Study of the Overall Equipment Effectiveness of a Cutting Process through a Digital Format

María de los Ángeles Martínez-Mercado, Azucena Minerva García-León, Daniela del Carmen Bacre-Guzmán and Elva Patricia Puente-Aguilar
Professor
School of Chemical Science
Universidad Autónoma de Nuevo León
San Nicolás de los Garza, Nuevo León, México
mariadla.martinezmrc@uanl.edu.mx, azucena.garcialn@uanl.edu.mx
carmen.bacregzm@uanl.edu.mx, elva.puenteagl@uanl.edu.mx

Abstract

In this research, the indicators that influence the calculation of the overall equipment effectiveness (OEE) of a cutting line in a manufacturing company were analyzed. The main objective was to examine the main causes that directly affect the increase in the production capacity of the line. The data collection regarding task performance, daily production, amount of nonconforming product and compliance with the daily program was categorized and standardized, in order to determine the construction of an interactive spreadsheet. The digital format included data recording, calculation of OEE indicators per machine and per product, frequency of events reported as downtime per day and per month, and also calculation of economic losses due to monthly inefficiency per product type. Subsequently, the results of the OEE calculations were checked and validated. Moreover, the results were graphed in order to visualize the behavior of the line. The results showed that the line presents a low OEE level of 65%, due to downtime per machine and per product, causing considerable economic losses. The causes of the inefficiency were mainly the lack of raw material and the problems with the gumming of the product. The factors that affected the OEE were non-conforming product rolls. Finally, it is concluded that the digital format designed for the OEE calculation is a successful tool for efficient decision-making in the organization, so it is recommended to implement it in other production lines and plants.

Keywords
Overall equipment effectiveness, Cutting line, Digital format.

Biographies
María de los Ángeles Martínez-Mercado works a full-time Professor and Leader of the Academic Body UANL-420 Operational Excellence 4.0 in the Department of Industrial Engineering and Management and as Head of Educational Innovation at Chemical Science College at the Universidad Autónoma de Nuevo León, Mexico. She is an Industrial Engineering with minor in Management at Universidad Autónoma de Nuevo León, Mexico. She obtained a Master's Degree in Industrial Engineering with an emphasis in Manufacturing at Universidad Autónoma de Nuevo León, Mexico and a Ph.D. in Educational Sciences at Universidad Autónoma de Coahuila, Mexico. She has published articles in magazines and conferences about: Quality and productivity of the human factor in the fourth industrial revolution, Efficiency of machinery, equipment and processes lean 4.0 and Training of skills in Industrial Engineering 4.0. She has participated as Coordinator of the Work Study Academy. She participated as Co-Responsible for 20 School-Company Linkage Projects. She worked for 18 years in various companies in the Private Industry as an Industrial Engineer and Industrial and Commercial Sales Administrator.

Azucena Minerva García-León is a full-time Professor at the School of Chemical Sciences of the *Universidad Autónoma de Nuevo León* (UANL). She is a member of the undergraduate and graduate in Industrial Engineering, teaching advanced courses on statistical process control, probability, statistics and experimental design, six sigma, total quality management. She holds a Ph.D. degree in Applied Economic from the *Université Grenoble Alpes*. She earned a M.S. degree in the Industrial Engineering from *Grenoble INP Génie Industriel*. She received her M.S. and B.S. degrees in Industrial Engineering from the *Universidad de la Américas-Puebla*. She chaired the program of

Master of Industrial Engineering at UANL. She has published journal and conference papers. She has participated as speaker in several conferences in Mexico, USA and France. She provides instruction to industrial sector on Lean Sigma for certifications in Green Belt and Black Belt. She has been working as researcher in the field of risk analysis, lean manufacturing, six sigma, analysis and experimental design, production processes reliability and optimization.

Daniela del Carmen Bacre-Guzmán is a full-time Professor and Head of the Academic Department of the Metrology Laboratory in the Department of Industrial Engineering and Management the Universidad Autónoma de Nuevo León, San Nicolas de los Garza, Nuevo León, México. She is an Industrial Engineer from the Instituto Tecnológico de Ciudad Madero, Mexico. She earned a Master's Degree in Manufacturing Systems from the Instituto Tecnológico y de Estudios Superiores de Monterrey, México. She is currently a doctoral student in the Strategic Management program at the Warden Institute, Mexico. She has published journal and conference papers. Quality and productivity of the human factor in the fourth industrial revolution and Training of skills in Industrial Engineering 4.0.

Elva Patricia Puente-Aguilar is a professor and Chief of Lean Manufacturing Laboratory at Chemical Science College at Universidad Autónoma de Nuevo León since 2010, teaching courses such as Industrial Engineering, Work Study, Manufacturing Processes, Material´s Technology and Production Control. She earned a B.Sc. in Industrial Engineering with minor in Management and master's degree in business administration from Universidad Autónoma de Nuevo León. Currently she is a PhD student in Project Engineering at Universidad Internacional Iberoamericana. She has got ten years experience in manufacturing industry with expertise in the areas of material and production planning, manufacturing engineering, quality engineering and new products engineering. She has participated as co-author and speaker in several conferences in Mexico and USA. Her research interests include design and optimization of operations, digital maturity and education and engineering linkage in production systems.