REVIEWING THE ROLE OF ENVIRONMENTAL MANAGEMENT SYSTEM IN ABATING INDUSTRIAL POLLUTION

(A CASE STUDY OF ISO 14000 CERTIFIED AND UN-CERTIFIED CEMENT INDUSTRIES IN PAKISTAN)

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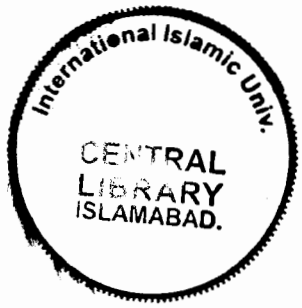

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Submitted in partial fulfillment of the requirements for the
Master of Studies Degree in Environmental Science,
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Islamabad

Supervisor: Dr. Rashid Saeed

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IN THE NAME OF ALLAH, THE MOST BENEFICIENT

AND MOST MERCIFUL

Dedicated To my loving

Parents

Title of Thesis: Reviewing the Role of Environmental Management System in Abating Industrial Pollution-A case study of ISO 14000 certified and uncertified cement industries in pakistan

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ABSTRACT

In the last few decades, industrialization has spread throughout the world with growing impact on the environment. Currently Ozone depletion, global warming, deforestation, polluted water and other environmental issues are of grave concerns around the world. The ISO 14000 series of environmental management system standards were developed by the International Organization for Standardization (ISO) in order to promote environmental protection and sustainable development throughout the globe. In Pakistan, environmental protection is given less importance due to poverty, corruption and weak enforcement mechanisms of regulation. Pakistan is facing a lot of barriers and constraints in implementing EMS. Implementation of EMS is hampered at the policy level due to lack of incentives to encourage adoption of EMS and absence of clear accreditation policy in the country to accredit certifying agencies besides lack of trained and qualified manpower in the country. In addition, cost of Certification is very high. The main objective of the present study is to review the role of ISO 14000 in meeting the actual reduction in the pollution load in a few ISO 14000 certified and uncertified cement industries in Pakistan. The contribution of cement industry is approximately 5% to global anthropogenic CO_2 emissions. In Pakistan, major environmental concerns of cement industry are dust emissions, CO_2, SO_x and NO_x as well as particulate matter. EMS certified industries are maintaining their environmental management program successfully. Certified industries involve very less maintenance expenditures as compared to uncertified industries. However uncertified industries need to improve a lot for better managing their environmental concerns. Drastic improvements are required in the national environmental policy to ensure strict enactment of rules in the country. It is imperative to increase the number of accredited entities in order to encourage EMS certification in the country. Also, there is dire need to ensure knowledge transfer between developed and developing countries with respect to EMS development and implementation.

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All praises to ALLAH, the most Merciful, Kind and Beneficent, and source of all Knowledge, Wisdom within and beyond our comprehension. He is the only God who can help us in every field of life. All respect and possible tributes goes to our HOLY PROPHET MOHAMMAD (SAW), who is forever guidance and knowledge for all Human beings on this earth.

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(Said Akbar Khan)

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LIST OF ABBREVATIONS

1. (BOD)	Biological Oxygen Demand
2. (BSI)	British Standards Institute
3. (BS)	British Standard
4. (EIPs)	Environmental Improvement Plans
5. EMAS)	Eco-Management and Auditing Scheme
6. (ETPI)	Environment Technology Programme for Industry
7. (EPA)	Environmental Protection Agency
8. (EMP)	Environmental Management Program
9. (EMS)	Environmental Management System
10. (EHS)	Environmental Health and Safety
11. (ISO)	International Standards Organization
12. (NCS)	National Conservation Strategy
13. (NWFP)	North West Frontier Province
14. (OHS)	Occupational health and safety
15. (PSQCA)	Pakistan Standards and Quality Control Authority
16. (PNAC)	Pakistan National Accreditation Council
17. (PAHs)	Poly-Aromatic Hydrocarbons
18. (PDCA)	Plan Do Check Act
19. (WRI)	World Resources Institute
20. (PEPA)	Pakistan Environment Protection Act
21. (SS)	Suspended Solids
22. (SAGE)	Strategic Advisory Group on Environment
23. (TC)	Technical Committee
24. (UN)	United Nation
25. (UK)	United Kingdom
26. (UNCED)	United Nations Conference on the Environment and Development
27. (VOCs)	Volatile Organic Compounds

FORWARDING SHEET

The thesis entitled, "Reviewing the Role of EMS in Abating industrial pollution- A case study of ISO 14000 certified and uncertified cement industries in Pakistan" submitted by Mr. Said Akbar Khan, Registration No. 23-FBAS/MSES/S08 in partial fulfillment of Master of Studies in Environmental Science has been completed under my guidance and supervision. I am satisfied with the quality of student research work and allow him to submit this thesis for further process as per IIU rules and regulations.

