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A Literature Review on Manufacturing Process Control Improvement Using Quality System Basics

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Abstract: A system of tools designed to help prevent/ minimize variation in manufacturing processes and reduce defects and warranty costs to the company. A system of tools to create solid quality fundamentals or basics to build on. Quality Systems Basics (QSB) is NOT a set of individual strategies, but a system for managing operations. Creates an Operations culture focused on "quality first". While you already have procedures and methods to make good product, QSB introduces some of the best practices. Tools designed to minimize manufacturing variation and improves internal yield and reduce external customer defects. And important to you as a supplier, when your customers are consistently satisfied, your costs to achieve that level of quality will actually be reduced. It is customized to fit business model. When we want to implement QSB, start with the strategy that will best help your company reduce costs or problems. Then grow your implementation from there. For many companies, Fast Response is a great starting point because is drives problem solving to the source of the problem and it develops the discipline of root cause thinking and correcting workflow so that the problem at hand and similar problems can be prevented down the road.
Keywords: Fast response, Quality control, 5s, layered audits

I. INTRODUCTION

Quality System Basics is a system of tools designed to help prevent/ minimize variation in manufacturing processes and reduce defects and warranty costs to the company. The goal of QSB implementation is to reduce External Parts Per million by driving down internal defects and putting immediate containment measures in place. It is accomplished via communication, scrap marketplace, layered audit, establishing visual and daily management metrics, basic and advanced problem solving tools. The QSB assessment is a scorecard and roadmap to track your progression through levels of quality system sophistication. A great way to incorporate QSB into every cell by creating goals for certification and competition between cells. QSB is a kit of tools and methods which provide a fast response in the case of claim. It also avoids our customers getting defective parts. These are the tools for QSB they are Fast reponse, Control of nonconforming products, Standardized work, Standard operator training, Risk Reduction (RPN), Error proofing verification, Layered Audits.

II. PROBLEM IDENTIFICATION

A new manufacturing line is being setup for the nozzle manufacturing at Gilbarco Veeder Root India pvt ltd. Right now nozzles are being imported from USA and planning to manufacture in-house to reduce the dispensing cost and to be competitive in the market. The challenge in setting up of this line is developing a detailed operation standard work, and applying rigorous problem solution methods via daily management to achieve 95% first pass yield.

III. LITERATURE REVIEW

Some literature survey about Quality operations for various materials has been made. From that study the following observations are made.

A. Basic Quality Tools in Continuous Improvement Process

Mirko Sokovic, Jelena Jovanovic, Zdravko Krivokapic, Aleksandar Vujovic during 2009 had given that the principle of continuous improvement using the seven basic quality tools which guarantee organizations to move from static to dynamic improvement status was presented. As shown, the 7QC tools have an important place in data collecting, analyzing, visualizing and all other phases in

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PDCA-cycle, DMAIC and DMADV phases, and also in Lean Six Sigma. Furthermore, systematic application of 7QC tools will enable a successful quality improvement process. It is evident that a continuous improvement process cannot be realized without quality tools, techniques and methods. These tools also help the quality engineer to use accessible data in decision processes. Therefore, it is very important that the passive status of using these tools, techniques and methods is transformed into proactive status, which is the only way towards further affirmation of a continuous improvement process. In view of this, it is evident that an even much more synthesized process could be realized and improved using different tools and techniques which have 7QC tools as their basis.

