

# A STUDY ON GREEN MANUFACTURING IN THE OIL AND PETROLEUM SECTOR IN INDIA

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## ABSTRACT

*Green manufacturing technology is one of those sciences which has been studied and experimented for many years but very seldom implemented. The impacts, costs and other social issues have probably stopped experienced managers to implement the earth-soothing technological methods. The scope and effects of implementation of green manufacturing technology in the Oil and Petroleum sector of India has been analyzed to show how far the sector can improve by adopting green manufacturing technology. A study was conducted at Oil India Limited (OIL), to evaluate the effects of implementation of GM. A questionnaire survey was carried out for the purpose. The Data received were processed on Minitab 17 to conduct Factor analysis and One way Analysis of Variance (ANOVA). Inferences were drawn from the result obtained. Through the results the positive impact of green manufacturing was shown.*

**Keywords:** *Factor Analysis, Green Manufacturing, One Way Analysis Of Variance, Positive Impact, Survey*

## I INTRODUCTION

Green Manufacturing is a method for manufacturing that minimizes waste and pollution. It slows the depletion of natural resources as well as lowering the extensive amounts of trash that enter landfills. Its emphasis is on reducing parts, rationalizing materials, and reusing components, to efficiently build products.

The Center of Green Manufacturing 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.” In simple words, green manufacturing is the method for manufacturing that minimizes waste and pollution achieved through product and process design. Application of green manufacturing has become an important aspect in the industries today.

The concept of Green Manufacturing has its roots from Germany that requires importing companies to take responsibility and remove any packaging materials used for that product. In fact, the Germans have established a de facto global manufacturing standard instilling that, “any company wishing to compete globally must start making products that will comply with the green dictates of the huge European market.”

Green Manufacturing involves not just the use of environmental design of products, use of environmentally friendly raw materials, but also eco-friendly packing, distribution, and destruction or reuse after the lifetime of the product.

Green Manufacturing has many aspects including:

1. Reducing the toxicity of raw materials used in production.
2. Reducing energy consumption during the manufacturing process.
3. Recycling materials and scrap.
4. Reducing the amount of packaging in final products.

## II LITERATURE REVIEW

- Nowadays, environmental consequences are considered essential for business operations with the aim to reduce costs and develop quality products. The environmental challenges that we face in the near future are significant and every part of society must respond to it, including manufacturing.(Atasu et al.,2008; Kleindorfer et al.,2005).
- Lee Voon-Hsien et al, 2014, discussed the relationship between five GSCM practices and Technological Innovation (TI), from the context of manufacturing firms. The GSCM practices comprise internal environmental management (IEM), eco-design (ED) investment recovery (IR), green purchasing (GP), and Cooperation with customers (CC).
- According to Mittal Varinder Kumar & Sangwan Kuldeep Singh, Manufacturing firms consume energy and natural resources in highly unsustainable manner and release large amounts of green house gases leading to many economic, environmental and social problems from climate change to local waste disposal. A growing number of organizations have begun working towards implementation of Green Manufacturing (GM) because of increased concerns about the pollution increase, natural resources depletion and global warming. However, there are barriers which hinder the implementation of GM. In order to mitigate these barriers, the prioritization of barriers is essential as high-priority barriers can be taken up first to address the issue more effectively within the available resources.
- According to Deif Ahmed M.,2011, Higher global awareness of environmental risks as a result of the new green movement is shaping new customer requirements in many places. In addition, the evolving green technology together with more eco-friendly product designs is helping in realizing the green manufacturing objectives in real practice.
- GOVINDAN. K. A, SHANKAR, M., 2013, evaluated the essential drivers of green manufacturing using fuzzy approach.
- Rehman Minhaj Ahemad.A, Shrivastava R. R, Shrivastava Rakesh. L,(2013) highlighted the road map of a company for achieving performance improvement through GM implementation and its impact on organizational performance. They also pointed out strengths and weaknesses of GM implementation practices and overall performance using developed research instrument.

- Paula I.D., et al, 2014, Discussed about the waste and the methodology of green manufacturing that can be applied and can reduce the wastage and increase the use of sustainable energy. The implementation of Green Manufacturing may not only be good for the environment — it is often good business, as well.

