

Analysis of Print Quality Control of Canned Materials with the DMAIC Method in PT United can Company New Printing Department

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Abstract:- PT. United Can Company is a company engaged in manufacturing cans for food, or other household needs. In this case, increasing productivity while maintaining quality in the production process is needed as one of the company's strategies to survive and have competitiveness with other companies. for a certain period of time in depth to identify and analyze various variables needed. In this analysis, of the total production of 567,882 sheets, there were 3,778 sheets in the number of scum defects in one month in June or 0.67% or 31.98% of the five types of defects that existed in one month. And in July of the total production of 610,027 sheets there were 5,115 sheets of scum defects in one month in July or 0.83% or 37.2% of the five types of defects that existed in one month, So it's important for PT. United Can Company Ltd. to meet the good print quality as requested by the customer.

This study uses the DMAIC method to analyze scum problems that occur at PT. United Can Company. The DMAIC method is a method of analyzing problems systematically consisting of 5 stages namely Define (problem definition), Measurement (measurement), Analyze (problem analysis), Improvement (corrective action) with FMEA, and finally the Control (control) stage. Based on the analysis and improvement with the FMEA method, the most dominant cause of defect is due to dirty mold with an RPN (Risk Priority Number) value of 486.

Keyword:- Quality, DMAIC, FMEA, Scum, Fishbone Diagram.

I. INTRODUCTION

In order to be more focused and directed, the author made this research report by discussing the types of causes of defective products during the production process in June to July and prioritizing repairs to the highest number of defective products first. After that, it analyzed the factors that caused the priority defective products during the production process and suggested improvements to reduce defective products in canned beverage production at PT United Can Company using the DMAIC method.

II. METHOD

The DMAIC method is useful for improving processes and for reducing production defects / eliminating defects. Define: Check the Production Data for 2 months (June-July). And take defective data on average. Measure: Sort 5 print problems based on frequency level with pareto diagram. Analyze: Shows the relationship between problems faced with possible causes of disability and the factors that influence it dengan Diagram *Fishbone*. Improvement :Menggunakan rumus RPN to see how much attention should be paid to the cause of the defect. Control: Monitor and control the Quality Control process so on.

III. RESEARCH SEQUENCE

The DMAIC method is useful for improving processes and for reducing production defects / eliminating defects. (Asmoko, 2013).

- Define: Checks Production Data for 2 months (June-July). And take the scum defect data on average for those 2 months.
- Measure: Sort 5 print problems based on frequency level with pareto diagram. And look at static conditions.
- Analyze: Shows the relationship between problems faced with possible causes of disability and the factors that influence them with the Fishbone Diagram
- Improvement: Using the RPN formula to see how much attention should be given to the causes of disability.
- Control: Monitor and control the Quality Control process so on.



Fig 1:- Scum Problem

IV. RESULTS AND DISCUSSION

A. Define (Problem Definition)

Scum is a print defect that occurs during the print production process where the printing or printing results are dirty due to over inking (excessive ink), and the dirty water of baldwin, this is caused by several factors, from the results of the research, the sources of the cause are obtained. scum defects are seen from several factors, namely human, method, machine, material, and environment. counted as spoilage.

