Available online at www.sciencedirect.com

SciVerse ScienceDirect

Procedia Engineering 41 (2012) 1702 – 1707

Engineering Procedia

www.elsevier.com/locate/procedia

International Symposium on Robotics and Intelligent Sensors 2012 (IRIS 2012)

Simulation of Integrated Total Quality Management (TQM) with Lean Manufacturing (LM) Practices in Forming Process Using Delmia Quest

Noor Azlina Mohd.Salleh, Salmiah Kasolang, Ahmed Jaffar*

Advanced Manufacturing Technology, Centre of Excellence
Faculty of Mechanical Engineering, Shah Alam 40000 Selangor, Malaysia

Abstract

Study on TQM in Malaysia is first reported in 1997 while LM in 2010. Since then, voluminous studies reported that TQM and LM can bring more benefits to a company but there is still lack of case study on company that has implemented both initiatives. Preliminary status of Integrating TQM and LM has been established from survey conducted on the highly practices LM in Malaysian automotive companies in 2011. The findings from the survey are used in order to evaluate the Integrated TQM and LM in a Malaysian Automotive Company. An Integrated Total Quality Management (TQM) with Lean Manufacturing (LM) is a system comprises TQM and LM principles. This system focuses in achieving total customer satisfaction by removing eight wastes available in any process in an organization. This paper presents the Integrated TQM and LM practices by a forming company. The integrated practices are an adaptation combination of four models award, ISO/TS16949 and lean manufacturing principles from Toyota Production System, SAEJ4000 and MAJAICO Lean Production System. A case study of the forming company in Selangor has been conducted and simulation of the process is done by Delmia Quest Software. It was found out that the company has been practicing TQM and LM separately. Other type of software can also be used to measure the level of TQM and LM implementation and can determine whether the model is adaptable for other industry and for all type of manufacturing process. This is the initial case study that combined 4 awards practices, ISO/TS16949, Toyota Production System, SAEJ4000 and MAJAICO Lean Production System (LPS).
Lean Total Quality (GLTQ).

Keywords: Total Quality Management, Lean Manufacturing, Automotive Industry, Operational Engineering Management and Manufacturing Simulation Software.

Nomenclature

LM	Lean Manufacturing
TQM	Total Quality Management
EMS	Environmental Management System

* Noor Azlina .Mohd.Salleh was with the Quality Management Section Hicom-Honda Manufacturing Sdn.Bhd and Research and Development Department PROTON Berhad. She is now a Ph.D student in Faculty of Mechanical Engineering Universiti Teknologi MARA Malaysia. (*E-mail address:* azlina_salleh@ yahoo.com).
Salmiah Kasolang is now an Associate Professor and Deputy Dean (Research and Industrial Linkage) of Faculty of Mechanical Engineering Universiti Teknologi MARA Malaysia. (*E-mail address:*salmiahk@salam.uitm.edu.my).
Ahmed Jaffar is now a Professor and Dean of Faculty of Mechanical Engineering Universiti Teknologi MARA Malaysia. (*E-mail address:* ahmedjaffar@salam.uitm.edu.my).

1877-7058 © 2012 Published by Elsevier Ltd.
doi:10.1016/j.proeng.2012.07.371

MAJAICO	Malaysia Japan Automotive Industries Cooperation
LPS	Lean Production System

1. Introduction

Automotive industry in Malaysia started in 1983 with the establishment of PROTON Berhad. The industry has started much earlier. TQM and LM coined in 1985 by different entity. TQM is coined by U.S Naval Air System while LM by Krafcik in International Motor Vehicle Program in Massachusetts Institute of Technology. However, TQM is first discovered in 1997 [1] for Malaysian Automotive Industry but the implementation of LM is only found in published paper in 2010 [2] a nd [3]. However, the LM implementation can be said to start in 2006 with the establishment of Malaysia Japan Automotive Industries Cooperation (MAJAICO) program under SME Corporation Malaysia which is one of the agencies under Ministry of International Trade and Industry (MITI). This program is a collaborative effort between the Malaysian government and the Japanese Government towards inculcation Lean Production System in this country from 2006 to 2011. However, due to the high demand of MAJAICO LM system in automotive companies, the program is extended in 2012 with different organization which is Malaysia Automotive Institute (MAI). MAI which is incorporated on 16 April 2010 is a non-profit organization under the custodian of MITI that functioned as a focal point and coordination centre for the development of local automotive industry in all matters related to Malaysian automotive industry [4].

Previous studies are available on manufacturing simulation such as NX-IDEAS, Star-CD, Micro Saint Sharp and ProModel and the advantages of these softwares vary based on the application type and the needs of the company [5]. Besides that, simulation models like Delmia Quest when combined with Catia and Product Data Management (PDM) have helped to improve communication between different units and departments. Simulation models have helped to generate more constructive proposals and ideas before the actual implementation. However, simulation works requires high software cost and high design engineers cost which not only need knowledge and skills on the software but also in the manufacturing processes [6]. A simulation model based on object oriented discrete system software eM-Plant on main shaft production line has been able to come out with the production line throughput, utilization and bottleneck operations and verifies that modelling and simulation technology could be successfully used in manufacturing industry [7].

This paper presents a case study on LM implementation for Integrated TQM with LM practices in a forming automotive company. The paper starts with the methodology and followed with the findings from TQM and LM practices in the forming process company, line improvement activity via simulation and ended with conclusion.

2. Methodology

The case study is based on the adaptation of MAJAICO Lean Production System method, Toyota Production System, SAEJ4001: Implementation of Lean Operation User Manual which has been issued in November 1999 by The Engineering Society for Advancing Mobility Land, Sea, Air and Space and four awards which are Malaysia Quality Award, Deming Prize Award, Malcolm Baldridge National Quality Award, European Award and ISO/TS16949. The case study is focused on the verification of operation control practices in the Integrated TQM and LM Systems [8].

The company were visited in order to judge the current production condition before improvement and to collect data. All the data and information gathered during the visit are then used for the Delmia Quest Simulation. Some actual data that are needed from the company will be current process flow, cycle time and number of labours employed. The simulation is conducted despite of actual improvement at production line so that company production will not be disrupted.

Delmia Quest Software is powerful tools that can create a virtual manufacturing environment that allow the simulation of actual processes. With this, the company understudy will know the effect of the integrated TQM and LM from the simulation first before actual improvement of the processes and will give initial expected outcome of the improvement.

3. Results and Discussion

3.1. TQM and LM Practices in Forming Process Company

Company A which was established in 1999 and located in Rawang, Selangor is a privately 100% Malaysian owned and has annual turnover of sales of RM74 million in 2009 with total employees of 350. According to Malaysia SME Corporation definition of an enterprise [9], Company A is considered as a large enterprise based on the annual sales turnover and number of employees. Company A is specializing in car interior parts and NVH products to its customers namely PROTON Berhad, Perodua, Honda and Toyota. Some of the products are headlining, floor carpet, pad dash panel, door trims, package tray and REM products. Currently, Company A has not exported any products. This company has Research and Development capability but no product is designed in-house. All of the products manufactured in this