International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2014): 5.611

Environmental Management in Small and Medium Scale Manufacturing Industries in Shah Alam

Mohd Rashdan Isa[1], Omar Suliman Zaroog[1], Krishnakumar Kalaiarasan[1]

[1]Department of Mechanical Engineering, Universiti Tenaga Nasional, Kajang, 43000, Malaysia

Abstract: ***Being one of the biggest industrialized city in Malaysia with large urban settlements, Shah Alam has been prone to serious environmental issues in the last decades. The small and medium manufacturing industries generate severe environmental impact and it lags far behind compared to other industries and sectors in implementing Environmental Management due to various factors. This study is to evaluate environmental impacts of manufacturing and to examine the company behaviour towards Environmental Management, thus explore the available measures for Environmental Management by employing a Questionnaire survey. This paper summarizes and discusses the result of a survey on Environmental Management in Small and Medium Scale Manufacturing Industries in Shah Alam. The primary respondents were from different manufacturing sectors such as automotive, petroleum, chemicals, plastics, food production, metal manufacturing, wood, paper, leather, electrical, electronics, and general machinery. The results discuss the respondent's profile, subject's environmental management practices, their relations with stakeholders, and environmental awareness. A thorough statistical analysis is carried out with the results obtained.***

Keywords: Environmental, Manufacturing, Small and Medium Manufacturing Industries.

1. Introduction

Due to the increasing environmental awareness from the public, the legal requirements in line with local city council, Majlis Bandaraya Shah Alam's (MBSA) policies and regulations, Environmental Management (EM) is an integral part of large manufacturing industries in Shah Alam. In comparison with other large sectors, it lags far behind in implementing environmental management (EM).

The ISO 14001 standard is the most comprehensive standard for environmental risk management and is directly linked to the European Eco-Management and Audit Scheme (EMAS). Environmental Management is becoming an imperative tool in observing and preserving the environment. They are used globally by industries to identify, monitor and regulate possible environment effects. In fact, EM is now a business approach and requisite for some industry sectors. Implementation of EM policies provides a competent guidance for companies to concurrently develop, establish themselves and assess their business practices towards both business and environmental goals. EM means the management of the interaction and impact of human societies on the environment.

2. Literature Review

EM is an aspect that signifies the overall management structure that addresses the instantaneous and long-term effect of its services, products and processes to the environment. It was fragmented with the establishment of the British Standard 7750 (BS7750) by the United Kingdom. Later, the European Commission developed Eco-management and Audit System (EMAS) to provide a standard that could be acknowledged worldwide (H. H. Low 2015).

In 1993, the ISO 14001 series were introduced to aid industries to be both sustainable and environmental friendly to acknowledge internationally and sets out the steps to be taken by an organization to implement an effective EM. ISO 14001 standards were endorsed more than 100 countries as an international standard and written by consensus of about 50 countries (Perumal Puvanasvaran 2012).

EM System should be built on the "Plan, Do, Check, Act" model to make sure that environmental problems are thoroughly recognized, controlled, and supervised. Using this approach will help to ensure that performance of the Environmental Management System progresses over time and that goals for implementing an EMS is in the first place (Philip J. Stapleton 2001).

EM improves quality, customer satisfaction, and production management (O. Boiral 2012) as well as enhances operational efficiency, help cost savings, promotes compliance assurance, improves relationship with regulators, reduces risks such as insurance costs (Homens 2011). EM provides very strong internal motivation, commitment of top management, communication with interest groups, stakeholder's involvement, accountabilities for environmental management (H.J.D. Vries 2012). Besides that, developments in productivity, competitiveness, business profitability, and green image are benefits of EM (P. Gonzalez 2008). Some of the major barriers for the implementation of Environmental Management are *motivation, resource issues, and implementation concerns* (The National Environmental Education & Training Foundation 2001).

Top management is the key success factors in the implementation of EMS. The common critical success factors in implementing EMS ISO 14001 are leadership and support of the management, internal analysis, learning and training and sustainability (Ambika Zutshia 2004) as well as the employee empowerment, commitment of management, rewards, feedback, and review (Nalini 2004).