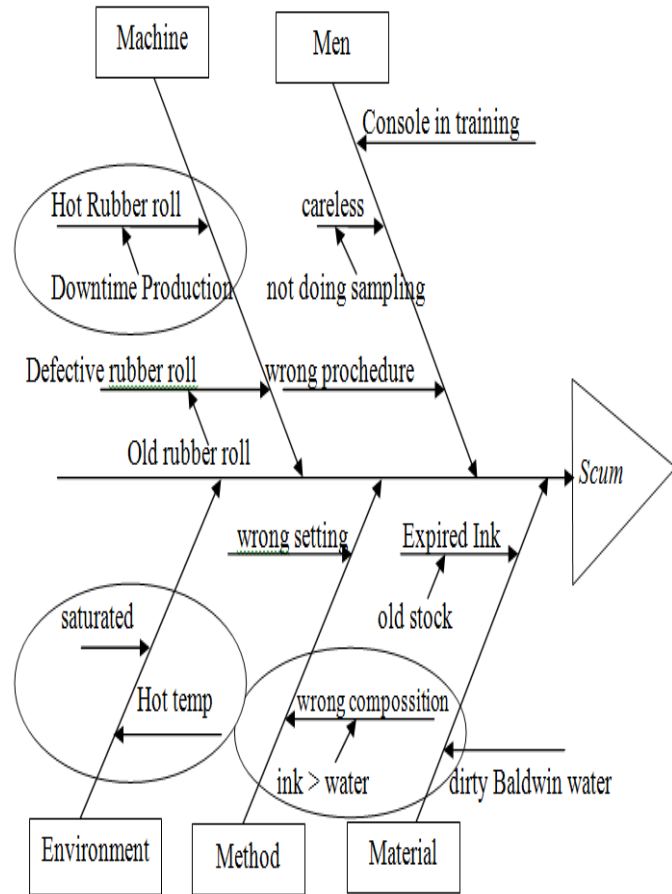


Fig 2:- Fishbone Diagram Due to Scum ausing Spoilage

B. Measure

From the commutative data in the previous chapter, it was known that the reject rate due to the highest production defects was a scum problem, namely 4447 sheets in the number of scum defects in two months or 0.74% or 35% of the five types of defects in one month print problem in the MS-2 printing process. From the Pareto diagram in the previous chapter, it is clear that the type of scum problem is the highest defect of the five types of defects during June-July 2018 on the MS-2 Line 2 engine.

June

WS + varnish	Inside scratch	Scum	Print variasi	Print bald
2381	3372	3778	1086	1195

July

WS + varnish	Inside scratch	Scum	Print variasi	Print bald
2625	3572	5115	1136	1300

Average

WS + varnish	Inside scratch	Scum	Print variasi	Print bald
2503	3472	4447	1111	1248

Table 1:- Commutative data print problem line MS-2 in June-July 2018

Problem	Frequency	Accumulation	Percentage	Accumulation Percentage
Scum	4447	5115	35	35
Inside Scratch	3472	8587	27	62
Waste Sheet	2381	10968	19	81
Print Bald	1248	12216	10	91
Print Variation	1111	13327	9	100
Total	12659		100	

Table 2:- Data komutatif problem cetak line MS-2 bulanJuni-July 2018

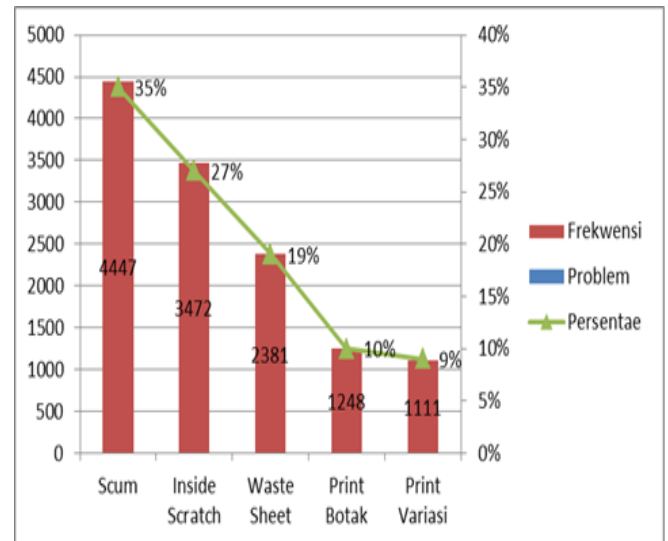


Fig 3:- Commutative Pareto diagram data

C. Analyze

At this stage it has been used in the previous chapter by using fishbone diagrams or commonly called causal diagrams which show the relationship between the problems faced with the possible causes and the factors that influence them. The factors that influence and cause damage to Scum defective products can be classified as follows:

➤ *Human Factors*

In the problem of scum defects, human factors are the most dominant factor. This is due to the fact that the operator has not yet found a frenzy or the best way to produce certain print designs. So that the feeling to combine the color between ink and water has not been able to be perfect and right, so the measurement is not appropriate. Besides that the factor of human fatigue is also quite influential on the performance of prints. The operator sets all color compositions feeling and with computer technology alone, besides that the operator has full responsibility for the printouts, whether the results are perfect or defective. Then it needs a good level of focus and concentration to get good print results.

