ISSN 2301-6590

QUALITY CONTROL ANALYSIS INTO DECREASE THE LEVEL DEFECTS ON COFFEE PRODUCT

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Abstract-*Many local companies were that engaged in the manufacturing of coffee beans into semi-finished carelessly ready for export. To maintain the product to fit customer demand, it is very necessary quality control. The problems are the following: (1) The destruction of coffee still within the limits of control or not. (2) Any type of damage that occurs in coffee product were produced. (3) The factors that cause damage to the coffee product. (4) Application of statistical tools in controlling product quality coffee and pressing the occurrence of damage to the product. This study aims to determine how the implementation of quality control using statistical tools useful in efforts to control the level of damage to the product in the company. P control chart analysis results indicate that the process is in a state of uncontrolled or still experiencing irregularities. Based on Pareto diagram, priority repairs that need to be done is for the dominant type of damage that the black seed (25.68%), broken seeds (19.23%), brown seeds (17.60%) and more than a hollow seeds (15.99%). the causal diagram analysis can be seen from the factors that cause damage to human factors/workers, machine production, work methods, materials/raw materials and the work environment, so the company can take precautions and repair the damage.*

Keywords: *Quality, Coffe, P Control Chart*

1. Introduction

Quality product company based on character of parameters. Good quality product will give value added the product, and low quality will give the loss that caused incapability competitive the company with the others. Focus in quality will gives positive impact to business tough cost production impact and revenues impact (Gaspersz, 2005 in Juita Alisjahbana, 2005). Quality control activity can help the company defend and improve the quality product though controlling the level product defect until zero defects.

2. Methodology

The steps in research are :

1. Early research to get the comprehensive problem, like data or information and observation.
2. Data process, where the data collected is processing. These steps are check sheet diagram, histogram and p control chart. The steps make p control chart are :
   a. Calculate the defect percentage
   $P = \frac{n_p}{n}$
   (Montgomery, Douglas C. 2001)
   Where : np = Total defect in sub-group
   n = Total checked in sub-group (day to-i)
   b. Calculate Central Line (CL)
   Central line is defect product average (p)
   $CL = \overline{P} = \frac{\sum n_p}{\sum n}$
   (Montgomery, Douglas C. 2001)
   Where : ∑np = Total defect
   ∑n = Total checked

 ISSN 2301-6590

c. Calculate Upper Control Limit (UCL)

$$UCL = \overline{P} + 3\sqrt{\frac{\overline{P}\,(-\overline{P})}{n}}$$

(Montgomery, Douglas C. 2001)

Where : p = Defect product average

n = Total production

d. Calculate Lower Control Limit (LCL)

$$LCL = \overline{P} - 3\sqrt{\frac{\overline{P}\,(-\overline{P})}{n}}$$

(Montgomery, Douglas C. 2001)

Where : p = Defect product average

n = Total production

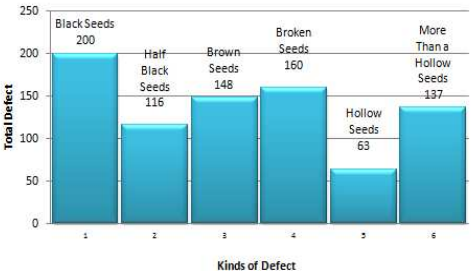
Note : If LCL < 0, so LCL assumed the same with zero (LCL= 0)

