

Green Supply Chain Management – An Overview

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Abstract – In today’s scenario industrialization contributes in economic development and growth of the country. Various employment opportunities are available due to industries but on the other hand it is also responsible for environmental deterioration. Excessive growth of small scale industries, lack of pollution control policies, use of obsolete technologies, and improper waste disposal techniques are leading to weakening of natural resources, global warming, air, water and soil and noise pollution, generation of hazardous wastes and dangerous diseases too. Green supply chain management is one such tool that surely helps in waste management and reducing pollution. This paper explains what GSCM really is, how to implement this technique, how this method is playing vital role in protecting natural environment. It also explains the role of customers, suppliers, green and lean manufacturing in implementing GSCM its advantages and barriers.

Keywords- Green Supply Chain Management (GSCM), Green Manufacturing, Lean Manufacturing. Waste Management

I. INTRODUCTION

Green is the colour of nature, prosperity, growth and energy. As it is a colour of nature, protecting our environment from the ill effects of growing industrialisation and pollution and preserving it has become one of the most important issues.

An environmentally conscious supply chain, also called a green supply chain, is a new concept appearing in recent literature. GSCM emerged as one of the most important tools in order to achieve environmental safety goals. GSCM emphasises upon eradicating quantity of wastes caused by SCM and other conventional techniques. Using environmental friendly inputs and achieve organisational excellence without deteriorating environment. Stages in implementation of GSCM involves use of different tools green purchasing, green manufacturing and green marketing, green design [1]. and few more tools and techniques like lean manufacturing, six sigma, Kaizen,, Just in Time (JIT),and basic quality control tools Objectives of Green Manufacturing is to minimise wastes, reducing pollution providing safe working environment to the employees and to achieve ecological sustainability and economic goals [2]. Various definitions of GSCM which are reported in literature by various experts are presented in tabular format.[1].

TABLE I
 VARIOUS DEFINITIONS OF GREEN SUPPLY CHAIN MANAGEMENT

S N	GSCM Definition Reported in the Literature	Researchers and years	Ref.
1.	Green supply referred to the way in which innovations in supply chain management and industrial purchasing may be considered in the context of the environment.	Green , Morton and New (1996)	[3]
2.	Green supply chain management is as the practice of monitoring and improving environmental performance in the supply chain.	Godfrey (1998 ,p244)	[4]
3	Green supply chain management is adding ‘green’ component to supply chain management, including operations, green design, green manufacturing, reverse logistics and waste management.	Srivastava S.(2007)	[5]
4.	Green supply chain management is integrating environmental thinking into supply chain management	Gilbert (2000)	[6]

GSCM differs in several ways from SCM. Difference between GSCM and conventional SCM has been explained in this paper [7].

TABLE II
 DIFFERENCE BETWEEN GSCM GREEN AND CONVENTIONAL SCM

S N	Characteristics	GSCM	Conventional SCM	Researcher’s
1	Objectives	Ecological and Economic	Economic	Beamon (1999) [8], Gilbert (2000)
2	Ecological Optimization	High Ecological Impacts	Integrated Approach Low ecological impacts	[6], Ho Johnny et al. (2009)
3	Supplier Selection criteria	Eco logical Aspects , Long Term	Price Switching suppliers , quickly Short term	[9]

		relation ship	relationshi p	
4	Cost Pressure	High	Low	
5	Flexibility	Low	High	

II. LITERATURE REVIEW

GSCM is a powerful way to differentiate a company from its competitors and it is a key to success. at the same time GSCM can help to achieve environmental performance index (EPI) which is not so good in India.

To achieve good EPI the following definition . Should be followed [10].

GSCM = green purchasing + green manufacturing / materials management + green distribution / marketing+ reverse logistics.

Developing economies, including China, India and Russia have had modest development over the past decade, but they have also paid an environmental price for their rapid growth. India is the fastest growing economy that ranks at in 2012 it is 125/132, in 2014 it is 155/178 now it's in 2016 it is 141/178 EPI, which is worst rank. It is mainly due to Air Quality, Biodiversity and habitat protection. [11].

The new Companies Bill making emphasis towards corporate social responsibility, activities, laws and environmental standards (CSR). It includes purchasing, inbound logistics, and production, distribution (outbound logistics and marketing), and reverse logistics. Green SCM amalgamates ecological management and supply chain management [12]. Increasing social demand of environmental sustainability, companies are recognizing that environmental concerns are the key strategic issue with the potential for a lasting impact on organizational performance. GSCM integrates environmental thinking into supply chain management. The U. S Environmental Protection Agency (2000) provided four basic steps to implementing a green supply chain. In his paper He has explained that the study of GSCM that includes following steps [13].

1. Identifying costs
2. Determine opportunities
3. Calculate benefits, and
4. Decide, implement and monitor.

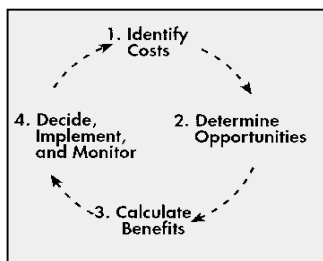


Fig . 1 Green supply chain decision making framework Source- EPA- 742-R-00-001 (January2000)

Environmental sustainability is gaining importance through GSCM. It includes, design of products, selection

of material and suppliers, manufacturing processes, delivery to customers and management of the product till the end of products useful life. Use of raw materials with no prohibited substance content and preparation of control list of such substances that are hazardous to environment is required [1].

