



ADVANTAGES OF ENVIRONMENTAL MANAGEMENT SYSTEM IN CONSTRUCTION COMPANIES

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Abstract

An Environmental Management System is a framework that helps an organization achieve its environmental goals through consistent review, evaluation, and improvement of its environmental performance. This paper deals with advantages of environmental management system in construction companies and advantages are assessed from the point of view of the construction company managers. This paper outlines the advantages of environmental management system in construction companies and such indicators are quantified and analyzed. This paper concludes with some interesting findings.

Introduction

An Environmental Management System is a set of processes and practices that enable an organization to reduce its environmental impacts and increase its operating efficiency. The environmental management system provides a framework that helps a company achieve its environmental goals through consistent control of its operations. In order to truly improve environmental performance in their business, companies are required to integrate environmental sustainability into all of their activities (Azapagic, 2003). This means they need a systems approach, where the environmental vision of the company is adopted in all parts of the organization. Hillary, (2004), Iraldo, Testa, and Frey, (2009) and Zorpas, (2010) note that environmental management systems are the approach that companies take to deal with the environmental aspects of their organization. The environmental management system of a company is the way in which it processes any demands it encounters related to environmental aspects, and how it embeds these demands into its organization. Just as organizations differ in their structure, goal, culture etc., so too do they differ in the way they can most effectively handle their environmental aspects.

Numerous approaches have been developed that aim to improve the environmental performance of companies, and to help them in setting up an environmental management system. While some of these approaches provide guidelines that cover all aspects of an environmental management system, others focus on a specific part of this system, or provide a different angle that may suit a different kind of company. The ISO 14001 standard and EMAS are approaches that aim to include all facets of the environmental management system, and are meant to be applicable for companies of any size, and regardless of the sector they operate.

An environmental management system helps an organization address its regulatory demands in a systematic and cost-effective manner. This proactive approach can help reduce the risk of non-compliance and improve health and safety practices for employees and the public. An environmental management system can also help address non-regulated issues, such as energy conservation, and can promote stronger operational control and employee stewardship. Basic Elements of an environmental management system include the following: These include reviewing the organization's environmental goals, analyzing its environmental impacts and legal requirements, setting environmental objectives and targets to reduce environmental impacts and comply with legal requirements, establishing programs to meet these objectives and targets, monitoring and measuring progress in achieving the objectives

,ensuring employees' environmental awareness and competence; and, reviewing progress of the environmental management system and making improvements.

Methods and Materials

This study aims at analyzing the environmental management system among the construction companies in Chennai region. In this study 75 construction companies are selected from the Chennai region representing small size construction companies, medium size construction companies and large size construction companies. From each group 25 project managers are selected as sample under simple random sampling method. The relevant data collected from the managers of the construction companies with the help of questionnaire method. The collected data are classified and tabulated with the help of computer programming. The data analysis is carried out with the help of mean, ANOVA two way analysis and t test.

Advantages of Environmental Management System

This section deals with respondents' rating on advantages of environmental management system. It can be assessed with the help of 20 factors on a 5 point rating scale. These include control of release of pollutants, improving efforts to achieve regulatory compliance, reduction in applicability of some regulations, better identification of future environmental liabilities, improving relations with regulatory authorities, allowing differentiation in products, improving facility profile, cost saving in terms of use of inputs, cost saving in terms of work management, improving information about facility operation, prevention of solid contamination, reducing the frequency of regulatory inspection, consolidating environmental permits, prevention of aesthetic effects, reducing the risk of severe accidents, reduction of waste generation, use of less toxic inputs, proper treatment of waste water, changes in production process to reduce waste generation and reduction in environmental inputs per unit of output.