3. Problems analysis is Paretto diagram and Cause-Effect diagram.

4. **Result**

Table 1. Data of Defect Coffee Product

Observation	Sample (gr)	Kinds of Defect						Total Defect (gr)	Defect Percentage
		Black (gr)	Half Black (gr)	Brown (gr)	Broken (gr)	Hollow (gr)	More Than a Hollow (gr)		
1	300	4	4	13	12	4	11	48	0,159
2	300	5	7	13	11	4	11	51	0,171
3	300	11	4	13	6	3	8	45	0,149
4	300	6	3	7	6	3	6	29	0,098
5	300	3	5	2	2	1	3	16	0,053
6	300	14	3	14	6	2	6	45	0,149
7	300	6	4	7	11	5	8	41	0,138
8	300	12	8	5	4	3	5	37	0,124
9	300	7	10	9	9	4	6	44	0,148
10	300	9	8	10	7	2	6	42	0,139
11	300	10	7	3	8	2	4	33	0,111
12	300	12	3	6	5	4	6	37	0,124
13	300	7	5	4	2	1	2	21	0,071
14	300	8	4	3	4	2	3	23	0,075
15	300	12	5	2	12	2	6	38	0,128
16	300	5	8	5	3	2	5	27	0,089
17	300	13	2	3	8	2	6	33	0,111
18	300	7	4	6	8	5	7	37	0,122
19	300	1	1	2	4	2	4	14	0,045
20	300	10	8	8	6	4	6	41	0,136
21	300	3	4	3	10	3	5	27	0,091
22	300	6	7	6	3	1	2	25	0,084
23	300	12	1	1	6	2	4	26	0,087
24	300	8	5	4	3	1	3	23	0,077
25	300	9	4	3	2	1	2	21	0,071
Total	**7500**	200	116	148	160	63	137	824	2,747



Picture 2. Histogram of Defect Coffee Product

Table 2. Calculation of p Control Chart

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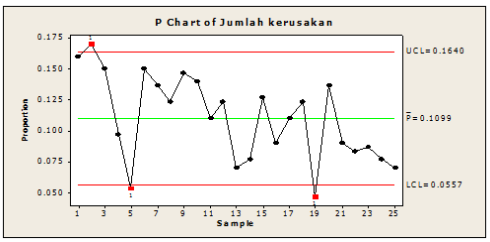
Observation	Sample (gr)	Total Defect	Proportion Defect	CL	UCL	LCL
1	300	48	0,159	0,1099	0,1641	0,0556
2	300	51	0,171	0,1099	0,1641	0,0556
3	300	45	0,149	0,1099	0,1641	0,0556
4	300	29	0,098	0,1099	0,1641	0,0556
5	300	16	0,053	0,1099	0,1641	0,0556
6	300	45	0,149	0,1099	0,1641	0,0556
7	300	41	0,138	0,1099	0,1641	0,0556
8	300	37	0,124	0,1099	0,1641	0,0556
9	300	44	0,148	0,1099	0,1641	0,0556
10	300	42	0,139	0,1099	0,1641	0,0556
11	300	33	0,111	0,1099	0,1641	0,0556
12	300	37	0,124	0,1099	0,1641	0,0556
13	300	21	0,071	0,1099	0,1641	0,0556
14	300	23	0,075	0,1099	0,1641	0,0556
15	300	38	0,128	0,1099	0,1641	0,0556
16	300	27	0,089	0,1099	0,1641	0,0556
17	300	33	0,111	0,1099	0,1641	0,0556
18	300	37	0,122	0,1099	0,1641	0,0556
19	300	14	0,045	0,1099	0,1641	0,0556
20	300	41	0,136	0,1099	0,1641	0,0556
21	300	27	0,091	0,1099	0,1641	0,0556
22	300	25	0,084	0,1099	0,1641	0,0556
23	300	26	0,087	0,1099	0,1641	0,0556
24	300	23	0,077	0,1099	0,1641	0,0556
25	300	21	0,071	0,1099	0,1641	0,0556
Total	7500	824	2,747			

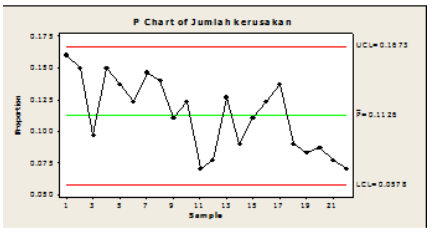


Picture 3. p Control Chart of Defect Coffee Product Proportion

Based on p control chart that quality control product needs improvement, because there are deviation points and irregularly that it shows the product had still deviation after it tested the sample. The p control chart is seemed some deviation points UCL and LCL out, after that it needs the new control limit to get the data uniforms. This thing is eliminating data reject lower than LCL or higher than UCL. There are three deviation datas (number 2, 5 and 19).

