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Application of Statistical Process Control on Sunbless Industrial Corporation

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I. ABSTRACT

This research analysed why there is in control and out of control when it comes to defects. Examines the data gathered and find out where the defects fell out of control. Minimization of defects is a must. From out of control, they need to make it in control. To understand if data should have to revise, they will use u chart to be able to know if the data gathered is in control or out of control. Using mini tab, it will give an accurate value of limits and a red point when the point is out of control. But if it doesn't, it is in control and in some other ways we can calculate it with the given formulas to get the control limit. When it is out of control, points that exceed from its limit should be eliminated. When it is in control, it doesn't need to be eliminated. The gathered data results to out of control. There's one point that exceeds the limit. Revision of gathered data will make the defects in control.

Keywords

Defect, Exceed, In Control, Out of Control, Quality Control

II. INTRODUCTION

Competitive in the manufacturing companies today become more and more fierce. They wanted to produce product beyond their limit just to meet customer's demand and to gain profits without giving an importance on the quality control in the production system. These quality controls are very important to have high quality products and to avoid non-conformance. It is a must in every company to stay in the competition. Without knowing the quality control, there are consequences that the company can get. This includes higher percentage of defects that is considered as wastes. It includes waste of raw materials as well as waste of time and money. Rejects should be lessened for higher production. Also, losses are the one companies should get rid of. If they do not, these losses will make their company go down as a result of being out of the completion or simply kicked out in the industry which as company, never wishes to happen. Defects may seem to be inevitable but it can be reduced.

Sunbless Industrial Corporation was built in the 1920. They have been in the industry for almost nine years. Their manufacturing arm is located at 240 Fresno Street, Pasay City while their marketing arm is at C.M Recto. The company produces three types of products: (a) bond papers, (b) envelops, and (c) notebooks. They also have three brand names namely Corona, Green Apple, and Blue Feather. They have two kinds of notebooks. These are spiral notebooks and bind notebooks.

A Sunbless Industrial Corporation monitors the reject that they get in each day. Rejects came from storage room, ruling machine, cutting machine, binding and punching machine. But quality control is in wrapping area where in defects are found. Researchers, 50 randomly selected packs of notebook (each pack has 12 notebooks) are examined and the errors are recorder.

In this study, the researchers focused much on how to control the numbers of defects and come up with feasible solutions using control charts for attributes (u chart) that will probably solve the problem for the betterment of the company.

III. METHODOLOGY

Control Chart for Attributes

Control Chart has types which are control charts for fraction nonconforming or p chart, control chart for nonconformities or c chart and control chart for nonconformities per unit or u chart.

Among this three, we use u chart because it is a control chart used for average number of nonconformities per unit when measuring subgroups at regular intervals from a process.

$$u=\frac{x}{n}$$

Equation 1. Formula for units as in defectives per lot

where:

x= total of nonconformities

n= sample size

$$\bar{\upsilon}=\frac{u}{n}$$

Equation 2. Formula for long-term process mean

where:

n= sample number

u= units as defectives per lot

Defects must be controlled. In order to control the defects, there are limitations that can determined through Upper Control Limit and Lower Control Limit in the control chart

$$UCL=\bar{\upsilon}+3\sqrt{\bar{\upsilon}/n}$$

Equation 3. Formula for upper control limit

$$CL=\bar{\upsilon}$$

Equation 4. Formula for centre line

$$LCL= \bar{\upsilon}-3\sqrt{\bar{\upsilon}/n}$$

Equation 5. Formula for lower control limit

Where:

n= sample size $\bar{\upsilon}$= mean

IV. RESULT AND DISCUSSION

Researchers gathered data to test notebooks if there's a defect. The data below has 50 randomly selected to examine, each has 12 sample sizes. Collected numbers of errors are selected from each of the sample size. Average number of errors came from the division of total numbers of errors by sample size.

Table 1. Data Gathered

Sample Number	Sample Size	Total Number of Errors	Average Number of Errors	Sample Number	Sample Size	Total Number of Errors	Average Numbers of Errors
1	12	1	0.0833	26	12	7	0.5833
2	12	5	0.4167	27	12	0	0.0000
3	12	3	0.2500	28	12	1	0.0833
4	12	2	0.1667	29	12	2	0.1667
5	12	2	0.1667	30	12	1	0.0833
6	12	3	0.2500	31	12	0	0.0000
7	12	4	0.3333	32	12	3	0.2500
8	12	0	0.0000	33	12	5	0.4167
9	12	2	0.1667	34	12	4	0.3333
10	12	4	0.3333	35	12	0	0.0000
11	12	3	0.2500	36	12	1	0.0833
12	12	4	0.3333	37	12	1	0.0833
13	12	2	0.1667	38	12	2	0.1667
14	12	5	0.4167	39	12	2	0.1667
15	12	3	0.2500	40	12	0	0.0000
16	12	1	0.0833	41	12	4	0.3333
17	12	1	0.0833	42	12	2	0.1667
18	12	2	0.1667	43	12	1	0.0833
19	12	2	0.1667	44	12	2	0.1667
20	12	4	0.3333	45	12	1	0.0833
21	12	1	0.0833	46	12	4	0.3333
22	12	3	0.2500	47	12	1	0.0833
23	12	2	0.1667	48	12	1	0.0833
24	12	2	0.1667	49	12	0	0.0000
25	12	0	0.0000	50	12	1	0.0833
						107	8.9167

