Production Control Analysis of Main Body using Statistical Process Control (SPC) Method

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Abstract:- This research will investigate PT. Astra Daihatsu Motor to producing Main Body. The production process has quality standard which set company, this research will analyze quality control Main Body production which is on production we still found defect so that do not reach target quality. The research method use to processing the production defect data from Main Body is Statistical Process Control (SPC) then the result will be analyzed by Cause and Effect Analysis method. The result of this research can be concluded that quality control in PT. Astra Daihatsu Motor requires improvement. Because of the graphic which is SPC method shown fluctuating and irregular points that indicating the production process is deviate.

I. INTRODUCTION

A company will develope product to provide value for its consumers in order to fulfill of their needs and desires which the products have maximum condition of the quality. Therefore, the company must maintain the quality of its products in order to meet consumer expectations.

Control and quality improvement in the company especially manufacturing companies is needed to producing a products with has international standard so the product can attract consumers in global competition. However, although the production process is done well and has high standard, in the field we could found many errors in the production process where at the time of the production process generate a products that are not in accordance with the company quality standards . So the result of its product defect production.

In this study, researchers will investigate departement of Body Plant 1 part of division of PT. Astra Daihatsu Motor (ADM). The department is tasked to assemble the frame for Avanza and Xenia cars on the Main Body Line section. This production line has 3 lines, consists of Under Body, Side Member, Roof. For Main Body production line already have quality standard set by company, so this research will analyze quality control from Main Body production which in its production still found disability so that does not reach target quality.

From the background of the problem the company needs a quality control that is useful to suppress the occurrence of production defects so as to achieve the target quality in accordance with the expected using quality control methods which is statistical tools, the Statistical Process Control (SPC) and we will describe the causes of the defect using Fish Bone Diagram.

II. LITERATURE REVIEW

A. Quality

Quality is the totality of features and characteristic of a product or service that bears on it's ability to satisfy stated or implied need (Heizer & Render, 2006: 253). Quality is not only seen in the product itself but also very complex involving all layers of the company as well as outside the company as a supplier or distributor and consumer. But basically the concept of quality is often considered as conformity, the overall characteristics or characteristics of a product expected by the consumer(prasetyawaty, 2014).

B. SPC

In statistical process control is known as "seven tools" (Metasari, 2008) ,. This Seven tools is a tool for quality control and how to solve the problem. Seven tools are (Heizer and Render, 2006: 263-268).

1. Check Sheet
2. Run Chart
3. Histogram
4. Control Chart
5. Pareto Diagram
6. Cause and effect Diagram
7. Scatter Diagram

Statistical Process Control (SPC) was discovered on the 1970s used to describe statistical techniques to monitor and improve quality in the production process. Statistical Process Control is a process used to monitor standart, making measurements and taking corrective action as a product or service is being produced (Heizer and Render, 2006: 268). In production processes there are quality standards that have been set, therefore must always be in control and monitored to maintain product quality.

In Statistical Process Control (SPC), there are 2 different kind of data(Gaspersz,1998:43):

1. Attributes Data

Attributes Data is a discrete qualitative data, Attributes Data is qualitative data that can be calculated for recording and analysis. Meaning is the observed data for the quality process can not be measured by value but can be observed in the characteristics

2. Variables Data

Variables Data is quantitative data that is measured by using a specific measurement tool for recording and analysis purposes.

C. Testing Data Adequacy

To ensure that the data collected is sufficiently objective. The Data Sufficiency Test uses the formula:

$$N' = \left[\frac{k/s \sqrt{N \sum X^2 - (\sum X)^2}}{\sum X}\right]^2$$

Where:
k = The confidence level
k = 95% = 2
s = Degree of thoroughness =5 %
N = Number of observation data
N' = Number of theoretical data
If N' ≤ N, so the data is considered sufficient, if N' > N the data is considered not sufficient and it is necessary to add data.