3. Methodology

Questionnaire survey is the main methodology employed in this research which allows the gathering of large of number of data from a significant amount of population in easy and more economical way. The first stage of this survey is Questionnaire Design Process where the survey questionnaire was designed, pre-tested, and debugged. The following stage is Data Collection. Data was collected from 100 different manufacturing companies in Shah Alam, in which only 57 were identified to be SMEs. Once the data was collected, they were thoroughly, analysed using SPSS (Statistical Package for Social Sciences). Once the data is thoroughly analysed, some of the data were validated to prove their reliability using the Cronbach Alpha. Cronbach Alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. It is considered to be a measure of scale reliability (UCLA, 2015).

4. Result

4.1 Respondent Profile

The response rate for this survey varied by industry from 7.02% to 24.56%. The highest number of positive responses were from petroleum, chemicals, and plastics sector (14 responses) and the lowest were from automotive sector (4 responses). Table 1 represents the statistical analysis of respondents by their nature of business.

The questionnaires were mainly addressed to managers, assistant managers, supervisor, section heads, and environmental specialists or engineers that has adequate knowledge on Environmental Management policies and practices, especially ISO 14001.

4.2 Environmental Management Practices

When questioned on how the companies communicate with their employees regarding their environmental policy if they have any, most of the respondent‘s choose to have it posted at their facility (27 responses). The least favourite option was distributing to employees, which constitutes 7%. A number of 12 respondents said that they don‘t communicate with their employees regarding this because they don‘t have any policy. The result is presented in Table 2 below

When a thorough cross tabulation done on EM policy communication from industry to industry, general machinery industry is found to be having 4 respondents without any environmental policy, followed by 3 electrical and electronics companies. The rest of the businesses had one respondent in this category with only automotive industry being an exclusion. Table 3 shows the EM policy communication result.

Table 1: Business nature by respondents

		Frequency	*Percent*	*Valid Percent*	*Cumulative Percent*
Valid	Automotive	4	7.0	7.0	7.0
	Petroleum, Chemicals, and plastics	14	24.6	24.6	31.6
	Food Production	8	14.0	14.0	45.6
	Metal Manufacturing	6	10.5	10.5	56.1
	Wood, Paper, and Leather	8	14.0	14.0	70.2
	Electricals and electronics	8	14.0	14.0	84.2
	General Machinery	9	15.8	15.8	100.0
	Total	57	100.0	100.0	

Table 2: EM Policy Communication

		Frequency	*Percent*	*Valid Percent*	*Cumulative Percent*
Valid	Posted at facility	27	47.4	47.4	47.4
	Distributed to employees	4	7.0	7.0	54.4
	Verbal Communication	14	24.6	24.6	78.9
	None	12	21.1	21.1	100.0
	Total	57	100.0	100.0	

Questions regarding environmental audits were divided into two categories, such as external and internal audits. Talking about external environmental audits, 54.4% of them said that they had it 1-2 times per financial year. Besides that, 24% of the respondents said they never had any external environmental audits. Only 3.5% of the respondents had 3 to 4 external environmental audits per financial year. When questioned about the frequency of internal environmental audits, based on table 12, 37 out of 57 respondents said they‘ve had at least 1 to 2 internal audits per financial year followed by 11 respondents saying 3 to 4 times, and 9 respondents saying none. Table 4 shows the result for both external and internal audit.

Table 3: Mode of EM Policy Communication by nature of business

		Mode of EM Policy Communication				Total
		Posted at facility	*Distributed to employees*	*Verbal Communication*	*None*	
Business Nature	Automotive	2	1	1	0	4
	Petroleum, Chemicals, and plastics	5	1	7	1	14
	Food Production	4	1	2	1	8
	Metal Manufacturing	4	0	1	1	6
	Wood, Paper, and Leather	5	0	1	2	8
	Electricals and Electronics	4	1	0	3	8
	General Machinery	3	0	2	4	9
Total		27	4	14	12	57

Table 4: External vs Internal Audit

		Frequency		Percent		Valid Percent		Cumulative Percent	
		External	Internal	External	Internal	External	Internal	External	Internal
Valid	1-2 times	31	37	54.4	64.9	54.4	64.9	54.4	64.9
	3-4 times	2	11	3.5	19.3	3.5	19.3	57.9	84.2
	None	24	9	42.1	15.8	42.1	15.8	100.0	100.0
	Total	57	57	100.0	100.0	100.0	100.0		

The next question in this section focuses on environmental training received by subject‘s employees by department. Respondents were required to indicate the frequency by department such as purchasing, sales, engineering, maintenance, operation, and management. Most respondents said that none of their employees from various department received environmental training over the past 12 months. The second famous option is 1-10 employees each department followed by 11-20 employees, and the least chosen option is 31 and above. Highest number of environmental training were carried out in the operations department. Table 5 shows the result.