### III OBJECTIVE

- To provide a practical example of performance improvement of the Indian Oil and Petroleum Company that has implemented Green Manufacturing initiative.
- To assess the Green Manufacturing implementation practices and performance improvement of the organization.
- The study was conducted in an industry that has already implemented this initiative. The study would help in evaluating the industry's GM implementation and overall business performance.
- The status of the industry before implementing Green Manufacturing is compared to its current status, i.e., after implementing Green Manufacturing
- Evaluation of the industry's GM implementation and overall business performance.

### IV ABOUT THE INDUSTRY

The Indian Oil Industry dates back to the time of the British Rule, when petroleum first became the global source of energy. The first oil deposits in India were discovered in 1889 near Digboi, Assam. The first well was completed in 1890 and the Assam Oil Company was established in 1899 to oversee production. Oil India Limited (OIL) is the second largest hydrocarbon exploration & production (E&P) Indian public sector Company and operational headquarters in Duliagan, Assam, India under the administrative control of the Ministry of petroleum and Natural Gas of the Government of India. Company's corporate office is located in Noida in New-Delhi-NCR region. The history of OIL dated back to February 18, 1959. Oil India Private Limited was incorporated to expand and develop the newly discovered oil fields of Naharkatiya and Moran in the Indian North East. (Wikipedia)

### V AWARDS AND RECOGNITIONS

- The **Golden Peacock Environment Management Award** for the year 2013 in July, 2013.
- In January, 2014, OIL received the **Greentech Environment Award 2013** of Gold Category in Petroleum Exploration Sector for sustainable achievement in Environment Management.
- OIL received Vigilance Excellence Award 2013-14 at a Conclave of Vigilance officers organized by the Institute of Public Enterprise (IPE) at Hyderabad..
- Oil India Limited (OIL) also bagged the prestigious TERI Corporate Social Responsibility Award, 2004, which was presented to OIL in recognition of corporate leadership for good corporate citizenship and sustainable community development initiatives. ([www.oil-india.com](http://www.oil-india.com))

## VI STRATEGY FOR GROWTH

The Company's focus remains on its core competence of Exploration and Production of hydrocarbons. The key focus areas for growth of the Company broadly cover the following:

- Continue to induct world class technology
- Focus on organic growth
- Develop fields with potential for quick monetisation
- Acquire blocks to augment existing reserve base
- Acquisition of companies that are value accretive
- Diversify through downstream investments

Presently, OIL's hydrocarbon production primarily comes from its matured fields in the North East and their biggest priority is to sustain and increase production from these matured fields. This needs induction of state-of-the-art and fit for purpose technology, increased drilling and fast tracking plans to explore newer and prospective areas. The Company has adopted strategy of balanced growth of portfolio of assets. ([www.oil-india.com](http://www.oil-india.com))

## VII RENEWABLE ENERGY

Oil India Limited had recently started to focus on renewable energy and since 2012-13 commissioned 67.6 MW of Wind Energy Power plants in Rajasthan. In its endeavor to harness Solar Energy, the Company successfully commissioned a 5.23 MW Solar Power plant at Ramgarh in Rajasthan during the financial year 2013-14. OIL has also undertaken a two phased study on "Wind Resource Assessment" (WRA) to assess wind potentiality in the state of Assam, a pre-requisite to install & commission a wind farm. In the first phase of WRA exercise, Centre for Wind Energy Technology (CWET), an R&D institution of the Ministry of New and Renewable Energy (MNRE), has identified nine (9) locations in Upper Assam. In the 2nd phase, Wind Monitoring Stations (WMS) will be set up at these identified locations to measure & monitor the wind data for a period of next two years. Currently the process to award the contract to CWET for 2nd phase is on and they have planned to complete the installations of WMS by 31st March 2015. The Company has plans to take up larger projects in the ensuing financial year in both Wind Power and Solar Power. ([www.oil-india.com](http://www.oil-india.com))

## VIII HEALTH, SAFETY, ENVIRONMENT

As a Company engaged in E&P Activities, OIL pays utmost importance to Health, Safety & Environment (HSE) and the same is reflected in its vision statements that "OIL is fully committed to Health, Safety & Environment". OIL is committed to continuously review & improve HSE initiatives to prevent accidents, minimize environmental impact, prevent environmental pollution and reduce health and safety risks. To this effect, HSE policy has been put in place by the Company. Also, to provide the framework and structure to meet the highest level of HSE expectations, a HSE manual along with a guide has been prepared and adopted for all the operational areas. The