III. PRACTICES IN GSCM:

In order to implement GSCM in an industry following practise are to be followed

- A. Green Purchasing
- B. Green Design
- C. Green Manufacturing
- D. Green Distribution
- E. Green Marketing

A. *Green Purchasing*: Green Purchasing refers to the procurement of products and services that have a reduced effect on human health and the environment when compared with competing products or services that serve the same purpose. This comparison can consider raw materials manufacturing, packaging, distribution, reuse, operation, maintenance, and disposal of the product or service [14]. Green Purchasing, also known as Environmentally Preferable Purchasing (EPP) is important because with every buying decision make - and purchase has a hidden cost on the environment [15]. Green Purchasing is the method wherein environmental and social considerations are taken with equal weight to the price, availability, and performance criteria. Green Purchasing is a serious consideration of supply chain management. Green Purchasing minimizes negative environmental and social effects through the use of environmentally friendly products. Green Purchasing attempts to identify and reduce environmental impact and to maximize Resource efficiency. He also has explained few Common Considerations for Effective Green purchasing [16].

1. *The Life-Cycle Analysis (LCA)*: Perspective the cost of environmental and social impacts over the lifetime of a product or service should be considered
2. *Pollution Prevention*: avoiding formation of wastes throughout the manufacturing process, reducing toxic emissions falls under pollution prevention.
3. *Resource Efficiency*: reusable content and recycled materials should be preferred over virgin materials.

B. *Green Design*: green design is also known as environmental design or sustainable design, basically is the philosophy of designing physical objects, the built environment, and services to comply with the principles of environmental sustainability [17].

C. *Green Manufacturing*: the main concerns of manufacturing industries are,

- 1) *Green energy*: Green energy includes production and use of clean energy. It involves both deploying renewable energy sources like CNG, wind, solar and biomass, and achieving higher energy efficiency in operations.
- 2) *Green products*: the second area is to develop and produce green products.
- 3) *Green processes*: use of green processes in business operations .it mainly involves reducing waste generation through lean operations [18].

D. *Green Distribution*: is defined AS any mean of transportation between vendor and purchaser with lowest possible impact on the ecological and social environment, and includes the whole distribution process from storage, order processing and picking, packaging, improved

vehicle loadings, delivery to the customer or purchaser and taking back packaging[19],[20],[21].

E. Green Marketing: Green marketing is the marketing of products that are presumed to be environmentally preferable to others. Thus green marketing incorporates a broad range of activities, including product modification, changes to the production process, sustainable packaging, as well as modifying advertising [22]. Green marketing includes Enhancing brand image as most efficient way than any other.

IV. OTHER TOOLS AND TECHNIQUES USED IN GSCM

Apart from the techniques mentioned above few basic tools are also helpful in implementing GSCM successfully in an organisation.

Lean manufacturing: lean manufacturing is a FAT reduction technique. These fats are nothing but excess resources like manpower, material, inventory, unused machines and capital. It is a combination of tools and techniques and practices to eliminate waste and improve productivity. Different tools that are used in lean manufacturing are, Kaizen, Kanban, 5s, Just –in –time, TPM, TQM, Six Sigma. etc. [23].

V. BARRIERS IN IMPLEMENTING GSCM

Various barriers in implementation of GSCM are explained in the following table [24].

TABLE III
BARRIER TO IMPLEMENT GSCM IN INDUSTRY
REPORTED IN LITERATURE

S N	Barriers of GSCM	Description	Source	Ref Nos
1	Lack of Government regulation and legislation	Providing reward for best green follower	Walker et al. (2008)	[25]
2	Lack of knowledge and experience	Lack of knowledge in GSCM among the supply chain stakeholders Lack of experience among the stakeholders in executing GSCM Feeling of 'too complex' to implement GSCM among stakeholders	Sreejith Balasubramanian (2012)	[26]
3	Lack of top level management commitment	Resistant top level management towards implementation of green practices.	Rao and Holt (2005), Holt and Ghobadian	[27-28]
4	Lack of managem	Poor managerial	M.D. Singh (2008)	[29]

	ent initiatives for transport and logistics	management involves in logistics in the organization.		
5	Market Competiti on and Uncertain ty	It enables new innovations in production and operation methodologies , confining wastes and reduces energy usages.	Yu Lin (2007)	[30]

VI. CONCLUSION

This paper explains various aspects of GSCM. From this we understand the importance of implementation of GSCM in industries from environmental protection point of view. It also explains the practices and tools used for adoption of GSCM, like green manufacturing, green marketing, green purchasing, green distribution etc.

Though implementation GSCM in industries is essential, but actually practicing it is not an easy task as it is a complex and costly affair. Also it is dependent upon the top level management and various barriers are seen at different levels.so government and top level management should take initiative and invent some cost effective methods and tool to practice GSCM successfully and help nation to save and preserve environment.

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