



ANALYSIS OF QUALITY CONTROL OF T-SHIRT SCREEN PRINTING PRODUCTS WITH SIX SIGMA DMAIC METHOD ON CV. MACCA CLOTHING.

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ABSTRACT

CV. Macca Clothing is a company engaged in Clothing screen printing. The resulting product is a short sleeve t-shirt screen printing. In producing the production, on average per month there are defective products of 6% types of defects, namely blurred colors, wrong colors, and wrong screen printing. Therefore, this study aims to provide levels *sigma* and *DPMO* and then analyze the factors causing disability and provide suggestions for improvements to reduce defective products at CV Macca Clothing. The data collection method used is to conduct interviews with CV Macca Clothing. Then in analyzing the data using the method *DMAIC* and the approach *six sigma*. From the research results, the value *DPMO* is 21,000 and the conversion result is 3.53, which means that out of a million opportunities there will be 3.53 possibilities for the production process to produce defective products. In the level stage *sigma* CV Macca Clothing has not yet reached the level *Six Sigma*, but it is still in the average industrial condition because in the production process there are still product defects that have not reached *zero defect*. The factors that cause defects in the product are the operator is not careful in doing the work, the quality of raw materials is not good, the cleanliness of the equipment is not maintained, and the production room facilities are inadequate. From the results of the analysis based on the implementation tools *kaizen*, the control and improvement to reduce defects that must be carried out by CV Macca Clothing is to carry out stricter supervision or control, carry out regular machine maintenance, and provide complete facilities.

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1. Introduction

Six Sigma is a statistical tool used to identify several vital factors, namely using the DMAIC cycle (define, measure, analyze, improve and control) where this cycle can identify problems that occur in the production process then can find out what causes the problem, and can also solve the problem. problems and provide suggestions for improvement (Yuliana, 2017).

One of the businesses engaged in the industry, namely CV. Macca Clothing is a t-shirt screen printing business that provides various kinds of quality screen printing results and also at affordable prices. At CV.Macca Clothing to produce quality screen printing t-shirts, it will go through a manufacturing process which is carried out with a manual process where material selection is carried out, then sticker or design manufacture, then design or sticker printing, screen printing, packaging and finishing processes. CV.Macca Clothing then sets the standard for the quality of the t-shirts to be comfortable to use, the physical appearance must be neat, the screen printing is durable and long-lasting, the design must be neat, creative and elegant. Then the color is bright and long lasting.

However, in the process, the product resulting from the production process experienced 6% defects, where there were three types of defects, namely blurred color, wrong color, and wrong screen printing with a total number of defects of 130 Pcs.

From the results of interviews with CV.Macca Clothing, it can be seen that there are defective products, then the number of production, number of defects, and types of defects can be known. To reduce defective products at CV.Macca Clothing, research is needed as an evaluation material by looking at the causes or factors of defects and then providing suggestions for improvements to reduce defects using the six sigma DMAIC method.

2. Research Method

This research was conducted at CV. Macca Clothing Jl. Sanrangan, Sudiang Raya, Kec. Biringkanaya, Makassar City, South Sulawesi 90242, the research implementation time is approximately one month. For the research variable, that is the object of research,

or what is the point of attention of a study. Variable

2.1. Data Type

2.1.1. Primary data

Primary data is original data collected by the researcher himself to answer his research problem in particular. Primary data obtained include the sequence of the screen printing product production process, the workings of the screen printing product production machine, and the causes of defects, this data is obtained from the results of interviews with the company.

2.1.2. Secondary Data

Secondary data is data sourced from existing records in the company and from other sources. for secondary data, namely data on the amount of production of screen printing products, data on types of defects in screen printing products, data on the number of screen printing products. This data comes from company documentation.

2.2. Method of collecting data

2.2.1 Data Collection

In the data collection process carried out in the study, primary data was obtained from interviews with CV. Macca Clothing so that the information obtained was knowing the number of productions for the period April-May 2021 as many as 2050 Pcs, the number of defects 130 Pcs, the production process, and types of product defects. namely blurred color, wrong color and screen printing misses.

3. Results and Discussion

3.1 Defining Stage (Define)

- a. Problem: From the interview results of the owner of CV.Macca Clothing, Muchsin. The information obtained is the number of productions in April-May, namely 2050 Pcs with a working system of 6 working days and the number of defects is 130 Pcs. In addition, CV.Macca Clothing has set several quality standard specifications for t-shirt screen printing products to meet customer satisfaction. However, from the standard specifications that

have been set, there are still production results from CV. Macca Clothing that have defects such as blurred colors, wrong colors, screen printing misses.

- b. Objective: To provide a sigma level, provide suggestions for improvement to reduce defective products in order to produce quality products.

