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A STUDY ON STATISTICAL PROCESS CONTROL & STATISTICAL QUALITY CONTROL WITH REFERENCE TO MSS PVT. LTD., NASHIK

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Abstract: - Statistical quality control (SQC) and statistical process control (SPC) are two powerful tools, which have different goals and requirements for successful application. By using a methodology that combines the strengths of both approaches, it is possible to overcome the individual weaknesses of each one. The volume of calculations required by this technique prohibits manual data collection in favor of computerized analysis. The specific SPC technique to be discussed in combination with SQC is the attribute control chart. SQC refers to the use of statistical tools to analyze variations in the manufacturing process in order to make it better while SPC is a category of SQC that also uses statistical tools to oversee and control the production process to ensure the production of uniform products with less waste. SPC checks the production process for flaws that may lead to low-quality products while SQC uses a specific number of samples to determine the acceptability of a product. This study is carried out in MSS Pvt. Ltd., Nashik.

Keywords: SQC, SPC, Variation, Process performance.



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INTRODUCTION

Statistical Process Control (SPC) methods have been widely recognized as effective approaches for process monitoring and diagnosis. Statistical process control provides use of the statistical principles and techniques at every stage of the production. Statistical Process Control (SPC) aims to control quality characteristics on the methods, machine, products, equipments both for the company and operators with magnificent seven. Some simple techniques like the “seven basic quality control (QC) tools” provide a very valuable and cost effective way to meet these objectives. However, to make them successful as cost effective and problem solving tools, strong commitment from top management is required. Statistical process control (SPC) is one of the important tools in quality control (QC). In order to survive in a competitive market, improving quality and productivity of product or process is a must for any company. SPC uses statistics to detect variations in the process so that it can be controlled. Control charts are used in SPC for measuring the variation in the process and that can be continuously improved by the different techniques used in the SPC such as 7 QC tools

OBJECTIVES OF THE STUDY

- To Study the variability
- To Study & Analyze basic statistical tools and their applications
- To measure and monitor process performance

RESEARCH METHODOLOGY

The researcher has visited and collected the data of MSS Pvt. Ltd., Nashik.

Data Collection:

The main modes of data collection are primary and secondary methods.

Primary Data:

Primary data collected in a company as follows:

- Observation Method- Quality checking using instruments.
- Inspection method- Daily inspection in quality lab.
- Through schedules etc- Job card are used in company to make schedule for operation.

Data Analysis:

SPC1: Product Detail and Readings:

PART NAME:	Busbar Output	INSTRUMENT:	vernier caliper	USL:	7.9600
PART NO.:	850025088	SPECIFIC:	CD 7.92 to 7.96 mm	LSL:	7.9200
SAMPLE SIZE:	30 NOS.	OPERATION:	Machining		

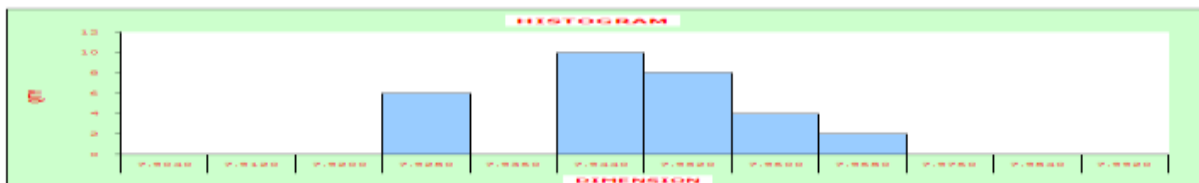
Readings:

SR NO.	1	2	3	4	5	6	7	8	9	10
1	7.9300	7.9200	7.9400	7.9300	7.9400	7.9500	7.9300	7.9500	7.9600	7.9400
2	7.9200	7.9300	7.9400	7.9300	7.9400	7.9300	7.9500	7.9200	7.9400	7.9200
3	7.9300	7.9200	7.9400	7.9200	7.9500	7.9300	7.9600	7.9400	7.9300	7.9300

