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IMPLEMENTATION OF DMAIC APPROACH TO IMPROVEMENT OF BLOCK PRESS PRODUCTION PROCESS (CASE STUDY PT. XYZ)

Wahyu Wiguna[1]
[1]Universitas Bina Bangsa

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ABSTRACT

The limit increase in the number of product defects p there is a block press production process line in January-July 2022 by 6.5%, namely Block Press too light, Block Press sample, Block Press scratch, Block Press cracked, Block Press broke, Block Press too heavy, Block Press top uneven, Oblique Block Press, Block Press bottom uneven. The purpose of this study is to control the process so that the company's target can control the number of product defects. The DMAIC approach is used to conduct quality control analysis using production data and production errors for January- June 2022. The result of the DPMO calculation is 7222 Pc which means that there will be a chance of product defects of 7222 Pc from process failures per one million opportunities, with a block press production process sigma rate of 3.9 Sigma. The result of the DPMO calculation is 7222 Pc which means that there will be a chance of product defects of 7222 Pc from process failure per one million opportunities, with a block press production process sigma rate of 3.9. Some types of defects that are dominant in BLOCK PRESS products are: too light (38%), compel (16%), and scratch (9%). Some proposals aimed at reducing the number of product defects on the block press are: Making work standards for checking powder moisture, Supervision and control by production supervisors, Making work standards for molding filling and operator training.

E-mail:
w-wigunawahyu@yahoo.co.id

1. INTRODUCTION

Process failure can cause losses in the manufacturing industry, all industries, both large and small, try to control the process so that production results can be by customer standards / requests. One of the efforts to control the process is to use several scientific methods including Six Sigma which is used to control product quality so that production can be more stable.

The Six Sigma application pays attention to shortcomings and variances, starting with identifying important parts of the quality of the process and providing relevant improvements as they occur, known as the 5 phases of DMAIC (Defining, Measuring, Analyzing, Improving and Controlling). According to Gaspersz (2007) six sigma is a vision of quality improvement towards the target of 3.4 Sigma failures per million opportunities for every transaction of goods and services products. (Ahmad, 2019). There was an increase in the number of product defects p there is a block press production process line for the January-June 2022 period by 6.5%, as for the types of defects as follows; Block Press is too light, Block Press is sompel, Block Press is scratched, Block Press is cracked, Block Press is broken, Block Press is too heavy, Block Press top is uneven, Block Press is Tilted, Block Press bottom is uneven.

2. METHOD

The research took place at PT. XYZ Block Press Section. The DMAIC approach is used to conduct quality control analysis using production data and production errors for January-June 2022. DMAIC is a six sigma targeted continuous improvement process. DMAIC focuses on new measures, technology applications, and quality improvement toward six sigma targets by eliminating ineffective process measures. The steps of this study are as follows: (Wahyuni, 2020).

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This is the first stage, which focuses on problem identification, process goal setting and customer needs identification internally and externally. Determining customer needs, developing goals and problems, team building, and determining sources are all part of the define phase.
The measuring stage is a stage that must be done after the defined stage. At this stage, collecting data and calculating the value of DPMO will be carried out. The data that should be available at this stage is the number of product defects based on the type of CTQ identified at the defined stage. At this stage of the measure, the DPMO value is obtained using the formula: DPMO = Jumlah defective products (the number of products produced ∗ potential CTQ) x1000000 With the formula, the DPMO value of each product will be known, then the DPMO value will be converted based on the six sigma table.
The analysis stage is an advanced stage after the measuring stage. An analysis of the DPMO value obtained at the measure stage will be carried out at this stage. The analysis was carried out by identifying the factors that caused the product's defects. Several quality management tools can be used at this stage, such as fishbone diagrams, rood cause analysis (RCA) etc.
The improve stage is a stage that aims to provide recommendations for improvement to improve product quality, and reduce defective products so that there is an increase in the value of sigma. Improvements can be done in various ways according to the conditions in each company. Improve can be done by improving the work system (SOP), providing training to employees, replacing mesi / repairing facilities and infrastructure etc.

The control stages are carried out to control the process after the repair is completed. This stage aims to control the production process by the steps of improvement that have been made. Company monitoring needs to be carried out optimally at this stage, so that all corrective measures can be implemented effectively and efficiently to reduce product defects.

3. RESULT AND DISCUSSION

The DMAIC approach was used in this study.