3.2 Stage of Measurement (Measure)

- a. Determine production quantity
The number of t-shirt screen printing production is 2050 Pcs.
- b. Determine the number of defects
The number of defects in the t-shirt screen printing product is 130 Pcs.
- c. Determining Critical To Quality
CV. Macca Clothing has Critical To Quality (CTQ) or characteristics that affect the quality produced for defects in the screen printing process, namely: blurred color, wrong color, wrong screen printing.
- d. Calculating DPMO Value and Sigma Level

Calculating the defect rate per DPO characteristic (defect per opportunity)

$$DPO = \frac{\text{Total n Defect}}{\text{Total n Units X Total n Critical to Quality}}$$

$$DPO = \frac{130}{2050 \times 3} = 0,021$$

- e. Calculating defect per million opportunity DPMO (defect per million opportunity)

$$DPMO = DPO \times 1.000.000$$

$$DPMO = 0,021 \times 1.000.000$$

$$DPMO = 21.000$$

- f. Convert DPMO values to sigma values using the conversion table. By using the DPMO conversion table to the sigma value, it is known that the DPMO value of 21,000 can be obtained at a sigma level of 3.53 sigma.

3.3 Analysis Phase (Analyze)

- a. Pareto chart

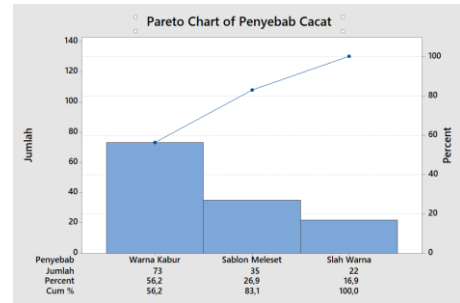


Figure 3.1 Pareto chart

From the Pareto diagram above, there are 3 causes for the error, namely blurred color, wrong color, and wrong screen printing. The main cause of disability is color blur with the percentage of the total disability is 56%. Another cause was the screen printing missed and the wrong color was 27% and 17%, respectively. So improvements can be made by focusing on the 3 biggest causes of disability, namely blurry color, wrong color, and wrong screen printing. This is because the three types of disability that occur in CV. Macca Clothing.

- b. Cause and Effect Diagram



Figure 3.2 Diagram of the Cause and Effect of Defective Products

3.4 Improvement Phase (Improve)

1. Repair phase with Five M-Checklist
2. Repair phase with Five Step Plan

Table 3.1 Improvements with Five M-Checklist

No	Faktor	Masalah	Pemecahan Masalah
1	Manusia	- Kurang terampil - Teledor	- Mengadakan program pelatihan bagi pekerja baik yang lama maupun yang baru secara berkala. - Melakukan pengawasan dan pengecekan ulang terhadap kinerja karyawan.
2	Mesin	- Proses pengeringan - Screen mampet	- Waktu proses pengeringan jangan terlalu lama. - Rutin membersihkan bekas tinta pada screen.
3	Material	- Kualitas tinta - Plate cacat	Melakukan pengecekan kualitas tinta, dan menggunakan tinta yang berkualitas.
4	Metode	- Standar takaran tinta - Kurang teliti	- menentukan standar ketebalan takaran tinta sehingga didapat hasil cetakan yang sesuai dengan warna yang dikehendaki. - Mengadakan program pelatihan bagi pekerja baik yang lama maupun yang baru secara berkala.
5	Lingkungan	Listrik padam	Menyediakan alat pembangkit listrik lainnya seperti genset.

The improvement stage with the Five step plan is the application of 5-S (seiri, seiton, seiso, seiketsu, shitsuke) in the company as suggestions for improvement. The implementation of 5-S is as follows:

a. Seiri (Sorting)

Seiri means sorting and grouping goods according to their type and function, so that it is clear which ones are needed and which are not. The situation in the CV. Macca Clothing, namely all work tools are not arranged neatly and the materials to be processed are placed irregularly. As a result:

Table 3.2 Implementation of Seiri

Akibatnya	Pelaksanaan
- Pekerja sulit menemukan barang yang diinginkan. - Gerak kerja terganggu. - Pemborosan waktu untuk mencari barang yang diperlukan. - Bahan dan barang tidak terjamin kualitasnya.	- Memisahkan barang yang dipakai dan sudah tidak terpakai. - Menyimpan alat dan bahan di tempat yang mudah dijangkau. - Hanya ada barang yang dibutuhkan yang ada pada tempat yang mudah dijangkau.

b. Seiton (Setup)

Seiton means arranging and placing materials in their proper place so that they can be easily found or reached when needed. The situation in the CV. Macca Clothing, namely all items are placed in piles and placed irregularly and there is no adequate arrangement. The result of that is:

