

Statistical Process Control Analysis of Newly Developed Components of Their Machining Parameters for Productivity Improvement

Mr. Vishwajit Vishwas Patil

PG Student

*Department of Mechanical Engineering
AMGOI Vathar, India*

Prof. M.A.Sutar

Professor

*Department of Mechanical Engineering
AMGOI Vathar, India*

Abstract

Strong operations support is one of the key requirements for competitive success of modern manufacturing organizations. An important aspect of operations support is Statistical Process Control (SPC); the use of statistical methods for monitoring and control of manufacturing processes and products. Implementation of SPC requires a certain amount of statistical knowledge and understanding. Although this is not an issue for big companies (e.g. in automotive sector), smaller companies are unable to provide the required knowledge in-house. In this paper, a service-driven approach for SPC is proposed, in which SPC is outsourced with modern information and communication technologies, such as web services.

Keywords: Statistical Process Control Analysis, Productivity Improvement

I. LITERATURE REVIEW

- 1) Ignatio Madanhiret al. -Application of Statistical Process Control (SPC) in manufacturing industry in a Developing Country. He says that “SPC tools are beneficial as an overall quality improvement effort and that it was an initiative to achieve quality management system. Quite a number of the companies SPC as important in for their organizations to match their competitors and reduce overall production costs.”
- 2) Boer Jozsef et al. A more efficient production using quality tools and human resources management. He says that “A number of techniques, methods or tools can be applied to increase production capacity, the volume of manufactured products and the quality of unfinished and finished products respectively. Most of them are focus on the technological processes, production machinery and equipment, and less on human resources.”
- 3) B.P. Mahesh et al. Process Variability Reduction through Statistical Process Control for Quality Improvement. He says that “The effective way to improve the Quality of the product or service is to improve the process used to build the product. Hence, TQM focuses on process, rather than results as the results are driven by the processes. Many techniques are available for quality improvement. Statistical Process Control (SPC) is one such TQM technique which is widely accepted for analyzing quality problems and improving the performance of the production process”.
- 4) N.A. Vitichuk et al. Improvement in Production Process for Pipelines Manufacturing Based on Quality Management Method. He says that “To achieve the purpose the scientific regulations of General Quality Management, the computation methodology of single and complex indices of industrial process quality, methods for the analysis and control of processes, structural and functional modeling IDEFO, statistical methods of quality management, the methodology of designing reengineering an operating process where used”.
- 5) Peter Butala et al. Statistical Process Control as a Service: An Industrial Case Study he concluded that “An important aspect of operations support is Statistical Process Control (SPC) the use of statistical methods for monitoring and control of manufacturing processes and products. However, implementation of SPC requires a certain amount of statistical knowledge and understanding”.
- 6) Masahiko Mori et al. Study on quality improvement of machine tools. He says that “Smart manufacturing enables us to efficiently manage the quality of machine tools before shipment in the factory. Remote monitoring enables us to efficiently perform maintenance work for customers’ machines after shipment. Sensing enables us to improve functions of preventive maintenance”.
- 7) Pavol Gejdosa al. Continuous Quality Improvement by Statistical Process Control. He concluded that “SPC and the DMAIC model as tools for continuous quality improvement. Here again, it was confirmed that with Stewart control charts, capability indexes, histograms can be for achieving the control of variation in the procedure in order to be filled with the requirements of the customer. SPC can be regret as a very effective tool in ensuring process stability. Benefits of Article are the use of SPC with DMAIC improvement model. This combination of tools is very suitable for achieving the desired objectives of quality improvement and efficient manner can help solve all tasks and problems of the process of quality improvement”.