Table 5: Environmental Training by Department

	1-10 times	11-20 times	21-30 times	31 and above	None
Purchasing	19	7	-	-	31
Sales	20	6	-	-	31
Engineering	13	5	-	-	39
Maintenance	31	9	-	-	17
Operation	11	6	13	19	8
Management	36	10	-	-	11

One of the keys to identify the subject‘s environmental management practices, is to know if they have ISO 14001 (Environmental Management) policy certification. Most of the respondents said that they are planning to implement EM policy (25 responses /43.9%). ‗Not considered‘ and ‗Future Consideration‘ share a percentage of 17.5% each. ISO 14001 is successfully implemented by 15.8% subjects and currently being implemented by 5.3% subjects. The highest number of ISO 14001 certifications are from petroleum, chemicals, and plastics, food production, wood, paper, and leather, electrical, and electronics sectors with an equal share of 16.7% each. The rest are equally shared by automotive, general machinery, and metal manufacturing. Table 6 represents the result obtained.

1.3 Relations with Stakeholders

There are EM events organized by government and NGO. Table 7 shows the participation in government programs by sectors. Most number of participations are from petroleum, chemicals, and plastics sector and the most inactive sector is general machinery

On the other hand, Table 8 shows the participation in NGO and industry-led programs in general. Almost 42.1% of the respondents said that they never participate in such programs, while 10.5% chose ‗Frequent‘. Almost more than half (52.6%) of the respondents said they never participate in such programs. Only 17.5% and 8.8% of respondents said they sometimes participate and frequently participate, respectively

Table 6: ISO14001 Status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not considered	10	17.5	17.5	17.5
	Future consideration	10	17.5	17.5	35.1
	Planning to implement	25	43.9	43.9	78.9
	Currently Implementing	3	5.3	5.3	84.2
	Successfully Implemented	9	15.8	15.8	100
	Total	57	100	100	

Table 7: Participation in Government programs by sectors

	Government events				Total
	Frequent	Sometimes	Barely participate	Never participate	
Automotive	0	2	1	1	4
Petroleum, Chemicals, and plastics	3	7	2	2	14
Food Production	1	2	5	0	8
Metal Manufacturing	1	2	2	1	6
Wood, Paper, and Leather	2	4	1	1	8
Electricals and electronics	2	3	1	2	8
General Machinery	1	2	2	4	9
Total	10	22	14	11	57

Table 8: Subject's participation in NGO and industry-led programs

		Frequency		Percent		Valid Percent		Cumulative Percent	
		NGO	Industry-led	NGO	Industry-led	NGO	Industry-led	NGO	Industry-led
Valid	Frequent	6	5	10.5	8.8	10.5	8.8	10.5	8.8
	Sometimes	16	10	28.1	17.5	28.1	17.5	38.6	26.3
	Barely participate	11	12	19.3	21.1	19.3	21.1	57.9	47.4
	Never participate	24	30	42.1	52.6	42.1	52.6	100	100
	Total	57	57	100	100	100	100		

The questionnaire also tested subject‘s view on soliciting opinions from non-profit organization (NPOs), such as involving them identifying and resolving environmental issues. This question garnered a very good positive response (84.2%). Only 15.8% of the respondents said ‗Maybe‘ to this question. With none of the respondents choosing ‗No‘ to this question, the possibilities of manufacturing industries to work together with NPOs to improve their environmental performance seems to be bright.

The last question in this section of the questionnaire discusses the group of people that influences the subject‘s improvement in environmental performance. The group of people that asked to rate according to their influence are customers, Government, NGOs, suppliers, shareholders, local community, competitors, members of the industry, and employees. The group that is said to be very influential in subject‘s improvisation of environmental performance is Government and the least is the local community.
Since this is a Likert scale question, reliability analysis has been done using Cronbach‘s Alpha. Table 9 shows item statistics of the survey. The scale statistics produced the mean value of 31.33, variance of 64.048 and standard deviation of 8.003. Cronbach‘s Alpha is more than 0.7, therefore the data obtained for this question is very reliable.

4.4 Environmental Performance

Since this section of the questionnaire tested the respondent‘s environmental awareness, the first question is about environmental issues they face or they observe in their surroundings. Result in Table 10 shows the most common type of environmental issue recorded is air pollution, with 89.5.4%.