Lost Time Injury Frequency performance for the year 2013-14 was excellent as per the MOU target set for the Company. ([www.oil-india.com](http://www.oil-india.com))

## IX RESEARCH METHODOLOGY

- A survey was carried out to find the overall performance of the Industry/Company before and after implementation of Green Manufacturing.
- Based on the evaluations the current situation of the industry's GM implementation and overall performance will be obtained.
- A questionnaire of two pages were designed consisting of the extent of relationship between various GM implementation practices and overall performance.
- 250 questionnaires were distributed and sent for survey, out of which 235 were evaluated.
- The research instrument validated by Minhaj Ahemad.A.Rehman was used for the compilation of data.
- Using Minitab the data obtained from the questionnaires were evaluated. Factors were extracted using Varimax rotation. A reliability test based on Cronbach's Alpha was used to assess whether the dimensions were consistent and reliable. ( Bulent Sezen and Sibel Yildiz Cankaya, 2013 ).
- One way Analysis of Variance (ANOVA) is conducted in this study to check the relationship of the factors taken into consideration.

**Table 1**

Mean and Proportionate Marks	
1.00 - 1.50	1(Not at all)
1.51 - 2.00	2
2.01 - 2.50	3
2.51 - 3.00	4 ( To a moderate extent)
3.01 - 3.50	5
3.51 - 4.00	6
4.01 - 4.50	7
4.51 - 5.00	8 (To a very large extent)

Table 2 below shows the various factors and the mean obtained after assessment of the questionnaire data. Marks are then allotted to the factor according to the Grand mean obtained from Table 1 above. Table 1 consists of mean and proportionate marks. 1 indicates that the Company is having a weak relationship between the implementation factors and the performance measure, whereas 8 indicates that the relationship between the implementation factors and the performance measure is very strong.

**Table 2:Assessment of Various Factors**

Assessment result – Factor 1: Organizational Capabilities				
Question Nos.	Addressed items of the factors	Mean	Grand Mean	Max Marks
1	Organization Capabilities lead to improvement in financial, manpower and Operational performance	3.2	3.18333333	5
11	Organization Capabilities lead to continuous improvement and improvement in competitive advantage and stakeholder's enrichment	3.05		
22	Organization Capabilities lead to improvement in green SC performance	3.3		
Assessment result – Factor 2 : Green Design Initiatives				
Question Nos.	Addressed items of the factors	Mean	Grand Mean	Max Marks
2	Green design Initiatives lead to improvement in financial, manpower and Operational performance	3.15	3.24166667	5
12	Green design Initiatives lead to improvement in continuous improvement and improvement in competitive advantage and stakeholder's enrichment	3.25		
23	Green design Initiatives lead to improvement in green SC performance	3.33		
Assessment result – Factor 3: Green Standards Adoption				
Question Nos.	Addressed items of the factors	Mean	Grand Mean	Max Marks
3	Green Standard Adoption lead to improvement in financial, manpower and Operational performance	3.28	3.33333333	5
13	Green Standard Adoption lead to improvement in continuous improvement and improvement in competitive advantage and stakeholder's enrichment	3.28		
24	Green Standard Adoption lead to improvement in green SC performance	3.45		
Assessment result – Factor 4 : Suppliers Management				
Question Nos.	Addressed items of the factors	Mean	Grand Mean	Max Marks
4	Supplier Management lead to improvement in financial, manpower and Operational performance	3.2	3.375	5
25	Supplier Management lead to improvement in green SC performance	3.55		
Assessment result – Factor 5 Technology Innovation				
Question Nos.	Addressed items of the factors	Mean	Grand Mean	Max Marks
5	Technology Innovation lead to improvement in financial, manpower and Operational performance	3.5	3.725	6
14	Technology Innovation lead to continuous improvement	3.95		
Assessment result – Factor 6 GM Planning				

