ACHIEVING ENVIRONMENTAL SUSTAINABILITY THROUGH GREEN MANUFACTURING PRACTICES-A PERCEPTUAL STUDY ON EMPLOYEES IN SMES IN HYDERABAD, TELANGANA STATE, INDIA

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ABSTRACT

The manufacturing industry is faced with the challenge to adhere to stringent environmental regulations due to the scarcity of natural resources, global warming and waste management issues. Increasing environmental concerns and awareness are the driving forces which push manufacturers all over the world to adopt green manufacturing practices. The present study on achieving environmental sustainability in manufacturing sector in SMEs through green manufacturing practices is motivated by the need for SMEs to employ best practices in manufacturing like other global manufacturing companies around the world. The study made use of primary data sourced from the employees of 10 selected SMEs located in and around Bachupalli Industrial belt, Hyderabad, Telangana state, through administering of questionnaire. Their responses were tested using appropriate statistical tools like the simple percentage and the Chi-square research techniques. Present study revealed that although environmental sustainability can be achieved in SMEs using green manufacturing practices but for the existence of certain obstacles that have made it look impossible. Therefore, the study recommended that such obstacles like lack of management support, lack of awareness, lack of strict legislation by government, lack of affordability, lack of skilled personnel etc., be promptly tackled and eliminated to make the SMEs achieve effective environmental sustainability through green manufacturing practices.

Keywords: *Environmental sustainability, SMEs, Green manufacturing practices, manufacturing sector, employee perception, environmental challenges, government legislations, Implementation*

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1. INTRODUCTION

With increased scrutiny on the sustainability practices of companies with which consumers, stakeholders and employees engage, it has become necessary for companies to incorporate transparency into their business practices with regard to their impact on the environment, community and workplace. Many small businesses do not perceive their own environmental impact as significant compared to those of larger companies. Most studies pertaining to environmental management in SMEs are focussed towards the experience of companies when it comes to greening their production facilities. When the environmental performance of SMEs in India and other countries are compared, it is found that Indian SMEs have more environmental targets but fewer methods in place for monitoring the performance.

2. SIGNIFICANCE OF THE STUDY

Nowadays, the manufacturing industry is faced with the challenge to adhere to stringent environmental regulations due to the scarcity of natural resources, global warming and waste management issues. Increasing environmental concerns and awareness are the driving forces which are compelling manufacturers all over the world to adopt green manufacturing practices. However, the obstacles in implementing green manufacturing practices in Small and Medium Enterprises (SMEs) differ from those for large enterprises since SMEs lack the data, resources, technical expertise and experience required to implement green initiatives. The environmental performance of SMEs is mostly driven by the intention of company owners also.

There are a limited number of studies focused on the identification of obstacles which motivate or hinder the implementation of GMP in SMEs, especially in a country like India. Since SMEs play a crucial role in a nation's economic growth, it is necessary to identify the obstacles and

identifying the ways and means of how to overcome such obstacles, forms the main intent of the present study.

3. LITERATURE REVIEW

3.1 DEFINITION OF SMEs

According to the National SME Development Council (NSDC), an enterprise is considered as a SME based on either its annual sales turnover or the number of full-time employees. SMEs are divided into two sectors: (1) manufacturing related to physical or chemical products and (2) Services and others. The latter category includes ICT services, private education, research and development, logistics, primary agriculture, construction, mining and quarrying.

3.2 STATUS OF SMEs IN INDIA

The Small and Medium Enterprises' (SMEs) contribution to Indian GDP is expected to increase to 22 per cent by 2020, from the present 17 per cent, according to an estimate. The small and medium enterprise sector is widely regarded as the engine of the Indian economy. Small and medium enterprises (SMEs) contribute significantly to industrial, economic, technological and regional development in all developed and developing economies. The SME sector is vital for the nation's economic progress and hence, needs to be carefully nurtured and supported. SMEs are the best vehicle for inclusive growth in the country, to create local demand and consumption. Besides supporting employment generation activities, they also act as feeder lines for the MNCs and large corporate of tomorrow, according to Reserve Bank of India.