B. Quality Improvement Model At The Manufacturing Process Preperation Level

Dusko pavletic, Mirko Sokovic during 2009 had given in order to achieve the effect of manufacturing process quality improvement, the possibilities of applying various methods and tools through an operating model of quality improvement in the process of production preparation are discussed. In the area of quality improvement in the field of metal manufacturing processes, both in engineering and shipbuilding, it was seen nonexistence of a complete model of process quality improvement, especially at the production preparation level. So, the main guidelines of an operational model of quality improving in the production preparation are set, the main algorithms of each phase of the model are developed and the possibilities of applying the model are discussed. Developed operating model of quality improvement is implemented through six phases, which has emphasized a systematic approach to the achievement of quality improving project objectives. The work on quality improvement project also involves the intensive teamwork, and application of appropriate methods and tools of improving quality. For the implementation of quality improvement in the production preparation there are typically short deadlines defined in accordance with the planned production start. For this reason the iterative analysis for elimination of non-conformances is usually not possible. Perceived non-conformances, as well as those who still can possibly occur, are analysed in the last phase of the model implementation. In that phase are, also, defined the necessary corrective actions to remove non-conformances and prevent their subsequent appearances. As model implementation implies involvement of complex methods, which requires a good knowledge of the mathematical statistics, it can not be expected that an engineer in practice will be able to apply the above mentioned methods without appropriate professional help. It is therefore, for the successful implementation of DFSS methodology, necessary to provide adequate professional support, so that engineers can focus on ensuring the quality of those activities that add value.

C. Integrating The Continuous Improvement Of Measurement Systems Into The Statistical Quality Control O Manufacturing Processes

Maria Villeta, Eva Maria Rubio, Jose Luis Valencia, Miguel Angel Sebastian during 2012 had given Reliability in measurements is a requirement for quality oriented organisations. A novel link is presented in this work for the integration of the continuous improvement loop of measurement systems into the statistical quality control of manufacturing processes. The proposal is based on the Index of Contamination of the Capability (ICC) and the Golden Rule of Metrology. It is expressed through clear-cut decision rules that consider the uncertainty of measurement, the intended use of the measurements and the risk of inaccurate measurements. The proposal makes it possible to improve production quality. Clear-cut decision rules regarding adequate and inadequate measurement systems and manufacturing processes were established to be used for controlling the quality of the manufacturing processes throughout measurements. To facilitate the application of the decision procedure for practitioners, an equivalent graphical approach has been generated with two operational boundary curves. These curves establish uncertainty-to-tolerance ratios consistent with observed process capabilities and also distinguish two types of inconsistencies ($ICC < 58$ and $ICC > 91$) that are detectable and are rectified by the proposed decision procedure. The proposal, which is easy to implement in practice, will help the manufacturing industries in making the best decisions for the measurement system and the manufacturing processes in an integrated and efficient way to achieve the desired production quality.

D. Foundry Quality Control Aspects And Prospects To Reduce Scrap Rework And Rejection In Metal Casting Manufacturing Industries

T.R.Vijayaram, S.Sulaiman, A.M.S. Hamouda, M.H.M. Ahmad during 2005 had given Metal casting industries are actively involved to reduce the scrap rejection and rework during the manufacturing process of the components. To achieve this, the production concerns must follow the quality control procedures correctly and perfectly without any negligence. Timely implementation of the modified techniques based on the quality control research is a must to avoid defects in the products. In this review paper, some of the solutions and quality control aspects are explained in a simplified manner to eliminate the unawareness of the foundry industrial personnel who work in the casting manufacturing quality control departments. Besides, statistical quality control (SQC) is also highlighted to understand its recent application and techniques adopted in the developing metallurgical engineering foundries. It is concluded that careful supervision with effect motivation of individual employees in achieving the quality is a must in reducing the rejection and scrap in metal casting manufacturing engineering industries. It is to be emphasized that quality is contributed to by all the members of an organization from the chief executive to the worker and is not the job of only foundry quality control staffs. In foundries addition to the quality control department, a scrap prevention team is needed to improve the quality and this should be felt by each employee.