	Addressed items of the factors	Mean	Grand Mean	Max Marks
15	GM planning lead to continuous improvement and improvement in stakeholder's enrichment	3.58	3.575	6
Assessment result – Factor 7 Green purchasing & marketing				
	Addressed items of the factors	Mean	Grand Mean	Max Marks
6	Green Purchasing & Marketing lead to improvement in financial, manpower and Operational performance	3.38	3.325	5
16	Green Purchasing & Marketing lead to continuous improvement and improvement in competitive advantage and stakeholder's enrichment	3.38		
26	green purchasing & marketing lead to improvement in green SC management	3.23		
Assessment result – Factor 8 Implementing RL				
	Addressed items of the factors	Mean	Grand Mean	Max Marks
7	implementing RL lead to improvement in financial, manpower and Operational performance	3.38	3.53333333	6
17	implementing RL lead to continuous improvement and improvement in competitive advantage and stakeholder's enrichment	3.63		
27	implementing RL lead to improvement in green SC management	3.6		
Assessment result – Factor 9 Top management Commitment				
	Addressed items of the factors	Mean	Grand Mean	Max Marks
8	top management commitment lead to improvement in financial, manpower and Operational performance	3.83	3.84166667	6
18	top management commitment lead to continuous improvement and improvement in competitive advantage and stakeholder's enrichment	3.98		
28	top management commitment and Customer focus lead to improvement in green SC management	3.73		
Assessment result – Factor 10 Customers Focus				
	Addressed items of the factors	Mean	Grand Mean	Max Marks
19	Customer focus lead to continuous improvement and improvement in stakeholder's enrichment	3.3	3.3	5
Assessment result – Factor 11 Green Disposal initiatives				
	Addressed items of the factors	Mean	Grand Mean	Max Marks
9	Green Disposal Initiatives lead to improvement in financial, manpower and Operational performance	3.25	3.43333333	5
20	Green Disposal Initiatives lead to continuous improvement and improvement in competitive advantage and stakeholder's enrichment	3.5		
29	green Disposal Initiatives lead to improvement in green SC management	3.55		
Assessment result – Factor 12 Process management				

	Addressed items of the factors	Mean	Grand Mean	Max Marks
10	Process Management lead to improvement in financial, manpower and Operational performance	3.28	3.29166667	5
21	Process Management lead to continuous improvement and improvement in competitive advantage and stakeholder's enrichment	3.25		
30	Process Management lead to improvement in green SC management	3.35		

**Table 3: Mean and P value of ANOVA**

Performance measure Critical success factor	Financial, manpower and Operational performance	Continuous improvement and improvement in competitive advantage and stakeholder's enrichment	green SC performance
Organizational Capabilities	3.2 ( 0.008)	3.05(0.019)	3.3(0.00)
Green Design Initiatives	3.15(0.154)	3.25(0.444)	3.325(0.357)
Green Standards Adoption	3.275(0.18)	3.275(0.678)	3.45(0.063)
Suppliers management	3.2(0.44)		3.55(0.4130)
Technology Innovation	3.5(0.455)	3.95(0.214)	
GM Planning		3.575	
Green purchasing and marketing	3.375(0.189)	3.375(0.349)	3.225(0.323)
Implementing RL	3.375(0.05)	3.625(0.056)	3.6(0.06)
Top management Commitment	3.825(0.012)	3.975(0.348)	3.725(0.016)
customers Focus		3.3	
Green Disposal Initiatives	3.25(0.204)	3.5(0.107)	3.55(0.86)
process management	3.275(0.011)	3.25(0.431)	3.35(0.039)

**Table 4: Factor and Reliability Analysis Result**

1 Organizational Capabilities	Cronbach's Alpha	Mean	2 Green Design Initiatives	Cronbach's Alpha	Mean
1	0.81	3.1833	2	<b>0.877</b>	3.24166
11			12		
22			23		
3 Green Standards Adoption	Cronbach's Alpha	Mean	4 Suppliers management	Cronbach's Alpha	Mean
3	<b>-0.744</b>	3.3333	4	<b>0.872</b>	3.375
13			25		
24					
5 Technology Innovation	Cronbach's Alpha	Mean	6 GM Planning	Cronbach's Alpha	Mean



5	<b>-0.869</b>	3.725	15	<b>-0.778</b>	3.575
14					
7 Green purchasing and marketing	Cronbach's Alpha	Mean	8 Implementing RL	Cronbach's Alpha	Mean
6	0.677	3.325	7	-0.809	3.5333
16			17		
26			27		
9 Top management Commitment	Cronbach's Alpha	Mean	10 Customers Focus	Cronbach's Alpha	Mean
8	-0.842	3.841667	19	0.826	3.3
18					
28					
11 Green Disposal Initiatives	Cronbach's Alpha	Mean	12 process management	Cronbach's Alpha	Mean
9	-0.9	3.4333	10	-0.807	3.291667
20			21		
29			30		

