A Review On Application Of Defect Analysis And Optimization For Quality Control In the Plywood Manufacturing Industry

Amruthasree Rajan[1], Sajan M P[2]

[1]PG Student, Department of Mechanical Engineering, G E C Thrissur, Kerala, India
[2]Associate Professor, Department of Mechanical Engineering, G E C Thrissur, Kerala, India

---

Abstract - *Customer expectations and needs are growing day by day causing tough competition between the industries to produce the best. Defected products when sent to the market will give rise to high customer dissatisfaction. This has brought out the process of Quality control to maintain the quality of the products. Defect analysis is the best possible method to identify and reduce the defects in the industry and reduce the rework cost in the industry.Several studies have illustrated the analysis of defects and cost optimization to control the quality in plywood and other industries. Researchers are still proceeding to identify better methods for defects analysis and optimization to provide quality products and optimize the cost.*

Key Words: *Defects analysis, rework cost optimization, quality control.*

1. INTRODUCTION

The world of industries is one of the fast-growing and competitive sectors which demands the best quality products and services. To withstand this competition high quality of the product should be maintained. only then the producers can satisfy the ascending needs of the customers. A proper quality control program in the firm should be structured which can ensure the product quality with minimum defects. In the industries like of plywood, there is high chances to produce the defective products due to the size and complexity. It involves the testing of units to determine if they are within the final product specifications. The main goal to implement quality control in an organization will be to enhance the product quality and reduce risks, increase production efficiencies, and gain customer loyalty. All the successful companies will have these goals gained mainly because of their robust and functional quality control programs adopted. To achieve quality the company should provide quality products to the market and eliminate any defects. this can be achieved by defect analysis and optimization techniques in a company. Defects when are identified and analyzed congruously then they can be corrected easily so that the company can deliver quality products to the customers and gain better customer satisfaction and more market demand. There are many successful steps taken by the large plywood producers for defectoscopy in plywood to reduce the cost spent after the delivery of product which has given them better profits andmarket.

2. A REVIEW OF THE APPLICATION OF DEFECT ANALYSIS AND OPTIMIZATION FOR QUALITY CONTROL IN THE MANUFACTURING INDUSTRY

Ei Mu Hlaing et.al, [2021] is an analysis of product qualityproblems in plywood production which aims at the root cause analysis of quality problems in the plywood manufacturing process and identifies the solutions to tacklethem. For the study, the researchers have collected the datafrom the plywood factory analyzing the manufacturing processes and defect data. Uneven thickness and high moisture content were the two main problems identified bythe researcher. These results were confirmed using Statistical Process Control (SPC) tools like pareto chart andcheck sheet. Solutions were also proposed by the researcher to reduce the defects and improve the quality of the plywood sheets.

Avinash Juriani [2015] this study is an industrial case study to analyze casting defects in foundry and their remedial measures. The casting of a product should be properly done to eliminate the casting defects in the plant. Most of the casting defects were identified in the paper, from which the critical casting defects are found using the lean six sigma tool, and root causes analysis. From the defects analysis technically feasible remedies were given to reduce the casting defects and improve the quality of the casting. These remedies can be used as control measures for quality control with the concept of zero defects.

S. Krishna Priya et.al, [2019] is a case study on the implementation of lean six sigma to reduce non-value-added processes in the assembly line in an automotive assembly plant. A detailed defect analysis was done in the particular automotive assembly plant by examining and measuring all the processes happening in the plant. In the particular automotive assembly division chosen by the researchers, three non-value added activities and 12 crucial defects were identified. They used the lean six sigma strategies like Define Measure Analyze Improve Control (DMAIC) & Root Cause Analysis (RCA)

techniques from which the improvement strategies to eliminate the defects and increase performance were made possible. After the implementation of proposed solutions, they could reduce the non-value-added processes and defect ratio in the assemblyline of the plant.

Xinmin Zhang et.al, [2019] In this study the model and analyze the observed defect count data using. They attempted to predict the occurrence of defects online in steel products and identify the causal variable that may lead to defects. They used random forests which can ensure the non-negativity of the prediction. During the training phase,random forests were used to construct several regression trees. It then predicts the output as an average of the predictions of each tree. Then identified the causal variable using partial dependence analysis along with the variable importance measure. The results after implementing it in the real steel-making process, showed that random forests were better than the PLS, SVR, Poisson, and NB methods in prediction accuracy.

