# Application Of Quality Control Of Carton Box In Quality Control Department At PT Purinusa Ekapersada

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# Application Of Quality Control Of Carton Box In Quality Control Department At PT Purinusa Ekapersada

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**Abstract.** This study aims to identify the cause of defect produced at PT Purinusa Ekapersada. Quality control (QC) is a process to measure the quality of an item by comparing it according to the specifications and requirements asked by the customer, or it can be said also as an effort to maintain the quality of the goods produced in accordance with predetermined specifications based on the customer's request. The method used to reduce various types of defects produced by PT Purinusa Ekapersada was analyzed using the Pareto diagram to indicate the type of defect and the most of the control chart that produced defects were still within the control limits, a fishbone diagram describe various disabilities, and a 4M1E Why Analuysis to determine the causes and consequences of events.

## 1. Introduction

PT Purinusa Ekapersada is manufacturing company that produce carton box based on customer's order. This company has already had a number of loyal customers which always repeat the order of the products. To maintain the loyalty of the customer and to attract more customer, the quality of its products must be controlled.

PT Purinusa Ekapersada produces several kinds of carton box according to the specification that are given by each customer. There are 2 type of basic carton that are used in producing the carton box in this company, they are a single wall carton and double wall carton. A single wall carton consists of 3 layers of paper and a double wall carton 5 layers of paper.

In this report, the authors will discuss the topic of application of Quality Control in the production of carton boxes at PT Purinusa Ekapersada by analyzing the cause of the reject products and what action should be taken to overcome and prevent the defects. The tools used are Control Chart, to reduce the variation of the defects, Pareto diagram, to identify the various type of defects, Fishbone diagram, to describe various causes and disabilities, and 4M1E Why Analysis to determine the cause of the problem and how to overcome it.

## 2. Method and materials

### *2.1. Sample preparation*

The sample was the production of carton box at PT Purinusa Ekapersada in July 2019. The daily production of carton box in July 2019 was noted and the percentage of the defect produced daily was calculated.

### *2.2. Method*

Pareto diagram is used to identify the various type of defects of the carton box produced in PT Purinusa Ekapersada. Based on the type and number of defects obtained from the quality control process, the data on the number of defective products per type of defect in carton box products can be analyzed [1].

The control chart is a graph used to study how a process changes over time. Data are plotted in time order. A control chart always has a central line for the average, an upper line for the upper control limit and a lower line for the lower control limit. These lines are determined from historical data [2].

The fishbone show the root of the problem [2]. Based on the fishbone diagram of the, it can be seen the causes of defects in the defective products. The cause of the defect itself is divided into several categories, namely 4M (Man, Material, Machine, Method,) and Environment [3].

## 3. Results and discussion

### *3.1. Pareto diagram*

In July 2019, PT Purinusa Ekapersada produced 2.758.491,15 kg of carton box. The data of the type and number of defect of carton box produced in July 2019 and the pareto diagram can be seen in Table 1 and Figure 2.

**Table 1.** Data of defective products in July 2019

| Type of Defect | Total (kg) | Percentage |
|---|---|---|
| Krepek | 5369,16 | 32,34% |
| Running Score | 3426,06 | 20,64% |
| Convex Bond | 2488,20 | 14,99% |
| Wrong Schedule | 1455,58 | 8,77% |
| Miss Print | 959,40 | 5,78% |
| Wrong Transfer Slip | 812,83 | 4,90% |
| Unstandard Colour | 635,40 | 3,83% |
| Torn, Broken | 324,76 | 1,96% |
| Unstandard Amount per Bunch | 218,40 | 1,32% |
| Box Compression Test below Standard | 208,80 | 1,26% |
| Unconfirmed Driver | 188,16 | 1,13% |
| Glue not Sticky | 167,06 | 1,01% |
| Gap Joint not Standard | 96,90 | 0,58% |
| Stripped Sheet | 84,08 | 0,51% |
| Wrong Design | 80,70 | 0,49% |
| Unstandard Sheet | 55,52 | 0,33% |
| Broken Sheet | 29,68 | 0,18% |
| Total | 16600,69 | 100% |