Date: _____ Signature: _____

Name: Dr. Rashid Saeed

Chapter 1

INTRODUCTION

All over the world, governments, industries and citizens have become more aware of environmental problems and demand for their effective solutions has increased noticeably. People have become more familiar with the concept of the environmental management system (EMS). When we talk about an EMS; it gives an idea about systematic management of ecological/ environmental and safety issues of an organization. Mostly EMS structure is based on four pillars; (i) Plan (ii) Do (iii) Check and (iv) Act. This model results into continual improvement of an organization by (i) pointing out the environmental aspects and subsequent planning of targets & goals (ii) implementing (doing) operational controls, training etc. (iii) checking/ monitoring corrective action; and (iv) reviewing the progress and acting to make needed changes to the EMS (Rashed *et al.*, 2008).

The processes which enable an organization to manage its environmental footprint and increase its operational output frame EMS of an organization. Environmentally speaking, foot print is the impact associated with the organization activities, products and services. Significant environmental impacts of an organization can be managed through a structured framework called environmental management system. Some of the

organizations have adopted EMS and afterwards externally assessed & certified while some organizations have developed their EMS quite casually (IEMA Report, 2005).

The limestone calcination is main cause of portion of CO_2 emissions in cement industry. Cement sector contributes around 5% to worldwide anthropogenic CO_2 emissions. In Pakistan, cement dust produces particulate matter causing air pollution. Major environmental concerns of cement industry are dust emissions, CO_2, SOx and NOx as well as particulate matter. In addition, traces of other poisonous compounds are also emitted in cement industry threatening the health of people besides having a negative impact on animal and plant life. These toxic chemicals include fluoride, magnesium, lead, zinc, copper, beryllium, sulfuric acid, hydrochloric acid, etc. (Avetisyan, 2009).

An EMS is to be implemented in an organization according to its policies and objectives as in-house problem identification and solving tool. It was gradually recognized that an EMS is in the interest of the industry itself and that pollution control actually pays. For an organization, an EMS provides a proactive approach to incorporate a set of policy measures, management actions, operating procedures, record keeping with defined responsibilities and accountability of personnel engaged in each of the environmental issues (Das and Behera, 2008).

1.1 Background of the EMS

The way of life of most of the developed world will put enormous pressure on environment; says a report "*Limits to Growth*" released by the Club of Rome in 1972. As the result of efforts by various environmental pressure groups during last few decades,

environmental issues have now become a political agenda of many governments and international governing parties. Since then, large-scale environmental policy management has evolved through need for appropriate response of industry to society's environmental pressure. At the individual level, various technical, end-of-pipe solutions for limiting pollution were found. It is creating a bigger challenge for their economies to address potentially large-scale clean-up problems. Effective environmental policies are being devised to solve the major land and water pollution problems. In 1980s, a systematic approach was adopted at industrial and government level for solution of environmental problems. It was found that most of the environmental problems arise from non-technical reasons, poor process control, human errors, reduced levels of communication and insufficient information. Consequently, cradle-to-grave solutions were at the focus of governments and industry that were to seriously consider their environmental issues throughout entire industrial processes (NATO-CCMS, 2000).

In the last few decades, industrialization has spread throughout the world with increasing impact the environment. In 1987, Ozone depletion, global worming, deforestation, polluted water and other environmental issues were of grave concerns around the world. As a result of such concerns, the concept of sustainable development was developed in 1987 by World Commission on the Environment & Development (Woodside, 1996).

The International Organization for Standardization (ISO) formed the Strategic Advisory Group on Environment (SAGE) in 1991, to develop such standards that would be helpful in environmental management, improvements in environmental performance, facilitate trade and remove trade barriers. United Nations Conference on the Environment and

Development (UNCED) was organized in 1992 in Rio de Janeiro. During the conference proceedings, ISO made commitment at the UNCED to create international environmental standards. In 1992 SAGE constituted a new committee "the Technical Committee 207". By January 1993 Technical Committee 207 developed environmental management system (Das and Bhera, 2008).

Pakistan is facing a lot of difficulties in putting into operation the environmental management system. Implementation of EMS is hampered at the policy level due to shortage of incentives to adopt EMS and absence of comprehensive official recognition policy in the country to authorize certifying agencies besides lack of trained and qualified manpower e.g., auditors in the country. Furthermore, high cost of certification and re-certification after a few years are secondary reasons for poor status of EMS realization in Pakistan. In particular, for small and medium enterprises, it is very difficult to bear the high cost of certification and indulge in a complex process of EMS certification from foreign auditors. It has been observed that companies need to apply for re-certification after every three years. There is almost no institution established in the country to promote awareness of EMS and its subsequent implementation in various industrial and non-industrial sectors. There is no trend to train the employees and make them aware of the environmental policy objectives. Sometimes lesser earnings may outcome in changing priorities and hence EMS implementation is hampered (Salman, 2003).