**Table 5: Effects of Organisational Capabilities**

Independent Variables	Dependent variable											
	Financial, manpower and Operational performance				Continuous improvement and improvement in competitive advantage and stakeholder's enrichment				green SC performance			
	SS	MS	DF	Confidence Level	SS	MS	DF	Confidence Level	SS	MS	DF	Confidence Level
Organizational Capabilities	4.574	1.525	3	98.93%	4.76	1.586	3	98.93%	0.31	0.305	1	95.00%
R Square	27.89%				23.91%				1.86%			
Adjusted R Square	21.88%				17.56%				0.00%			
F	4.64				3.77				0.72			

**Table 6: Effects of Green Design Initiatives**

Independent Variables	Dependent variable											
	Financial, manpower and Operational performance				Continuous improvement and improvement in competitive advantage and stakeholder's enrichment				green SC performance			

	SS	MS	DF	Confidence Level	SS	MS	DF	Confidence Level	SS	MS	DF	Confidence Level
Green Design Initiatives	0.479	0.479	1	98.93%	0.18	0.178	1	95.00%	0.48	0.237	2	98.04%
R Square	5.26%				1.55%				5.41%			
Adjusted R Square	2.77%				0.00%				0.30%			
F	2.11				0.6				1.06			

**Table 7: Effects of Green Standards Adoption**

Independent Variables	Dependent variable											
	Financial, manpower and Operational performance				Continuous improvement and improvement in competitive advantage and stakeholder's enrichment				green SC performance			
	SS	MS	DF	Confidence Level	SS	MS	DF	Confidence Level	SS	MS	DF	Confidence Level
Green Standards Adoption	1.657	1.657	1	95.00%	0.17	0.083	2	98.04%	1.37	0.685	2	98.04%
R Square	13.84%				2.08%				13.85%			
Adjusted R Square	11.57%				0.00%				9.19%			
F	6.1				0.39				2.97			

**Table 8: Effects of Suppliers management**

Independent Variables	Dependent variable											
	Financial, manpower and Operational performance				Continuous improvement and improvement in competitive advantage and stakeholder's enrichment				green SC performance			
	SS	MS	DF	Confidence Level	SS	MS	DF	Confidence Level	SS	MS	DF	Confidence Level
Suppliers management	0.452	0.226	2	98.04%					0.84	0.418	2	98.04%
R Square	4.35%								4.67%			
Adjusted R Square	0.00%								0.00%			
F	0.84								0.91			

**Table 9: Effects of Technology Innovation**

Independent Variables	Dependent variable											
	Financial, manpower and Operational performance				Continuous improvement and improvement in competitive advantage and stakeholder's enrichment				green SC performance			
	SS	MS	DF	Confidence Level	SS	MS	DF	Confidence Level	SS	MS	DF	Confidence Level

	SS	MS	DF	Confidence Level	SS	MS	DF	Confidence Level	SS	MS	DF	Confidence Level
Technology Innovation	0.417	0.208	2	98.04%	0.4	0.4	1	95.00%				
R Square	4.17%				4.04%							
Adjusted R Square	0.00%				1.52%							
F	0.8				1.6							

**Table 10: Effects of Green purchasing and marketing**

Independent Variables	Dependent variable											
	Financial, manpower and Operational performance				Continuous improvement and improvement in competitive advantage and stakeholder's enrichment				green SC performance			
	SS	MS	D F	Confidence Level	SS	MS	D F	Confidence Level	SS	MS	D F	Confidence Level
Green purchasing and marketing	0.602	0.602	1	95.00%	0.52	0.259	2	98.04%	0.28	0.28	1	95.00%
R Square	4.50%				5.53%				2.57%			
Adjusted R Square	1.99%				0.42%				0.00%			
F	1.79				1.08				1			

**Table 11: Effects of Implementing RL**

Independent Variables	Dependent variable											
	Financial, manpower and Operational performance				Continuous improvement and improvement in competitive advantage and stakeholder's enrichment				green SC performance			
	SS	MS	DF	Confidence Level	SS	MS	DF	Confidence Level	SS	MS	DF	Confidence Level
Implementing RL	2.292	1.146	2	98.04%	2.22	1.11	2	98.04%	1.64	0.819	2	98.04%
R Square	14.91%				14.44%				14.12%			
Adjusted R Square	10.31%				9.81%				9.48%			
F	3.24				3.12				3.04			

