Journal of Applied Sciences Research, 4(4): 383-390, 2008

Environmental Management System as a Tool for Improving the Environmental Performance (Case Study)

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Abstract: The main objective of this study was to provide a review of key concepts and issues relevant to Environmental Management System (EMS) in developing countries to analyze, evaluate EMS implementation (in the Egyptian companies) and suggestion of recommendations. The chosen company was the Egyptian Minerals and Salts Company (EMISAL). It is an Egyptian joint stock company, its main objective is to extract salts from lake Qarun in Fayoum Governorate, Egypt and produce about 100000 ton/year Anhydrous Sodium Sulphate (Na_2SO_4), 200000 ton/year Sodium Chloride (NaCl), 27000 ton/year Magnesium Sulphate ($Mg\ SO_4.\ 7H_2O$) and minor amounts of Potassium. This study was reviewing ISO 14001 (environmental requirements for EMS using the ISO 14001) and address the advantage that could be achieved of EMS implementation through describing, reviewing and evaluating the functionality of an implemented EMS in EMISAL as a case study (against ISO 14001:2004 requirements). Two tables are generated, the first is a check list table (all requirements for ISO standard) and the second is a questioner table to evaluate the documented elements which the company has been certified to realize to what extent the company agrees with EMS requirements and assesses the adopted procedures and action that are lie beyond the EMS required. The obtained results showed that, environmental policy, objective and target, emergency preparedness and monitoring and management indicating that the company agreed with ISO 14001 requirements with 82, 90, 80 and 86%, respectively, while each of environmental aspects, environmental management, structure and responsibility, training awareness and competence, communication, documentation and operation control, non conformance and corrective and prevention action, records, management review, indicating that the company was agreed with ISO 14001 requirements with 100%.

Key words: Egyptian Salt Company, Environmental Management System, Environmental Policy, ISO 14001 requirements.

INTRODUCTION

The concept of Environmental Management System (EMS) as a tool for improving the environmental performance of many private companies, governmental bodies, non governmental organizations and even citizen has emerged as a response to the globally increasing environmental demands[2,13]. Awareness about the importance of the EMS implementation has recently started in the Middle East countries. In spite of struggling with the unstable economic climate and with the new strict environmental legislation, most companies might adopt and implement Environmental Management Systems within their general management as a solution to improve their environmental performance, complying with the environmental regulations and increasing their competitiveness in the external markets[1,9]. An EMS allows an organization to systematically manage its environmental and health safety matters. Most EMS is built on the "Plan, Do, Check and Act" model. This model leads to continual improvement based upon:

Plan: Planning, including identifying environmental aspects and establishing goals.

Do: Implementing, including training and operational controls.

Check: Checking, including monitoring and corrective action.

Act: Reviewing, including progress reviews and acting to make needed changes to the EMS[11].

Environmental Management System (EMS) can result in both business and environmental benefits. For example, an EMS may help in improving the

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environmental performance, Prevention of pollution and conserve resources, reduction of risks, attraction of new customers and markets (or at least retain access to customers and markets with EMS requirements), increasing the efficiency, reduction of costs, enhancement of employee morale and possibly recruitment of new employees, enhancement of image with public, regulators, lenders and investors, achievement/improvement of employee awareness of environmental issues and responsibilities, and qualify for recognition/incentive programs such as the EPA Performance[6,8].

ISO14001[4] standard can be used to establish EMS. It is used to manage the environmental aspects of any organization's activities, products and services. It is used to improve environmental performance. Environmental performance is all about how well manage and control environmental aspects and the impact they have on the environment. It can be also using this standard to demonstrate everything to protect the environment and to improve organization environmental performance. Organization's commitment can be demonstrated in several ways such as announce to the world that organization's EMS complies with the ISO14001 standard and it can be asked an ISO14001 registrar or external auditor to verify that organization EMS complies with the ISO14001 standard[7]. ISO 14001[4] expects organizations to comply with all of the requirements that make up the standard. According to ISO14001, every requirement must be built into every EMS. However, the size and complexity of environmental management systems vary quite a bit. Many factors affect the ISO14001 requirements, including the size, the location and the scope of the organization's EMS, the contents of the organization's environmental policy, the nature of the organization's activities (products and services), and the legal and other requirements that must be met[11,3]. Essentially, EMS is adopted in order to fulfill current environmental legislation and continuously improve environmental performance[12]. The initial environmental goals and the pace of the improvement are thus decided by the organization itself[10,5].

