IMPROVING QUALITY BY PDCA APPROACH WITH THE SMALL GROUP ACTIVITY (SGA) CONCEPT: A CASE STUDY IN MANUFACTURING INDUSTRY

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ABSTRACT
In manufacturing industry, quality control becomes an important point in running the manufacturing process. One of the ways used to produce quality products according to standards is with continuous improvement across all manufacturing process lines. A continuous improvement system must have the right stages in order that the planned objectives to overcome the existing problems can be achieved. Control and quality improvement in this research using Plan Do Check Action (PDCA) approach with Small Group Activity (SGA) concept. Based on the existing data in one of the manufacturing industry in Indonesia, found one type of product reject in the corrugated sheet machineis 0.26% of the total product reject 0.85%.With the concept of continuous improvement, quality improvement can be done by lowering one type of reject product that is expected to lower the reject by accumulation. In the case of this problem, the quality control applied using the concept of Small Group Activity (SGA) in which there are 8 steps of improvement with the Plan Do Check Action (PDCA) approach.

Keywords: *quality, reject, small group activities, PDCA*

I. Introduction

In manufacturing industry, quality control becomes an important point in running the manufacturing process. One of the ways used to produce quality products according to standards is with continuous improvement across all manufacturing process lines. A continuous improvement system must have the right stages in order that the planned objectives to overcome the existing problems can be achieved.

Control and quality improvement in this research using Plan Do Check Action (PDCA) approach with Small Group Activity (SGA) concept. The PDCA approach is an activity to keep the quality to the maximum as expected and planned. So that the concept can act as a driving factor, steering, and facilitator tools that are systematic and dynamic. On the basis of this, the concept of PDCA is used because it has benefits [1]:a) Have ease in terms of authority and responsibility in an organization, b) Can be a reference to the pattern of continuous improvement work, c) As a structured and systematic problem solving, d) The workflow is very efficient and regular, e) Improve effectiveness, productivity, and eliminate waste.

The concept of small group activites (SGA), has a function as a frame of mind in terms of continuous improvement, which is used as a method of finding root causes, solving problems together structurally and eliminating them thoroughly. The concept of SGA is usually shaded by the concept of a team consisting of several individuals (5-8 people) to complete the detail of the problem and conduct sustainable development, it can indirectly grow the sense of ownership attached to the individual in the organization team and help each other solve problem cross functionally [2].

Based on the problems that exist in one manufacturing industry in Indonesia, has found one type of product reject in the X machine is 0.26% of the total product reject 0.85%. With the concept of continuous improvement of quality improvement by lowering one type of reject product is expected to lower the rejects accumulated. In the case of this problem suitable quality control as an alternative solution is to use the concept of Small Group Activity (SGA) in which there are 8 steps of improvement with Plan Do Check Action (PDCA) approach to overcome reject problems in related industries.

II. Literature Review

In the 1980s, Japan has embarked on a system or management technique that focuses on engagement, role participation, and employee empowerment in the process of continuous improvement through top-down teamwork approach, interactive communication, structured analysis and documentation. It is applied by Japanese companies, in order to compete globally and establish a commitment philosophy in terms of long-term sustainable improvement, the philosophy is called kaizen [3].

The core of kaizen is to cultivate a high sense of ownership in management with a top-down system, the whole team must encourage change and innovate, be the contributor and creative leader in the improvement. It is done as a manufacturing competitiveness, business of all people and as a media customer-driven strategy for improvement [4].
Small Group Activities is a continuous improvement method for finding root problem in teams consisting of several people (normal 5 - 8 people), team members can come from across mini business in industry organization, All team coordinate in making decision, effective sharing learning and communication as well as learning to use cause-effect and fish bone diagram techniques. They are directly involved in eliminating, standardizing and preventing repetition of structural problems. The SGA team works independently, and reports on its development progress openly on the communication board [2].