- 8) Farzana Sultana et al. Implementation of Statistical Process Control (SPC) for Manufacturing Performance Improvement. He says that “SPC is an important tool of TQM. Again, HDS is the real time view of production floor of any manufacturing industry. In usual practice, SPC is use as quality control tool. However, in this research SPC is use to increase total output identifying major loss times from various machine breakdowns using HDS. Successful implementation of the recommendations of this paper cansignificantly improve the manufacturing performance of a manufacturing environment”.
- 9) Nada Smigicet al. Statistical Process control in Serbian Food Packing. He says that “The results show that packaging process is more accurate than precise, although for some productions it is both inaccurate and imprecise. More companies show overweight packaging compared to under filling packaging. Although SPC is not a mandatory requirement in the food industry, it can provide benefits to organizations in the sector regardless of their particular specialism and size. Although many companies associate SPC with expensive statistical software, in some cases, manual control charts can be just as effective, and can enable operators and other users to understand the packing process”.
- 10) Gajendra Patidaret al Implementation of Statistical Process control in small Scale Industries-A Review He states “SPC have been introduced into a vast number of companies around the world in the last decades. The methods and practices of process control in Manufacturing help companies to continually meet and exceed the needs of their customers in providing high quality products at a low price. Quality has become one of the most important customer decision factors in the selection among the competing product and services. Consequently, understanding and improving quality is a key factor leading to business success, growth and an enhanced competitive position. Hence, quality improvement program should be an integral part of the overall business strategy. Quality has become one of the most important customer decision factors in the selection among the competing product and services”.
- 11) Pranay Sureshbhai Parmar et al. Implementation of Statistical Process Control Techniques in Industry. He says that “product quality depends on the ability to control the production process. This is where Statistical Process Control- SPC, comes in. Statistical Process Control (SPC) applies statistical methods to monitor and control a process to operate at full potential. Statistical process control is a collection of tools that when used together can result in process stability and variance reduction. Control charts are use in SPC for measuring the variation in the process and that can be continuously improve by the different techniques used in the SPC such as basic 7QC tools. 7QC Tools are called Basic because they are suitable for people with little formal training in statistics and they can be used to solve the vast majority of quality-related issues. Management involvement and commitment to the quality improvement process is the most vital components of SPC’s potential success”.
- 12) Soroush Avakh Darestaniet al. Short-Run Control Chart for Multi products with Multi-Items Based on Unequal Means and Variances. Hestates that “unequal variables can be monitored simultaneously for batch production industries, which helps save monitoring time for products and processes. In practice, when the same characteristics of different parts are to be monitoring statistically, short-run charts are efficient, as insufficient data do not support normality assumption of the control charts. In this context, short-run control charts can be useful. To improve SPC characteristic over time, out of-control signals were test on short-run control charts. It was shown that the data had no out-of-control point and no no normal signals and could be used as a standard for implementing SPC”.
- 13) Omogbai Olegheet al. Schedule performance measurement based on statistical process control charts. Estates that “Most studies on scheduling have focused on finding an ideal schedule for a set of job shop orders, but little work has been done to measure the performance of the optimal schedule. The methodology outlined in this research paper provides an approach to effectively and continuously measure the performance of a schedule. Statistical Process Control charts monitor variations within a process and are widely used in performance management systems. By applying the Individuals Control chart to the scheduling system for a jobshop, we were able to use the control limits of the chart as performance targets while the variations in the schedule could be monitor to seek ways of eliminating or reducing the variations. The method when applied would provide more accurate schedules, which improve organizational planning”.
- 14) Metin Uçurumet al. Implementation of Statistical Process Control (SPC) Techniques as Quality Control in Cast Iron Part Production. Hestates that “The process variations have to be controlled using control diagrams and process capability index which is one of the important aspects in any production line. Controls diagrams R, and X are the most popular control charts. Statistical Process Control (SPC) methods can be simply applied on a foundry floor in order to control the process parameters and improve quality of the cast products”.
- 15) Vikas Sheelet al. A Systematic Review of SPC Implementation in the Manufacturing Industry He concludes, “SPC implementation is significant as can be seen from the results of the above case studies. From the above study of the different case studies, it can be concluded that to survive in today’s era of competitive market, companies need to produce the quality products. In addition, quality can be achieved by using the SPC tools and techniques. The study reveals that SPC techniques can give the significant improvement to the quality. These tools and techniques are simple to implement and needs the top management involvement and employee support”.
- 16) S. Subbulakshmi1 et al. Essential Role of Statistical Process Control in Industries. He states, “Better quality and production of product or process is a must for any Industry. Statistical Process Control (SPC) is an efficient controlling methodology for analyzing, monitoring, managing and recuperating process performance. Biggest benefits for implementing SPC in industries are enhanced quality products and condensed process variation. The objective of this paper is to examine SPC implementation in the industry setting by applying systematic literature review and to explore the comprehensiveness of SPC applications in the industry”.

II. FINDING FROM LITERATURE REVIEW

There are plenty of different verified quality tools. Statistical process control (SPC) is one of the important approaches used in quality management. SPC can be applied in organization to obtain good quality and high standard products, which have become very popular in many industries. This study contains construction of a system design to observe whether the conditions of an alloy production line are within the specification and control limits.

III. PROBLEM DEFINITION

Every part having some critical characteristics which having precisely maintenance; these critical characteristics are suggested from the customer. If critical characteristics are not maintained that affect component specifications so we need to analysis by statistical process control. Company has Developed New Three Components having two Individual Critical Parameter so analysis this Parameter on SPC.