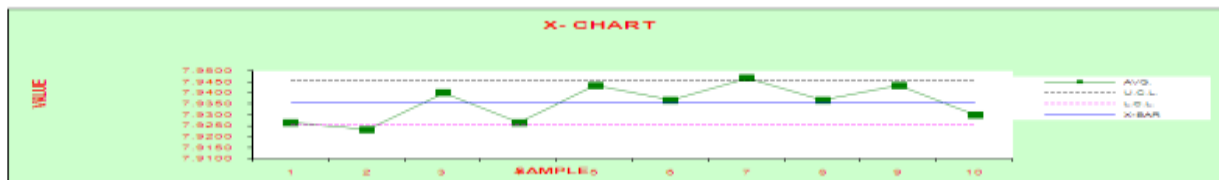
Calculation for histogram:

INTERVAL	FREQ.	CUFREQ
7.8960	0	0
7.9040	0	0
7.9120	0	0
7.9200	6	6
7.9280	0	6
7.9360	10	16
7.9440	8	24
7.9520	4	28
7.9600	2	30
7.9680	0	30
7.9760	0	30
7.9840	0	30

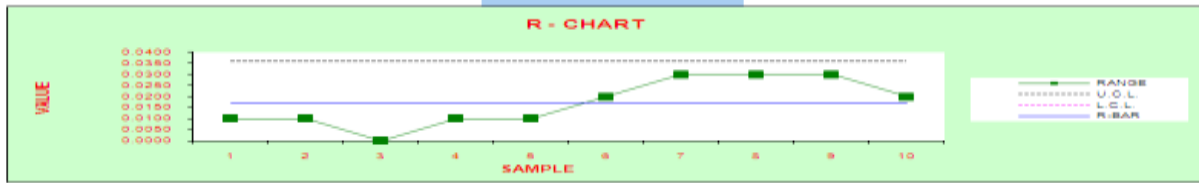
SPC1 (Histogram)



SPC1 X-Chart



SPC1 R-Chart



Result:

NO. OF NON CONFORMING PART	0 NOS
NO. OF PARTS ABOVE U.T.L. =	0 NOS
NO. OF PARTS BELOW L.T.L. =	0 NOS
Std.Dev."s"=	0.01167
Cp=(S/6s)=	0.57150
Cpk={1-K}xCp)=	0.44000

Interpretation:

- "Process is very poor take immediate action."
- Here Cp & Cpk is less than 1.33, it should be ≥ 1.33

SPC2: Product Detail and Readings

PART NAME:	Connecting part below	INSTRUMENT:	Air gauge	USL:	44.9900
PART NO.:	GCE7003978	SPECIFIC:	OD 44.95 to 44.99 mm	LSL:	44.9500
SAMPLE SIZE:	30 NOS.	OPERATION:	Machining		

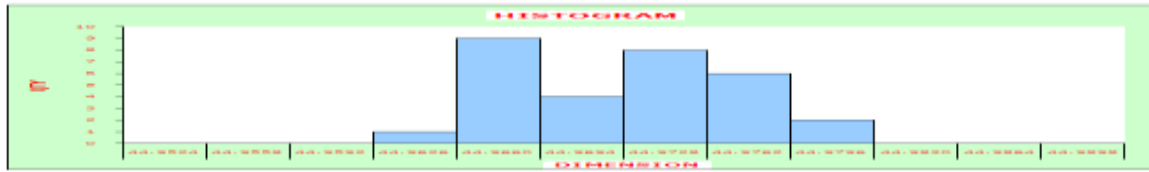
Readings:

SER NO.	1	2	3	4	5	6	7	8	9	10
1	44.9618	44.9696	44.9594	44.9596	44.9610	44.9679	44.9600	44.9669	44.9646	44.9641
2	44.9594	44.9598	44.9642	44.9592	44.9598	44.9683	44.9696	44.9600	44.9673	44.9760
3	44.9712	44.9718	44.9700	44.9690	44.9740	44.9690	44.9640	44.9727	44.9663	44.9669

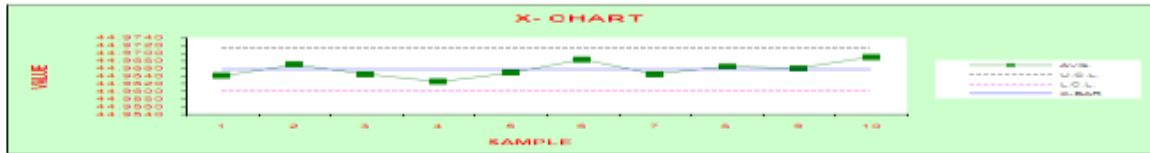
Calculation for histogram:

INTERVAL	FREQ.	CUFREQ
44.9490	0	0
44.9524	0	0
44.9558	0	0
44.9592	1	1
44.9626	9	10
44.9660	4	14
44.9694	8	22
44.9728	6	28
44.9762	2	30
44.9796	0	30
44.9830	0	30
44.9864	0	30

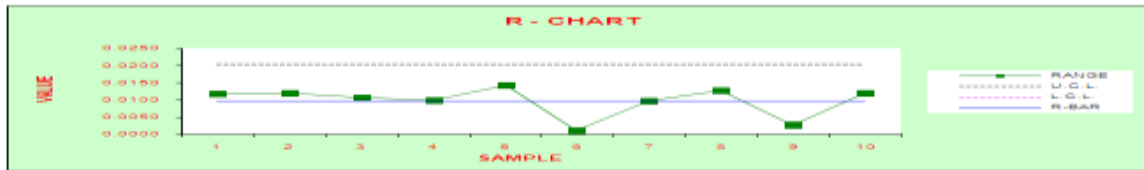
SPC2 (Histogram)



SPC2 X-Chart



SPC2 R-Chart



Result:

NO. OF NON CONFORMING PART	0 NOS
NO. OF PARTS ABOVE U.T.L. =	0 NOS
NO. OF PARTS BELOW L.T.L. =	0 NOS
Std.Dev. "s" =	0.00498
Cp = (S/6s) =	1.33890
Cpk = (1-K) x Cp =	1.05780

Interpretation:

- "Process needs correction."
- Cp & Cpk should be ≥ 1.33 .
- All readings are within limit but varies inconsistently.

SPC3: Product Detail and Readings:

PART NAME:	Horizontal Earth Bar Shouldered Spacer	INSTRUMENT:	Air gauge	USL:	4.9000
PART NO.:	THM0044873	SPECIFIC:	4.7 to 4.9	LSL:	4.7000
SAMPLE SIZE:	30 NOS.	OPERATION:	Machining		

Readings:

SR NO.	1	2	3	4	5	6	7	8	9	10
1	4.8000	4.8000	4.7100	4.8000	4.8000	4.7700	4.7900	4.8000	4.8000	4.8100
2	4.7900	4.8000	4.7900	4.7800	4.7900	4.7900	4.8000	4.7800	4.8000	4.8100
3	4.8000	4.7900	4.8000	4.8000	4.8100	4.7900	4.7900	4.8000	4.8100	4.8000

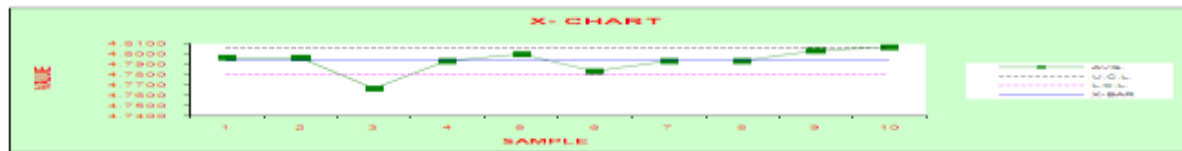
Calculation for histogram:

INTERVAL	FREQ.	CUFREQ
4.6500	0	0
4.6700	0	0
4.6900	0	0
4.7100	1	1
4.7300	0	1
4.7500	0	1
4.7700	1	2
4.7900	10	12
4.8100	18	30
4.8300	0	30
4.8500	0	30
4.8700	0	30
4.8900	0	30

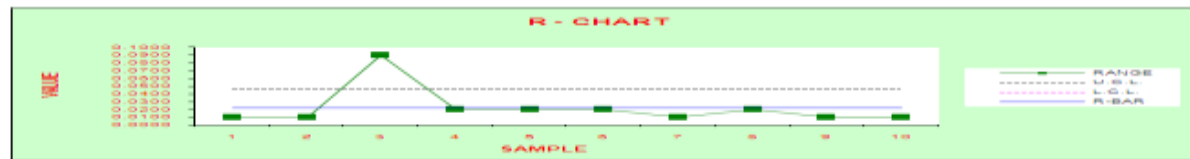
SPC3 (Histogram)



SPC3 X-Chart



SPC3 R-Chart



Result:

NO. OF NON CONFORMING PART =	0 NOS
NO. OF PARTS ABOVE U.T.L. =	0 NOS
NO. OF PARTS BELOW L.T.L. =	0 NOS
Std.Dev."s"=	0.01826
Cp=(S/6s)=	1.82580
Cpk={1-K}xCp)=	1.70530