III.   RESEARCH METHODOLOGY

This research has a way of thinking how to analyze the level of production defects and identify the causes of these things can occured as well as provide solutions to the company in order to control the quality of products that have been produced by PT. Astra Daihatsu Motor. This research will generate recommendations for improving the quality of production in the future. Based on the theoretical basis of the review, it can be arranged in framework study as follows.
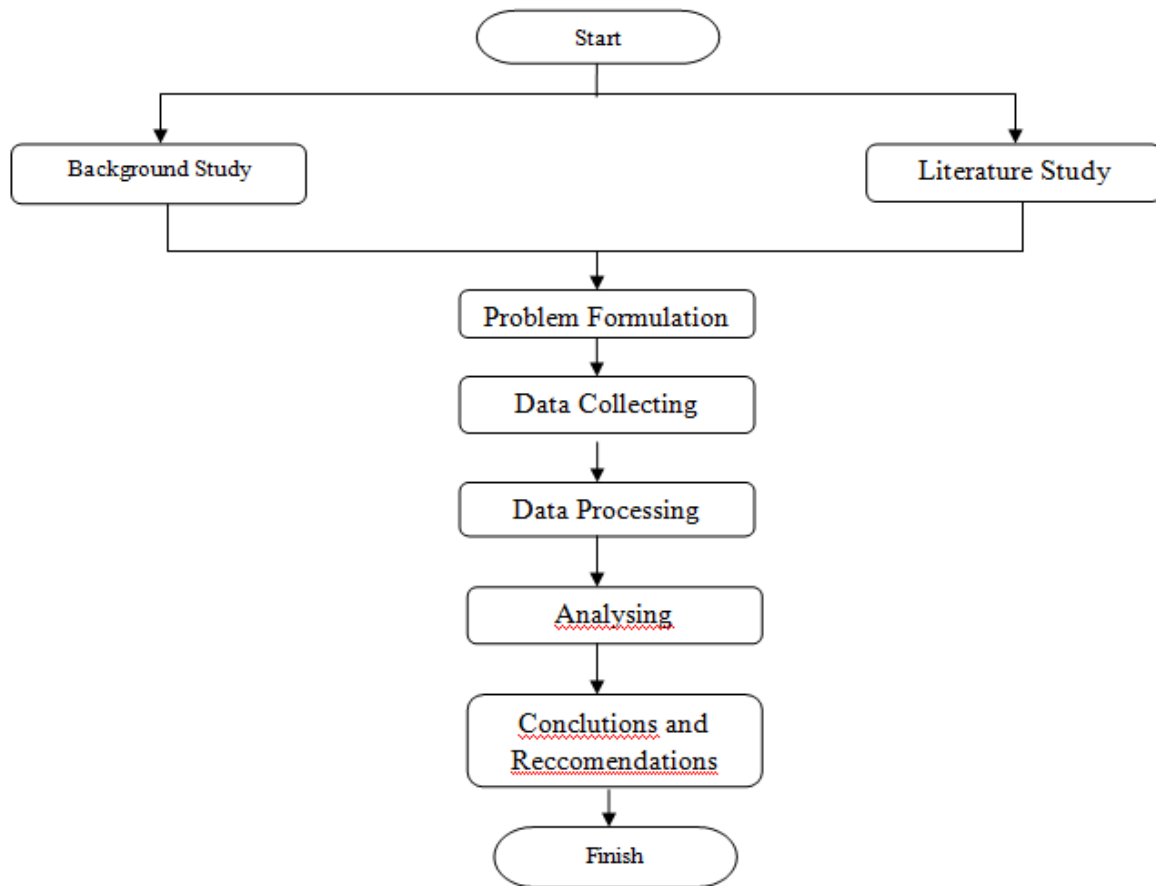

Fig 1:- flow diagram of research

IV. DATA AND STATISTIC

A. Data Sample

This is report of the producing Main Body PT. Astra Daihatsu Motor which are the data taken from Quality Control Metal Finish Division.

Day	Amount of Production (body)	Amount of Defect (body)	Defect Proportion
1	408	21	0,0515
2	426	3	0,0070
3	432	4	0,0093
4	484	13	0,0269
5	463	4	0,0086
6	488	11	0,0225
7	465	4	0,0086
8	477	8	0,0168
9	461	3	0,0065
10	450	12	0,0267
11	425	17	0,0400
12	492	35	0,0711
13	483	17	0,0352
14	459	21	0,0458
15	456	12	0,0263
16	417	14	0,0336
17	426	13	0,0305
18	424	8	0,0189
19	427	13	0,0304
20	424	12	0,0283
21	410	11	0,0268
22	444	23	0,0518

Table 1. Sample Data producing Main Body PT. Astra Daihatsu Motor

To ensure that the data collected is sufficiently objective. Testing of data adequacy is done by referring to the concept of statistics with the degree of accuracy and level of confidence. Degree of thoroughness and level of confidence is to reflect the level of certainty desired by researcher after deciding not to make measurements in large numbers (population).

Day	Amount of Production (x)	X^2
1	408	166464
2	426	181476
3	432	186624
4	484	234256
5	463	214369
6	488	238144
7	465	216225
8	477	227529
9	461	212521
10	450	202500
11	425	180625
12	492	242064
13	483	233289
14	459	210681
15	456	207936
16	417	173889
17	426	181476
18	424	179776
19	427	182329
20	424	179776
21	410	168100
22	444	197136
	9841	4417185

Table 2. Data Amount of Production

From the table 2, we acquire result N' =0.13 , so the data can be considered sufficient because N'<N (N=22).

B. *Data Processing*

The results of data processing which processed from table 1 by SPC method and the results are fully described the table below so as to make it easier to analyze the problem.