Computation:

$u = \frac{x}{n} = \frac{107}{12} = 8.9167$

$\bar{u} = \frac{u}{n} = \frac{8.9167}{50} = 0.1783$

$UCL = \bar{u} + 3\sqrt{\bar{u}/n} = 0.1783 + 3\sqrt{0.1783/12} = 0.5441$

$CL = \bar{u} = 0.1783$

$LCL = \bar{u} - 3\sqrt{\bar{u}/n} = 1783 - 3\sqrt{0.1783/12} = -0.0947 = 0$

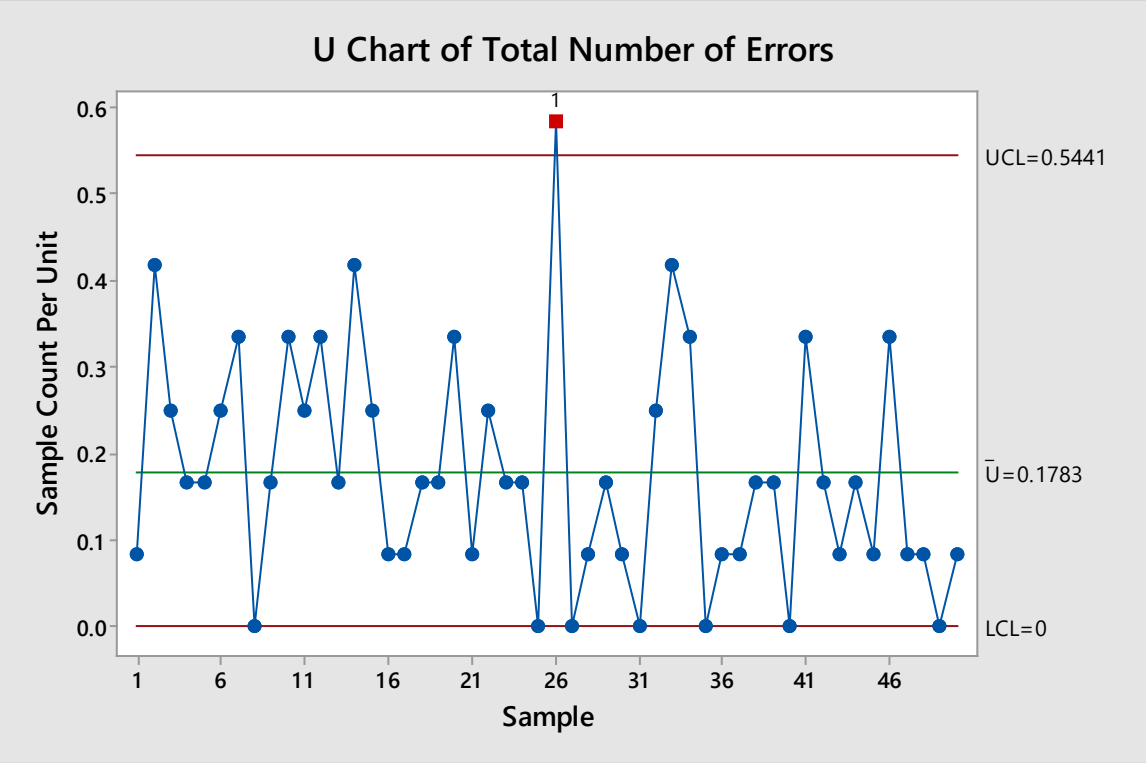

Figure 1. Control Chart

Based from the figure above, the upper control limit is 0.5441, the centre line is 0.1783 and lower control limit is 0. We can compute the control limit using the computation above. It will also give same value from the graph. There's one point exceed beyond upper limit. The exceeding point is the defect that fell out of control.

REVISED CONTROL CHART

In order to eliminate the exceeding point, revise the gathered data. Remove sample number to eliminate exceeding point.