This SGA concept project comes from PDCA Deming Cycle and consists of 8 steps:

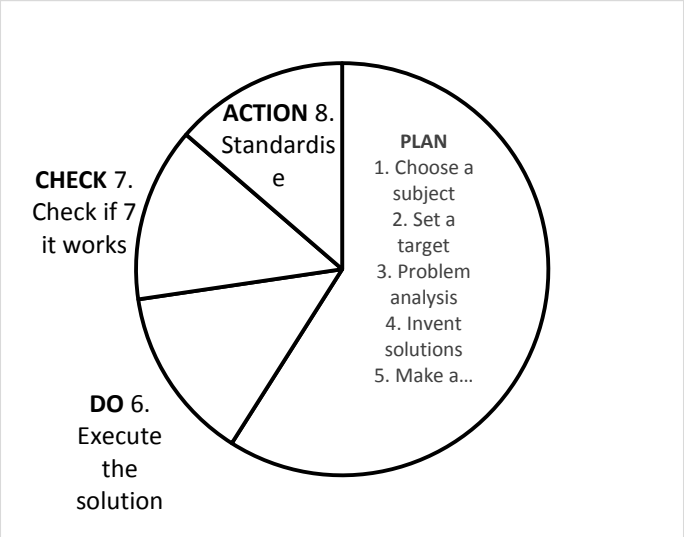


Fig 1. Small Group Activity Improvement Cycle

From the figure 1 above it can be seen that the plan weight is 56.5% where there are steps 1-5, and do, check, action weight are 12.5% respectively.

Based on the diagram, the SGA concept takes an important role in the process of quality control (researching, developing, designing and fulfilling customer satisfaction), environment, Human Resources, monitoring activities, ensuring a performance is in the design, meet the expected quality standards. The PDCA concept is suitable for small-scale continuous improvement activities to shorten the work cycle, eliminating waste in all areas of the work area and productivity [5].

Authority and responsibility need to be recorded in the form of visual documents to facilitate in identifying activities that have been done. The authority is adjusted to the functionality of its position, harmonized and balanced its distribution in accordance with standard operational procedures, therefore the necessary tools in the process of quality control are: (i) Check sheet, used to know the trend record data, (ii) Scatter diagram, (iii) Fishbone diagram, (iii) Pareto diagram, (iv) Stratification, (v) Histogram, (vi) Control chart.

The PDCA cycle is also known as "Deming cycle", which is the Process quality management mode. The meaning of PDCA has the meaning as:
plan (P), which includes action programs and objectives and formulation of activities;
plan what goals, objectives, and processes are needed to determine the results that are in accordance with the specified goals.Planning is carried out as a goal and process by knowing what things are the solutions to finding solutions to these ideas. Stages that need to be noted include:
(i) identify the services provided, expectations, and customer satisfaction to provide results in accordance with the requirements specifications. (ii) Then describe the process from beginning to end. Focus on improving the quality of the root causes of the problem. (iii) Putting the targets and processes needed to provide results that are in accordance with the needs specifications and make opportunities for improvement [7].
Do (D) is a special operation that functions as an act of the realization of the planner, the implementation process.In this step, (i) that iswork plan that has been prepared in accordance with the previous plan, (ii) Rooting processes on a small scale, (iii) Referring to the implementation and implementation of planned activities [8].
Check (C) that is as a summary of the results of a plan, identify the problem, the evaluation process and re-examine the plan whether it is in accordance with the expected standards or whether there are still irregularities that must be corrected.This is done to: (i) Monitor and evaluate the process and results of targets and specifications and report the results, (ii) In checking there are two things that need to be considered, namely monitoring and evaluating the process and the results of targets and specifications, (iii) The techniques used are observation and survey, (iv) If in the check process finds a weakness, then a repair plan is made to be carried out further. If it fails, then look for another implementation, but if successful, do it regularly.Referring to verification of whether the application matches the desired increase and improvement plan [9].
action (A) that is processing and improving the results of the examination, providing standardization or formulating instructions. conduct a total evaluation of the target results, process and follow up with improvements. If it turns out that what has been done

there is still something that is lacking or not perfect, then as soon as possible an action is taken to fix it. the steps to do it are: (i) review all steps and modify the process to fix them before the next implementation, (ii) Following up on results means standardizing changes, such as considering which areas might be applied, revising the process that has been improved, modifying existing standards, procedures and policies, communicating to all staff, customers and suppliers for changes made if necessary, developing plans that clear, and document the project. In addition, it is also necessary to monitor changes by regularly measuring and controlling processes [10].

Benefits of PDCA include: (i) To facilitate the mapping of the authority and responsibility of an organizational structure unit, (ii) As a work pattern and point of view in improving a process or system in an organization, (iii) To solve and control a problem with a structured and systematic pattern (iv) For continuous improvement activities in order to shorten the workflow, (v) Eliminating waste in the workplace and increasing productivity and increasing efficiency [11].

