

Seven Tools as Quality Control to Reduce Defective Products in the Honeycomb Board Machine Process

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Abstract

Quality is a requirement for a product that will be distributed to consumers. Quality is also a competitive advantage for the company. PT NKR Industri as a company that produces paper still has not met the target to reduce the number of product defects. Product defects set by the company are a maximum of 3%, but currently product defects are up to 5%. Seven tools are tools used to control quality. This research is quantitative research. Data was collected through interviews and direct observation. The population and sample in this research is defect data on honeycomb board machines for the period July to December 2022. The data analysis technique uses seven tools. After mapping with seven tools, one of which is through a fishbone diagram, product defects that occur are caused by environmental factors consisting of room temperature, material factors consisting of damp paper and expired glue, method factors consisting of the dandori method is not suitable, machine factors consisting of less maintenance and the equipment has entered a maintenance period, the measurement factor consists of less careful measurement process, and finally the man factor consists of lack of knowledge and not careful.

Keywords: Fishbone Diagram, Quality Control, Seven Tools.

INTRODUCTION

Industry must be able to survive competition by maintaining quality (Kiki et al., 2019). Based on (Olifiyati Zahro, 2022) Managers within the company continue to maintain quality because of increasing competition. This is because consumers choose quality before buying goods, besides that companies can set high prices if goods are of high quality (Gultom & Felicia, 2018). Quality is the main factor so that products can provide satisfaction for customers (Mashabai, 2020).

According to (Shania et al., 2022) Good quality is goods whose specifications are in accordance with those determined by the company. Quality control seeks to suppress products that do not conform to standards (Arianti et al., 2020). Seven tools are quality control tools consisting of flow charts, check sheets, histograms, control charts, scatter diagrams, fishbone diagrams and Pareto diagrams (Hamdani, 2022).

PT NKR Industri is a manufacturing company engaged in packaging with the main raw material being paper. PT NKR Industri is located in the MM2100 industrial area, West Cikarang with 50 employees. Employees are required to produce good quality goods to meet customer needs. The company continues to analyze the quality of goods to reduce the number of rejects in the production process. However, the rejects that occurred were still 5.1%, exceeding the tolerance standard applied by the company, namely 3%. Defective products in the company are not permanent and fluctuate (Hamdani, 2022). The following is the reject data generated in the production process on the honeycomb board machine:

Table 1. Product Defects for July to November 2022

Month	Defect percentage
July	6%
August	7%
September	6%
October	4%
November	4%
December	3%

In table 1 is data regarding PT NKR Industri's product defects. PT NKR Industri prioritizes customer satisfaction by improving and maintaining quality. Product defects become an internal problem that causes the company to make improvements for good quality. Quality is the most important element when consumers buy goods (Gultom & Felicia, 2018). Quality control guarantees quality in accordance with planned specifications starting from raw materials, production processes, processing of semi-finished materials and finished goods, to the delivery process (Riadi, 2020).

According to (Suprianto, 2020) quality control deviations are still found that must be corrected including human factors, methods, and machines. The benefits of the company do quality control (Wislah, 2022) is that producers can prevent major disasters from occurring by finding the cause. According to (Viery, 2020) factors that affect quality control are the ability of the production process, valid specifications, non-conformances obtained, and quality budget. Based on (Permono et al., 2022) There are seven tools used to solve quality problems, namely check sheets, stratification, histograms, pareto charts, fishbone charts, control charts, and scatter charts. With this, it is necessary to carry out further research to find out how the seven tools are used to control product quality at PT NKR Industri.

RESEARCH METHOD

This research is quantitative research (Priadana & Sunarsi, 2021) that uses a lot of numbers, starting from the data collection process, data analysis and data appearance. Population is a combination of all objects studied (Wahyu, 2020). The population in this study is all NG that occurred in the honeycomb board production process in the period July to December 2022 at PT NKR Industri. The sample is selecting a smaller number of individuals to be studied (Firmansyah & Dede, 2022). The sample in this study used the entire population, namely NG in the honeycomb board production process from July to December 2022.

Data collection techniques use primary and secondary sources. Methods of data collection using observation, interviews, and documentation. Data analysis techniques use Seven Tools to find out how to implement quality control at PT NKR in order to reduce product defects that occur. These seven tools use seven quality control tools (Erdhianto, 2021) namely check sheets, control charts, cause and effect diagrams, pareto diagrams, histograms, scatter diagrams, and stratification.

RESULTS AND DISCUSSIONS

Based on the results of observations and identification for 6 months from July to December 2022, there was a very high increase in defective products during the production process. After that, an analysis was carried out to find out the various problems that caused the increase in Reject numbers and what factors caused them.