The following questions ask subject‘s opinion on critical factors that affect the effective implementation of Environmental Management. Table 11 shows the critical factors. Employee‘s behaviour is chosen to be most important critical factor with 96.5%.

Table 9: Item Statistics

	Mean	Std. Deviation	N	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Customers	4.12	1.181	57	27.21	50.348	.734	.902
Government	4.35	.991	57	26.98	51.982	.776	.900
NGOs	4.16	1.031	57	27.18	52.576	.696	.905
Suppliers	3.18	1.241	57	28.16	48.778	.792	.897
Shareholders	3.35	1.157	57	27.98	50.053	.773	.899
Local_community	2.60	1.400	57	28.74	50.519	.581	.915
Competitors	3.89	1.113	57	27.44	50.501	.778	.899
industry_members	3.60	1.033	57	27.74	51.662	.763	.900
Employees	2.09	1.199	57	29.25	53.939	.492	.919

Table 10: Environmental Issue

		Responses		Percent of Cases
		N	Percent	
Valid	Air Pollution	51	27.4%	89.5%
	Water Pollution	35	18.8%	61.4%
	Solid Waste	46	24.7%	80.7%
	Hazardous Waste	15	8.1%	26.3%
	Noise Pollution	39	21.0%	68.4%
Total		186	100.0%	326.3%

Table 11: Critical Factors

		Responses		Percent of Cases
		N	Percent	
$CF[a]	Financial Restrictions	35	25.7%	61.4%
	Company Policy	21	15.4%	36.8%
	Human Power	25	18.4%	43.9%
	Employees' Behaviour	55	40.4%	96.5%
Total		136	100.0%	238.6%

The upcoming question is asked to obtain subject‘s opinion regarding how they can overcome the challenges in practicing Environmental Management successfully. All 3 of the given options garnered an equal response of 94.7% each. Table 12 shows the result obtained.

Table 12: Overcoming Challenges

		Responses		Percent of Cases
		N	Percent	
Overcome Challenges	Train Employees	54	33.3%	94.7%
	Participate in environmental Programs	54	33.3%	94.7%
	Work closely with Government, NGOs, and NPOs	54	33.3%	94.7%
Total		162	100.0%	284.2%

The last question in the questionnaire is about subject‘s opinion on implementation of Environmental Management‘s direct or indirect effect on production. About 52 respondents said ‗Yes‘ to this question, which yields a percentage of 91.2%. Only an 8.8% respondents said ‗No‘ to this question. The responses shows that the industry has positive view on Environmental Management Policy.

.

5. Discussion

Based on the result, the target respondents were mostly occupying middle or higher position of the manufacturing company. They have more exposure and knowledge of environmental management practices and behaviour of a manufacturing company which makes the data obtained very reliable.

Most companies has full-time employees working on the safety and health issues of the facility instead of environmental specialist or engineers. When inquired on this, the sole reason given by the respondents was financial restrictions of the organization that doesn‘t have the capability to specially hire an environmental engineer or specialist.

A company should undergone environmental audits regularly, and the company‘s management should review it from time to time to make sure that its effective and adequate (Jesús Ángel del Brío, 2001). A manager‘s attitude towards environment will directly or indirectly influence their attitude towards SME green concept (Peter Yacob, June 2012).

Based on the data, the participation of SME manufacturing companies in environmental programs organized by local city council or authorities, NGOs, and the industry members themselves is very poor. The survey results clearly shows how vital is the role of Government authorities and NGOs in influencing a company‘s environmental behaviour and practices and the respondents were also very well aware of that. Observations made prior to the survey helped to come up with a list of environmental issues.

Effective implementation of EM also means that an organization should overcome some of the challenges. They must first identify the critical factors that affects implementation of environmental management. As discussed earlier, financial restriction have always been a hurdle for SMEs in the process of inducing environmental policies. Moreover, the survey also identified that employee‘s behaviour is also another important critical factors. Training the employees, working closely with stakeholders such as government agencies, NGOs, and participating in environmental programs are some of the elements for improving environmental performance and compliance (Commission for Environmental Cooperation, 2000).

