

The Implementation of Green Supply Chain Management Practices in Automobile Industry

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ABSTRACT: This research aims to survey current green activities in Automobile parts' manufacturers in India and to evaluate green supply chain management. To survey current green activities in automobile parts' manufacturers in India, few manufacturers are case studied who provided in-depth interview about green procurement, green manufacturing, green distribution, and/or reverse logistics. To evaluate green supply chain management, the questionnaire related to investigate GSCM practices, measure GSCM performance, and explore GSCM pressure/ driver within Indian automobile industry is used to obtain survey results. Then suggestions to develop GSCM in Automobile industry are presented.

KEYWORDS: Supply Chain Management, Green Supply Chain Management, Go Green, Reuse, Recycle, Reduce

I.INTRODUCTION

Supply chain management is the coordination and management of a complex network of activities involved in delivering a finished product to the end-user or customer. All stages of a product's life cycle will influence a supply chain's environment burden, from resource extraction, to manufacturing, use and reuse, final recycling, or disposal^[1]. Beyond this definition with adding the "green" component, it refers to green supply chain management (GSCM) which is defined as "green procurement+ green manufacturing+ green distribution+ reverse logistics". The idea of GSCM is to eliminate or minimize waste (energy, emissions, and chemical/hazardous, solid wastes) along supply chain^[2]. Environmental issues under legislation and directives from customer especially in the US, the European Union (EU), and Japan become an important concern for manufacturers. As a more systematic and integrated strategy, GSCM has emerged as an important new innovation that helps organizations develop "win-win" strategies that achieve profit and market share objectives by lowering their environmental risks and impacts, while raising their ecological efficiency^[3]. Recent studies of GSCM can be separated into two ways: framework for GSCM, and performance measurement. Some frameworks propose how to improve the collaborative relationships between manufacturers and suppliers, to explore the gaps between the framework and the present state, to aid managerial decision making, or to develop general procedure towards achieving and maintaining the green supply chain^[1,5,6]. A set of performance measures is used to determine the efficiency and/or effectiveness of an existing system, to compare competing alternative systems, or to design proposed systems by determining the values of the decision variables that yield the most desirable levels of performance^[1,2,6]. This research aims to survey current green activities in Automobile parts' manufacturers in India and to evaluate green supply chain management.

II. AUTOMOBILE INDUSTRY IN INDIA

Automobile industry plays an important role to India's economic growth in top ranking.^[7,8] In 2009, India emerged as Asia's fourth largest exporter of passenger's car, behind Japan, South Korea, and Thailand,^[9] overtaking Thailand to become third in 2010. In recent years Automobile manufacturers face some barriers such as instability in manufacturing costs, skill labour need, technology change, exchange rate, and impacts of high competitiveness, environmental legislation and directives as well.

Reverse views of automobile supply chain also challenge with incremental wastes of end-of-life (EOL) products such as:

1. **NATURAL ELVS:** This refers to a vehicle that has come to the end of its life due to natural wear and tear (usually vehicles over ten years old). This type of ELV will simply be de-polluted and then recycled for scrap metal.

2. **PREMATURE ELVS:** This type of ELV refers to those vehicles that have come to the end of their life for unnatural reasons such as accident, fire, and flood or vandalism damage. However, rather than be scrapped, the insurance companies will categorise and approve for these vehicles to be sold complete as damaged-repairable salvage, or for Parts dismantling only. In addition low quality of electronics products is imported with higher rate which has increased waste from short lifetime. Small number of effective recycling and disposition system, incomplete collection infrastructure, lack in incentives to separate recycled or hazardous substances, ineffective law enforcement, and technology limitations in community level also are obstacles for waste management.



Figure 1: 3 Rs

III. GREEN SUPPLY CHAIN MANAGEMENT

Case study on three local Automobile parts manufacturer in Thirumazhisai, Chennai SIPCOT are made. Their products or services are related to production of Automobile parts. Also, several stakeholders in EOL automobile parts: used automobile parts (2nd hand markets), waste collectors (Moore Market) are involved.