Table 3. Calculation of p Control Chart After Revision

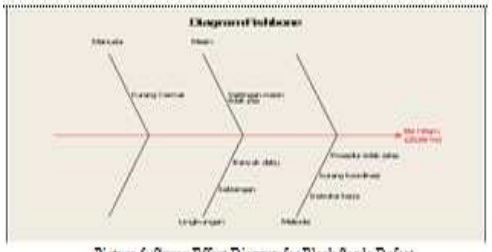
Observation	Sample (gr)	Total Defect	Proportion Defect	CL	UCL	LCL
1	300	48	0,159	0,113	0,1680	0,058
2	300	45	0,149	0,113	0,1680	0,058
3	300	29	0,098	0,113	0,1680	0,058
4	300	45	0,149	0,113	0,1680	0,058
5	300	41	0,138	0,113	0,1680	0,058
6	300	37	0,124	0,113	0,1680	0,058
7	300	44	0,148	0,113	0,1680	0,058
8	300	42	0,139	0,113	0,1680	0,058
9	300	33	0,111	0,113	0,1680	0,058
10	300	37	0,124	0,113	0,1680	0,058
11	300	21	0,071	0,113	0,1680	0,058
12	300	23	0,075	0,113	0,1680	0,058
13	300	38	0,128	0,113	0,1680	0,058
14	300	27	0,089	0,113	0,1680	0,058
15	300	33	0,111	0,113	0,1680	0,058
16	300	37	0,122	0,113	0,1680	0,058
17	300	41	0,136	0,113	0,1680	0,058
18	300	27	0,091	0,113	0,1680	0,058
19	300	25	0,084	0,113	0,1680	0,058
20	300	26	0,087	0,113	0,1680	0,058
21	300	23	0,077	0,113	0,1680	0,058
22	300	21	0,071	0,113	0,1680	0,058
Total	6600	744	2,479			



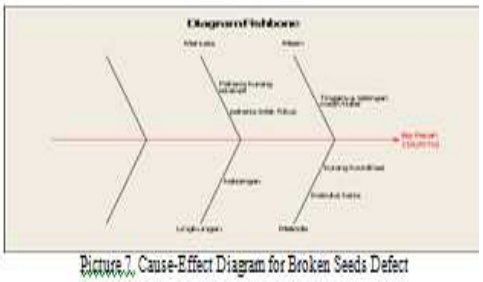
Picture 4. p Control Chart After Revision

Picture 4. Control Chart After Revision

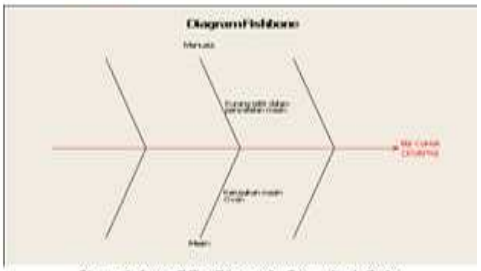
 ISSN 2301-6590



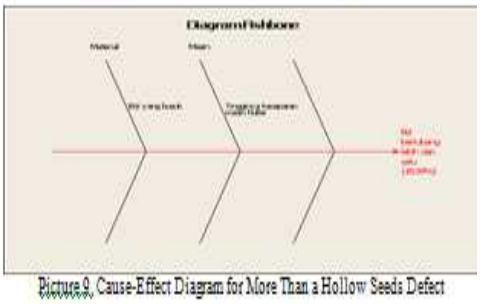
Picture 6. Cause-Effect Diagram for Black Seeds Defect



Picture 7. Cause-Effect Diagram for Broken Seeds Defect



Picture 8. Cause-Effect Diagram for Brown Seeds Defect



Picture 9. Cause-Effect Diagram for More Than a Hollow Seeds Defect

5. Conclusion

1. Using statistical p control chart tools in quality control can identify that quality of coffeeis out of control, it shows that production still had deviation. And after revision shows the sample data has been controlled or no deviation.
2. Based on Paretto diagram, improvement priority to press or decrease total defect of product can be done on four dominant kinds of defect, they are black seeds (25,68 %), broken seeds (19,23 %), brown seeds (17,60%) and more than a hollow seeds (15,99%).
3. Based on Cause-Effect diagram (fishbone diagram), can be seen the influence of factors and become the cause of defect the product, they are man, material, machine, methods and environment.

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