1.2 Objectives of the Study

With the introduction of ISO 14000, industries are expected to show environmental improvement, regulatory compliance, conservation of input material and energy, pollution control and improvement in employee's environmental awareness. The major objective of this study is to review the role of ISO 14000 in meeting the above expectations, in particular, abating the pollution load in a few ISO 14000 certified and uncertified cement industries in Pakistan. The study aims at:

- Reviewing the overall EMS implementation in Pakistan
- Identifying the key environmental issues of cement industry in Pakistan
- Checking the status of EMS implementation in various cement industries in Pakistan
- Assessing the role of EMS in ensuring the occupational health & safety related to cement industry in Pakistan
- Evaluating the role of EMS in abating industrial pollution in selected industries

1.3 Scope of the Research Work

The project aspires to ascertain the effectiveness of EMS in abating industrial pollution. For this purpose, various cement industries whether certified or not, were visited to analyze the implementation status of EMS and identify its significance in preventing industrial pollution. Major cement industries visited for this purpose included Askari Cement Factory at Wah Cantt, Lucky Cement Plant at Lucky Marwat (Pezu), Fauji

Cement Factory at Feteh Jhang and Kohat Cement Plant. Basic information from these industries was obtained through a questionnaire survey and interviewing the key personal of the industries in order to analyze the role of EMS in abating the pollution prevention. In addition, pictorial surveillance of various environmental issues was also carried out which has been made a part of the research work.

1.4 Significance of the Project

The study will act as a model research project for other industries, which have not yet started implementation of environmental management system. The gaps and measured performance of EMS explored during the subject research will be helpful for government agencies and other research oriented organization to formulate better further policies. The study results and the recommendations made would be shared with the management of each of the industry examined, EPAs and other stakeholders.

Chapter 2

LITERATURE REVIEW

Environmental management system (EMS) is implemented by an organization to manage legal environmental compliance & commitment as well as to reduce environmental risks and satisfy customer expectations etc (IEMA Report, 2005). It is very essential to know how an EMS helps an organization to improve its environmental compliance besides providing other economical advantages too. Environment is the environs in which an organization operates; it includes air, water, land, natural resources, flora fauna, humans and their interrelation (BS-ISO Report, 2009). As far as management of environment is concerned, it is described as management of an organization's impact on the environment by reducing the environmental impact and controlling all aspects of their operation (Gbedemah, 2004). British Standards Institute also provides same definition and states EMS as the organizational structure, responsibilities, practices, procedures, processes and resources for determining and implementing environmental policy (Maier and Vanstone, 2005).

EMS provides us the convenient approach to better arrange our precedence and projects in order to discover health and safety problems before they cause serious damage. It is continual process of planning, implementing, reviewing and improving the procedures

and actions of an organization to meet its environmental goals. It is mainly operated through "Plan, Do, Check, Act" model (US-EPA Report, 2009).

An EMS provides effective tools for solving many managerial and systematic issues. An EMS is about the 'E', but one should also improve 'M' and the 'S' as depicted by following diagram.

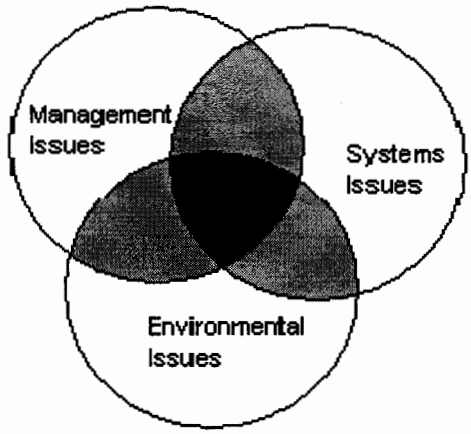


Figure 2.1 EMS is about "E" but never forget about "M" & "S"

EMS, involving communications, awareness, decision-making, governance as well as monitoring & evaluation etc about environmental issues, is more excellent tool for saving the environment. It helps to solve environment, management and systems issues. Decision-making, capacity building, governance, leadership, review are components of EMS providing better solution to management issues whereas communication, awareness-raising, the PDCA cycle, monitoring and evaluation assist in better remedy of systems issues which associate with them ecological and pollution problems as the major environmental issues. This makes EMS a flexible, scalable and holistic tool to be applied for variety of problems; ranging from a family of 5 people to a town of 5 million people.

Being an effective tool for communicating the worth of an environment protection and preservation on global scale, Environmental management systems have become increasingly popular. Some of the developed nations have made it compulsory requirement to be fulfilled for trade at international level. EMS demands for effective planning, management, and communication skills of health and safety professionals along with the coordinated development of other information systems within an organization (Stuart, 2000).

2.1 EMS MODEL

An EMS structure consists of five major pillars, including the Environmental Policy, Planning, Implementation & Operations, Checking and Corrective Action, and Management Review. EMS model is schematically represented in Figure 2.2 (Rendell and Mcginty, 2004).

