factors causing the occurrence of disability that is human and methods that result in waste motion. The proposal given by the researcher is giving the training in doing the job. In the factors causing waste motion method. The proposal given by the researcher gave the training in choosing firewood.
c. On the type of classification of defects of porous known factors causing the occurrence of disability is the method that leads to waste motion. The suggestion given by the researcher is giving the training in doing the job so as not wrong in choosing the raw material of the soil.
d. In the type of classification of crack defects known factors causing the occurrence of disability that is human and methods that result in waste motion. The proposal given by the researcher is giving the training in doing the job.
e. In the type of classification of charred defects known to cause the occurrence of disability that is human and methods that result in waste motion. The proposal given by the researcher is giving the training in doing the job In the factor of waste method that occurs is waste motion. The proposal given by the researcher gave the training in the burning of tile.

5 References

[1] Syukron, Amin dan Kholil, Muhammad (2012). *Six sigma*, Quality For Bussines Improvement, Jakarta: Graha Ilmu

[2] Gasperz, Vincent (2011). *Lean six sigma* For Manufacturing and Service Industries, Jakarta: Gramedia Pustaka Utama.

[3] Aziz, Giri Hardyantoro. 2015. Analisis Pengendalian Kualitas Proses Produksi Produk Airbus A-380 Menggunakan Pendekatan Konsep *Lean six sigma* Di PT Dirgantara Indonesia. Tugas Akhir. Bandung: Universitas Komputer Indinesia

[4] http://sixsigmaindonesia.com/5-why-analysis/ Di akses pada tanggal 12 Juni 2017