Stratification is used to see a comparison of all the damage that has occurred and to help create a scatter diagram (Prastiyo et al., 2023). During observation, the types of defective products

and the percentage of defects are collected to find the cause. The data that has been collected is then stratified as in Table 2 below:

Table 2. Data Stratification

Defect Type	Stratification Period July until December 2022					
	16	25	45	20	30	50
Dandori	V					
Material						v
Dry Vanbelt	V					
Man Power						v

The data stratification in Table 2 serves to see where the problem machine is located during the ongoing production process. From this data, the most defective problems in Honeycomb machines are at number 16 and 50. Apart from this process, no problems occurred on the machine.

The scatter diagram shows the correlation of the number of defective products with the products produced (Alfadilah et al., 2022). Scatter diagram of defective products on PT NKR Industri's Honeycomb machine is:

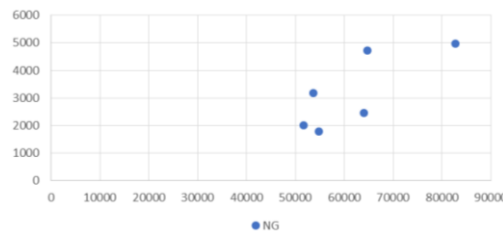


Figure 1. Diagram Scatter Cacat Produk Mesin Honeycomb

Figure 1 is a comparison of total production with the defects caused or the defects produced have an unrelated or uncorrelated pattern seen from the tendency of certain values in variable X towards certain values in variable Y.

A check sheet is a special form whose results can be interpreted immediately (Lestari & Purwatmini, 2021). Check sheets simplify the analysis process as well as simplify the data collection process and to find out problem areas based on the frequency of the type and cause of defective products as well as the process of making a decision whether to make repairs or not. The following are the results of data collection through Check Sheets that have been carried out for 6 months:

Table 3. Defect of Check Sheet

Number	Period	Production Total	Dandori	Material	Dirty Vanbelt	Man Power	Defect Total	Percentage
1	July	53636	1205	567	938	461	3171	6%
2	August	64756	1722	880	1309	814	4725	7%
3	Sept	82768	1601	790	1778	809	4978	6%
4	Oct	64089	899	447	751	360	2457	4%
5	Nov	51748	779	303	545	386	2013	4%
6	Dec	54878	884	228	422	249	1783	3%
Tot		371875	7090	3215	5743	3079	19127	30%

Based on table 3, there are 4 types of defects, namely Dandori, Material, Dirty Vanbelt, Man Power. This rejection number occurs almost every month on honeycomb board machines.

The highest reject rate was for Dandori defects with a figure of 7,090 pcs in the period January – June 2023, which exceeds the tolerance value for NG goods approved by the company, namely 3%. So it is necessary to make improvements related to product defects that occur.

Histograms are used to show frequency distribution data (Sari et al., 2022). In this case, it is the frequency distribution of defective products that occur in PT NKR Industri Honeycomb machines. Histogram of PT NKR Industri Honeycomb machine defect products for the period January – December 2023 is as shown in Figure 2.



Figure 2. Histogram of Honeycomb Machine Product Defects

Figure 2 is the total number of NG data in the Honeycomb Board machine production process from July to December 2022, where the highest number of product defects was in September with a reject number of 4928 pcs and the lowest number of production defects in the Honeycomb Board machine process was in December with a reject number. production 1784 pcs.

Another analysis was carried out to see the extent of the number of production defects that still occurred in July – December 2022. In this case, the aim was to see the extent of quality performance during that period and which product defects were the next priority for improvement. So from the results of the data analysis above can be seen Run Chart analysis.

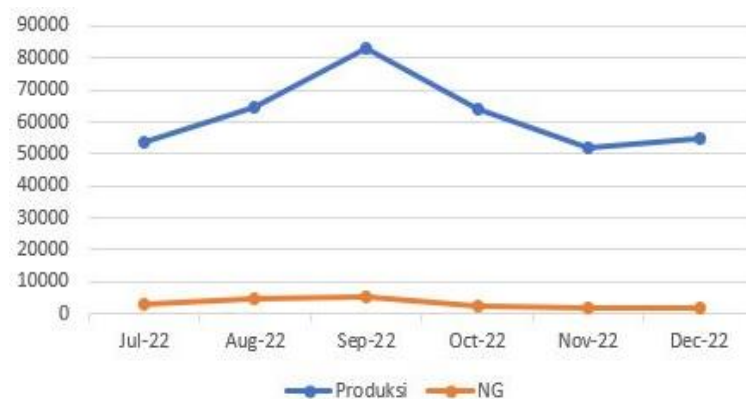


Figure 3. Run Chart of Honeycomb Machine Product Defects

Based on the Run Chart, product defects show that all of them are not within the control limits for the period July – December 2022. This shows quality abnormalities that occur in the material line or process, so quality control needs to be carried out in the PT NKR Industri Honeycomb Board process line.