E. Integrated product and process control for sustainable semiconductor manufacturing

Chen Liang & Yinlun Huang during 2011 had given Semiconductor fabrication is a manufacturing sequence with hundreds of sophisticated unit operations and it is always challenged by strategy development for ensuring the yield of defect-free products. In this paper, an advanced control strategy through integrating product and process control is established. The proposed multiscale scheme contains three layers for coordinated equipment control, process control and product quality control. In the upper layer, online control performance assessment is applied to reduce the quality variation and maximize the overall product performance (OPP). It serves as supervisory control to update the recipe of the process controller in the middle layer. The process controller is designed as an exponentially weighted moving average (EWMA) run-to-run controller to reject disturbances, such as process shift, drift and tool worn out, that are exerted to the operation. The equipment in the process is individually controlled to maintain its optimal operational status and maximize the overall equipment effectiveness (OEE), based on the set point given by the process controller. The efficacy of the proposed integrated control scheme is demonstrated through case studies, where both the OPP (for product) and the OEE (for equipment) are enhanced. An advanced multiscale approach towards integrated product and process control (IPPC) is proposed to tackle the sophisticated nature of the mixed-product semiconductor manufacturing. Case studies on the CMP operations show that the IPPC scheme can improve both the OPP for product quality and the OEE for process efficiency. Future studies on this topic will extend the IPPC philosophy to consider the environmental benefits in semiconductor manufacturing.

F. Quality Control In The Production Process Of Smc Lightweight Material

Alexandra Kraemer, Song Lin, Daniel Brabandt, Thomas Bohlke, Gisela Lanza this year 2014 had given The use of sheet molding compounds (SMC) in diverse applications requires different specific material properties for each type of finished parts. These material properties have to be assured by a reliable quality control, which does not only have to be performed for the prefabricated SMC itself but also during the production process of the semi-finished material. This is of high importance because quality fluctuations and defects can already occur during the production of the semi-finished SMC. Hence, an inline quality control can help to establish objective quality criteria for semi finished SMC and can enable controlled and stable production processes. Therefore, this helps to reduce the scrap rates of parts and to establish a further automated production process. The increasing importance of lightweight material especially in the automotive and transportation sector leads to the need of highly automated production processes. Thus, inline measurement systems are one of the important factors to assure the high quality of the product. This results in high scrap rates as well as machine failure and can additionally cause further problems in the following process steps. Air entrapping and fiber distribution are identified as two parameters that influence the quality of the semi-finished product significantly. Based on the results of the measurements an inline integration of the chosen sensor systems for fiber distribution and foil control will be performed. Further reduction of the measurement and processing time is necessary to achieve an early detection and to avoid downtime of the production. In future, more tests are necessary to evaluate its suitability for the inline integration in a SMC process. In addition, the relation between the results from air entrapping of the semi-finished material and the air entrapping and impregnation of the semi-finished mats after curing as well as the finished parts has to be further investigated. This information can be related with the material properties and can eventually lead to the definition of suitable quality parameters in the process.

IV. METHODOLOGY USED

QSB implementation consists of the following 5 steps

A. Process Fundamentals

1) Communication – establish sense of urgency and accountability
2) Process Documentation – clear, concise and binary method for assembly / test

B. Process Monitoring Fundamentals

1) Voice of the Process / VOC – real-time problem solving at Gemba sustaining quality processes
2) Layered Audit – regular "checks" on adherence to quality standard work

C. Problem Solving Process

1) Corrective Actions
2) Process Capability
3) Establishing visual and daily management metrics
4) Basic and advanced problem solving tools – methods, tools and skills

D. Problem Prevention

1) Problem Prevention – proactive system improvement

E. Sustainment

1) *Quality System Basics Benefits The Organization In The Following Ways*
a) Improves Quality metrics - reduces PPM, warranty costs, reduces PRR's and increases customer satisfaction.
b) Provides a systematic approach for Problem Solving and communication of Quality issues.
c) Ensures the Natural owner is assigned to each issue.
d) Supports continuous improvement.
e) Strengthens documented implementation of Lessons Learned.
f) Prevents repetitive mistakes and reduces waste of resources.
g) Engages all stakeholders in an organization.

V. CONCLUSION

Hence, it is concluded from literature that to study the behaviour of Quality under few key tools has becoming interesting preference for the researcher. Development of new manufacturing processes which having a system of tools designed to minimize manufacturing variation and improves internal yield and reduce external customer defects.
Therefore, in the existing work, it is observed those researchers are merely applied quality operations with the mixing of other local research. The performance of the quality depends upon its manufacturing variations in processes and reducing defects. This information can be related with the material properties and can eventually lead to the definition of suitable quality parameters in the process.