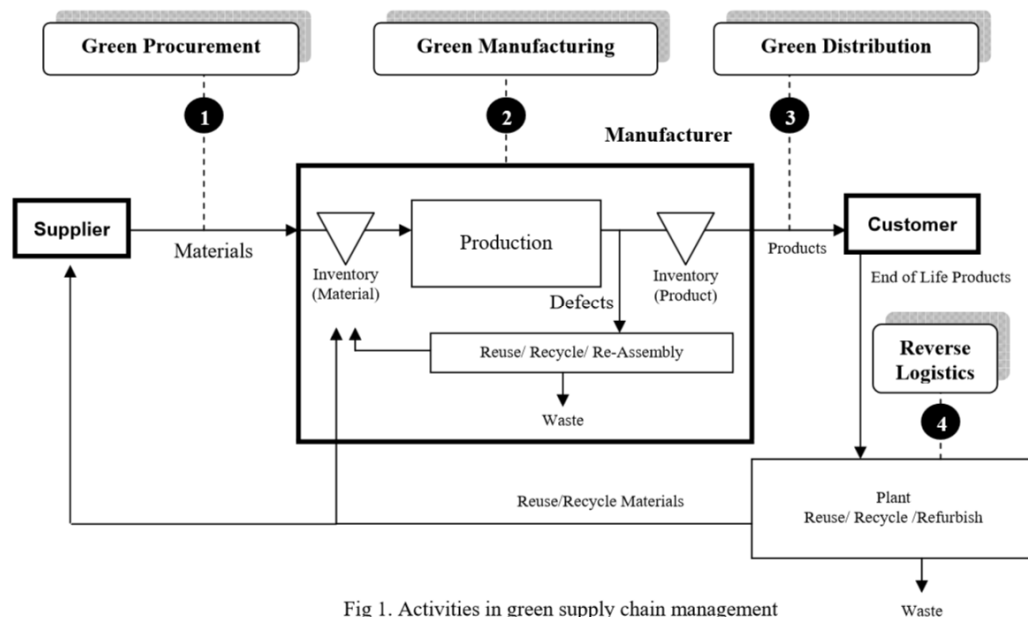
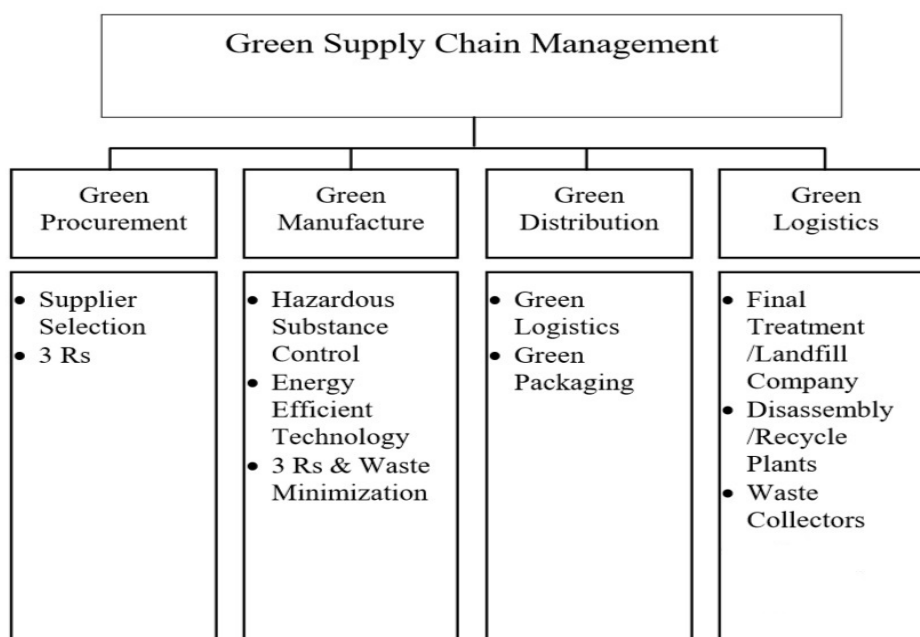


Fig 1. Activities in green supply chain management

1) GSCM practices in automobile parts manufacturing units:

Automobile parts manufacturing companies has initiated multiple dimensions of GSCM practices, including internal environmental management, green purchasing, green marketing and eco-design.

Producing environmentally sound engines is one key dimension they use to establish their environmental image, and thus gain and keep competitiveness. Within this competitive market, leading manufacturers put forward a call of "Green plant, environmental engines". They have worked on furthering their environmental image by producing engines with low emissions, low fuel consumption, low noise, as well as high dynamic functions and reliability.