Table 3.3 Implementation of Seiton

Akibatnya	Pelaksanaan
- Waktu persiapan produksi tidak efektif. - Sulit menemukan peralatan atau barang saat diperlukan. - Kemungkinan barang hilang atau terselip cukup besar.	- Menata rapih alat produksi. - Menata rapih bahan baku. - Menata rapih kaleng-kaleng tinta. - Memberikan label pada tinta.

c. Seiso (Cleaning)

Seiso means cleaning all facilities and work environment from dirt. The situation in the CV. Macca Clothing, namely the cleanliness of the screen tool is not maintained so that the dried ink often settles and the room is often filled with logo and sticker waste. The result of that is:

Table 3.3 Implementation of Seiso

Akibatnya	Pelaksanaan
- Terjadi kerusakan pada peralatan kerja. - Menurunkan produktivitas. - Proses sablon kurang merata dan kasar.	- Membuang semua bekas cetakan logo atau stiker. - Membersihkan frem screen secara rutin. - Membersihkan ruangan dan alat sablon.

d. Seiketsu (Maintenance)

Seiketsu means keeping all belongings, equipment, clothes, workplace, and other materials in a clean and orderly condition. Seiketsu is the result of selection, arrangement and cleaning activities that are carried out correctly and repeatedly. In seiketsu there must be standardization of selection, arrangement, and cleanliness. Here is the execution of seiketsu:

Table 3.4 Implementation of Seiketsu

Pelaksanaan
- Menetapkan jadwal pembersihan. - Menyiapkan peralatan kebersihan. - Menetapkan jadwal pemeriksaan.

e. Shitsuke (Habit)

Shitsuke means forming an attitude to fulfill or obey the rules and discipline regarding the cleanliness and tidiness of the equipment and workplace. In habituation, the goal to be achieved is the formation of an independent

attitude. Some factors that help the implementation of habituation, namely:

Table 3.4 Shitsuke Pelaksanaan Implementation

<u>Pelaksanaan</u>
✓ <u>Disiplin dalam bekerja.</u>
✓ <u>Melakukan kegiatan diskusi.</u>
✓ <u>Melakukan perbaikan secara terus menerus (continius improvement).</u>
✓ <u>Memiliki rasa tanggung jawab yang tinggi.</u>
✓ <u>Budayakan senang melakukan perbaikan dan malu melakukan pelanggaran.</u>

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3.5 Control Phase (Control)

Control is the last stage of the six sigma DMAIC program. At this stage, control measures are taken from the results of increasing six sigma. Therefore, in improving the process, it is necessary to standardize corrective actions that are documented and disseminated to serve as standard work guidelines so that failures that have occurred do not recur. The corrective actions taken are:

- Always implement continuous improvement.
- Perform maintenance and inspection of machines and production equipment before and after the production process.
- Supervise raw materials and production staff so that the quality of the goods produced is better.
- Carry out the inspection and cleaning schedule that has been determined and agreed.

4. Conclusions and suggestions

4.1 Conclusion

Based on the data processing that has been done, it can be concluded that:

- The DPMO result is 21,000 and the conversion result is 3.53 sigma, which means that out of a million opportunities there will be 3.53 possibilities for the production

process to produce defective products. in the sigma level stage CV.Macca Clothing has not yet reached the Six Sigma level, but is still in the average industrial condition because in the production process there are still product defects that have not reached zero defect.

- Factors causing defective products include operators being less careful in doing their work, lack of supervision of operators, careless operators and lack of concentration. the quality of raw materials is not good, work instructions are not carried out properly, the cleanliness of the equipment is not maintained, as well as production room facilities that are not equipped with fans and there are sudden power outages.
- Proposed quality control and improvement based on the implementation tools of kaizen, it is necessary to hold even tighter supervision and control in terms of work, cleanliness, maintenance, and raw materials, pay attention to the state of the workplace facilities by providing facilities such as fans and generators, providing direction and advice to employees to have an attitude of ownership and maintain the company so that their work is more thorough and responsible

4.2 Suggestion

There are several suggestions that can be given to the company so that it becomes useful input for future improvements, namely:

- It is expected that the company will arrange a schedule for regular machine maintenance and cleanliness.
- It is expected that the company provides training to all workers in order to improve the quality of the company's human resources. The training carried out should be continuous where there is an evaluation of what is being done and what will be done in the future so that

- the progress of the training provided can be seen.
3. It is expected that the company will carry out direct supervision to the place of the production process and continuously (intensively) in the production process to supervise production activities so that the quality of the goods or products produced is better.
 4. It is expected that the company will implement cleanliness and tidiness, especially in the production room.

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