Table 1 Company Size Wise Respondents’ Rating on Advantages of Environmental Management System

Variables	Small	Medium	Large	Mean
Control of release of pollutants	1.72	1.82	2.25	1.93
Improving efforts to achieve regulatory compliance	2.63	2.93	3.56	3.04
Reduction in applicability of some regulations	3.05	3.35	3.98	3.46
Better identification of future environmental liabilities	2.26	2.56	3.19	2.67
Improving relations with regulatory authorities	1.59	1.69	2.12	1.80
Allowing differentiation in products	2.05	2.35	2.98	2.46
Improving facility profile	3.27	3.57	4.20	3.68
Cost saving in terms of use of inputs	3.88	4.18	4.21	4.09
Cost saving in terms of work management	3.41	3.91	4.14	3.82
Improving information about facility operation	2.18	2.48	3.11	2.59
Prevention of solid contamination	3.18	3.48	4.11	3.59
Reducing the frequency of regulatory inspection	2.90	3.20	3.83	3.31
Consolidating environmental permits	1.73	2.03	2.66	2.14
Prevention of aesthetic effects	2.38	2.68	3.31	2.79
Reducing the risk of severe accidents	3.81	4.01	4.14	4.02
Reduction of waste generation	4.04	4.23	4.25	4.18
Use of less toxic inputs	3.60	3.90	4.23	3.91
Proper treatment of waste water	2.50	2.80	3.43	2.91
Changers in production process to reduce waste generation	1.98	2.28	2.91	2.39
Reduction in environmental inputs per unit of output	2.81	3.11	3.74	3.22
Average	2.75	3.03	3.52	3.10

Source: Computed from primary data

ANOVA					
Source of Variation	SS	df	MS	F	F crit
Variation due to advantages of environmental management system	30.99703	19	1.631422	83.73916	1.867332
Variation due to company size	6.06061	2	3.030305	155.5423	3.244818
Error	0.740323	38	0.019482		
Total	37.79796	59			

Data presented in table 1 indicate the company size wise respondents’ rating on advantages of environmental management system. It could be noted that out of the 20 advantages of environmental management system, the respondents rate the reduction of waste generation is the first level advantage of environmental management system and it is evident from their secured a mean score of 4.18 on a 5 point rating scale. Cost saving in terms of use of inputs is rated at second level advantage of environmental management system and it is estimated from the respondents’ secured a mean score of 4.09 on a 5 point rating scale. The respondents rate the reducing the risk of severe accidents is the third level advantage of environmental management system. It is evident from their secured a mean score of 4.02 on a 5 point rating scale. The respondents rank the fourth level advantage of environmental management system by citing the fact that use of less toxic inputs and it is observed from the respondents’ secured a mean score

of 3.91 on a 5 point rating scale. Cost saving in terms of work management is rated at fifth level advantage of environmental management system and it could be known from the respondents' secured a mean score of 3.82 on a 5 point rating scale.

The respondents' rate the improving facility profile is the rated sixth level advantage of environmental management system and it is revealed from their secured a mean score of 3.68 on a 5 point rating scale. Prevention of solid contamination rated at seventh level advantages of environmental management system and it is observed from the respondents' secured a mean score of 3.59 on a 5 point rating scale. The respondents' rate the reduction in applicability of some regulations and it is their eighth level ranking. It is evident from their secured a mean score of 3.46 on a 5 point rating scale. The respondents rank the ninth level advantage of environmental management system by citing the fact that reducing the frequency of regulatory inspection as per their secured a mean score of 3.31 on a 5 point rating scale. Reduction in environmental inputs per unit of output is rated at tenth level advantage of environmental management system and it is evident from the respondents' secured a mean score of 3.22 on a 5 point rating scale. The respondents rate the improving efforts to achieve regulatory compliance is the eleventh level advantage of environmental management and it could be known from their secured a mean score of 3.04 on a 5 point rating scale. Proper treatment of waste water is rated at twelfth level advantage of environmental management system and it is reflected from the respondents' secured a mean score of 2.91 on a 5 point rating scale. The respondents rank the thirteenth level advantage of environmental management system by citing the fact that prevention of aesthetic effects. It is evident from their secured a mean score of 2.79 on a 5 point rating scale. The respondents rank the fourteenth level advantage of environmental management system by citing the fact that better identification of future environmental liabilities and it is clear from their secured a mean score of 2.67 on a 5 point rating scale. Improving information about facility operation and it is rated at fifteenth level advantage of environmental management as per the respondents' secured a mean score of 2.59 on a 5 point rating scale. The respondents' rate the allowing differentiation in products and it is their sixteenth level ranking. It is evident from their secured a mean score of 2.46 on a 5 point rating scale. The respondents rank the seventeenth level advantage of environmental management system by citing the fact that changes in production process to reduce waste generation as per their secured a mean score of 2.39 on a 5 point rating scale. Consolidating environmental permits is rated at eighteenth level advantage of environmental management system and it is evident from the respondents' secured a mean score of 2.14 on a 5 point rating scale. The respondents rate the control of release of pollutants is the nineteenth level advantage of environmental management and it could be known from their secured a mean score of 1.93 on a 5 point rating scale. Improving relations with regulatory authorities is rated at twentieth level advantage of environmental management system and it is reflected from the respondents' secured a mean score of 1.80 on a 5 point rating scale.