Interpretation:

- "Process is excellent."
- Cp & Cpk is > 1.33

SPC4: Product Detail and Readings

PART NAME:	SWITCH BLADE FOR O/S	INSTRUMENT:	Vernier Caliper	USL:	79.5070
PART NO.:	3713002000	SPECIFIC:	79.253 to 79.507	LSL:	79.2530
SAMPLE SIZE:	50 NOS.	OPERATION:	Machining		

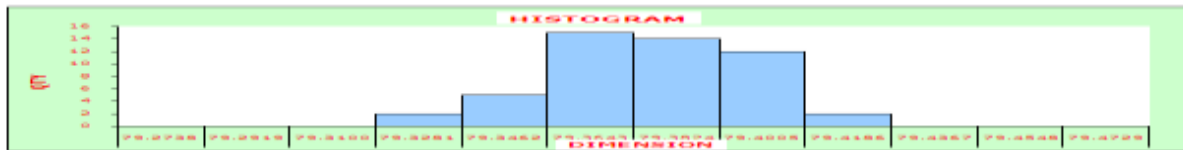
Readings:

SR NO.	1	2	3	4	5	6	7	8	9	10
1	79.310	79.340	79.400	79.320	79.360	79.340	79.320	79.330	79.350	79.340
2	79.360	79.340	79.320	79.370	79.340	79.340	79.350	79.360	79.380	79.350
3	79.340	79.330	79.340	79.370	79.360	79.340	79.320	79.360	79.370	79.350
4	79.380	79.320	79.360	79.350	79.340	79.350	79.360	79.330	79.370	79.350
5	79.360	79.360	79.370	79.340	79.360	79.310	79.360	79.390	79.340	79.370

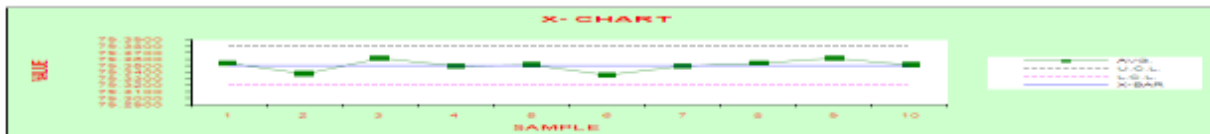
Calculation for histogram:

INTERVAL	FREQ.	CUFREQ
79.2557	0	0
79.2738	0	0
79.2919	0	0
79.3100	2	2
79.3281	5	7
79.3462	15	22
79.3643	14	36
79.3824	12	48
79.4005	2	50
79.4186	0	50
79.4367	0	50
79.4548	0	50
79.4729	0	50

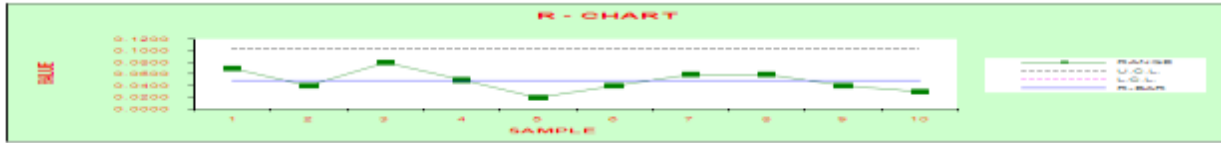
SPC4 (Histogram)



SPC4 X-Chart



SPC4 R-Chart



Result:

NO.OF NON CONFORMING PART =	0 NOS
NO. OF PARTS ABOVE U.T.L. =	0 NOS
NO. OF PARTS BELOW L.T.L. =	0 NOS
Std.Dev."s"=	0.02150
Cp=(S/6s)=	1.96980
Cpk={1-K}xCp=	1.52010

Interpretation:

- "Process is good but still improvement is required."