2.2 ISO 14000 series

The International Organization for Standardization is an international nonprofit federation of national standards organizations who develops standards for every manufacturing unit taking into account the paper size to film speed (Haufler, 2000). The international organization for standardization (ISO) started just after World War II (Joseph *et al.*, 1996). ISO has 161 members at the present from all over the world. ISO contains more than 18000 standards; which provide practical tools for business, government and society to go for economic and environmental development. These standards facilitate trade, spread knowledge, distribute original advances in technology,

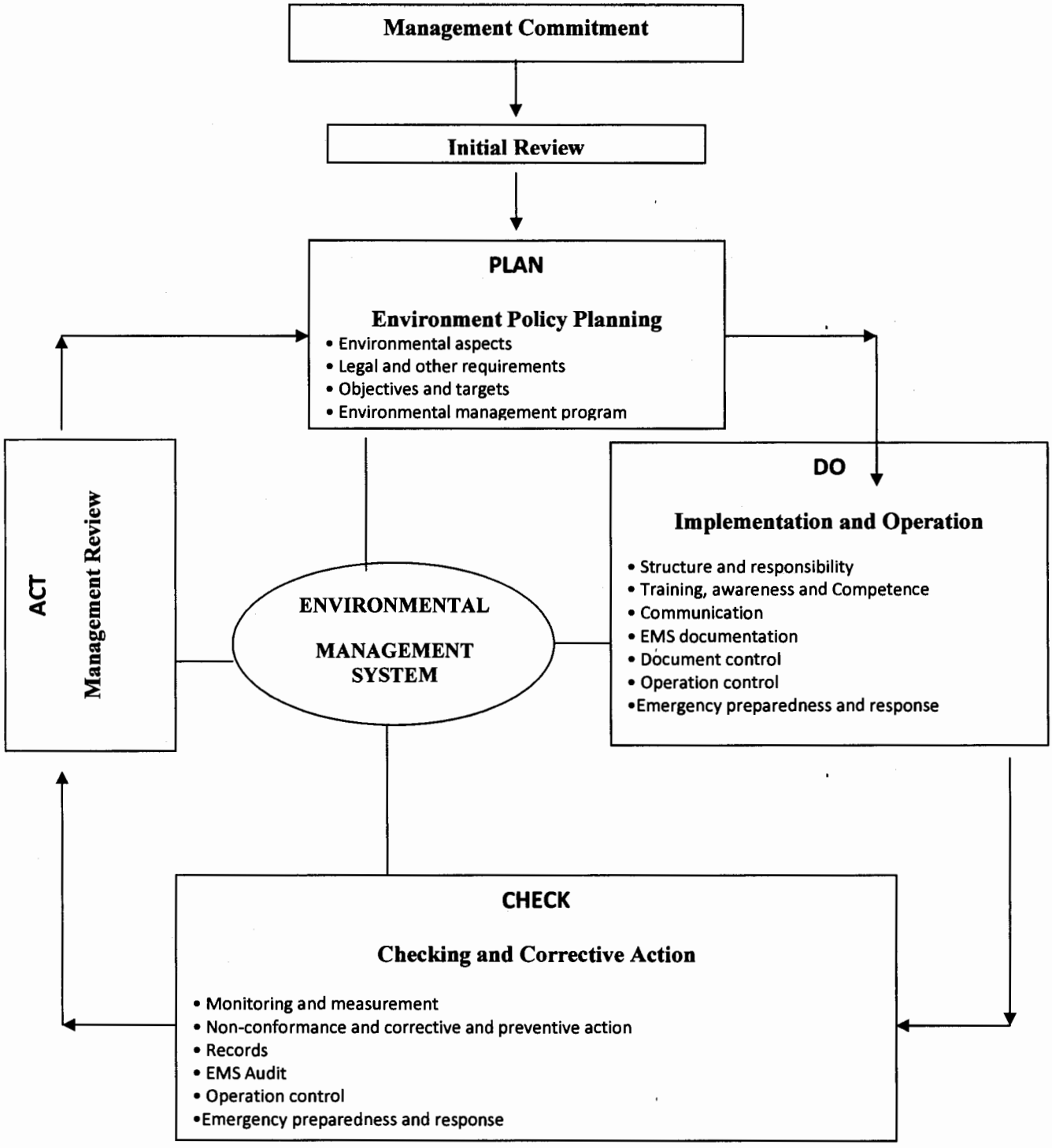


Figure 2.2 EMS Model

and share good management. The ISO Survey discloses that ISO 14001 began in 148 at the beginning of 2008 (ISO Annual Report, 2008).