A. Green Procurement:

Green procurement is defined as an environmental purchasing consisting of involvement in activities that include the reduction, reuse and recycling of materials in the process of purchasing. Besides green procurement is a solution for environmentally concerned and economically conservative business, and a concept of acquiring a selection of products and services that minimizes environmental impact [10]. The findings in green procurement activities of Indian manufacturers are presented:

- *Supplier selection:*

- (1) Purchase materials or parts only from “Green Partners” who satisfy green partner environmental quality standards and pass an audit process in following regulations for the environment-related substances.
- (2) Select suppliers who control hazardous substances in company’s standard lists and obtain green certificate achievements

- *Procurement process:*

- (1) Reuse or recycle – paper, parts container (plastic box/bag) (2) order via email (paperless).

B. Green Manufacturing

Green manufacturing is defined as production processes which use inputs with relatively low environmental impacts, which are highly efficient, and which generate little or no waste or pollution. Green manufacturing can lead to lower raw material costs, production efficiency gains, reduced environmental and occupational safety expenses, and improved corporate image [11]. The findings in green manufacturing activities of Indian manufacturers are presented:

- *Hazardous substance control:*

- (1) Lead free – replace other substances such as bismuth, silver, tin, gold, copper
- (2) Rinse parts with clean water instead of using chemicals and reuse water
- (3) Quality control in inputs at vendor site and recheck before processing

- *Energy-efficient technology:*

- (1) Reduce power consumption in products such as ramp load/unload technology in HDD
- (2) Increase product life-span resulting in higher efficiency and productivity
- (3) Improve machine uptime
- (4) Improve machine performance
- (5) Design product, for example compact design with improved features yet using fewer resources to produce, Strive for higher %recyclability and % recoverability for products as stipulated by WEEE directive, product exterior using bio-based plastics achieves high level of fire retardancy.

- *Waste minimization:*

- (1) Promotes reuse/recycle of parts
- (2) Enhance environmental consciousness via minimisation activities
- (3) Reduce indirect materials

C. Green Distribution

Green distribution are consists of green packaging and green logistics. Packaging characteristics such as size, shape, and materials have an impact on distribution because of their affect on the transport characteristics of the product. Better packaging, along with rearranged loading patterns, can reduce materials usage, increase space utilization in the warehouse and in the trailer, and reduce the amount of handling required [12]. The findings in green distribution and activities of Indian manufacturers are presented:

- *Green packaging:*

- (1) Downsize packaging
- (2) Use “green” packaging materials
- (3) Cooperate with vendor to standardize packaging
- (4) Minimize material uses and time to

D. Reverse Logistics

Reverse logistics is the process of retrieving the product from the end consumer for the purposes of capturing value or proper disposal [13]. Activities include collection, combined inspection/selection/sorting, re-processing/direct recovery, redistribution, and disposal. The findings in reverse logistics are presented:

- (1)Used Automobiles stores
- (2)Disassembly/recycle plants

SUGGESTION

To obtain efficient and effective in GSCM, collaborative among important stakeholders in Automobile industry must be strongly concerned. After making discussion about research results with experts and manufacturers, some important suggestions are noted here:

- Promote Eco design: Eco design as an activity that integrates environmental aspects into product design and development, the integrated activities lead to continual improvement of the environmental performance of the entire product through technological innovation. Developing environmentally friendly products is cause to change in product design using 2 principles:
 - (1) Designed to extend lifetime of product, it can be improved, repair, and re-use of products such as modular design.
 - (2) Designed for recycling / design for disassembly, after end of life products that can be more recovered
- Set rules for disposing automobile waste and consider more investment in recycle plants
- Propagate GSCM knowledge and encourage using environmentally friendly goods and services
- Set a direct responsible unit to take in charge of automobile waste only which will increase reverse logistics efficiently
- Promote refurbishing and recycling through campaigns/ activities to raise reuse/recycle awareness in electronics consumption
- Set a database unit to collect and record information about production, import/export data, and waste management (do traceability)
- Encourage team building and train skilled labours for reverse logistics management
- Raise the applications in Extended Producer Responsibility (EPR); EPR is an environmental protection strategy based on the "polluter pays" principle, by making the manufacturer of the product responsible for the entire life-cycle of the product and packaging they produce
- Promote Product Service System (PSS); services and product-service combinations are recognized as a potentially powerful concept for sustainable development. A product-service system (PSS) is a new trend that has the potential to minimize environmental impacts of both production and consumption. Thus, more traditional material intensive ways of product utilization are replaced by the possibility to fulfil consumers' needs through the provision of more dematerialised services

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