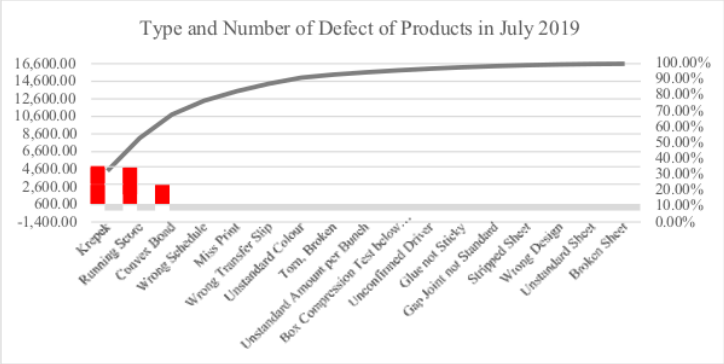


**Figure 1.** Pareto diagram of defect of products in July 2019

*3.2. Control chart*

Control charts for variable data are used in pairs. Top chart monitors the average, or the centering of the distribution of data from the process. Bottom chart monitors the range or the width of the distribution [2]. Calculation table of UCL, CL and LCL can be seen in Table 2.

**Table 2.** Calculation of UCL, CL and LCL of Carton Box Production in July 2019

| Day | Defect (kg) | Products (kg) | Defect Proportion | UCL | CL | LCL |
|---|---|---|---|---|---|---|
| 1 | 530,31 | 89332,31 | 0,006 | 0,19 | 0,06 | -0,07 |
| 2 | 535,22 | 89423,98 | 0,006 | 0,19 | 0,06 | -0,07 |
| 3 | 535,42 | 88567,09 | 0,006 | 0,19 | 0,06 | -0,07 |
| 4 | 536,43 | 86564,34 | 0,006 | 0,19 | 0,06 | -0,07 |
| 5 | 536,22 | 89734,54 | 0,006 | 0,19 | 0,06 | -0,07 |
| 6 | 534,25 | 89345,54 | 0,006 | 0,19 | 0,06 | -0,07 |
| 7 | 539,36 | 90332,21 | 0,006 | 0,19 | 0,06 | -0,07 |
| 8 | 534,63 | 88121,34 | 0,006 | 0,19 | 0,06 | -0,07 |
| 9 | 535,65 | 88562,98 | 0,006 | 0,19 | 0,06 | -0,07 |
| 10 | 530,44 | 89653,53 | 0,006 | 0,19 | 0,06 | -0,07 |
| 11 | 536,78 | 89453,55 | 0,006 | 0,19 | 0,06 | -0,07 |
| 12 | 534,65 | 88856,66 | 0,006 | 0,19 | 0,06 | -0,07 |
| 13 | 535,62 | 88211,33 | 0,006 | 0,19 | 0,06 | -0,07 |
| 14 | 535,63 | 89543,33 | 0,006 | 0,19 | 0,06 | -0,07 |
| 15 | 536,43 | 89992,43 | 0,006 | 0,19 | 0,06 | -0,07 |
| 16 | 534,43 | 88544,65 | 0,006 | 0,19 | 0,06 | -0,07 |
| 17 | 534,56 | 88367,44 | 0,006 | 0,19 | 0,06 | -0,07 |
| 18 | 538,76 | 88665,76 | 0,006 | 0,19 | 0,06 | -0,07 |
| 19 | 534,77 | 88543,67 | 0,006 | 0,19 | 0,06 | -0,07 |
| 20 | 535,99 | 88989,54 | 0,006 | 0,19 | 0,06 | -0,07 |
| 21 | 539,63 | 90889,55 | 0,006 | 0,19 | 0,06 | -0,07 |
| 22 | 535,23 | 88652,49 | 0,006 | 0,19 | 0,06 | -0,07 |
| 23 | 538,11 | 88819,43 | 0,006 | 0,19 | 0,06 | -0,07 |
| 24 | 530,77 | 88365,32 | 0,006 | 0,19 | 0,06 | -0,07 |
| 25 | 538,76 | 89564,32 | 0,006 | 0,19 | 0,06 | -0,07 |
| 26 | 535,55 | 88566,98 | 0,006 | 0,19 | 0,06 | -0,07 |
| 27 | 535,44 | 88796,43 | 0,006 | 0,19 | 0,06 | -0,07 |
| 28 | 535,66 | 89823,54 | 0,006 | 0,19 | 0,06 | -0,07 |
| 29 | 534,66 | 88432,11 | 0,006 | 0,19 | 0,06 | -0,07 |
| 30 | 535,34 | 89342,32 | 0,006 | 0,19 | 0,06 | -0,07 |
| 31 | 535,94 | 88432,44 | 0,006 | | | |
| Total | 16600,64 | 2758491,15 | 0,187 | | | |

Control chart of the defective products in July 2019 can be seen in Figure 2.