3.3 GREEN MANUFACTURING PRACTICES

The term ‘green manufacturing’ was coined to reflect a new manufacturing paradigm which implement various green strategies and techniques (technology and innovation) to become more

efficient. In general, green manufacturing includes generating processes which utilize inputs with low environmental impact, as well as processes which are profoundly productive with nearly zero waste and contamination. The examples of green manufacturing practices (GMP) include the prevention of pollution which involves reducing energy use, raw materials and solid waste, reusing products as well as recycling water, the use of renewable materials, eco friendly energy, redesigning products and processes, and training employees regarding product stewardship practices.

Deif (2011) defines green manufacturing as a sustainable approach to the design and engineering activities involved in product development and/or system operation to minimize environmental impact.

Dornfeld (2013) recognizes that green manufacturing is about implementing any kind of substitution in the manufacturing process which leads to a reduction in energy consumption, resource consumption, waste by-products, and water usage. That is, any and every step that makes the production of a product, component or part of a system more sustainable can be termed as green manufacturing.

According to Rehman & Shrivastava (2013) green manufacturing (GM) is a term used to describe manufacturing practices that do not harm the environment during any part of the manufacturing process emphasising the use of processes that do not pollute the environment or harm consumers, employees, or other members of the community. In today‘s world, green manufacturing is not a choice but an imperative for sustainable development (Miller et al., 2010). Adoption and/or adaptation of green manufacturing entail costs which are substantial especially for Micro, Small and Medium Enterprises (MSMEs).

Amidst all the attention on its economic importance, the environmental impact of manufacturing industries is sometimes overlooked. In reality, manufacturing organizations have a direct impact on the natural environment (Vachon & Klassen, 2008). Manufacturing industries consume significant amounts of resources and generate large volumes of waste. Over the span of 3 decades (1974 to 2004), the worldwide energy consumption of manufacturing industries had increased by 61 percent . Manufacturing industries account for nearly a third of today's global energy usage and is responsible for 36 percent of global carbon dioxide (CO_2) emissions (IEA, 2007) which is largely blamed for the problem of global warming. In the wake of such problems, there has been a rise in the public's environmental consciousness. Due to the rise in environmental awareness, we are currently in the midst of a "green revolution" where green technologies and sustainable business practices have become the conscientious necessity expected from all manufacturing industries. As a result, environmental issues are becoming an essential part of the strategic planning in organizations.

3.4 ENVIRONMENTAL SUSTAINABILITY

The importance of environmental sustainability is being recognised by mainstream business practices in many sectors. Challenges relating to resource depletion and the production of green house gases are attracting increasing attention owing not least to regulatory, supply chain, reputational and consumer pressure. While there is evidence of some awareness and good environmental practice among small and medium-sized enterprises (SMEs), this segment of the business community remains notoriously difficult to influence. Given that the vast majority of private enterprises are small and medium sized (with 250 or fewer employees), and that they are responsible for well over half of employment and business turnover, we can ill-afford to neglect their practices.

For any business to continue in existence, the organization must not only be profit-minded, but also must be conscious of the environment and be accountable to the society for its actions and inactions (Mojekeh & Eze, 2011).

From the previous studies, producing product in a sustainable way proves that it can improve company business profits performance. For that reason, many companies now realize that they will have a very significant cost reduction if their business activities are carried out properly to increase the sustainability of the environment (Rodrigue *et al*., 2001).

Apart from conserving the environment, manufacturing industries are set to benefit from implementing green technologies and sustainable business practices because it enables them to establish and maintain a competitive position in the marketplace. The globalization of world trade and the escalating demands for better, 'greener' products and services has intensified competition among manufacturing industries worldwide. It is unsurprising then that manufacturing industries would turn to adopt green technology and practices as a strategy to differentiate themselves from their competitors. SMEs are more partial towards adopting green manufacturing practices than large companies.

Henceforth, to understand the problem in hand thoroughly the following objectives are formulated in the present study.

