Investigation of the Philosophy Practised in Green and Lean Manufacturing Management

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ABSTRACT

Green manufacturing management has attracted research attention in the recent past. In this paper, an attempt is made to review the status of literature and philosophy practised in Green manufacturing management. A number of articles and refereed journals are reviewed and classified into the types of the industry, with the focus on automotive industry. Knowledge, understanding and culture of green manufacturing philosophy within this focused industry community are captured, in order to develop the theoretical framework and design for Green manufacturing management.

Keywords: Automotive Industry, Green Manufacturing Management, Knowledge, Lean Manufacturing Management, Sustainable Manufacturing

1. INTRODUCTION

Manufactured products are the key elements of human expenditure, whether as finished or semi-finished. Manufacturing processes are one the key stages in the life-cycle of products, which begins with natural resource extraction and ends with final disposal. Basic industries sub-sector such as iron and steel, cement, chemicals and chemical products, pulp and paper, aluminium, and textile and leather supply the semi-finished, or intermediate goods, used to build end-products used in daily life. However, today’s manufacturing is inflicted with the environment health issue which has become a topic of concern today (United Nation [UN], 2011). Since 40 years ago, several highly visible environmental disasters have demonstrated the importance of having a comprehensive environmental strategy in place (Walton, Handfield, & Melnyk, 2008). Thus, there is a need for this sector to become more environmental friendly or eco-friendly which can be simply pronounced as ‘green’. UN (2011) highlighted 3 major challenges for manufacturing sector today to become ‘greener’. The first one is the natural resource scarcity which comprise of land, metal, water and fossil fuels resources. Next, is the industrial cost to air, water, noise...
and other pollutions. Finally, this sector also needs to deal with the production of hazardous substance and waste.

As are true of Total Quality Management (TQM) and other improvement initiative programmes, environmental strategies must be conceived and supported not only by top management, but also deployed in every functional area of an organization to be meaningful (Walton et al., 2008). With current competitive business environment and environment-friendly awareness, management should not only focus on the initiatives such as TQM, lean manufacturing, performance measurement, and supply chain but also the sustainability aspects of the initiatives.

The purpose of this paper is to review the main issues discussed by the scholars in the respective field regarding this matter. This paper will emphasize on the previous theoretical framework associated with the adoption of environmental component into the manufacturing sector. Therefore, we did not review specifically the methods used and the implementation. Prior to this, we will also discuss the theoretical background which relates green manufacturing management (GMM) and other components that should be focus on in order to develop a better model for green manufacturing system.

2. GREEN MANUFACTURING MANAGEMENT

Green manufacturing management (GMM) is a management system that contains only required resources and materials, manufactures only required quantity of quality products on time that meet customers’ demands which driven the aim to reduce environmental impact. The center for Green Manufacturing of the University of Alabama defines the goal of green manufacturing as “To prevent pollution and save energy through the discovery and development of new knowledge that reduces and/or eliminates the use or generation of hazardous substances in the design, manufacture, and application of chemical products or processes” (Center for Green Manufacturing [CGM], 2011).

The idea behind GMM is the manufacturing planning and control (MPC) system of the materials and information flow which involve initiatives of manufacturing resources planning (MRP II) and lean manufacturing (King & Lenox, 2001; Rothenberg, Pil, & Maxwell, 2001). In addition, Total Quality Environmental Management (TQEM) is integrated to ensure the quality of the processes and products of the system which contribute the ecological sustainability. The capabilities of continuously improving the processes by identifying and eliminating manufacturing wastes are essential for effectiveness of GMM. The main benefit of effective GMM is high ratio of quality to cost of the products manufactured which finally contribute to high profitable organisation with minimum pollution. Green manufacturing has evolved from production shop floor to the whole organisation and from the individual organisation to all organisations in the supply chain (Hines, Holweg, & Rich, 2004; Womack & Jones, 2003). The term itself is also extended to the terms such as green remanufacturing, green operations, green design, and green supply chain (Srivastava, 2007).

2.1. Environmental Management System

Perhaps the most important element for a company to practice GMM is to execute Environmental Management System (EMS) into their business operations. The United States Environmental Protection Agency (EPA) defines EMS as “a set/system of processes and practices that enable an organization to reduce its environmental impacts and increase its operating efficiency” (Environmental Protection Agency [EPA], 2003). An EMS integrates environmental management into the organization’s overall management system by identifying the policies, environmental targets, measurements, authority structures and resources necessary to produce both regulatory compliance as well as environmental performance “beyond compliance”. (Rendell & McGinty, 2004). Through this process of integration, a continual
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