**Table 12: Effects of Top management Commitment**

Independent Variables	Dependent variable											
	Financial, manpower and Operational performance				Continuous improvement and improvement in competitive advantage and stakeholder's				green SC performance			

					enrichment							
	SS	MS	DF	Confidence Level	SS	MS	DF	Confidence Level	SS	MS	DF	Confidence Level
Top management Commitment	6.73	2.243	3	98.93%	1.61	0.804	2	98.04%	4.8	2.4	2	98.04%
R Square	26.11%				5.55%				20.02%			
Adjusted R Square	19.95%				0.45%				15.70%			
F	4.24				1.09				4.63			

**Table 13: Effects of Green Disposal Initiatives**

Independent Variables	Dependent variable											
	Financial, manpower and Operational performance				Continuous improvement and improvement in competitive advantage and stakeholder's enrichment				green SC performance			
	SS	MS	DF	Confidence Level	SS	MS	DF	Confidence Level	SS	MS	DF	Confidence Level
Green Disposal Initiatives	0.4	0.4	1	95.00%	1.14	0.57	2	98.04%	0.9	0.9	1	95.00%
R Square	4.21%				11.40%				7.56%			
Adjusted R Square	1.69%				6.61%				5.13%			
F	1.67				2.38				3.11			

**Table 14: Effects of process management**

Independent Variables	Dependent variable											
	Financial, manpower and Operational performance				Continuous improvement and improvement in competitive advantage and stakeholder's enrichment				green SC performance			
	SS	MS	DF	Confidence Level	SS	MS	DF	Confidence Level	SS	MS	DF	Confidence Level
process management	1.893	1.893	1	95.00%	0.42	0.212	2	98.04%	1.46	0.732	2	98.04%
R Square	15.80%				4.45%				16.08%			
Adjusted R Square	13.59%				0.00%				11.54%			
F	7.13				0.86				3.54			

The data obtained from the questionnaire was then analyzed using 12 factors. The analysis was done using Varimax rotation and rotated factor loadings were obtained.

Table 3 shows the analysis of the various results obtained.

Table 4 to Table 14 shows the effects of the 12 factors taken into consideration. The results obtained from One way Analysis of variance (ANOVA) was assessed to bring out the effects of the factors

## X DISCUSSION

- Oil India limited aims to grow in a sustainable manner by integrating its diverse activities to the three pillars of Sustainability i.e. Environment, Society and Economics.
- Oil India Limited upheld its fine tradition of delivering economic value to shareholders by continuing to post impressive financial performance figures in Financial Year 2012-13. Economic growth is the driving force behind OIL's Sustainable Development journey and has enabled the company to pursue various initiatives in the areas of engagement with local communities, reduction of environmental impacts from operations, employee health & safety and safeguarding of biodiversity & eco-systems in areas of operations. During the year 2012-14 OIL has earned a total revenue of total revenue of Rs. 11456.32 crore against Rs. 11279.90 crore. During the year 2013-14, its total revenue was Rs. 915,943.86
- The overall performance of the industry has increased after implementation of GM. An increase in the total revenue can be seen in the subsequent years. OIL has been vigilant towards its responsibility to the society. Steps were taken to reduce pollution. Various environmental policies and initiatives were taken up. OIL has been able to reach 10th position in world ranking by its vigorous effort in various dimensions. Through GM implementation its energy production too has increased.
- The result obtained showed positive relationship between the various factors as analyzed.

Based on the above analysis, the overall grade of the company was estimated as follows:

Numerical weightage assigned to each factor=8 marks

Number of factors taken into consideration=12

Maximum marks=12\*8

=96

Total marks achieved=64

% marks achieved=66.7%

## XI CONCLUSION

- Due to increasing pollution and global warming, it has become a responsibility for the industries to implement environment friendly manufacturing process. Implementing GM is not just ecofriendly but it also has helped increase their average revenue. Recycling waste products too have proved to be profitable.
- The study shows that the Company still has a long way to go. OIL is planning to harness wind energy in the NE region of India. Harnessing wind energy will pave a way to the production of a large amount clean energy. The R&D department is working hard to produce fuel that gives off less amount of polluting gases to the atmosphere when burnt.
- The study will help improve implementation of green manufacturing in the Company.

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