Day	Amount of Production (body)	Amount of Defect (body)	Defect Proportion	Deviation Standart	UCL	LCL
1	408	21	0,0515	0,008217	0,052651	0,003349
2	426	3	0,0070	0,007974	0,051921	0,004079
3	432	4	0,0093	0,007983	0,051948	0,004052
4	484	13	0,0269	0,007599	0,050798	0,005202
5	463	4	0,0086	0,007777	0,05133	0,00467
6	488	11	0,0225	0,007643	0,050928	0,005072
7	465	4	0,0086	0,007855	0,051564	0,004436
8	477	8	0,0168	0,007830	0,05149	0,00451
9	461	3	0,0065	0,008015	0,052046	0,003954
10	450	12	0,0267	0,008204	0,052611	0,003389
11	425	17	0,0400	0,008459	0,053378	0,002622
12	492	35	0,0711	0,007832	0,051496	0,004504

13	483	17	0,0352	0,007733	0,051198	0,004802
14	459	21	0,0458	0,007907	0,051722	0,004278
15	456	12	0,0263	0,007860	0,051581	0,004419
16	417	14	0,0336	0,008233	0,052698	0,003302
17	426	13	0,0305	0,008125	0,052375	0,003625
18	424	8	0,0189	0,008137	0,05241	0,00359
19	427	13	0,0304	0,008158	0,052474	0,003526
20	424	12	0,0283	0,008181	0,052542	0,003458
21	410	11	0,0268	0,008324	0,052972	0,003028
22	444	23	0,0518	0,008012	0,052036	0,003964

Table 3. results of data processing which processed from table 1 by SPC method
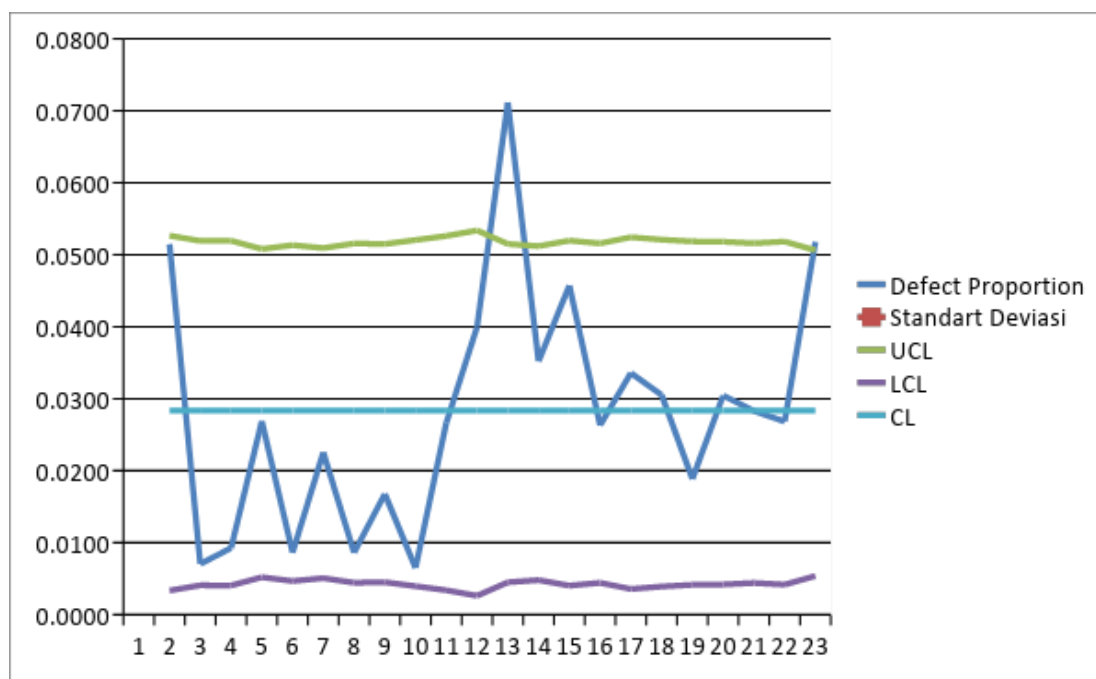
V. RESULT

Fig 2:- Result of Defect Proportion

Based on the image of the control chart above it can be seen that the data obtained is not entirely within the Upper Control Limit (UCL) that has been calculated. In the research days 12 and 23 are above the upper limit data that has been obtained so that it can be said that the process is not controlled. This indicates a deviation process.

Research on the field we found that the defect occurred in the Front Door Opening section and therefore to reduce the number of defects in production the next step is to investigate the cause of the defect in production itself. By using Cause and Effect Analysis, so it will be known the relationship of problems that arise with the causative factors and factors that influence it. The factors that affect and cause defects in production as follows:

- Man, Operators who do the work involved in the production process,do not check the welding gun periodically so they do not know the components of the tool worn out or not
- Machine, Occurrence of worn out on the cover welding gun because the absence of change
- Method, the absence of a reference welding process because each operator only uses estimates so that the welding process is not stable.

- Environment, Operator footwork is disrupted due to the transformer cover on the base.

After knowing the cause of defectability in the production that occurred, then PT Astra Daihatsu Motor needs to take corrective measures so that in the future can reduce the number of defects in the production process Front Door Opening.

VI. CONCLUSION

From this research can be concluded that quality control in PT. Astra Daihatsu Motor requires improvement. Due to a high fluctuating and irregular point that indicates that the production process is still deviated. The main cause of the defect is the unstable welding process in which there is a factor supporting the cause of the main problem is the absence of periodic checks of welding gun periodically so operators do not know the components of the tool are worn out and the absence of a reference welding process because each operator only uses estimates so that the welding process is not stable. Corrective measurement can be done what if the cause of production defects is overcome consistently.

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