IV. OBJECTIVES

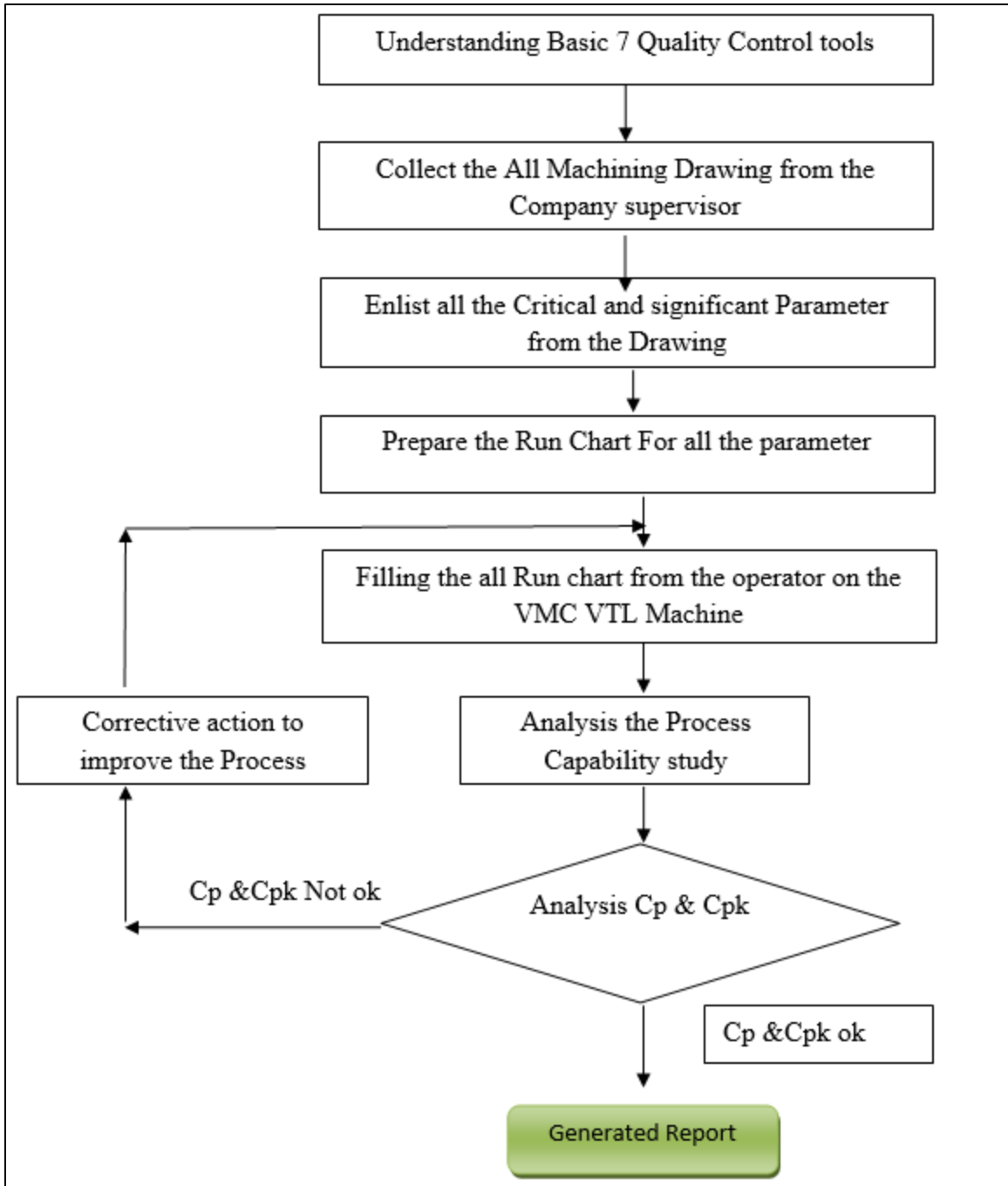
- 1) Understanding Seven Basic Quality Control tools.
- 2) Understanding the process of the Statistical process control (SPC) implementation on the machine shop floor.
- 3) Prepare Part wise Inspection Plan for different Machining parameter.
- 4) Prepare Run chart for Different machining parameter.
- 5) Prepare SPC format and analysis the result
- 6) Understanding Calculation for Process Capability (Cp) & Process Capability Index (Cpk).
- 7) Implementing or Correct the Process is if the Cp &Cpk is on outer Limit.

V. WORKING METHODOLOGY

To fulfill this Objectives following methodology is use.

- 1) Select the Parameter of the Machining for the SPC analysis.
- 2) Prepare Run chart for The Machining Parameter analysis.
- 3) Calculate Process Capability (Cp) & Process Capability Index (Cpk).
- 4) Analysis the Process Capability study
- 5) If Cp and Cpk ok then generate the Report.
- 6) If Cp and Cpk not Ok then take corrective actions to improve the process.