This study was concerned with describing, reviewing and evaluating the functionality of an implemented EMS in an Egyptian company. The Egyptian minerals and salts Company (EMISAL) which was chosen as a case study because it has ISO14001 certification and its activities may affect on the surrounding environment.

MATERIALS AND METHODS

The evaluation and assessment of the study rely on the following structure and concepts:

A- Checklist Table: The evaluation of the documentation procedure on the basis of checklist table (which are devoted to ISO14001 requirements), demonstrate the visual effects of the inspection fraction of both the ISO14001 standards and compiled data, and headlines of the terminated which could be extracted from the previous analysis.

It consists of:

a) The environmental policy checklists.
b) Planning stage checklists includes:
1. Environmental aspects.
2. Objective and target.
3. Environmental management program.
4. Legal requirements.
c) Implementation and operation checklists include:
1. Structure and responsibility.
2. Training awareness and competence.
3. Communication.
4. Environmental management system documentation.
5. Operation control.
6. Emergency preparedness.
d) Checking and corrective action checklists include:
1. Monitoring and measurement.
2. Non conformance, corrective and prevention action.
3. Records.
4. Environmental management system audit.
e) Management review checklists of the company.

B. Questioner Table: A questioner table has been made and discussed with the environmental management representative of the company in order to assess the adopted procedures and actions that lie beyond the EMS required documents for certification.

RESULTS AND DISCUSSIONS

Environmental Policy: Table (1) shows the results of reviewing EMISAL's environmental policy. It indicates that it had an 82% agreement with ISO14001 requirements, the positive achievement of compiled date requirement reached 50% and the shortcoming reached 50%.

Planning Stage: It consists of four different parameters, environmental aspects checklist, objective and target checklist, environmental management program checklist and legal requirements.

Environmental Aspects, Objective and Target, and Environmental Management Program: Table (2) shows the results of reviewing EMISAL's environmental aspects, objective and target, and environmental management program indicating that they

Table 1: Environmental policy and compiled data checklist.

Description	Yes	No
Includes a commitment to continual improvement.	√	
Includes a commitment to prevent pollution.	√	
Simple and understandable.	√	
Includes a commitment to comply with relevant environmental legislation and regulation.	√	
Reflect all aspects related to products, services and activities.	√	
Explicit enough to be audited.	√	
Integrated with health and safety quality, or other organization policies (if exist).		√
There is a procedure for maintaining developing and updating.		√
Communicated externally.	√	
There is a procedure to check awareness and understanding of employees.	√	
Communicated externally.	√	
Sustainable development and /or product life cycle thinking.	√	
Sharing of environmental expertise with others.		√
Minimization of adverse environmental impact.		√
Minimization of pollution, waste and resource consumption at all levels in the organization.	√	
Commitment to recover recycling and reuse.	√	
Encouragement of EMS practices in suppliers/ contractors.		√

had a 100, 90 and 100% agreement with ISO14001 requirements, respectively and the positive achievement of compiled date requirement reached 62.5, 47 and 100%, respectively. The shortcoming reached 37.5% for environmental aspects and 53% for objective and target.

Legal and Other Requirements: This is the procedure which contains and detects legal and other environmental requirements which detect the safe levels of the activities. EMISAL Company is committed to the following legislation:

- Law No. (4) 1994 about the environment.
- Legislation number (137) 1958, No. (10) 1966, No. (215) 1985, No. (48) 1982, No. (93) 1962 and No. (57) 1978 about environmental protection pollution.
- Law No. (59) 1960 about work systematization.
- Law No. (79) 1961 about marine catastrophes.
- Law No. (45) 1949, and No. (543) 1954 about industrial protection and work risk.
- Law No. (52) 1981 about air and environmental protection of pollution.
- Law No. (12) 2003 about new labor.

As a result of inducting the two tables (checklist and questioner) the following characteristics of EMISAL planning stage can be presented:

- The environmental policy is not a beautiful prose, it must reflect on the whole image of a company system.
- The policy does not refer to the involvement of suppliers and contractors in the EMS practices.
- The program covers all the environmental aspects and sets the demand objectives and target in appropriate way go with the company policy.
- They achieved their objectives and targets in a successful time schedule.