(1) Define

Collecting data on total product defects is focused on the production of Block Press, whose production results are used as a base in the tightening of pallet packaging . The total number of defective products from January - June 2022 is 210,600 pc with a total production of large Block Presses of 3,240,000 Pc, then the percentage of defective products produced is 6.5 %. There are 9 CTQ (Critical to Quality) for block press quality, namely: Block Press is too light, Block Press is sompel, Block Press is scratched, Block Press is cracked, Block Press is broken, Block Press is too heavy, Block Press top is uneven, Block Press is Tilted, Block Press bottom is uneven.

(2)Measure

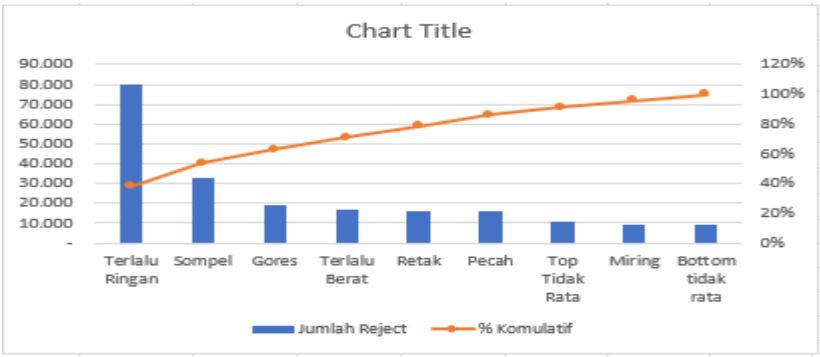

Figure 1 Pareto Diagram

Figure 1 shows a pareto diagram of defects occurring in the Block Press. Dominant defects are identified by looking at the block press defects that contribute ± 80% of the total number of defects. This dominant defect will be a priority for handling quality improvement in the Block Press. Dominant defects are too mild defects (38%), sompel (16%), and scratches (9%). From the calculation results, a DPMO value of 7222 pc of product defects was obtained in one million opportunities, with a sigma level of 3.9.

Analyze

Based on the *measure* stage, it is known that the dominant defects are too mild, sompel, and scratch. Next, an evaluation is carried out to determine the cause of each defect with a causal diagram. A causal diagram

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is a structured approach that allows for a more detailed analysis of the causes of a problem, discrepancies and gaps (Nasution, 2001).

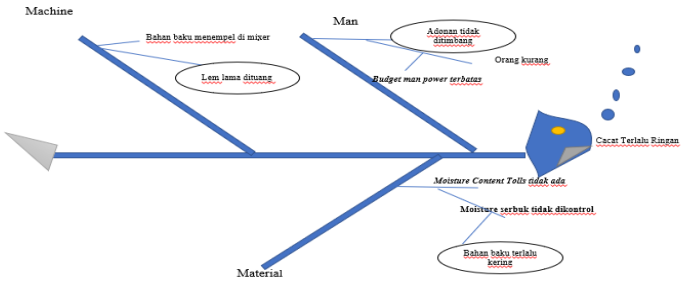

Figure 2 Causal Diagram of Defects Tand R ingan

Through the causal diagram in figure 2, it is explained that defects are too light due to several things including: Dough is not crushedng, Raw materials are too dry, old glue is poured.
The analysis results were obtained (the absence of a standard defect is too light, so it is necessary to have a standard in the Block Press process.

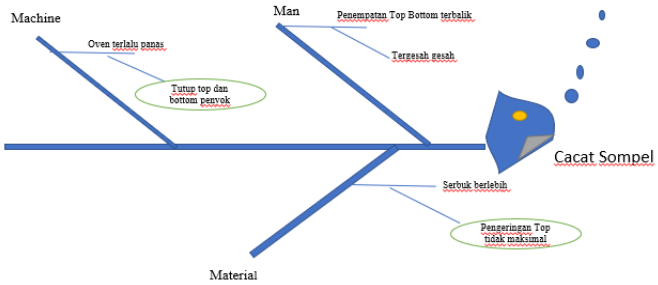

Figure 3 Causal Diagram of Sompel Defects

Through the causal diagram in figure 3, it is explained that the occurrence of defects is too light due to several things including: Top lid and bottom dented, Top Drying is not optimal.
The analysis results were obtained (no standard standard to prevent Sompel Block Press) .

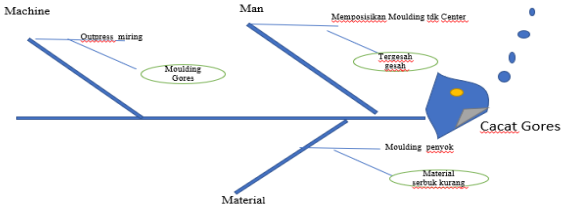

Figure 4 Scratch Cause and Effect Diagram

The causal diagram in figure 3 explains that the occurrence of defects is too light due to several things including: Hashy, Moulding Scratches, Less Powder Material .
The analysis results were obtained (there is no standard for correcting block press scratch defects).