2.2.1 History and Development of ISO 14001

United Nations Conference on Environment and Development, or Earth Summit was held in Rio de Janeiro, Brazil in 1992 in which Agenda 21 and ISO 14000 were the two most vital considerations. Agenda 21 is a set of guidelines for obtaining universal sustainability. 172 nations at the conference adopted Agenda 21. ISO 14000 provides a group of standards including ISO 14001 addressing environmental management and pollution prevention as an effort to achieve sustainable development (Boudouropoulos and Arvanitoyannis, 1999). Sustainable development seeks a balance between economic growth and environmental protection. Sustainable development is an approach that uses the earth resources in such a way that future generation needs are not compromised (Quazi *et al.*, 2001).

2.2.2 Development of EMS standards

In March 1992, the British Standards Institute created BS 7750 which is a standard for environmental management. The Eco-Management and Audit Scheme (EMAS) in the European Union and the International Organization soon followed it for Standardization (ISO). Adoption of the EMAS is necessary for EMS implementation at international trade terms.

2.2.3 British Standard 7750 (BS 7750)

The British Standard Institute is the first national standards body in the world who published a draft British Standard (BS 7750) on environmental management in March

1992. 2nd edition of this standard was published in 1994. BS 7750, being a specification for an EMS, provided details on how organizations could implement an EMS and ensures compliance with related environmental policies and objectives.

2.2.4 Eco-Management and Auditing Scheme (EMAS)

European Union published the Eco-Management and Auditing Scheme (EMAS) in April 1995. Recently in UK, EMAS demands for evaluating environmental performance of an organization in a member country and demonstrate its commitment to continual improvement. It also requires that relevant performance information should be made available to the public.

2.2.5 ISO 14001

International Organization for Standardization was established in 1947. It is a non-governmental organization of about 100 national standards bodies for which various working groups and executive technical committee have been remained involved in development of EMS standards since 1991 for environmental aspects. 1st draft of ISO 14001 was made in 1995 and was finalized in 1996 (NATO-CCMS, 2000).

ISO 14000 is a series of international standards on environmental management that provides structure for the development of an environmental management system. ISO 14001 updated in 2004 are most widely implemented standards; other ISO standards are also used worldwide by businesses and organizations in public and private sectors. Some of these industries include petroleum products, chemicals, telecommunication, food products, engineering, cement, and business centers. To improve the overall

environmental performance by ISO 14000, a large number of consultancy services are operating worldwide. In addition to provide assistance in achieving environmental standards and enhanced competitiveness in the market, these also provide services like documentation, training, implementation and continual assessment etc (TERI Report, 2009).

2.3 Benefits of Environmental Management System

EMS benefits an organization by being a less waste producing approach and resulting in sufficient decrease of environmental costs by reducing the detrimental risks to the environment. Pollution prevention is also improved through environmental awareness, planned strategies and a structure for implementation of environmental management. It is important to note that an EMS is only a system for management and does not offer technical solutions to environmental problems (Holland, 2002).

The most effective change that ISO standard implementation brings to an organization is the change in the behavior of managers and workers. This increases the awareness about environmental aspects, regulations and effects on community. Devoted commitment to ensure environmental protection brings more customers preference and more reliable products. Most of defamed companies, known as destroyers of the environment, can build their good repute by EMS implementation (Poksinska *et al.,* 2003).

The ISO 14000 is set of voluntary standards for environmental management systems (EMS) aiming at reducing pollution. Pollution prevention is at the heart of an ISO 14000,

but the amount of reduction depends upon the voluntary actions supported by the management system. Most difficult task is to inspire the organizations for certification of ISO 14000. It is increasingly realized that the benefits of registration are of greater worth than the costs of the EMS certification and associated efforts required for this certification. Hence ISO 14001 is a comprehensive approach providing many benefits of EMS registration. As there is no compulsion on the companies to certify EMS, hence they can improve environmental performance through EMS without certification also.

Saving the invested cost by pollution prevention by EMS brings benefits to the organization. Theses benefits may be operational, financial, social, regulatory, and marketing. Most of the firms adopt an EMS to get the operational and regulatory benefits, some for getting more profits in the future (Haklik, 2002). Business and environmental benefits from EMS are discussed as under:

2.3.1 Improving environmental performance

The possibility of reduced environmental impacts increases by EMS implementation (Nawrocka *et al.,* 2009). ISO 14001-certified companies confirm improved environmental performance through waste recycling, air and waste emissions reductions, materials reuse, energy and water conservation, and environmental and safety incidence reduction (Morrow and Rondinelli, 2002). A systematic approach to management leads indirectly to improved environmental performance and improve cost control (IISD Report, 1996)

2.3.2 Enhancing compliance

There are many laws and regulations designed to protect the environment in USA and other countries. Non compliance to these rules results in financial charge and / or criminal penalties. ISO 14000 demands for complete compliance with existing laws. This improvement in regulatory compliance reduces penalties and compensation costs. Less frequent inspections and more flexible enforcement by the regulatory authorities offers potential relief for environmental front-runners (Nawrocka *et al.*, 2009). A company's public image becomes much better through EMS maintenance and cost on civil suits is decreased significantly. Mismanagement of environmental regulations results in rigid penalties (Boudouropoulos and Arvanitoyannis, 1999). In developing nations, companies are liable to exploit abundantly available resources and need to be investigated more strictly with regard to their environmental track records. EMS can help such firms to achieve greater success in securing the rights to these resources (Brown, 2004).