Implementation and Operation: It consists of six checklists, structure and responsibility**,** training awareness and competence, communication, environmental management system documentation, operation control and emergency preparedness.

Table 2: Environmental aspects, objective and target, and environmental management program, and complied data checklist.

Environmental aspects			Objective and target		
Description	Yes	No	Description	Yes	No
There is a procedure to identify the significant environmental aspects of activities, products and services.	√		Objective and target are established, maintained and documented.	√	
There is a procedure to maintain environmental aspects procedure	√		Establishing and reviewing objectives consider: Legal and other requirements- Significant environmental aspects- Technological options- Financial operational- Business requirements.	√	
			Views of interested parties.		√
The identification procedure determines the aspects which can be controlled and influenced by the company	√		The objectives and targets are consistent with the environmental policy including (The pollution prevention- Compliance- Continual improvement).	√	
The identification procedure determines obvious and potential significant aspects	√		The objectives are communicating to employees.	√	
The organization ensures that the significant impacts are considered in setting objectives.	√		The objectives are flexible, understood and realistic.	√	
The organization keeps this information up to date.	√		Targets and objectives include the following concerns: Reduction of waste generation- Resource depletion- Pollution prevention.	√	
			Environmental impacts of suppliers and subcontractors activities- Environmental product design parameters.	√	
The identification procedure includes technical concerns:			The identification procedure conceders the factors of:		
Process- Storage.	√		Raw material/energy per unite production-		
Transfer- Transportation- Utilities.	√		Emission/releases /unit- Recycled material used.	√	
			Number of violation- Potential for recycle- Vehicular use/ unit prod-Environmental Cost /unit- Environmental Restoration project.		√
The identification procedure includes environmental concerns:					
Air quality-Water-Waste-External safety-Energy use- Nuisance concerns.	√				
Soil & ground water.		√			
	Environmental management program				
Description	Yes	No			
The identification procedure considers the following requirements:			Environmental Management Program and procedures are established and maintained.	√	
Legislation- Permits- Banks /insurance- Policy guidelines.	√				
Customers- Complaints.	√				
The identification procedure considers the following levels:			Environmental Management Program and procedures are periodically carried out an environmental management system audits.	√	
Site/plant- Department.	√				
Installation/equipment- Subcontractor/supplier.		√			
The identification procedure considers the potential impacts:			Environmental Management Program is linked directly to the organization ´s objectives and target.	√	
Hazardous material storage and handling.	√		The program describes how the organization will translate its goal and policy commitments into concrete action.	√	
Off-site	√				
The identification procedure conceders the factors of:			EMP documented include: (The roles- Responsibilities- Processes- Schedules- Frame time).	√	
Ecological effects- Human health- Catastrophic effects- Resource depletion.	√				
Scale, severity& duration of impact- Probability of occurrence- Cost of changing- Other business effects.		√			

Table 3: Structure and responsibility, training awareness and competence, communication, environmental management system documentation, and complied data checklist.

Structure and responsibility			Communication		
Description	Yes	No	Description	Yes	No
Roles, responsibility and authorities are defined, documented and communicated.	√		There report on environmental performance.		√
There is specific management representative.	√		Procedures are established and maintained for (Internal communication- External communication).	√	
Roles and responsibilities are documented in organization charts.	√		Procedures deal with external interested parties in (Receiving- Documenting- Responding).	√	
Management provides resources which include (Human resources- Specialized skills- Technology- Financial resources- Business requirements).	√		Communication procedures are considered: Neighbors- Local officials- Regulatory agencies- Emergency responders. Community groups- Other interested groups.	√	√
Training awareness and competence	EMS documentation				
Description	Yes	No	Description	Yes	No
The training program established and maintained	√		Documents (EMS manual or rod map) are established in hard and soft copy	√	
Newly hired members receive adequate training	√		Documents include (Roles- Responsibilities- Processes- Schedule).	√	
Suppliers and contactors receive training consistent with their impact on the EMS.	√		Documents are amended to be up to date.	√	
The training program ensure that the employees are aware of : (Importance of conformance with environmental policy- The environmental impact of their activities- The environmental benefits by improving personal performance- The roles and responsibilities in achieving conformance with the environmental policy- The potential consequences of departure from specific operation).	√		EMS documents (Describes the system's core elements-How the element related to each other- Provides direction to related documentation- Environmental policy- Organization structure and key responsibilities- A description or summary of how organization satisfies EMS- System and level procedures- Activity or process specific procedures/work instructions- Other EMS related documents).	√	