4. OBJECTIVES OF THE STUDY

The objectives of the present study are mainly to:

1. To examine whether environmental sustainability can be obtained among the SMEs through green manufacturing practices

2. To understand the viability of the success of the green manufacturing practices among the SMEs.

3. To find out if there are obstacles against the use of green manufacturing practices among the SMEs.

4.1 RESEARCH HYPOTHESES

The hypotheses that shall guide this study are as stated below:

Hypothesis one

Null Hypothesis: Environmental Sustainability cannot be achieved in the SMEs through green manufacturing practices.

Alternative Hypothesis: Environmental Sustainability can be achieved in the SMEs through green manufacturing practices.

Hypothesis two

Null Hypothesis: There are no obstacles against the use of green manufacturing practices in the SMEs.

Alternative Hypothesis: There are obstacles against the use of green manufacturing practices in the SMEs.

5. RESEARCH METHODOLOGY

5.1 THE RESEARCH DESIGN

The approach adopted in the execution of the study was a survey method. Survey method was chosen as it is one method where a group of people is studied by collecting information from them using questionnaire and oral interview.

5.2 RESEARCH SAMPLE AND SAMPLING TECHNIQUES

The population for the study comprises the small and medium manufacturing enterprises in one of the industrial belts of Hyderabad and its staff. However, the impossibility of including all the members of the population makes sampling inevitable. As a result, the study concentrated on 10 manufacturing units in one Industrial belt i.e. Bachupalli, Hyderabad. Questionnaires were administered to 150 respondents who are chosen through convenience sampling method from the 10 selected SMEs.

5.3 SOURCES OF DATA

The data was collected from both primary and secondary sources. Questionnaires and oral interviews were used to collect the primary data, while the secondary data was collected from books, journals, magazines, newspapers and other documents.

5.4 DATA ANALYSIS

All the data collected from primary source through questionnaires and oral interview were statistically presented and analysed. Frequency and tabular percentage forms were used for data presentation while Chi-square test was used to test and analyse some selected hypotheses.

6. PRESENTATION AND ANALYSIS OF DATA

A total of 196 questionnaires were administered, and a total of 150 were duly filled and returned, and it is these returned questionnaires that were analysed and inferences were drawn.

6.1 PRESENTATION OF DATA

The data for this study is hereby presented and analyzed below using the Simple Percentage and the Chi-Square statistical technique for test of Hypotheses as appropriate.

Table 1. Showing Gender distribution of the respondents

Gender	No. of respondents	Percentage %
Male	89	59.4
Female	61	40.6
Total	150	100

Source: Primary data

Table 1 above shows that 89 respondents representing 59.4 percent of the total respondents are male while 61 respondents representing 40.6 percent are female.

Table 2. Showing Age distribution of respondents

Age distribution	No.of respondents	Percentage %
25-30	40	15.2
31-35	43	16.3
35-40	33	12.5
41-45	20	7.6
45 and above	14	5.3
Total	150	100

Source: Primary data

Table 2 above shows that 40 respondents representing 15.2 percent of the total respondents are between 25-30 years, 43 respondents representing 16.3 percent of the total respondents are between 31-35 years, 33 respondents representing 12.5 percent of the total respondents are between 35-40 years, 20 respondents representing 7.6 percent of the total respondents are between 41-45 years while 14 respondents representing 5.3 percent of the total respondents are 45 years and above.

Table 3. Showing respondents' response on whether they agree that environmental sustainability can be achieved through green manufacturing practices among the SMEs

Option	Respondents		Total	Percentage%
	Male	Female		
Strongly agree	33	26	59	39
Agree	25	16	41	27
undecided	13	11	24	17
disagree	11	6	17	11
Strongly disagree	7	2	9	6
Total	89	61	150	100

Source: primary data

From Table 3 above, it is shown that 59 respondents representing 39 percent strongly agreed that environmental sustainability can be achieved through green manufacturing practices in the manufacturing industry, 41 respondents indicated 27 percent agreed to that as well; but 17 respondents representing 11 percent disagreed, and only 2 respondents representing 9 percent strongly disagreed while 24 respondents representing 17 percent were undecided.