Pareto chart is a diagram used to identify, sort and work to exclude permanent product damage (defects). By using this diagram, it can be seen that the most dominant type of defects in production results from July – December 2022.

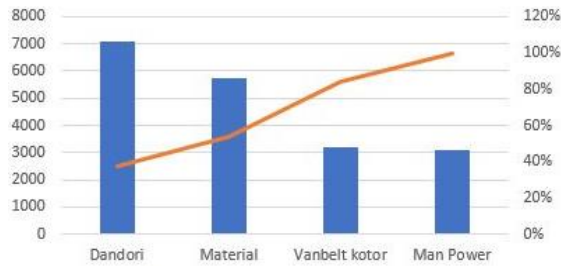


Figure 4. Pareto Diagram of Honeycomb Machine Product Defects

Based on Figure 4, defects that occur in products when Dandori is the most dominant defect, where the data shows a percentage of 37% with a total number of NG reaching 7090 pcs. So the proposed improvements will be focused on the NG Dandori process, because this type of defect is the most common type of defect generated during the July – December 2022 period.

Cause and effect diagrams show the relationship between the problems encountered and all possible causal factors that have influenced them. The cause and effect diagram is:

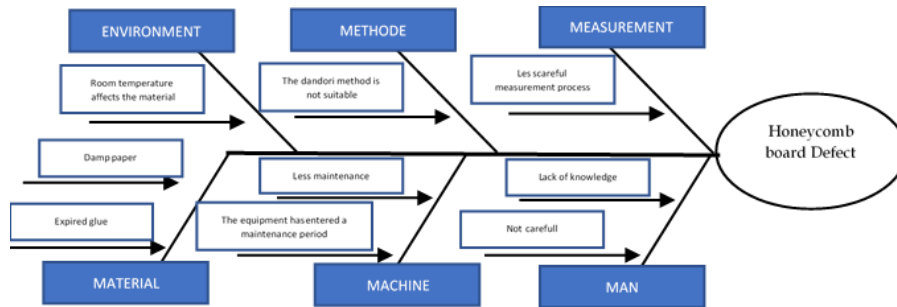


Figure 5. Fishbone Diagram Cacat Produk Mesin Honeycomb

In Figure 5 is a fishbone diagram of product defects at PT NKR Industri. The causes of defects consist of 6 (six) factors, namely measurement (less careful measurement process), method (the dandori method is not suitable), environment (room temperature affects the material), man (lack of knowledge and not careful), machine (the equipment has entered a maintenance period), and material (expired glue and damp paper).

Quality control at PT NKR Industri, especially in the Honeycomb Board Machine line, still does not meet the targets set by the company. The monthly disability period is still higher than the specified 5%, while the maximum disability target is 3%. This is a concern for management to immediately make improvements. This has a negative impact on internal and external companies. These impacts include decreased productivity and decreased company performance to produce goods that meet company standards and consumer standards. Quality control carried out by the company has a positive effect, of course for the company to be able to survive, compete, and produce quality products. This is also related to the cost of repairing internal and external failures. Internal failure costs consist of re-examination costs and rework costs. External failure costs consist of customer complaint costs and warranty or compensation costs.

Analysis performed using a fishbone diagram reveals the factors that cause product defects to be made. The description is carried out in accordance with 5M1E which has been classified using a fishbone diagram. The factors that cause product defects based on the fishbone

diagram that has been made are the Man Factor, the Machine Factor, the Method Factor, the Material Factor, the Measurement Factor.

CONCLUSION

After mapping the main problems through fishbone diagrams, the factors that cause product failure on honeycomb board machines are environmental factors consisting of room temperature, material factors consisting of damp paper and expired glue, method factors consisting of the dandori method is not suitable, machine factors consists of less maintenance and the equipment has entered a maintenance period, the measurement factor consists of the less carefull measurement process, and finally the man factor consists of lack of knowledge and not carefull.

After knowing the factors that cause product defects, the company is more focused on making improvements. These improvements include the dandori process. The dandori process is the initial process during production, so it is necessary to check the paper, whether the machine is in a ready condition, and it is necessary to increase knowledge regarding good product quality for the workforce. With knowledge of product quality, workers will be aware of making improvements.

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