## **IMPLEMENTATION OF GREEN MANUFACTURING IN INDUSTRY -**A CASE STUDY

### Swapnil V. Ghinmine<sup>1</sup>, Dilip I. Sangotra<sup>2</sup>

<sup>1</sup>Assistant Professor, Department of Mechanical Engineering DMIETR Wardha, Maharashtra India <sup>2</sup>Associates Professor, Department of Mechanical Engineering YCCE Nagpur, Maharashtra India

#### Abstract

The aim of this paper is to identify the factors that helps to implement the green manufacturing in the industry. The CO2 emission and the waste that is generated from the industry is one of the main factor for the environmental degradation which leads to global warming and acid rain. Government rules and regulation are the key important factors that helps achieve the environmental, economic and intangible performance. Data regarding the survey was collected and analyzed by the mean score. Implementation of these factors in the industry helps achieve economic growth at national and international level.

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**Keywords:** Green design, training and employee involvement, green distribution, green manufacturing

#### **1. INTRODUCTION**

Manufacturing plays an important role or strategic role in an organization especially to build competitive advantage and improve the performance of the manufacturing firm. With the rapid changes in the technologies, customers' needs and globalizations manufacturing is itself is transforming and evolving. In early 19<sup>th</sup> century the production system adopted is mainly the mass production system without giving much stress on the green manufacturing. In 1970s the concept adopted is the flexible manufacturing system. As the progress is made in the manufacturing system the surrounding environment starts facing the problems of pollutions which leads to environmental degradations. The major challenge to the government was to protect the environment from these pollutions. So in 20<sup>th</sup> century the concept of Green Manufacturing was evolved. The term "green" manufacturing can be looked in two ways: the manufacturing of "green" products, particularly those used in renewable energy systems and clean technology equipment of all kinds, and the "greening" of manufacturing - reducing pollution and waste by minimizing natural resource use, recycling and reusing what was considered waste, and reducing emissions.

#### **2. LITERATURE SURVEY**

Various case studies has been carried out by different authors on green manufacturing. Shang et al. (2010) [4] conducted a case study in which he has observed six different parameters of green supply chain management i.e eco design, green manufacturing and packaging, environmental participation, green marketing, stock and suppliers which helps to achieve the environmental performance. Lamming and Hampson (1996) [5] mainly focused on the concept of environmentally sound management and linked them to the supply chain system management establishing environmental procurement policy, collaborative supply strategies, vendor assessment and working with the suppliers to enable improvements. Handfield et al. (2002) [3] has made a multi attribute decision making model for measurement of the environmental performance. Walton et al. (1998) [9] has observed several many ways to increase the impact of procurement on green manufacturing. Quinghu Zhu et al (2008) [6] has identified different drivers such as Green Procurement, Internal Environmental Management, Eco Design, Customer Cooperation, and Investment Recovery which helps in the implementation of green supply chain management.

#### 2.1 Objective of the Study

Objective of the study is to look after the factors or drivers and implementation of green manufacturing.

#### 2.2 Green Manufacturing

Green manufacturing is a system that integrates product and process design issues with a issues of manufacturing, planning and control in such a manner to identify, quantify, assess and manage the flow of environmental waste with the goal of reducing and ultimately reducing environmental impact while also trying to maximize the resource efficiency.

#### **3. RESEARCH METHODOLOGY**

Research methodology consists of development of competitive strategies and benchmarking questionnaire about green. Manufacturing. These questionnaires were discussed with the industrial experts who believe to have the fair knowledge about the green practices that were followed in the industries. Performance of each of these strategies will depends upon the mean aggregate score. The ratings of these factors were marked on five point scale (1-good, 2average, 3-better, 4- excellent, 5- best) the extent to which they perceived their companies implementing each of the dimensions of green concept practices. These factors were analyzed on the basis of the mean score. These factors helps in the implementation of the green manufacturing and enabling organizations to evaluate their strength and weakness in the course of implementing these practices.

#### 4. IMPLEMENTATION OF GREEN

#### MANUFACTURING PROCESS

Sr.No	IMPLEMENTATION PROCESS
1	Explaining how green considerations impact
	on design decisions relating to
	manufacturing processes and products
2	Analyzing a technological outcome to
	determine its suitability for green
	manufacture
3	Making design changes as required for the
	technological outcome guided by good
	design judgment criteria
4	Establishing specifications, including
	tolerances, required of the outcome that is to
	opportunities of the manufacturing location
5	Selecting a green manufacturing process and
	quality control procedures to enable units to
	meet the established specifications and tolerances
	tolerances
6	Organizing resources and ensuring
	procedures are carried out accurately in
-	keeping with relevant codes of practice
1	Monitoring the manufacturing process and
8	Evaluating the success of the manufacturing
5	process in meeting green considerations
9	Justifying the level of success the
	manufacturing process has attained in
	meeting green considerations