The PDCA concept applies as a guideline for each company to process quality improvement continuously without stopping but to improve to a better state and run in all parts of the organization. Identifying the problems to be solved and the search for the causes and the determination of corrective actions must always be based on facts and scientific points of view. This is intended to avoid the existence of elements of subjectivity and over-decision making and emotional decisions [12].

therefore, the Company and organization must have and need a way of assessing the management system as a whole, in the sense of how the system and method can affect every process and every employee to improve service quality, but it depends on the health and vitality of the organization, leadership and commitment [13].

III. Research Methodology

In this stage a research methodology is undertaken to find the root cause of the problem and to find a solution to the problem by (i) determining the theme for finding the phenomenon of the problem, (ii) determining the achievement targets to be achieved, (iii) analyzing the existing conditions to find abnormalities, (iv) root cause failure analysis, (v) create improvement plan, (vi) implementation of improvement according to plan (vii) checking and evaluating improvement result whether positive or negative impact, if the result is good then (viii) done standardization.

To clarify the above explanation, then the above methodology concept can be converted to a flow diagram below:

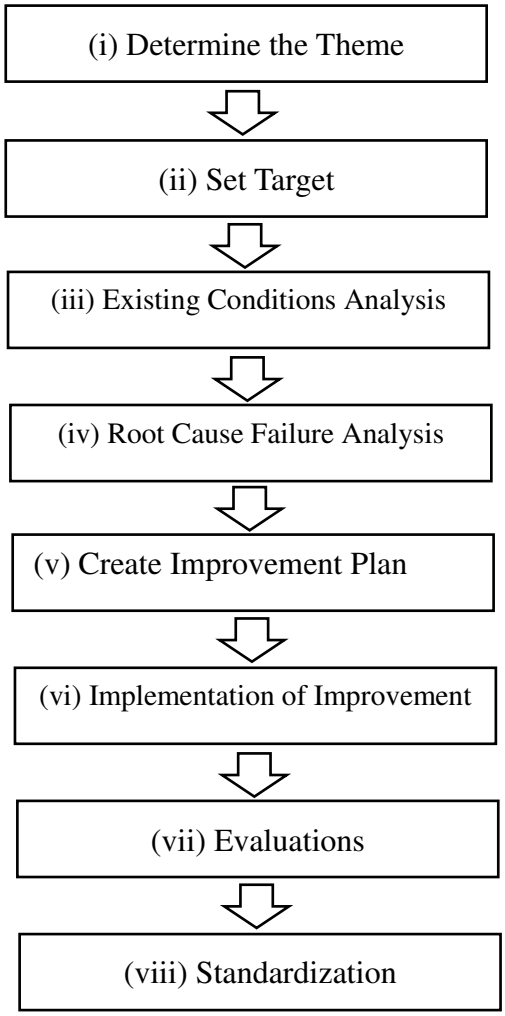


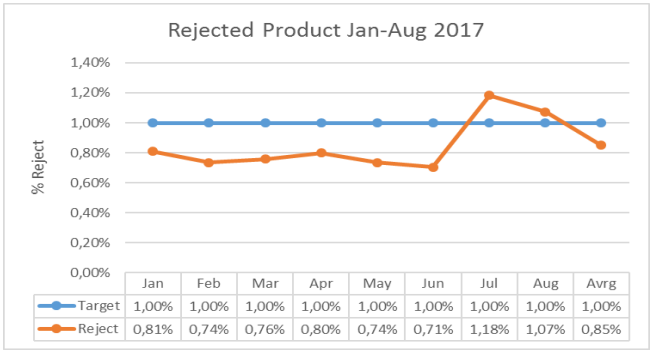
Fig 2. Research Metodhology Chart

The figure 2 above is a sequence of steps in doing research from step 1 to step 8. Step step is a concept of PDCA that must be done in sequence to ensure good research results [14].

IV. Result and Discussion

4.1. Determine the Theme

The first step is to search for defective product data in machine.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Avrg
Target	1,00%	1,00%	1,00%	1,00%	1,00%	1,00%	1,00%	1,00%	1,00%
Reject	0,81%	0,74%	0,76%	0,80%	0,74%	0,71%	1,18%	1,07%	0,85%

Fig 3. Rejected Product Jan-Aug 2017 Diagram

The data above is data taken from the production report in 2017 oncorrugated sheet machine. From July

there was an increase in defective products which is a phenomenon of this study. After that, a pareto of rejected product data is created to determine the type of rejected to be repaired.