Structure and Responsibility, Training Awareness and Competence, Communication, Environmental Management System Documentation: Table (3) shows the results of reviewing EMISAL's structure and responsibility, training awareness and competence, communication, and environmental management system documentation indicating that they had agreed with ISO14001 requirements with a 100% for each parameter and the positive achievement reached 100, 50, 71 and 100%, respectively.

The shortcoming of training awareness and competence was 50%, while it was 29% in case of communication.

Operation Control, and Emergency Preparedness and Response: Table (4) shows the results of reviewing EMISAL's operation control, and Emergency preparedness and response indicating that they had agreed with ISO14001 requirements with a 100 and 80%, respectively and the positive achievement of compiled date requirement reached 100 and 83%, respectively. The shortcoming of Emergency preparedness and response reached 17%.

As a result of inducting the checklist and compiled data, the following characteristics of EMISAL implementation and operation stage can be presented as follows:

- There is an environmental management representative who is responsible for generating and modifying EMS documents.
- In general many Egyptian companies which are certified by ISO14001 have a problem in disclosing their documents to the public or to the interested parties.
- EMISAL company has successfully managed its operations and activities which affect the environment such as management of wastewater by constructing a treatment plant to treat wastewater generated from the administrative unites to be used as an irrigation water and management of solid waste and servicing equipment solid wastes generated through the production line including plastic bags, mechanical maintenance and car workshops wastes.

Table 4: Operation control, and Emergency preparedness and response and complied data checklist.

Operation control		
Description	Yes	No
Documented procedures are established and maintained to control the operation and activities.	√	
The documented procedures include operating criteria.	√	
The documented procedures serve the organization by (Manage their significant environmental aspects- Ensure regulatory compliance- Achieve environmental objectives- Improve employee training).	√	
Emergency preparedness and response		
Description	Yes	No
Procedures to identify potential for and respond to accidents and emergency situations are established and maintained.	√	
Procedures for preventing and mitigation the environmental impacts that may be associated with accidents and emergency are established and maintained.	√	
Procedures are periodically tested in practice.		√
Assessed the incorporated responsibilities pertain to each procedure.		√
Releases of hazardous materials procedures include (Information- Training- Planning- Practicing).	√	
Setting communication plans.	√	

Table 5: Checking and corrective action and complied data checklist.

Monitoring and measurement			Records		
Description	Yes	No	Description	Yes	No
Procedures are documented and include the recording of information.	√		Procedures for the identification, maintenance and disposal of environmental records are established and maintained.	√	
Monitoring equipments are calibrated and maintained.	√		Environmental records retention times are established and recorded.	√	
Records of monitoring equipments are retained according to the organization's procedures.		√	Environmental records include (Training records- Commensurate with the environmental impact encountered results of audits and reviews).	√	
Documented procedure for periodically evaluating compliance with relevant environmental legislation and regulations is established and maintained.	√		Environmental records are (Legible- Identifiable- Traceable to the activity product or service involved).	√	
Procedures to monitor and measure are established and maintained on a regular basis after identifying (Operation with significant environmental aspect- Operation control- Key characteristics of Operation or activity).	√		Environmental records include: Details of non conformance- Records of violation- Inspection and maintenance- Monitoring data. Incident report and follow up- Complaints and responses- supplier.	√	√
Non conformance and corrective and prevention action			**Environmental management system audit**		
Description	Yes	No	Description	Yes	No
Changes resulting from corrective and preventive action are implemented and recorded in the documented Procedures	√		Programs and procedure for EMS are established and maintained.	√	
Procedures for defining responsibility and authority are established and maintained for (Handling and investigation non conformance- Taking corrective action to mitigate any impacts- Initiating and completing corrective and preventive action).	√		Environmental management program is linked to organization's objectives	√	
Corrective or preventive action which taken to eliminate the causes of actual and potential non conformance are (Appropriate to the magnitude of problems- Commensurate with the environmental impact encountered).	√		Organization's audit program is based on (The environmental importance- The results of previous audits)	√	

Table 5: Continued

The corrective and preventive procedures include these steps : (Identify the problems- Investigate to identify the root cause- Come up with solution- Implement solution- Document solution- Communicate solution- Evaluate effectiveness of solution.	√	Organization's audit procedures cover (Audit scope and methodologies- The responsibilities- The requirements for conducting results)	√

Table 6: Management review and complied data checklist.