2.3.3 Preventing pollution and conserve resources

ISO certification provides three types of benefits; environmental benefits, competitive advantage, effective operation and improvement in the company's image. Effective environmental management and reduction of damage to the environment is achieved by EMS for the improvement of the company's image (Tan, 2004).

2.3.4 Attracting new customers and markets

A strong environmental image can help attract environmentally conscious customers through ISO 14000. The number of customers, investors, creditors, suppliers, employees,

and other stakeholders is increased. This also gives an advantage to the organization over other competitors. For a company with ISO 14001 certification, the customer feel more secured about environment, he lives in with his fellow beings (Gbedemah, 2004)

2.3.5 Increasing efficiency

Financial benefits are received by reduction in resource use, waste reduction, or improvements in operational efficiency (Dammar *et al.,* 2009). ISO 14000 EMS improves the operations of a company by reducing costs and requires a common strategy to make the procedures environment friendly. Improved communications results in better decision making. Also conserving material and energy inputs, reducing wastes helps to improve process efficiency (IISD Report, 1996).

2.3.6 Reducing costs

EMS implementation saves valuable resources and reduces costs efficiently. The benefits include lower distribution costs, control of waste management, and savings in consumption of energy and materials besides to enjoy a positive corporate image among regulators, customers, and the public (Mersch, 2008).

2.3.7 Enhancing employee morale

The human related benefits of EMS include greater awareness and a affirmative change in the behavior of employees (Nawrocka *et al.,* 2009). The PDCA cycle assist to successfully tackle environmental problems and increases work efficiency besides improving staff morale (Boudouropoulos and Arvanitoyannis, 1999). Reinforcing and strengthening good environmental management practices, reviewing and improving

procedures & operation efficiency and enhancing employee awareness of the environmental impacts are primary benefits of EMS (Rondinelli et al., 2000). EMS also minimizes impacts on employees by reducing risk of employee injuries and illness (Gbedemah, 2004)

2.3.8 Improving relationships with local community.

When companies intend to and go far reducing the pollution by adopting ISO 14000, nearby local population feel more secured and get benefited rather than be at risk. For example landfill sites if get reduced waste load, they can serve for longer period. Improved and cleaner environment is there for society in the form of cleaned air, water and soil. These benefits to humanity ultimately return the companies in a more profitable way.

2.3.9 Marketing tool.

Successful business demands for effective implementation of ISO 14000. Customers expect their dealers have ISO 14000 certification (IISD Report, 1996), meaning thereby that companies with EMS certification have more business opportunities and can flourish their business throughout the world. Other benefit is reduction in poverty through creation of more employment opportunities associated with more flourished business (Gbedemah, 2004). The increasingly international character of businesses means that many organizations find themselves under foreign ownership, no matter where they are located in the world. ISO 14001 is also effective tool for foreign owners to manage their worldwide environmental operations in corporate sector that requires much higher environmental performance than local regulations (Brown, 2004).

2.3.10 Possibility of cheaper insurance

There are third party conformity assessment programs built in the EMS that ensure that company's products and services meet certain conditions, limiting others companies to individually inspect each supplier's products and services with their own auditors. International standards such as the ISO 14000 series provide the widest possible recognition of this assurance. (IISD Report, 1996) Insurance companies prefer to carry out business with EMS certified companies, as they are likely to result in comparatively less accidental problems. Moreover, the shareholder these days inquire about investment in environment friendly companies (Gbedemah, 2004)

2.4 Key Environmental Issues of Cement Industry

Different phases in cement production processes are likely to release emissions keeping in view the type of raw materials, procedures used, kiln type and system control devices etc. CO_2 leads the substances emitted during the production of cement. Different environmental issues taking place in cement industries have been depicted in figure 3.1 and discussed in the next paragraphs. One of the main environmental problems of cement sector is the air pollution. Air pollution is significantly contributing towards the global warming. The concentration of emission depends on the type of fuel used as well as installed control measures and their efficiency (WRI Report, 2001).

Cement plants also generate large amount of particulate and gaseous air emissions. The exhaust gases from a cement kiln consist of nitrogen, carbon dioxide, water, and oxygen as well as small quantities of dust, chlorides, fluorides, sulfur dioxide, NOx, carbon

monoxide besides still smaller quantities of heavy metals also (Marlowe and Mansfield, 2002). Some of the key environmental issues of the cement industry are explained as below:

2.4.1 Air Emissions

Dust/ Particulates; Emissions of coarse dust, fine dust, soot, particles and aerosols are termed as, "dust" or "particulate matter". Raw material storage, grinding and blending, clinker production, final grinding, and packaging are hotspots from emitting dust and other particulate matter. Kiln operation, which consists of feeding system, the fuel firing system, and the clinker cooling and hauling system, is major contributing operation (US-EPA Report, 1995).