VI. IMPLEMENTATION DETAILS



VII. CONCLUSION

Implementation of SPC requires a certain amount of statistical knowledge and understanding. Although this is not an issue for big companies (e.g. in automotive sector), smaller companies are unable to provide the required knowledge in-house. SPC can be applied in organization to obtain good quality and high standard products, which have become very popular in many industries. SPC implementation is significant as can be seen from the results of the above case studies. From the above study of the different case studies, it can be concluded that to survive in today's era of competitive market, companies need to produce the quality products.

REFERENCES

- [1] Ignatio Madanhire, Charles Mbohwa Application of Statistical Process Control (SPC) in Manufacturing Industry in a Developing Country, 13th Global Conference on Sustainable Manufacturing - Decoupling Growth from Resource Use.

- [2] Boer JozsefaPetrutaBlaga, A more efficient production using quality tools and humanresources management, *Procedia Economics and Finance* 3 (2012) 681 – 689.
- [3] B.P. Mahesh, M.S. Prabhushwamy process variability reduction through statistical process control for quality improvement, *International Journal for Quality research UDK- 005.6.642.2Short Scientific Paper* (1.03).
- [4] V. Yu. Antseva, N.A. Vitchukb, V.V. Miroshnikovc, Improvement in Production Process for Pipelines Manufacturing Based on Quality Management, *international Conference on Industrial Engineering, ICIE 2017, Procedia Engineering* 206 (2017) 950–957.
- [5] Peter Butalaa, AlojzijaSlugaa, Statistical Process Control as a Service: An Industrial Case Study, *Forty Sixth CIRP Conference on Manufacturing Systems 2013, Procedia CIRP* 7 (2013) 401 – 406.
- [6] Makoto Fujishima1, Masahiko Mori1, Kimiyuki Nishimura1, Katsuhiko Ohno1, Study on quality improvement of machine tools, *The 5th International Conference on Through-life Engineering Services (TESConf 2016), Procedia CIRP* 59 (2017) 156 – 159.
- [7] PavolGejdoša, Continuous Quality Improvement by Statistical Process Control, *Business Economics and Management 2015 Conference, BEM2015, Procedia Economics and Finance* 34 (2015) 565 – 572.
- [8] FarzanaSultanaNahid Islam RaziveAbdullahilAzeem, Implementation of statistical process control (spc) for manufacturing performance improvement, *Journal of Mechanical Engineering, Vol. ME 40, No. 1, June 2009.*
- [9] Ilija Djekic1 Nada Smigic Nikola TomicAndrejaRajkovicSTATISTICAL PROCESS CONTROL IN SERBIAN FOOD PACKAGING, *International Journal for Quality Research* 8(3) 323-334 ISSN 1800-6450.
- [10] GajendraPatidar Dr. Devendra SinghVerma, IMPLIMANTATION OF STATISTICAL PROCESS CONTROL IN SMALL SCALE INDUSTRIES-A REVIEW, *International Journal of Emerging Technologies and Engineering (IJETE) Volume 2 Issue 7, July 2015, ISSN 2348 – 8050.*
- [11] Pranay S. Parmar, Vivek A. Deshpande, Implementation of Statistical Process Control Techniques in Industry: A Review, *Nov 2014 (Volume 1 Issue 6) ISSN-2349-5162*
- [12] SoroushAvakhDarestani and NedaAminpour, Short-Run Control Chart for Multiproducts with Multi-Items Based on Unequal Means and Variances, *Journal of Quality and Reliability Engineering Volume 2014, Article ID 458418, 4 pages.*
- [13] Omogbai Oleghe1, Konstantinos Salonitis2, Schedule performance measurement based on statistical process control Charts, *International Journal of Engineering Management and Economics, 2014, Vol. 4, No. 3/4, pp194-212* DOI:10.1504/IJEME.2014.066940
- [14] Metin Uçurum1, Murat Çolak2, Mehmet Çınar1, Derya Dişpınar3, Implementation of Statistical Process Control (SPC) Techniques as Quality Control in Cast Iron Part Production, *ISSN: 2456-2734, Vol. 1, Issue 3, Oct.2016, pp.14-24.*
- [16] Vikas Sheel1 SumanKant2, A Systematic Review of SPC Implementation in the Manufacturing Industry *IJSRD Vol. 5, Issue 05, 2017 | ISSN (online): 2321-0613.*
- [17] S. Subbulakshmi1, A. Kachimohideen2, R.Sasikumar3 and S. Bangusha Devi4, An Essential Role of Statistical Process Control in Industries, *ISSN 0973-2675 Volume 12, Number 2 (2017), pp. 355-362*