Table 2. Revised Gathered Data

Sample Number	Sample Size	Total Number of Errors	Average Number of Errors	Sample Number	Sample Size	Total Number of Errors	Average Numbers of Errors
1	12	1	0.0833	26			
2	12	5	0.4167	27	12	0	0
3	12	3	0.25	28	12	1	0.0833
4	12	2	0.1667	29	12	2	0.1667
5	12	2	0.1667	30	12	1	0.0833
6	12	3	0.25	31	12	0	0
7	12	4	0.3333	32	12	3	0.25
8	12	0	0	33	12	5	0.4167
9	12	2	0.1667	34	12	4	0.3333
10	12	4	0.3333	35	12	0	0
11	12	3	0.25	36	12	1	0.0833
12	12	4	0.3333	37	12	1	0.0833
13	12	2	0.1667	38	12	2	0.1667
14	12	5	0.4167	39	12	2	0.1667
15	12	3	0.25	40	12	0	0
16	12	1	0.0833	41	12	4	0.3333
17	12	1	0.0833	42	12	2	0.1667
18	12	2	0.1667	43	12	1	0.0833
19	12	2	0.1667	44	12	2	0.1667
20	12	4	0.3333	45	12	1	0.0833
21	12	1	0.0833	46	12	4	0.3333
22	12	3	0.25	47	12	1	0.0833
23	12	2	0.1667	48	12	1	0.0833
24	12	2	0.1667	49	12	0	0
25	12	0	0	50	12	1	0.0833
						100	8.3333

Computation:

$u = \frac{x}{n} = \frac{100}{12} = 8.3333$

$\bar{u} = \frac{u}{n} = \frac{8.3333}{49} = 0.1701$

$UCL = \bar{u} + 3\sqrt{\bar{u}/n} = 0.1701 + 3\sqrt{0.1701/12} = 0.5272$

$CL = \bar{u} = 0.1701$

$LCL = \bar{u} - 3\sqrt{\bar{u}/n} = 0.1701 - 3\sqrt{0.1701/12} = -0.1871 = 0$

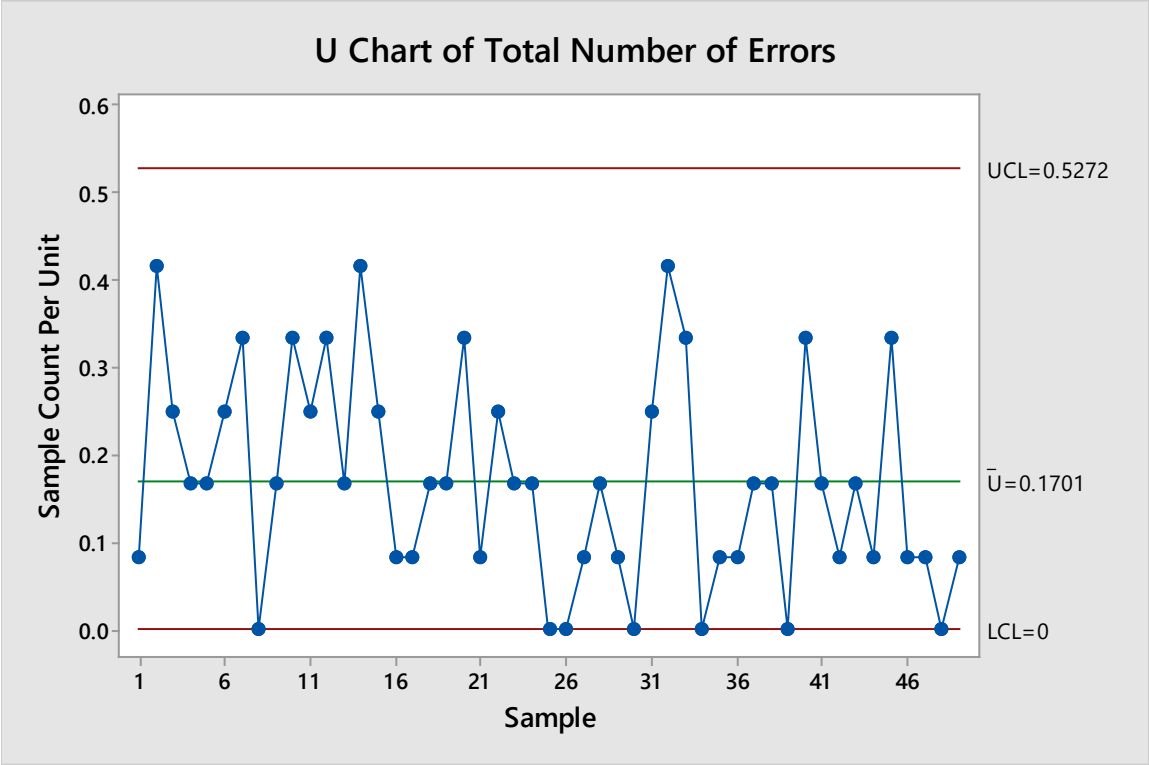

Figure 2. Revised Control Chart

Based from the figure above, the upper control limit is 0.5752, the centre line is 0.1701 and lower control limit is 0. We can compute the control limit using the computation above it will also give same value from the graph. Since, there's no point that exceeds the control limit. Hence, the graph is in control.

V. CONCLUSION

We, the researchers conclude that defects are inevitable. In 50 samples there's a point that exceed the control limit as shown in the figure 1. Since the point exceeds the control limit, we need to eliminate this defect to make the non-conformance in control. It is important to use u chart to know the limit of defects. In other words, defects should not go beyond its capacity. Quality control is a must to avoid too much defects.

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BIBLIOGRAPHY

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