SPC5: Product Detail and Readings

PART NAME:	GCE7003978	INSTRUMENT:	Air gauge	USL:	44.9900
PART NO.:	Connecting part below	SPECIFIC:	OD 44.95 to 44.99 mm	LSL:	44.9500
SAMPLE SIZE:	30 NOS.	OPERATION:	Machining		

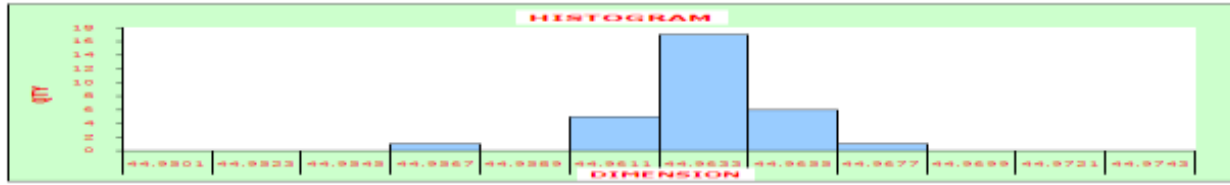
Readings:

SR NO.	1	2	3	4	5	6	7	8	9	10
1	44.9596	44.9596	44.9650	44.9584	44.9621	44.9591	44.9581	44.9628	44.9625	44.9573
2	44.9593	44.9591	44.9579	44.9588	44.9596	44.9595	44.9545	44.9595	44.9596	44.9593
3	44.9596	44.9614	44.9604	44.9603	44.9613	44.9613	44.9595	44.9600	44.9609	44.9593

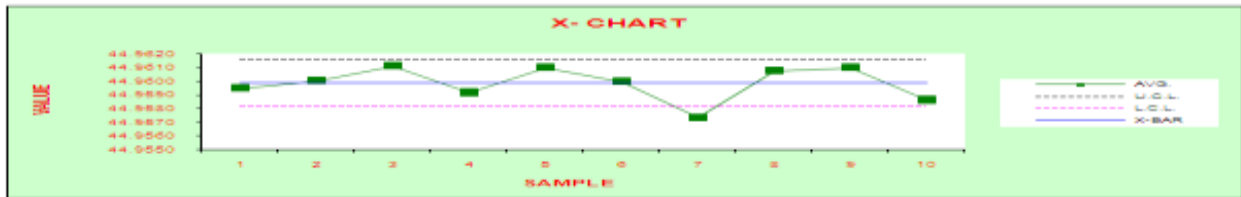
Calculation for histogram:

INTERVAL	FREQ.	CU FREQ
44.9479	0	0
44.9501	0	0
44.9523	0	0
44.9545	1	1
44.9567	0	1
44.9589	5	6
44.9611	17	23
44.9633	6	29
44.9655	1	30
44.9677	0	30
44.9699	0	30
44.9721	0	30

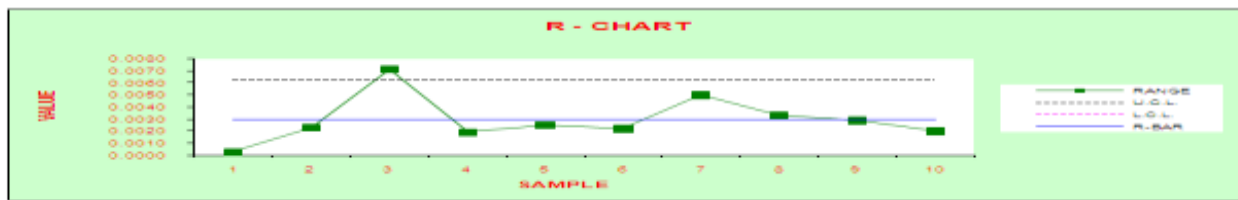
SPC5 (Histogram)



SPC5 X-Chart



SPC5 R-Chart



Result:

NO.OF NON CONFORMING PART =	0 NOS
NO. OF PARTS ABOVE U.T.L. =	0 NOS
NO. OF PARTS BELOW L.T.L. =	0 NOS
Std.Dev. "s" =	0.00189
Cp=(S/6s)=	3.52970
Cpk={1-K} x Cp =	1.74730

Interpretation:

- "Process is excellent."
- Cp & Cpk is > 1.33

CONCLUSION

SPC charts can be very useful in monitoring survey data quality and productivity. X-charts and R-charts utilize quantifiable data and display it in graphical form. These two parameters when used in conjunction provide a very effective means of monitoring quality and productivity. As

organizations administer surveys in production systems in that it is possible to collect quantifiable data which describe the performance of the system. In order to perform their function, management of organizations which conduct surveys. The application of X and R charts present data to management in a format that will enable them to carry out their duties. The result depends on skill with which it is applied, but also on how suitable or amenable the process is to SPC. In some cases, it may be difficult to judge when the application of SPC is appropriate. It reduces the causes of variation and product meets the customer requirement.

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