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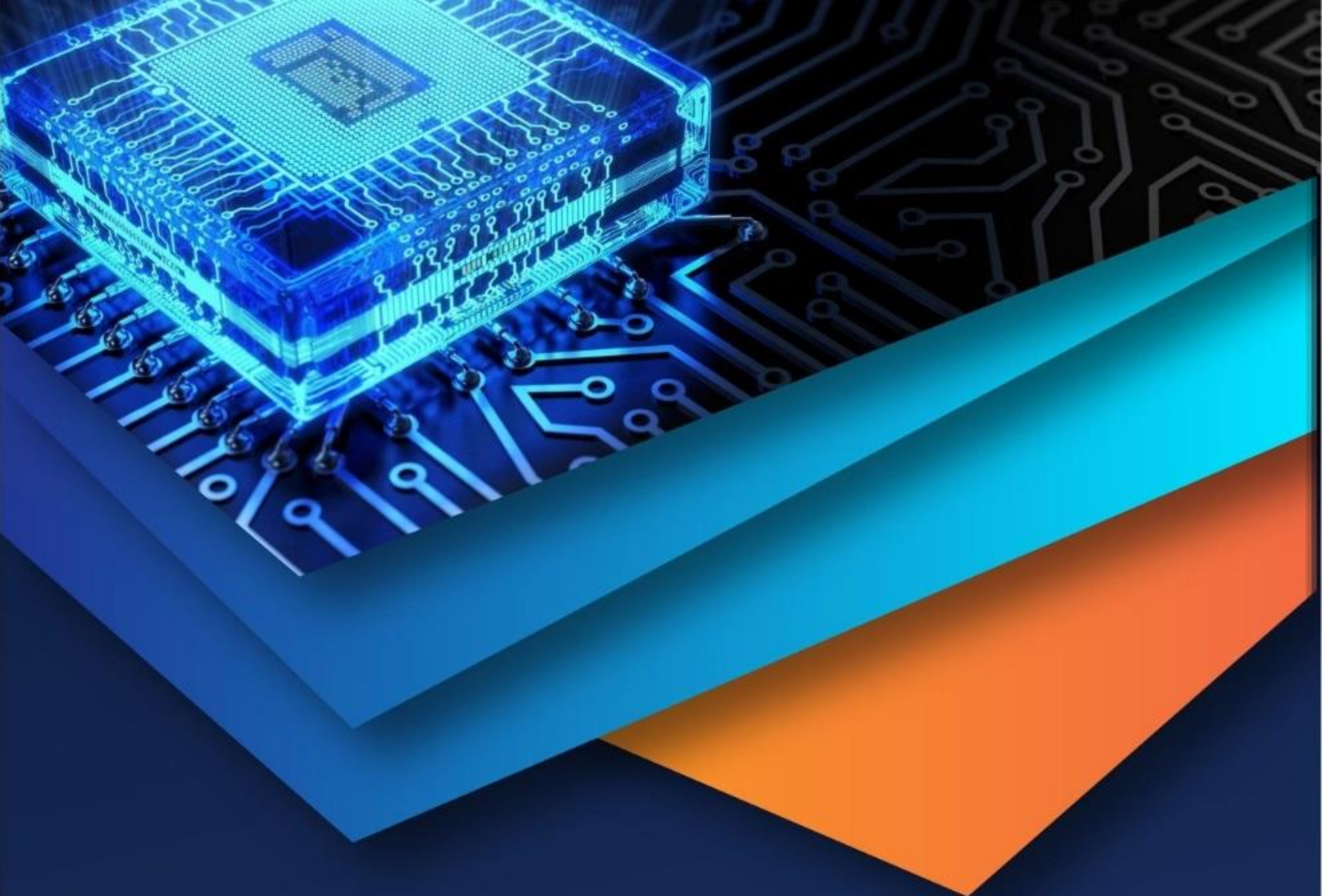

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