➤ *Method Factors*

In the production process, the method used is to combine one ink with another ink with a different number of portions and use water as a reducer (a mixture of diluents) ink so as not to dry. For example, to get light green, you should combine the yellow (yellow) base with cyan (light blue) which has a different level of density so it requires a different amount of water.

From the method factor, scum occurs when the amount of ink supply is greater than the amount of water used. Ink and water are transferred by roll which rotates at a certain rotational speed with a unit of turn sheet per hour (sph). Then the operator needs to consider the rotation of the engine with the intake of ink and water. The working method of replacing Baldwin wetters also plays an important role in ink.

➤ *Machine Factor*

At the time of production, all of these rolls rotate to transfer ink from ink duct to print blankets and cause friction that causes heat, so it is very possible if production is carried out for 24 hours the roll will experience defects. From this roll defect the ink will be applied imperfectly

➤ *Material Factors*

The can printing process the main material used is ink. The ink used here is ink from the production of CemaniToka 261 and CemaniToka 361. Ink is the same as food, which has an expired time limit. When expired, the thickness of the ink will increase and this is where it is possible to make scum defects due to the texture of the ink that has begun to change. While the water used is Baldwin water which consists of a mixture of RO water (water with several filtering times) and 70% alcohol to get PH 3600 - 4000 levels. Both of these

materials are mixed automatically on the Baldwin machine. RO water hose is directly connected to the water tap, and hose alcohol directly connected with alcohol drums. If the pH of this water exceeds the PH 4000 then the water will look visually cloudy. With turbid water, it is not good for the production process because it will cause water to be unable to recondition the ink perfectly, therefore scum defects occur in the mold.

➤ *Environmental Factors*

Environmental factors are not so influential on the results of prints. On the other hand, environmental factors are actually very helpful indirectly, because the room temperature is circulated by air conditioners with temperatures ranging from 22-24°C. This certainly helps cool the engine and ink used from the outside climate in its cold home country.

D. FGD

The FGD form is submitted to 3 department officials, namely Printing Manager, Printing Supervisor, and QC Manager. The similarity of the characteristics of participants is that they have experience working in can printing fields for more than 10 years and have an equal education. The three answers representing each department concluded that Scum problems were very frequent and high-level problems, namely level 5 from level 1 (safe) to level 5 (problematic).

Conversions	
Level	Ranking
1	1
	2
2	3
	4
3	5
	6
4	7
	8
5	9
	10

Table 3:- Severity and Occurrence Conversions

➤ Occurrence: How often does a scum problem occur and how is it handled?

Number 5 shows the top level in the questionnaire which means that it is often during production. (ranking 9)

➤ Severity: How much of a disability problem can result in the final result & customer?

Number 5 shows the top level in the questionnaire which means it will cause problems. (ranking 9)

➤ Detection: Measurement of detection rate using a total average of 2 months production data, namely in June, amounting to 589049 + 610027 in July = 1199076: 2 = 599538

The second-month average is 599538: 4447 the average number of scums for the second month = 135: 1. Got a ranking of problem ranking 6 in table detection gaspers.

Failure mode	Effect Failure	Ranking	Criteria
Scum	Requires setup time	9	Failure Is Almost Always in the Production Process
	Inhibiting Production		

Table 4:- Determination of Severity Failure Mode Ranking

Cause Of Failure Mode	FrekuensiJuni – July	Presentase	Ranking
Dirty product mold surface	4447	0,74	9

Table 5:- Frekuensi Cause of failure dan Ranking Occurrence Failure Mode

Failure mode	Current Proses Control	Ranking
Print Scum	Visual detection, percentage appears	6