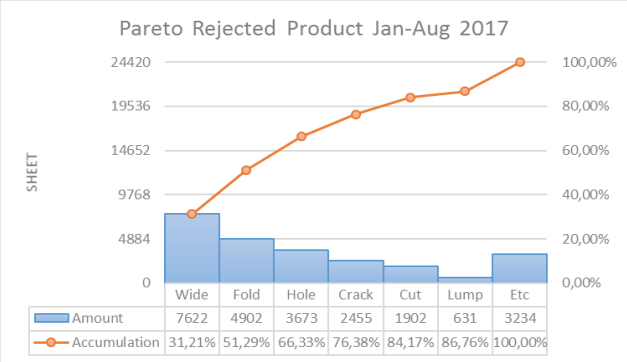


Fig 4. Rejected Product Jan-Aug 2017 Diagram

Pareto above is a rejected product type in 2017 and wide is the largest pareto which will be the focus of research.After the rejected product that will be fixed is determined, then seen the trend of achievement for a year.

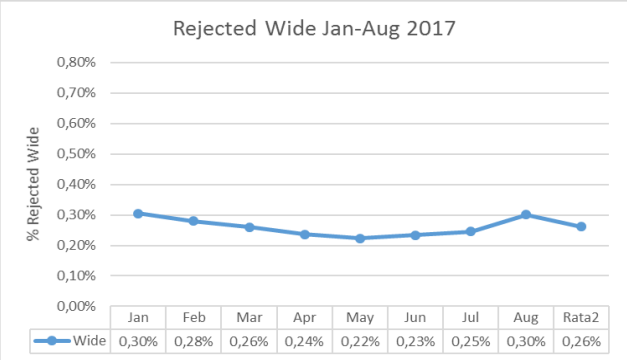


Fig 5. Rejected wide Jan-Aug 2017

The figure 5 above is a trend of rejected product wide during 2017 and reaching an average of 0.26%.

4.2. Set Target

In doing we determine the target to be achieved, in this study the target set is 50% according to the SMART Method: Specific, Measurable, Achievable, Realistic, Time Bound.

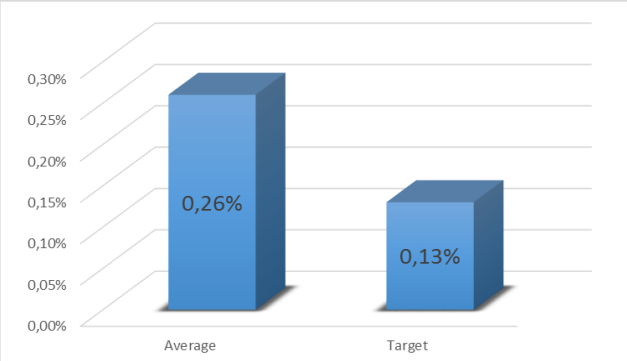


Fig 6. Target improvement

The figure 6 above is a picture of the target to be achieved, namely a decrease of 50% from 0.26% to 0.13%.

4.3. Existing Conditions Analysis

The table below is an explanation of the non standard conditions found in the corrugated sheet machine process and there are 5 findings of conditions that could cause defective products in production.

Table 1. 4M + 1W Analysis

No	What Should Be Happened	What Actually Happened	4M + 1E	Improvement Opportunity / Note
1	Circle time corrugating sheet standard	Circle time corrugating sheet not standard	Method	**Standardization**
2	High springs standard	High springs not standard	Machine	**Standardization**
3	Up/down sensors sensitive	Up/down sensors not sensitive	Machine	**Change sensor type**
4	Lifter tilt	Lifter not tilt	Machine	**Replace the lifter**
5	Steel mold should be precision	Steel mold should be not precision	Machine	**Reforming steel mold**

4.4. Root Cause Failure Analysis

Table 2 is an explanation of problem analysis with the method why why analysis to find the root cause.