#### 5. COMPRATIVE ANALYSIS OF FACTORS

# 5.1 Top Management Commitment (Mean Score 1.570)

Sr.No	Top Management	Mean Score
	Commitment	
1	Focus on the	1.238
	commitment and	
	responsibilities of	
	Green Manufacturing	
2	Monitors the process	1.174
	of GSCM	
3	It mainly supports the	1.539
	Green practices over	
	long budget	

Γ	4	It makes changes in	1.426
		current manufacturing	
		process to implement	
		Green Practices	
	5	It increases the profit	1.328
		of the organization	

#### 5.2 Green Purchasing (Mean Score 1.526)

Sr.No	Green purchasing	Mean Score
1	Purchasing of the	1.540
	product and services	
	that has no adverse	
	effect on the	
	surrounding	
2	It reduces overall	1.274
	energy, cost and weight	
	of the product	
3	It improves the	1.384
	environmental	
	performance of the	
	organization	
4	Collect information on	1.531
	environmental product	
	and suppliers	
5	It improves supplier	1.529
	manufacturer	
	relationship	

#### 5.3 Environmental Policy (Mean Score 1.726)

Sr.No	Environmental Policy	Mean Score
1	To protect and	1.326
	conserve critical	
	ecological systems and	
	resources, and	
	invaluable natural and	
	man-made heritage,	
	which are essential for	
	life support,	
	livelihoods, economic	
	growth,	
	and a broad	
	conception of human	
	well-being	
2	To ensure judicious	1.579
	use of environmental	
	resources to meet the	
	needs and	
	aspirations of the	
	present and future	
	generations	
3	To integrate	1.259
	environmental	
	concerns into policies,	
	plans, programs, and	
	projects for economic	
	and social	
	development.	
4	To ensure efficient use	1.423

of environmental	
resources in the sense	
of reduction	
in their use per unit of	
economic output, to	
minimize adverse	
environmental impacts	

#### 5.4 Green Design (Mean Score 1.448)

Sr.No	Green Design	Mean Score
1	Design of	1.446
	product whose	
	composition and	
	design should	
	have minimum	
	negative impact	
	on the	
	environment	
2	It involves	1.729
	recycling, reuse,	
	reduce,	
	remanufacturing,	
	disassembly	
3	It mainly focus	1.319
	on the customer	
	requirement	
	while design the	
	product	

#### 5.5 Green Manufacturing (Mean Score 1.424)

Sr No	Green	Mean Score
51.110	Manufacturing	incuit Score
1	It involves	1 362
1		1.302
	class of	
	technologies	
	that use	
	cleaner fuels	
	for generating	
	Power.	
	Examples	
	include	
	biomass,	
	hydro power,	
	Integrated Gas	
	Combined	
	Cycle (IGCC).	
	etc	
2	use of Green	1 578
2	production	1.570
	methods and	
	technologies in	
	technologies in	
	industries such	
	as iron and	
	steel, cement,	
	refining,	
	chemicals.	
3	It helps in low	1.423
	raw material	

cost, improve	
production	
efficiency,	
reduce	
environmental	
impacts with	
low or no	
waste and	
pollution	

#### 5.6 Green Distribution (Mean Score 1.440)

Sr.no	Green	Mean Score
	Distribution	
1	It includes	1.221
	transportation	
	of good with	
	minimum	
	environmental	
	impact.	
2	Transportation	1.192
	system should	
	be fuel	
	efficient	
3	Environmental	1.434
	friendly	
	vehicle like	
	solar vehicle	
	should be used	

## 5.7 Training and Employee Involvement (Mean

### Score 1.420)

Sr.No	Training and	Mean Score
	employee	
	involvement	
1	Workers from	1.998
	different	
	departments	
	should come	
	together for	
	brainstorming	
	session	
2	Workers should	1.885
	do the work at	
	there allocated	
	place	
3	Employee	1.297
	should be	
	rewarded for	
	there innovative	
	ideas,	
	involvement in	
	decision	
4	Involvement in	1.192
	decision making	
	process for	
	implementing	
	green concept	

# 5.8 Customer Awareness Programme (Mean Score 1.340)

Sr.no	Customer	Mean Score
	Awareness	
	Programs	
1	General	1.429
	meetings	
	should be	
	conducted for	
	GSCM	
2	Feedback on	1.238
	GSCM ,	
	products	
	should be done	
3	Customer	1.174
	requirements	
	survey should	
	be done.	

#### 6. ANALYSIS OF FACTORS

The present analysis shows that the most important factor is environmental policy which has the mean score of 1.726 followed by top management commitment (1.570), Green purchasing (1.526), Green design (1.448), Green distribution (1.440), Green manufacturing (1.424), Training and Employee involvement (1.420), Customer awareness program (1.340).

#### 7. CONCLUSION

The purpose of the study is to identify the Green manufacturing factors and its sub factors and its relationship with the organizational performance which include environmental performance, competitive advantage, and economic performance. The results shows that the industry with large manufacturing capacity can heavily invest on the green supply chain management than the industry with small manufacturing capacity. This is due to the larger firm has more investment capacity on green concept than the smaller firm. Thus it is concluded that to protect the environment and the earth appropriate methodology should be adopted by the industries to minimize the detrimental effect on the earth.

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