Umesh S. Patil et.al, [2017] is numerical optimization of casting for defects analysis and minimization. In this paperthey had classified the defects based on different relevant categories to analyze the casting defects. casting simulation or numerical optimization which is the process of imitating a real phenomenon using a set of mathematical equations implemented in a computer program. This is to Improve the Quality by predicting and eliminating internal defects like porosity, blow holes, cracks, yield improvement, and rapid development of new products. Casting Simulation Formulation is done in the AutoCAST software for the study and a low cost modified gating system was developed which shows the Hot spots in the cast part and suggests the proper location in the feeder, thereby minimizing the defects virtually like shrinkage porosity, blow holes, cold shuts, etc.

Yasuaki Yabuki et.al, [2000] illustrates an industrial experience of two practical approaches to the control of final product quality in semi-batch reactors. The traditional approach was the first approach considered And the secondapproach is mid-course correction policies. The control of final quality was achieved through a high degree of automation including all the reactor charging operations, stable temperature and pressure control. Traditional approach has shown to be very important to reduce the variability in the final product quality. The second approach was useful to compensate for the new disturbances that areaffecting the batch that is running at the current time. Basicautomation should be done efficiently and then implementthe second approach to get the best result was the major conclusion made in the research.

E.J. Lourenço et.al, [2016] this paper assesses the overall efficiency and waste of a production system with a case study of the plywood industry. The Multi-layer Stream Mapping (MSM) was developed for multi-domain analysis to assess whether resources, processes and other domains are used to their full potential. The costs resulting due to the inefficiency were quantified and also integrated in a simplified manner using the MSM method. A real case study in the plywood industry was carried out, implementing theMSM method application in a Medium Density Fibreboard (MDF) finishing line considering all the resources and materials consumed in each unit process. The overall efficiency was assessed and improvements actions were identified and evaluated.

O O Pinchevska et.al, [2017] This paper Research about the quality inspection in plywood using acoustic methods. Due to the large size of the plywood it is more prone to the size defects so shock method was found easier to implement than other non-destructive testing methods non-destructivetesting methods NDT. The existing classical shock method is carried out by the absolute values of the deviations with respect to the relative oscillatory processes characteristics of the plywood. Results were compared with the known most accurate value which is obtained from the ultrasonic methods. The highest correlation revealed that ultrasound has such a parameter of the shock sensor ,that is coefficient of harmonic distortion from which the schock method can be used as an elite method for defectoscopy in plywood to maintain the quality of the plywood products.

3. CONCLUSION

Defect analysis and optimization in plywood manufacturingcan be done using many tools and softwares with respect to the manufacturing practices chosen. Lean tools are easily applicable in case of plywood manufacturing to identify the major defects happening. Rework cost can also be identified and reduced using numerical methods and there are statistical tools and softwares to solve them. These when practiced, the industry can reduce the defective products and reworks that are causing unnecessary expenses and therebyincrease cost minimization and customer satisfaction.

REFERENCES

[1] S. Krishna Priya, V. Jayakumar and S. Suresh Kumar, (2018), Defect analysis and lean six sigma implementation experience in an automotive assemblyline, Materials Today: Proceedings

[2] X. Zhang, M. Kano, M. Tani, (2020), Defect analysis and lean six sigma implementation experience in an automotive assembly line, Control Engineering Practice

[3] Ei Mu Hlaing, Aung Myo Lwin, (2021), A Study on Analysis of Product Quality Problems in Plywood Production of No (2) Plywood Factory in Myanmar, International Journal of Trend in Scientific Research and Development

[4] Avinash Juriani,(2015) Casting Defects Analysis in Foundry and Their Remedial Measures with Industrial Case Studies IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE), Volume 12 Pages 43-54

[5] Umesh S. Patil1 , Dr. K. H. Inamdar,(2020) Numerical Optimization of Casting for Defects Analysis and Minimization: A Review, International Journal of Advance Research in Science and Engineering

[6] Yasuaki Yabuki, T Nagasawa, J F MacGregor (2000) An industrial experience with product quality control in semi-batch processes, Computers and Chemical Engineering

[7] E.J. Lourençoa , J.P. Pereiraa , R. Barbosaa , A.J. Baptista (2016), Using Multi-layer Stream Mapping to assess the overall efficiency and waste of a production system: a case study from the plywood industry, Procedia CIRP

[8] Pin-Shou Ting , Kun-Jen Chung (2013) Remarks on theoptimization method of a manufacturing system with stochastic breakdown and rework process in supply chain management, Applied Mathematical Modeling

[9] O O Pinchevska, O S Baranova (2019) , Research of plywood quality by acoustic methods, Materials Science and Engineering

[10] Kumar, S., Satsangi, P.S. and Prajapati, D.R. (2013), "Optimization of process factors for controlling defects due to melt shop using Taguchi method", International Journal of Quality & Reliability Management, Vol. 30 No.1, pp. 4-22