6. Conclusion

Some very valuable data in regards with Environmental Management in small and medium scale manufacturing industries in Shah Alam have been gathered via this research. Some of the assumptions and observations made prior to the survey are proven to be accurate, as it is strongly backed by the survey results. For instance, SME manufacturing do lag far behind compared to other industries in implementing EM. Besides that, this research enabled us to understand the behaviour and practices of SME manufacturing industries in Shah Alam towards the environment. Government and NGOs are found to be playing an important role in the environmental performance of these companies. The implementation of EM is a continuous effort which requires constant aid in the form of advice and knowledge sharing. At the end of this research, we were able to provide with some recommendations and measures for effective implementation of Environmental Management is provided. Overall, the objectives of this research have been achieved.

References

[1] SME Corp. Malaysia. 2013. *Guidelines For New SME Definition.* SME Corp. Malaysia.
[2] Ambika Zutshia, Amrik Sohal. 2004. "A study of the environmental management system (EMS) adoption process within Australasian organisations—2. Role of stakeholders." *Technovation* 371–386.
[3] Commission for Environmental Cooperation. 2000. *Improving Environmental Performance and Compliance: 10 Elements of Effective Environmental Management Systems.* Montreal: Commission for Environmental Cooperation.
[4] H. H. Low, O. K. Tan, S. L. Choi, and A. R. Rabeatul Husna. 2015. "The Adoption of Environmental Management System in Malaysia‘s Manufacturing Organizations." *Journal of Economics, Business and Management* 93-97.
[5] H.J.D. Vries, D.K. Bayramoglu, T.V Wiele. 2012. "Business and environmental impact of ISO 14001." *International Journal of Quality & Reliability Management* 425 – 435.
[6] Homens, J.L.M. 2011. *Labeling Schemes or Labeling Scams? Auditors' Perspectives on ISO 14001 Certification.* Blacksburg: faculty of the Virginia Polytechnic Institute and State University.
[7] Jesús Ángel del Brío, Esteban Fernández, Beatriz Junquera andCamilo José Vázquez. 2001. "Motivations for Adopting the ISO 14001 Standard: A Study of Spanish Industrial Companies." *Environmental Quality Management* 10 (4): 13-28.
[8] Nalini, G. and Bonnie, F.D. 2004. "Motivating employees for environmental improvement." *Industrial Management & Data System* 364-372.
[9] O. Boiral, J.F. Henri. 2012. "Modelling the impact of ISO 14001 on environmental performance: A Comparative Approach." *Journal of Environmental Managemen* 84-97.
[10] Oliver Ling Hoon Leh, Siti Nur Afiqah Mohamed Musthafa and Noralizawati Mohamed. 2014. "Air Quality and Land Use in Urban Region of Petaling Jaya,." *Environmental Asia* 134-144.
[11] P. Gonzalez, J. Sarkis, B. Adenso-Diaz. 2008. "Environmental management system certification and its influence on corporate practices: Evidence from the

automotive industry." *International Journal of Operations & Production Management* 1021 – 1041.

[12] Perumal Puvanasvaran, Robert Kerk Swee Tian, Vasu Suresh, Mohd Razali Muhamad. 2012. "Lean principles adoption in environmental management system (EMS): A survey on ISO 14001 certified companies in Malaysia." *Journal of Industrial Engineering and Management* 406-430.

[13] Peter Yacob, M.Krishna Moorthy. June 2012. "Green Practices: Perception of Malaysian SME Owners/Managers." *International Journal of Academic Research in Economics and Management Sciences* 1 (3): 103-111.

[14] Peter Yacob, Nur Syaheeda Binti Aziz, Mohamad Fared bin Mohamad Makmur, Adi Wira bin Mohd Zin. 2013. "The policies and green practices of Malaysian SMEs." *Global Business and Economics Research* 23-65.

[15] Philip J. Stapleton, Margaret A. Glover, S. Petie Davis. 2001. *Environmental Management Systems: An Implementation Guide for Small and Medium-Sized Organizations.* Ann Arbor, Michigan: NSF International

[16] S.S.Chen. 2000. *ENVIRONMENTAL ISSUES OF MALAYSIA.* Shah Alam: Sirim Berhad.

[17] The National Environmental Education & Training Foundation. 2001. *Standardizing Excellence: Working with Smaller Businesses to Implement Environmental Management Systems.* Guidance , Washington DC: The National Environmental Education & Training Foundation.

[18] UCLA. 2015. *IDRE.* July 11. http://www.ats.ucla.edu/stat/spss/faq/alpha.html.

.