Table 2.Root cause failure analysis

No	Failure Mode	WHY 1	WHY 2	WHY 3	4M/IE
1	Circle time corrugating sheet not standard	There is no standard corrugating time			Method
2	High springs not standard	No high standard springs yet			Method
3	Up/down sensors not sensitive	Input signal unreadable	Limit switch is not sensitive	Mechanical limit switches are easily damaged	Machine
4	Lifter not tilt	The bottom side of lifter's frame is broken	Metal fatigue	Llifetime	Machine
5	Steel mold should be not precision	The Steel mold is broken	Clash on oiling process	The 642topper position is in the middle of the oiling	Machine

4.5. Create Improvement Plan

Table 3. 5W + 1H Analysis

What	Why	How	Who	Where	When
No standard corrugating time has been made in SOP	In order for standard corrugating time	Standardize	Bismar	Stacking Machine	09/29 2017
There is no standard yet	In order to have a high standard hanger	Standardize	Bismar	Stacking Machine	09/29 2017
Mechanical limit switches are easily damaged	So that the sensor is more sensitive in eading the signal	Replace with proximity sensor	Maden ur	Stacking Machine	08/31 2017
Llife time lifter	Lifter level, declivity = 0	Replace with new lifter	Maden ur	Stacking Machine	08/31 2017
The stopper position is in the middle of the oiling	In order for steel mold is not damaged	Move position and add stopper	Maden ur	Oiling Machine	09/08 2017
Steel mold is broken	Steel mold back to standard form	Reforming steel mold	Deni A	Workshop	09/08 2017

Table 3 is an improvement step after an analysis of the root causes of the problem. From the root cause of the problem will be done how to repair it, anytime, and who will be responsible for the improvement.

4.6. Implementation & Improvement

Table 4 is the documentation of the results of the improvement of the condition before and after the repair. In this research there are 4 items that are done improvements to improve the achievement of the corrugated sheet machine.

Table 4. Implementation improvement

What	Before	After
Replace proximity sensor		
replace lifer		
Replace and add stoper		
Reforming steel mold		

4.7 Evaluations

From the evaluation of improvements that have been implemented there is a decrease in reject trend like the graph below:

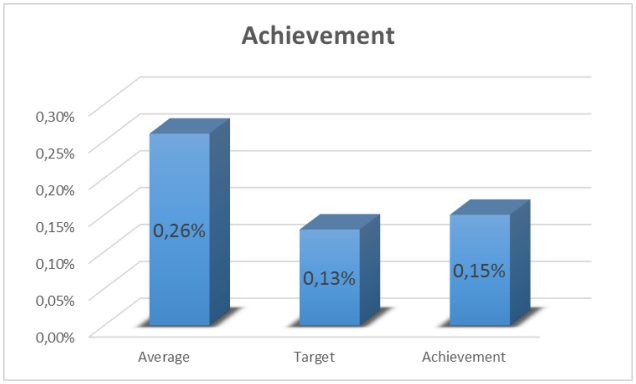


Fig 7. Achievement Diagram

From the improvement, there is an increase of 42% from 0.26% to 0.15% as seen in figure 7. While the achievement of the target set is 86.67% ie the set target is 0.13% while the achievement is 0.15%.The improvement trend can also be seen in Figure 8 below which explains the decline in reject products in the x machine production process.

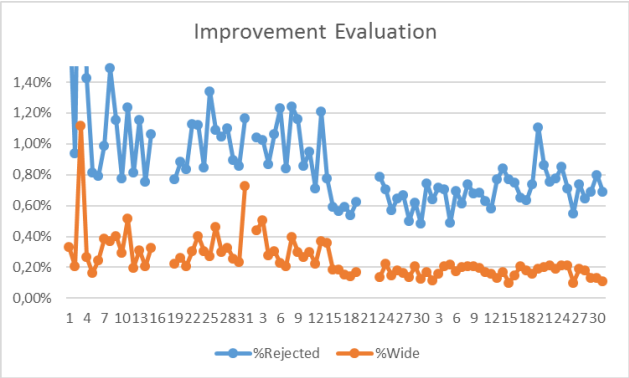


Fig 8. Improvement Evaluation Diagram

From the results of the improvement showed a decrease in reject from 0.26% to 0.15% or 0.11%.

4.8. Standardization

Standardization is done to keep the results of improvement in order to stay awake. Standardization can be standard operating procedures and work instructions [15].

V. CONCLUSION

1. Using the concept of PDCA, can set the Goals that want to be issued in an accurate process
2. The Concept of Small Group Activities contributes greatly to the process of deeper data analysis or experimentation.
3. From learning application of PDCA and SGA method, qualitatively able to reduce and decrease BS Product Widen in Machine 7, from 0.26% to 0.13%, and quantitatively, able to provide cost saving process of Rp. 273.600.000 / year
4. Parameters in Standard Manufacturing Process (SMP) to improve product quality have been standardized.

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