Table 4. Showing whether the respondents agree that the SMEs have adopted green manufacturing practices.

Option	Respondents		Total	Percentage%
	Male	Female		
Strongly agree	31	26	57	38
Agree	27	18	45	30
undecided	18	11	29	20

disagree	10	4	14	9
Strongly disagree	3	2	5	3
Total	89	61	150	100

Source: primary data

From Table 4 above, it is shown that 57 respondents representing 38 percent strongly agreed that the manufacturing firms have adopted green manufacturing practices, 45 respondents indicated 30 percent agreed, 29 respondents are undecided representing 20 percent, and 14 respondents representing 9 percent disagreed while only 5 respondents have strongly disagreed representing 3 percent.

Table 5. Showing whether green manufacturing practices have impacted positively on SMEs in sustaining environment.

Option	Respondents		Total	Percentage%
	Male	Female		
Strongly agree	35	21	56	38
Agree	28	20	48	32
undecided	13	11	24	16
disagree	9	8	17	11
Strongly disagree	4	1	5	3
Total	89	61	150	100

Source: primary data

From the Table 5 above, it shows that 56 respondents, indicated 38 percent strongly agree, 48 respondents representing 32 percent agree that green Manufacturing practices have impacted positively on SMEs in sustaining environment, 24 respondents representing 16 percent being undecided about it, while 17 respondents representing 11 percent disagree and only 5 respondents have strongly disagreed representing 3 percent.

Table 6. Showing opinion of employees on to what extent are they satisfied with green manufacturing practices implemented in relation to environmental sustainability in manufacturing firms in Hyderabad.

Option	Respondents		Total	Percentage%
	Male	Female		
Very high extent	11	4	15	10
High extent	11	11	22	15
Low extent	44	29	73	49
Very low extent	13	7	20	13
Not at all	10	10	20	13
Total	89	61	150	100

Source: primary data

Table 6 above indicates that 15 respondents representing 10 percent says to a very high extent they are satisfied with the green manufacturing practices that their companies adopted in environmental sustainability, 22 respondents representing 15 percent says to a high extent while 73 respondents indicating 49 percent believes it is to a low extent, 20 respondents representing 13 percent says it is to a very low extent and 20 respondents representing 13 percent says they are not at all satisfied.

Table 7. showing the viability of the success among the manufacturing firms in implementing green manufacturing practices in Hyderabad

Option	Respondents		Total	Percentage%
	Male	Female		
Strongly agree	46	18	64	43

Agree	17	27	44	29
undecided	14	9	23	15
disagree	9	5	14	10
Strongly disagree	3	2	5	3
Total	89	61	150	100

Source: primary data

Table 7 above shows that 64 respondents strongly agreed representing 43 percent about the viability of the success of the companies in implementing green manufacturing practices, responses from 44 respondents representing 29 percent agreeing, 23 respondents are undecided indicating 15 percent, 14 respondents disagreed which constitute 10 percent while only5 respondents were strongly disagreed which represent 3 percent.

Table 8. showing whether there are challenges and obstacles against the implementation of green manufacturing practices by the manufacturing firms in Hyderabad

Option	Respondents		Total	Percentage%
	Male	Female		
Strongly agree	56	50	106	71
Agree	23	4	27	18
undecided	5	3	8	5
disagree	2	3	5	3
Strongly disagree	3	1	4	3
Total	89	61	150	100

Source: primary data

Table 8 above indicates that 106 respondents representing 71 percent strongly agree that there are obstacles against the implementation of green manufacturing practices by SMEs, 27 respondents agree to it representing 18 percent , 8 respondents are undecided accounting to 5 percent , 5 respondents have disagreed accounting to 3 percent and 4 respondents have strongly disagreed accounting to 3 percent .

Table 9. Showing the prominence of obstacles in implementing green manufacturing practices in Hyderabad.