Table 6:- Penentuan Ranking Detection Failure Mode

Failure Mode	Effect Of Failure	Sev.	Cause Of Failure	Occ.	Current process Control	Det.	RPN
Scum	Inhibiting the Production Process	9	Dirty Printed	9	Visual Detection, Percentage appears scum	6	486
	Requires reset		Error Set Up	3			162

Table 7:- Perhitungannilai RPN

E. Results from FMEA calculations

The calculation results have been obtained using the RPN formula which is displayed in the form of a table as follows. Cause Of Failure Dirty RPN 486 set up errors Table 5.1 RPN Calculation Results Based on the table above, the higher the RPN value, the greater the attention that must be given to the cause. The ink application conditions are too thick / thin have the highest RPN value of 486 , meaning that PT United Can Company must take this matter seriously if it wants a scum problem to be suppressed.

F. Improvement (Corrective Action)

From a series of scum type defects above, of course there are a number of things that can be used as input and solutions that have been implemented as input. This solution is used to reduce the minimum type of scalability during the printing process on MS-2 machines. And beforehand, please note that the previous situation at PT United Can Company Ltd. Before the solution to this problem is as follows:

- Human factors in this case the operator, are given the responsibility to work alone, and less assistance from the production supervisor. In fact, it is very important for operators to get regular assistance during the production process. This can result in pressure on the operator because they do everything themselves.

- The method used today is still relying on feeling in regulating the composition of water and ink, so in the printing process there is no list of history of last jobs that are stored for later backup when printing the same print design.
- Machine repair (maintenance) is carried out only at certain times, and is uncertain. Because sometimes there should be a schedule for Machine Repair (PM) and even production.
- In terms of the material used, Baldwin water used for the production process is still drained randomly, not routinely, only at certain times.

From that condition, a number of things are expected to solve the problem. This method is the most dominant solution to scum problems in PT United Can Company Ltd.'s New Printing department.

G. Control (Monitoring)

The control stage is the last stage in the DMAIC approach, where at this stage the process of organizing or improving the product and monitoring the ongoing performance is carried out. In addition, at the control stage there is also a transition to process control and ensuring that from the side of the material used, Baldwin water used for the production process is still drained randomly, not

routinely, only at certain times, this is certainly very critical and periodic breaks and controls must be made. from the control plan and document all information related to who is responsible for monitoring and controlling this process so on, what is measured and the correct performance and measurement parameters. However, in this case, especially regarding the completion of the scum defect, the control stage cannot be fully implemented, because the author only provides proposed corrective actions to resolve the problem that occurred.

V. CONCLUSION

- In this analysis, of the total production of 567,882 sheets, there were 3,778 sheets in the number of scum defects in one month in June or 0.67% or 31.98% of the five types of defects in one month. And in July of the total production of 610,027 sheets there were 5,115 sheets of scum defects in one month in July or 0.83% or 37.2% of the five types of defects that existed in one month, so it is important for PT. United Can Company Ltd. to meet the good quality print images as requested by the customer, and minimize the problem to the customer.
- Based on the analysis of causal diagrams can be known the causes of damage in production, especially Scum which comes from machine, human factors and methods.
- Based on the analysis and improvement with the FMEA method, the most dominant cause of defect is due to dirty mold with an RPN (Risk Priority Number) value of 486.

SUGGESTION

- Companies need to use the DMAIC method to analyze the problems that occur and to find out the sources of the causes of the problem. Thus the company can immediately take preventive actions and repairs to reduce the occurrence of damage.
- The use of the DMAIC method involves all components of the company, from low-level management to top-level management, therefore it is necessary to understand this DMAIC method. So that there is an understanding between levels of management that are expected to facilitate decision making in the process of improvement or improvement.
- Efforts to improve or improve an object of quality are carried out not only the production team leader, but also involve other related parts, such as machine operators, mechanics, quality control and other related parts.
- In general, the main causes of product damage come from method factors. So there needs to be improvement and improvement of Baldwin water drainage and the use of printing ink FIFO since the ink material is purchased. In terms of humans themselves also need the existence of education and training and supervision while in the production process so that a sense of belonging and responsibility for what is their job assignment arises.

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