

Improvement in the Performance of Computer Numeric Controlled (CNC) Router by OEE for Digital Pattern Manufacturing

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Abstract

The overall equipment effectiveness is an indicator of the improvement of the process. This paper focuses on overall equipment effectiveness. This paper aims to improve the digital patterns' production by extending the computer numeric controlled (CNC) router capability. It would help to capture the day-to-day fluctuations in the manufacturing process and performance of the CNC router. In this research, the CNC router's performance was analyzed, and the root cause was identified as it was the bottleneck of the process. For data analysis, checklists were designed which identified the value-added and non-value-added activities that resulted in underutilization of the "Availability." After studying the current scenario, it was justified that the CNC router was underutilized, so the focus was to optimize the utilization of the router's availability. There were six significant problems identified from the checklist: machine breakdown, low air pressure, management loss, unavailability of the operator, unavailability of the tool, and heat up due to high feed. After identifying the significant problems, Pareto analysis was conducted to check each problem's impact on utilizing the "Availability" of the CNC router. The Pareto analysis results indicated that 49% of the total loss time was due to the machine breakdown, whereas 11% of total loss time was due to low air pressure. These two problems were significant and targeted for improvement. After selecting the significant problems, a cause-and-effect diagram was used to identify the reasons for these losses. It was observed from the cause-and-effect diagram that the machine breakdown's possible causes were maintenance problems, flawed method or delay in lubrication, and poor mechanism of the dust collector. For process optimization, preventive maintenance was adopted to reduce the maintenance's impact on the machine breakdown. A checklist was maintained, which helped to improve the utilization of "Availability" by 10%. A dust collector was installed to make the machine tidy, which improved the utilization of "availability" by 4%. As a result, the percentage of "Availability" increased to 90% from 61%.

Keywords

Overall Equipment Effectiveness, Digital Pattern Manufacturing, Process Improvement, Performance measurement

Biographies

Abdul Hannan is a Lab Engineer at the Institute of Quality and Technology Management, University of the Punjab. He earned his B.Sc. and M.S. Industrial Engineering and Management from the same Institute. Earlier, he worked as an In-charge Quality Assurance at Qadri Brothers Pvt. Limited, a leading industry in heavy casting and machining, has served there for two years from 2018 to 2020. He also served SANPAK Engineering Industries Pvt. Limited, a leading industry in the HVAC system of automotive, for one and a half years from 2016 to 2018. His research interest includes Manufacturing, Simulation, Material Science, Lean and Six Sigma.

Shazray Khan is currently employed at the Institute of Quality and Technology Management, the University of the Punjab, as a Research Scholar. She earned her B.Sc. and M.S. Industrial Engineering & Management (IEM) degrees from the University of the Punjab. Currently, she is also working as a visiting Lecturer in the same department. She

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Sana Hassan is a lecturer at Institute of Quality and Technology Management, University of the Punjab Lahore. She has done her MS in Manufacturing Engineering with specialization in Metal Ceramics composites. She is currently doing her PhD from UET, Lahore in the same field with area of research as Hard Machining. Currently she also serves the department as Incharge Internship, making sure the placement of students in different industries during the summer break. She is a member of CQI team, responsible for implementing and evaluating the OBE system at IQTM. She is also Incharge Industrial Liaison office, facilitating the students in job hunting. Meanwhile, she teaches different subjects at undergraduate level. She is also actively involved in supervising thesis of BSc IEM students.