Management review		
Description	Yes	No
The organization's top management at intervals reviews the EMS.	√	
The management review process ensures that the necessary information is collected.	√	
The management review process is documented.	√	
The management review process is addressing the possible need for changes to (Policy- Objectives- Other elements).	√	
The report from review process is submitted to:		
Top management.	√	
The MR- Appropriate line management specific to the operation being reviewed.		√
The review process agenda includes review of instances of :		
Non-conformance- Corrective action- Continuous improvement with EMS- Results of compliance.	√	
Complaints- Waste minimization program- Results of any pollution prevention- A summation of measurement and monitoring results.		√

Checking and Corrective Action: Table (5) shows the results of reviewing EMISAL's monitoring and measurement, non conformance, corrective and prevention action, records, and environmental management system audit indicating that they had agreed with ISO14001 requirements with 86% for monitoring and measurement, and 100% for the other parameters.

The positive achievement of non conformance, corrective and prevention action, and records compiled date requirement reached 100 and 57% respectively. The shortcoming of records reached 43%. As a result of inducting checklist and questioner list the following characteristics of EMISAL checking and corrective action stage can be presented:

- Monitoring equipments are calibrated but there is not a frequented procedure for doing that.
- There must be criteria to identify performance indicators.
- EMISAL maintain records in paper form, but it is preferable to maintain in electronic form.
- EMISAL audit system is not combined with quality audits in spite of being certified by ISO14001.

Management Review: Table (6) shows the results of reviewing EMISAL's management review, indicating that it agreed with ISO14001 requirements with a 100%, the positive achievement of compiled date requirement reached 57% and the shortcoming reached 43%.

EMISAL Company has discovered the business benefits that can be achieved through environmental improvement through:

- Reduction of air emission (replace diesel by natural gas) and cost associated with air emission equipments.
- Elimination of wastewater (using treatment unit and the effluent used in irrigation purposes).
- Lowering the disposal and handling cost (reduce waste and sold it).
- Handling of hazardous materials.
- Reduction of energy use (the boilers steam is used for electric power generators and heating purpose).
- Marketing and communication of environmental performance increase sales and community acceptance.

Conclusions: According to the results of the study on the examined company, we can conclude that:

There is a gap between the theory and applications of EMS implementation. ISO14001 certified Egyptian companies have ambiguity in dealing with EMS publication. The lack of awareness and governmental support leads fewer companies to be volunteered. The academic research concerning EMS implementations in Egypt is less than the one hand fingers. The adopted approach in the evaluation process has been proved as a significant tool guide in assisting non certified company in starting its own EMS and put it into

implementation. According to the proposed methodology relying on the two tables (check list table and the questioner table), it could be conclude that:

- Investigation and evaluation of the functionality of Egyptian salts and mineral company (EMISAL) implementation of EMS against ISO 14001:2004 requirements have been approved as a successful and sufficient EMS.
- Whatever the verification ratio of the ISO14001, it does not clarify to what extent the facility has implemented the standards.
- The validation of the fully accomplished standard does not inevitably lead to the full accomplishment of the compiled data.
- As the validation ratio of the standards decreases, the shortcoming in the compiled data increases.

Recommendations:

- A standalone governmental body or a division of the Egyptian environmental affairs agency should be created to be responsible for EMS (theory, implementation, certification and audition).
- Procedures concerning academic researches facilitations are recommended in order to organize communication between universities and companies.
- ISO14001 certified companies should have an annual report available online in order to be easily utilized by researches and to serve as investment incentive.
- The suppliers and contractors involvement in EMS practice is recommended.
- It is recommended when updating the objectives and targets to survey the views of interested parties as well as communicate the procedure to employees.

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