Improve

The previous process used a causal diagram. The result of the causal diagram will be the input for the FMEA calculation at this stage. *Failure Mode and Effect Analysis* (FMEA) will generate a *Risk Priority Number* (RPN) value, later becoming a priority scale for improvement. Three (3) types of defects were analyzed using this tool.

Table 1 FMEA Types of Defects are too mild

Mood	Potential Failure	Potential	Value		Countermeasures

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Potential Failures	Effects	Causes	S	O	D	Rpn	Recommendations
Dough is not weighed	The material processed in the machine becomes too light	Moulding filling standards are not yet clear and refer only to operator experience	4	4	3	48	Manufacture of working standards for moulding filling
Too dry raw materials	Imperfect material	Powder Moisture standards are not yet clear and refer only to the operator's experience	4	5	6	120	Manufacture of working standards for checking powder moisture.
Old glue poured	The viscosity of the glue changes to a less degree of degree	Undisciplined when putting glue into the mixer	7	4	6	168	Supervision and control by production supervisors

Table 1 shows the FMEA for too mild a defect. In this too mild defect, several potential failure modes are identified to look for the cause of the failure. From the table, the cause of the failure of the old glue in the pour has the highest RPN. This suggests that the cause of the failure contributes greatly to the occurrence of too mild a defect and is a priority in remedial measures as recommended in the table.

Table 2 FMEA Types of Sompel Defects

Potential Failure Mode	Potential Failure Effects	Potential Causes	Value			Rpn	Countermeasures Recommendations
			S	O	D		
Close top and bottom dents	The shape of the processed Block Press connection becomes imperfect	The tuning standards are not yet clear and refer only to the operator experience	6	3	5	90	Standard work making for Top and Bottom Usage
Top drying is not maximum	The shape of the Top Block Press becomes not straight	The tuning standards are not yet clear and refer only to operator experience	3	2	4	24	Standard working manufacture for drying Top Block Press

Table 2 shows the FMEA for sompel defective types. From the FMEA table of the type of defect sompel, the failure modes of Top Close and Bottom Dent are the priority for repair because it produces the highest RPN. This suggests that the causes of such failures contribute greatly to the occurrence of too mild defects and are a priority in remedial measures such as those recommended on the table.

Table 3 FMEA Types of Scratch Defects

Failure Mode Potential	Potential Failure Effects	Potential Causes	Value			Rpn	Countermeasures Recommendations
			S	O	D		
Haste gesah	The thickness of the Block Press becomes too thick or becomes too	Moulding Filling Standards are not yet clear and there are often operator	6	6	7	252	Creation of working standards for moulding filling and also operator training

	thin	inaccuracies					
Scratch Moulding	Moulding position impact with top and bottom	Standard Top and bottom moulding is often not controlled	7	4	2	56	Manufacture of working standards for the tuning of the steering wheel bolts
Less Powder Material	The speed of the *extruder* becomes slower than the speed of *the haul off*	Undisciplined when tuning engine speed	6	3	2	36	Supervision and control by production supervisors

Table 3 shows the FMEA for the type of hash gesah defect. Of the several causes of scratch failure, it has the highest RPN value, so the priority of repair will focus on it. Recommendations include making work standards for moulding fillers and training operators to be skilled in the moulding filling process.

Control

The *control* stage is the final stage in the DMAIC approach. This stage is an act of controlling the stages that have previously been carried out, so that documenting, and controlling are important to maintain consistency of improvements made to improve quality. In this study, the control stage has not been implemented to the company, so some suggestions are given, with the hope that in the future this suggestion can be applied or become considerations for the company:
(Caesaron & Simatupang, 2015)

1. *Check Sheet*

It is a very effective tool that is easy to use, so it is very suitable for data retrieval (control) of production defects.

2. *Quality Report*

Quality report is a record of the number of production, the number of product defects, and the problems that cause product defects in the production process.

3. P *Chart* and U *Chart*

Control maps can be used to see a production process and the quality of the product, whether it is still in one control system or not. This tool is very effectively carried out for the control of a production process

4. CONCLUSION

The result of the DPMO calculation is 7222 Pc which means that there will be a chance of product defects of 7222 Pc from process failure per one million opportunities, with a block press production process sigma rate of 3.9. Some types of defects that are dominant in BLOCK PRESS products are: too light (38%), sompel (16%), and scratch (9%). Some proposals aimed at reducing the number of product defects on the block press are: Making work standards for checking powder moisture, Supervision and control by production supervisors, Making work standards for molding filling and also operator training

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