The large size construction company respondents' rank the first position in their overall rated advantages of environmental management system as per their secured a mean score of 3.52 on a 5 point rating scale. The medium size construction company respondents' record the second position in their overall rated advantage of environmental management system as per their secured a mean score of 3.03 on a 5 point rating scale. The small size construction company respondents' come down to the last position in their overall rated advantages of environmental management system and it is estimated from their secured a mean score of 2.75 on a 5 point rating scale.

The anova two way model is applied for further discussion. The computed anova value 83.73 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the advantages

of environmental management system is statistically identified as significant. In another point, the computed anova value 155.54 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the company size is statistically identified as significant as per the respondents expressed advantages of environmental management system.

Table 2 Education Wise Respondents’ Rating on Advantages of Environmental Management System

Variables	Research degree	Post graduation	Under graduation	Diploma	Mean
Control of release of pollutants	2.21	2.02	1.84	1.65	1.93
Improving efforts to achieve regulatory compliance	3.62	3.13	2.95	2.46	3.04
Reduction in applicability of some regulations	4.04	3.55	3.37	2.88	3.46
Better identification of future environmental liabilities	3.25	2.76	2.58	2.09	2.67
Improving relations with regulatory authorities	2.18	1.89	1.71	1.60	1.80
Allowing differentiation in products	3.04	2.55	2.37	1.88	2.46
Improving facility profile	4.16	3.77	3.59	3.20	3.68
Cost saving in terms of use of inputs	4.27	4.18	4.10	3.81	4.09
Cost saving in terms of work management	4.20	4.01	3.83	3.24	3.82
Improving information about facility operation	3.17	2.68	2.50	2.01	2.59
Prevention of solid contamination	4.17	3.68	3.50	3.01	3.59
Reducing the frequency of regulatory inspection	3.89	3.40	3.22	2.73	3.31
Consolidating environmental permits	2.62	2.23	2.05	1.66	2.14
Prevention of aesthetic effects	3.37	2.88	2.70	2.21	2.79
Reducing the risk of severe accidents	4.22	4.19	4.03	3.74	4.02
Reduction of waste generation	4.26	4.25	4.12	4.00	4.18
Use of less toxic inputs	4.19	4.10	3.92	3.43	3.91
Proper treatment of waste water	3.49	3.00	2.82	2.33	2.91
Changers in production process to reduced waste generation	2.97	2.48	2.30	1.81	2.39
Reduction in environmental inputs per unit of output	3.80	3.31	3.13	2.64	3.22
Average	3.56	3.20	3.03	2.62	3.10

Source: Computed from primary data

ANOVA

Source of Variation	SS	df	MS	F	F crit
Variation due to advantages of environmental management system	41.16177	19	2.166409	126.2423	1.771972
Variation due to educational status	9.091514	3	3.030505	176.5954	2.766438
Error	0.978161	57	0.017161		
Total	51.23145	79			

Table 2 reveals data on the education wise respondents’ rating on advantages of environmental management system. The research degree level educated respondents rank the first position in their overall rated advantages of environmental management system in their organization as per their secured a mean score of 3.56 on a 5 point rating scale. The post graduate degree level educated respondents record the second position in their overall rated advantages of environmental management system in their organization as per their secured a mean score of 3.20 on a 5 point rating scale. The under graduate degree level educated respondents register the third position in their overall rated advantages of environmental management system in their organization as per their secured a mean score of 3.03 on a

5 point rating scale. The diploma level educated respondents turn down to last position in their overall rated advantages of environmental management system in their organization as per their secured a mean score of 2.62 on a 5 point rating scale.

The anova two way model is applied for further discussion. The computed anova value 126.24 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the advantages of environmental management system is statistically identified as significant. In another point, the computed anova value 176.59 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the educational status is statistically identified as significant as per the respondents rated advantages of environmental management system.