Cement dust is too fine to be transferred/ send by the slightest breeze easily far out of the plant into its neighborhood area. Another chance to get dust into the air is during the process of putting the cement into bags. Due to these reasons, environmentally speaking the cement making is considered as a very dirty process (WRI, 2001).

In most of the countries; dust emissions account for above 40% of the total emissions. Another important source of dust pollution is quarry site in cement industry. In China, cement plants were responsible for over 40 % of total industrial particulate emissions in 1998 where Particulate emissions were observed as 2% of production amounts. Cement production producing high levels of dust is causing respiratory diseases and other health problems (Marlowe and Mansfield, 2002). Particulates also result from burning of finely divided mineral debris in the coal and other fossil fuels, also containing toxic heavy

metals (Rogers, 1999). Karachi is the most industrialized city, suffering from heavy cement dust pollution, which is a major source of particulate matter deposited on the buildings and plants. It also has an adverse impact on plant growth. In addition to Traces of toxic metals such as chromium and copper are frequently found in some types of cement and are harmful to human beings and other living systems (Iqbal and Shafug, 2000).

Oxides of carbon: CO and CO_2; Growing economies and populations demand for more infrastructure development like housing, roads, hospitals and schools etc in developing countries. This further increases the demand for cement production and associated CO_2 emissions. It has been estimated that 80% of future CO_2 emissions will be contributed by cement sector of developing economies. Where cement plants are equipped with pre-calcination processes, before entry of raw materials into the kiln, it passes a cyclone tower with a pre-calcinatory, where the temperature rises to approximately 950 °C (not). This high temperature decomposes $CaCO_3$ thermally to CaO and CO_2 (Bahr *et al.*, 2003). Carbon dioxide (CO_2) and Carbon monoxide (CO) are released during the cement preparation process due to incomplete combustion of carbon-containing fuels (Rogers, 1999).

Cement production shares 5% of global man-made carbon dioxide emissions. Of this share, largest portion (about 50%) of the carbon dioxide emissions is from calcination and about 40% come from fossil fuel combustion besides remaining from clinker production process etc. Recently, approximately one ton of CO_2 is produced for each ton

of clinker which is significant man's contribution to global warming claiming adaptation of allowable CO_2 emissions limits (Howard, 2003).

Oxides of Nitrogen (NOx); During the clinker production process, at the high temperatures NOx are formed by the reaction of nitrogen in air with oxygen. NO_x affect air quality and human health; NO_x are likely to produce into ground-level ozone, which causes problems in respiratory systems (Marlowe and Mansfield, 2002).

The kiln generates nitrogen oxides, less amount of NO_x emission is released in coal combustion as compared with SO_x. Reason is that the coal normally contains some amount of sulfur due to which coal remains un-utilized for local power plants.

Oxides of Sulfur (SOx); Cement production give rise to comparatively low emissions of SOx normally. Lime absorbs a large portion of SOx and resulting product is calcium sulfate. Calcium sulfate is present in clinker and kiln dust. Canadian cement plants are also using coal to prevent additional pollution (Sindh Vision Report, 2007). SO_x emissions dominate by contributing 99% in the form of sulfur dioxide (SO_2). SO_x are emitted by volatile sulfur of raw materials and fuels. Coal and other fossil fuels produce oxides of sulphur (SO_x) due to presence of sulphur compounds in the fuel (Rogers, 1999). The cement industry contributes less than 2% SO_x and NO_x emissions of the total emissions in the US and UK (Howard, 2003).

Volatile Organic Compounds (VOCs); incomplete kilns combustion give rise to emissions of VOCs. They are hazardous to the environment because they form ground-

level ozone by reacting with oxides of nitrogen under certain atmospheric conditions (Marlowe and Mansfield, 2002).

2.4.2 Waste and Land pollution

When cement kiln dust is recovered through wet scrubbing of kiln stack emissions, wastewater is generated from the cooling process of equipment. This wastewater contains pollutants such as dissolved solids (potassium and sodium hydroxide, chlorides, and sulfates), suspended solids (calcium carbonate), and waste heat. In the cooling process cooling ponds are used to decrease temperature of water being used whereas settling ponds to reduce the concentration of suspended solids. Waste kiln dust is disposed of through the containment ponds and clarifiers separate solids (US-EPA Report, 1995).

Water Pollution; Although water pollution being an insignificant issue, micro-pollutants were found measured in cement kiln stacks like Vanadium metal from fuel oil, dioxins, and poly-aromatic hydrocarbons (PAHs). All such materials pose significant setback for the industry (Howard, 2003).

Land Pollution; Widely available limestone is the primary raw material for cement production. Quarry site digging and blasting operation has adverse impact on biodiversity and the surrounding communities and demand for prior environmental assessments and social assessments before new quarrying operations. A very regretful position is that all over the world, there are no universal standards for quarry operation, maintenance, closure, and rehabilitation (Howard, 2003).