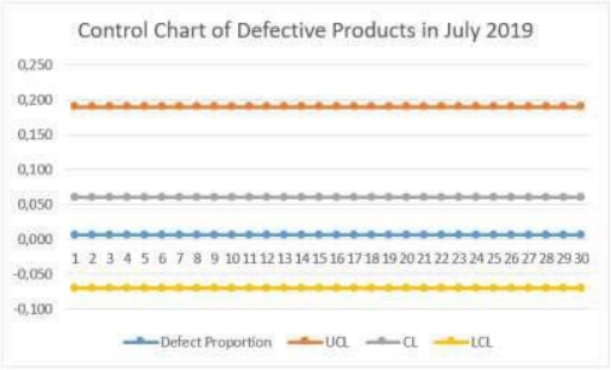


**Figure 2.** Control chart of the defective products in July 2019

*3.3. Fishbone diagram*

Of all types of defects found in carton box produced at PT Purinusa Ekapersada, the type of "krepek" and "score lari" are the most common types of defects that occurred in July 2019, as many as 32.34% and 20.64% of the total number of defects found . The fishbone diagram of the "krepek" defect can be seen in Figure 3 [4].

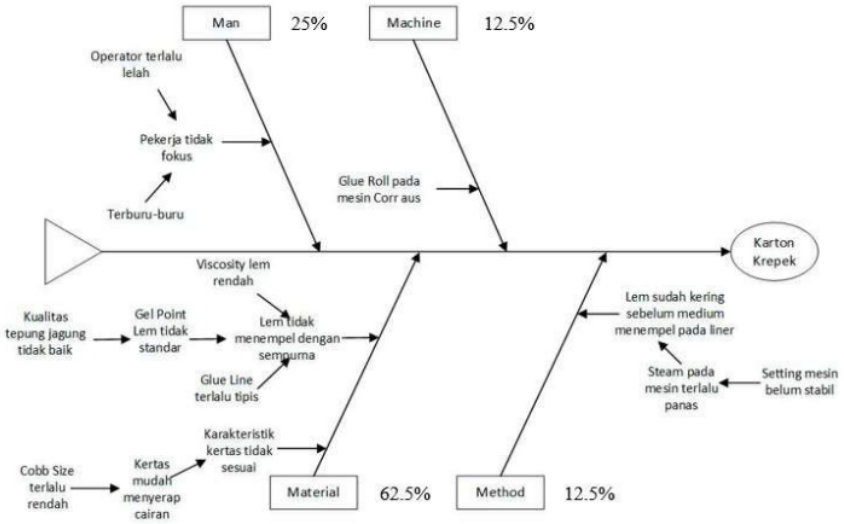


**Figure 3.** Fishbone diagram of "krepek" defect

*3.4. 4M1E Why analysis*

Based on the fishbone diagram of the "krepek" type defects above, it can be seen the causes of defects in the defective products. The cause of the defect itself is divided into several categories, namely 4M (Man, Material, Machine, Method,) and Environment. Why Analysis table of the types of "krepek" defects in the carton box production process at PT Purinusa Ekapersada can be seen in Table 3.

**Table 3.** 4M1E Why analysis of "krepek" defect

| Analysis | Root Cause(s) | Action |
|---|---|---|
| Man | Operator didn't focus during the production process | Safety talk is given in every shift change |
| Material | The characteristics of the paper didn't match and each layer didn't stick properly | Conduct material inspection, namely paper, corn flour, glue and sheets produced |
| Machine | The Glue Roll on the Corrugator machine was worn | A skilled technician is required to carry out regular maintenance on the machines used |
| Method | The steam used to heat the paper on the Corrugator machine was too hot | Wait a few moments when the engine has just started so the temperature is stable |

## 4. Conclusion

The method used to reduce various types of defects produced by PT Purinusa Ekapersada was analyzed using the Pareto diagram to identify the type of defect, control chart to show that the defects produced were still within the control limits, a fishbone diagram to describe various disabilities, causes and consequences of events, and a 4M1E Why Analysis to determine the cause as well as the action needed to overcome the defects. Most of the defect produced in July 2019 were "krepek", that is the condition when the layers of the paper do not stick properly. The main cause of that type of defect is the material, which are the paper itself and also the glue used in the production process. The action that can be taken to reduce this type of defect is inspection of the material.

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