Table 3 Company Duration Wise Respondents' Rating on Advantages of Environmental Management System

Variables	5-10 years	10-15 years	15-20 years	20-25 years	Mean
Control of release of pollutants	1.58	1.80	2.06	2.28	1.93
Improving efforts to achieve regulatory compliance	2.59	2.91	3.17	3.49	3.04
Reduction in applicability of some regulations	3.01	3.33	3.59	3.91	3.46
Better identification of future environmental liabilities	2.22	2.54	2.80	3.12	2.67
Improving relations with regulatory authorities	1.55	1.67	1.83	2.15	1.80
Allowing differentiation in products	2.01	2.33	2.59	2.91	2.46
Improving facility profile	3.23	3.55	3.81	4.13	3.68
Cost saving in terms of use of inputs	3.84	4.06	4.22	4.24	4.09
Cost saving in terms of work management	3.37	3.79	3.95	4.17	3.82
Improving information about facility operation	2.14	2.46	2.72	3.04	2.59
Prevention of solid contamination	3.14	3.46	3.72	4.04	3.59
Reducing the frequency of regulatory inspection	2.86	3.18	3.44	3.76	3.31
Consolidating environmental permits	1.69	2.01	2.27	2.59	2.14
Prevention of aesthetic effects	2.34	2.66	2.92	3.24	2.79
Reducing the risk of severe accidents	3.67	3.99	4.15	4.17	4.02
Reduction of waste generation	4.13	4.17	4.20	4.23	4.18
Use of less toxic inputs	3.46	3.78	4.04	4.36	3.91
Proper treatment of waste water	2.46	2.78	3.04	3.36	2.91
Changers in production process to reduced waste generation	1.94	2.26	2.52	2.84	2.39
Reduction in environmental inputs per unit of output	2.77	3.09	3.35	3.67	3.22
Average	2.70	2.99	3.22	3.49	3.10

Source: Computed from primary data

ANOVA

Source of Variation	SS	df	MS	F	F crit
Variation due to advantages of environmental management system	41.46802	19	2.182528	226.7866	1.771972
Variation due to company duration	6.687624	3	2.229208	231.6372	2.766438
Error	0.548551	57	0.009624		
Total	48.7042	79			

Data presented in table 3 indicate the company duration wise respondents' rating on advantages of environmental management system in their organization. The respondents belong 20-25 years company duration group rank the first position in their overall rated advantages of environmental management system in their organization as per their secured a mean score of 3.49 on a 5 point rating scale. The respondents come under the company duration group in the range of 15-20 years register the second position in their overall rated advantages of environmental management system in their organization as per their secured a mean score of 3.22 on a 5 point rating scale. The respondents included in the working experience group in the range of 10-15 years occupy the third position in their overall rated advantages of environmental management system in their organization as per their secured a mean score of 2.99 on a 5 point rating scale. The respondents observed in the 5-10 years company duration group turn down to last position in their overall rated advantages of environmental management system in their organization as per their secured a mean score of 2.70 on a 5 point rating scale.

The anova two way model is applied for further discussion. The computed anova value 226.78 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the advantages of environmental management system is statistically identified as significant. In another point, the computed anova value 231.63 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the company duration groups is statistically identified as significant as per the respondents rated indicators of advantages of environmental management system.

Table 4 Sex Wise Respondents' Rating on Advantages of Environmental Management System

Variables	Male	Female	Mean
Control of release of pollutants	2.16	1.70	1.93
Improving efforts to achieve regulatory compliance	3.37	2.71	3.04
Reduction in applicability of some regulations	3.79	3.13	3.46
Better identification of future environmental liabilities	3.00	2.34	2.67
Improving relations with regulatory authorities	2.03	1.57	1.80
Allowing differentiation in products	2.79	2.13	2.46
Improving facility profile	4.01	3.35	3.68
Cost saving in terms of use of inputs	4.22	3.96	4.09
Cost saving in terms of work management	4.15	3.49	3.82
Improving information about facility operation	2.92	2.26	2.59
Prevention of solid contamination	3.92	3.26	3.59
Reducing the frequency of regulatory inspection	3.64	2.98	3.31
Consolidating environmental permits	2.47	1.81	2.14
Prevention of aesthetic effects	3.12	2.46	2.79
Reducing the risk of severe accidents	4.15	3.89	4.02
Reduction of waste generation	4.26	4.10	4.18
Use of less toxic inputs	4.14	3.68	3.91
Proper treatment of waste water	3.24	2.58	2.91
Changers in production process to reduced waste generation	2.72	2.06	2.39
Reduction in environmental inputs per unit of output	3.55	2.89	3.22
Average	3.38	2.82	3.10