Option	Respondents		Total	Percentage%
	Male	Female		
Lack of affordability	6	2	8	5
Lack of strict legislation by government	15	20	35	23
Lack of management support	33	19	52	35
Lack of awareness	26	16	42	28
Lack of skilled personnel	9	4	13	9
Total	89	61	150	100

Source: primary data

Table 9 above shows that out of all the obstacles to green manufacturing practices in SMEs 52 respondents representing 35 percent says lack of management support as the challenging obstacle, 42 respondents representing 28 percent believe it is lack of awareness that is pronounced next, 35 respondents representing 23 percent opined that lack of strict legislation by government being another obstacle, whereas 13 respondents indicating 9 percent opined that it is lack of coordination and 8 respondents representing 5 percent have opined that it is lack of affordability.

6.2 ANALYSIS OF DATA

In analysing our data, we shall recall our statement of hypotheses one and two, and also sought out presented tables that have direct bearing on stated objectives and hypotheses.

Recall statement of hypothesis one and two

Hypothesis to be tested

Hypothesis one

Null Hypothesis:

Environmental sustainability cannot be achieved among the manufacturing firms through green manufacturing practices.

Alternative Hypothesis:

Environmental sustainability can be achieved among the SMEs through green manufacturing practices.

Table 10 showing the chi square results for environmental sustainability through green manufacturing practices.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	24.255[a]	3	.000
Likelihood Ratio	26.655	4	.000
Linear-by-Linear Association	280 1	1	.597
N of Valid Cases	150		

Significant at .05 percent

Based on the respondents' responses we can infer that, using the Chi-Square research technique to test our stated hypotheses with the content of Table 3, Test Statistics provides the actual result of the chi-square goodness-of-fit test. It is observed that the chi square value is. 53.600[b] p= .000 is statistically significant, $p < .05$. Therefore, we can reject the null hypothesis at the 5 percent level of significance and conclude that green manufacturing practices have a relationship with environmental sustainability.

Hypothesis two

Null Hypothesis: There are no obstacles perceived against the use of green manufacturing practices in the manufacturing firms in Hyderabad.

Alternative Hypothesis: There are obstacles perceived against the use of green manufacturing practices in the manufacturing firms in Hyderabad.

Table: 11 showing the chi square results for obstacles perceived against the use of green manufacturing practices .

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.551[a]	4	.002
Likelihood Ratio	11.613	4	.000
Linear-by-Linear Association	1.575	1	.009
N of Valid Cases	150		

Significant at .05 percent

Based on the respondents' responses we can infer, using the Chi-Square research technique to test our stated hypotheses with the content of Table 8, Test Statistics provides the actual result of the chi-square goodness-of-fit test. It is observed that the chi square value is. 10.551^{a} p= .000 is statistically significant, $p < .05$ at the 5 percent level of significance . Thus the hypotheses is rejected and conclusions drawn that there are obstacles to implement green manufacturing practices.

It is understood that Green manufacturing practices are practically implementable in the manufacturing firms, given the right environment but there are obstacles in the implementation. Prominent among these obstacles according to the present study are lack of management support, lack of awareness, lack of strict legislation by government and the negligible obstacles are lack of affordability, and lack of skilled personnel.

The implication is that all of these obstacles more or less have made green manufacturing almost impossible and impracticable in the manufacturing firms. Although a part of its principles are currently been implemented by some of the firms but not at the level desired by global best practices.

7. CONCLUSION

The present paper examined how the green manufacturing practices can be adopted to attain environmental sustainability among the SMEs in Hyderabad. If various green manufacturing practices are strictly adhered to, it will surely impact positively on the sustainability of the environment. However, it is not without some identified obstacles like lack of management support, lack of awareness, lack of strict legislation by government, lack of affordability, and lack of skilled personnel. All these are considered to be surmountable problems provided the

management of SMEs as well as the government come together hand in hand in implementing the practices strictly. Governments can provide crucial support for SMEs to overcome the main barriers for their transition towards the green growth economy and encourage entrepreneurial investment and firm creation in the green markets taking shape. Priorities include initiatives such as: raising SMEs' awareness of the scale and implication of the transition towards a green and low carbon economy; tackling SME knowledge and skill gaps in relation to green technologies, practices and business models; and enhancing SME access to the emerging markets of environmental goods and services.

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