Strategies and Techniques to Enhance Productivity in North American Automotive Industry

Amir Abolhassani and Bhaskaran Gopalakrishnan
Industrial Management Systems Engineering
West Virginia University
Morgantown, WV 26506, USA
aabolha@mix.wvu.edu, bgopalak@mail.wvu.edu

E. James Harner
Department of Statistics
West Virginia University
Morgantown, WV 26505, USA
jharner@stat.wvu.edu

Abstract

The research investigates current strategies that help automobile manufacturers to enhance their productivity. The study utilizes robust statistical methods to define the most important factors on the Hours per Vehicle (HPV) in the automotive industry in North American manufacturing plants. Data are synthesized using a uniform methodology from information supplied by the plants from 1999-2007. Overall, there are 682 manufacturing plants in the statistical sample from ten automobile manufacturers brands. During the study period, the HPV was reduced 51.84 minutes on average in each year.

During a comprehensive literature review, thirteen important factors that affect HPV were defined. Annual production volume, flexible manufacturing, and year factors improve HPV. However, vehicle variety, model types, annual working days, and launching a new model impact the HPV negatively. On average, the HPV is lower for Japanese and joint ventures in comparison to American automotive manufacturers by 1.92 and 1.86 hours, respectively. Launching a new model and adding a new variety in body styles or chassis configurations raises the HPV up to 2.9 and 0.38 hours, respectively, depending on the vehicle class. The HPV regression equations that are provided in this research may be used effectively to help automotive manufacturers to set guidelines to improve their productivity.

Keywords
Productivity improvement; Automotive industry; Hours per vehicle.

Biography

Amir Abolhassani is a Ph.D student pursuing a degree in Industrial Engineering at West Virginia University (WVU) and is a Graduate Research Assistant at the Industrial Assessment Center (IAC). He has held various positions associated with productivity improvement in the automotive manufacturing facilities from 1999 to 2012. His areas of research interest are energy efficiency, lean manufacturing, productivity improvement, and quality. Email: aabolhas@mix.wvu.edu

Bhaskaran Gopalakrishnan is a Professor of Industrial and Management Systems Engineering (IMSE) at West Virginia University (WVU) and Director of the Industrial Assessment Center (IAC) funded by the US DOE. Through the IAC and as a private consultant, he has conducted numerous industrial and energy assessments as well as plant wide energy assessments for manufacturing facilities and has published widely in this field. Dr. Gopalakrishnan obtained his B.E. (Hons) degree in Production Engineering from the College of Engineering at Guindy, University of Madras, India, M.S. degree in Operations Research from Southern Methodist University, and Ph.D degree in Industrial Engineering and Operations Research from Virginia Tech. He is a Certified Energy Manager (CEM) certified by the Association of Energy Engineers, Atlanta, Certified Practitioner in Energy Management Systems (CPEnMS), and a US DOE Qualified AirMaster+ Specialist, SSAT Qualified Specialist, FSAT Qualified Specialist, PSAT Qualified Specialist, and a PHAST Qualified Specialist. He is a registered Professional Engineer (PE) in the State of West Virginia. His areas of research interest are industrial energy conservation, waste reduction, and productivity improvement. Email: bgopalak@mail.wvu.edu

E. James (Jim) Harner received his PhD in Statistics and Biometry from Cornell University in 1972. Prior to that he received a BS in Industrial Engineering from West Virginia University in 1967. Currently, Dr. Harner is Professor of Statistics at West Virginia University (WVU). From 1997 to 2014 Professor Harner was Chair of the WVU Department of Statistics and from 2014 to 2015 he was Director of Data Science. From 2002 to 2016 he was Director of the Bioinformatics and Biostatistics Core in the WVU Mary Babb Randolph Cancer Center. Professor Harner has published about 70 papers in statistics or related areas during his tenure at West Virginia University. He has been PI, Co-PI, or Co-I on over 100 grants and contracts from agencies such as NIH, NSF, and NIOSH. He has written a book on introductory statistics for undergraduates and is under contract for two other books at the graduate level. During the last five years Professor Harner began working in data science. He has developed courses and programs in data science and currently he is involved with several open source projects involving big data. Email: eharner@mix.wvu.edu