Source: Computed from primary data
 t statistical value 15.43, df, 19, t critical value 1.72

Table 4 shows data on the sex wise respondents' rating on advantages of environmental management system. The male respondents' rank the first positions in their overall rated advantages of environmental management system in their organization as per their secured a mean score of 3.38 on a 5 point rating scale. The female respondents' hold the second position in their overall rated advantages

of environmental management system in their organization and it is estimated from their secured a mean score of 2.82 on a 5 point rating scale.

The t test is applied for further discussion. The computed t value 15.43 is greater than its tabulated value at 5 per cent level significance. Hence, there is a significant difference between male respondents' and female respondents' in their overall rated advantages of environmental management system.

Conclusion

It could be seen clearly from the above discussion that the respondents' rate the high level advantages of environmental management system by citing the indicators that reduction of waste generation, cost saving in terms of use of inputs, reducing the risk of severe accidents, use of less toxic inputs, cost saving in terms of work management, improving facility profile and prevention of solid contamination as per their secured a mean score above 3.50 on a 5 point rating scale. The respondents' report the moderate level advantages of environmental management system by stating the facts that reduction in applicability of some regulations, reducing the frequency of regulatory inspection, reduction in environmental inputs per unit of output, improving efforts to achieve regulatory compliance, proper treatment of waste water, prevention of aesthetic effects, better identification of future environmental liabilities and improving information about facility operation as per their secured a mean score in the range of 2.50 to 3.50 on a 5 point rating scale. The respondents' rate the low level advantages of environmental management system by indicating the facts that allowing differentiation in products, changes in production process to reduce waste generation, consolidating environmental permits, control of release of pollutants and improving relations with regulatory authorities as per their secured a mean score below 2.50 on a 5 point rating scale. It could be observed that the large size construction company respondents' rank the first position in their rated overall advantages of environmental management system, medium size construction company respondents' the second and small size construction company respondents' the last.

The result of education wise analysis reveals that the research degree level educated respondents rank the first position in their overall rated advantages of environmental management system in their organization, post graduate degree holder respondents the second, under graduate degree level respondents the third and diploma level educated respondents the last. The result of company duration wise analysis reveals that the respondents belong to the 20-25 years company duration group rank the first position in their overall rated advantages of environmental management system in their organization, respondents come under the 15-20 years company duration group the second, respondents identified in the 10-15 years company duration group the third, and respondents observed 5-10 years company duration group the last. The result of gender wise analysis reveals that the female respondents lag behind the male respondents in their overall rated advantages of environmental management system in their organization.

References

- Azapagic, A. (2003). Systems Approach to Corporate Sustainability. *Process Safety and Environmental Protection*, 81(5), 303-316.
- Hillary, R. (2004). Environmental management systems and the smaller enterprise. *Journal of Cleaner Production*, 12(6), 561-569.
- Iraldo, F., Testa, F., & Frey, M. (2009). Is an environmental management system able to influence environmental and competitive performance? The case of the eco-management and audit scheme (EMAS) in the European union. *Journal of Cleaner Production*, 17(16), 1444-1452.

Zorpas, A. (2010). Environmental management systems as sustainable tools in the way of life for the SMEs and VSMEs. *Bioresource Technology*, 101(6), 1544–1557.

Pojasek, R. (2012a). Checking and Reviewing Sustainability Progress. *Environmental Quality Management*, 83–91

McKeiver, C. (2005). Environmental Management Systems in Small and Medium Businesses. *International Small Business Journal*, 23(5), 513–537.

Heras, I., & Arana, G. (2010). Alternative models for environmental management in SMEs: the case of Ekoscan vs. ISO 14001. *Journal of Cleaner Production*, 18(8), 726–735.