Other waste in cement industry includes waste oil and laboratory wastes etc. Machinery used in production of the clinker and subsequent finishing & grinding operations is to be

maintained for effective process and long-lasting successful procedures. When a variety of oils and other lubricants etc is used in cleaning and maintenance operations, waste oil is produced as machinery maintenance waste (US-EPA Report, 1995).

2.4.3 Exposure to Hazardous Substances

Many substances in industry are likely to produce allergy problems. Like chromate components in cement industry have been found very toxic leading to carcinogenic problems. Chromate compounds are required to be used in cement for downstream construction activities. Silica can be present in some of the raw materials used in the cement manufacturing process. There prevails also a risk of inhaling crystalline silica. Its exposure is another major issue of cement industry (Marlowe and Mansfield, 2002).

2.4.4 Acid Rain

SOx and NOx gases arise from the combustion of fossil fuels. These gases react with water vapors and other pollutant to acids which fall on earth as acid rain or acid precipitation (Rogers, 1999). Since the Industrial Revolution, levels of CO_2 in the Earth's atmosphere have risen and these levels are likely to increase further in future. In cement industry, combustion of fossil fuels is major cause of raising global emission levels of CO_2. The increasing levels of CO_2 and other greenhouse gases in the Earth's atmosphere are creating long-term climate changes (Rogers, 1999).

2.4.5 Noise and Vibration

Besides CO_2, other main types of emissions in the cement industry are SO_2, NO_x, dust and heavy metals. Noise and vibrations are also the direct environmental issues (Bahr *et al.*, 2003). Noise and vibration is greater from heavy truck traffic associated with quarry operations and transport of raw materials as well as of the finished product bags (Marlowe and Mansfield, 2002).

Milling plants used to grind the cement product is the major cause of noise whereas heavy and relatively old mobile equipment, not properly maintained generate vibration. It is recognized that risks of mining or construction are small as compared to vibrating equipment. Current movable apparatus provides damped seating and insulated cabins for reducing the noise and vibration hazard to trivial levels. In cement industry, equipments like fans, engines, generators, cement grinding plant are the heavy mobile equipments causing noise problem. This suggests that cement plants should be nearer to quarry site for reducing the noise potential of blasting and/or drilling operations. Due to road or rail traffic, including truck movement and loading equipment, cement-manufacturing industries generate noise (Marlowe and Mansfield, 2002).

2.5 Health & Safety Issues

In addition to details, Cement Industry has also a very close link to the subject of occupational health and safety. Various cement plants in Pakistan, whether certified or not, have been visited and it has been observed that within a cement plant, there is no proper OHS management system.

Likely risks of health Hazards; The processing materials including the toxic chemicals are being handled quite carelessly, which may result into serious tragedy. In order to mitigate high temperature effects, there is no proper ventilation system. Floors are given slippery finishes which increase the likelihood of slip accidents. Noise level is very high due to running of machines and their vibrations. This is mainly due to improper maintenance and lubrication of moving machine parts. Use of ear protection, job rotation and other noise avoidance measures are not always practiced. Owing to high temperatures required for kiln, working environment to employees is very hot. More intensive labor and more hazardous manufacturing processes are involved in the cement industry. Also the accident rates are higher when compared with some other manufacturing industries. Major risks to these hazards are exposure to dust and high temperatures, contact with allergic substances, and noise exposure (Marlowe and Mansfield, 2002).

Safety Concerns; Proper employee training and other safety arrangement if in place, greatly reduce chances of occurrence of OHS accidents. If proper safety does not exist there are serious mishaps. In cement industry, chemicals are used in powdered form and their handling generates chemical dust. Such chemicals are often handled without required protective devices. Personal protective equipment is either not provided, or workers do not use it which might lead to accidents, and long term problems like chronic diseases to workers. In many cement industries, the fire fighting arrangements are not properly located close to the potential accident area or access to fire extinguishers is not understandable (Sindh Vision Report, 2007).

In some places, relatively weak employee safety record, higher incident rates and fatalities are found much higher than a number of other industries. In the UK and US, accident rates in the cement industry are three times the average rate for all heavy industry (Howard, 2003).

2.6 EMS Implementation in Pakistan

Pakistan is also member of ISO and is represented by Pakistan Standards and Quality Control Authority (PSQCA), working under Ministry of Science and Technology. The effective implementation of ISO standards is certified by Pakistan National Accreditation Council (PNAC). PNCA has further authorized following four bodies to monitor and issue the certification of EMS in different industries.

1. Bureau Veritas Quality International (BVQI).
2. Moody International.
3. S.G.S Pakistan (Pvt) Ltd.
4. Pakistan System Register.

In Pakistan, as a whole, there are 15 certified bodies, having direct or indirect link with ISO for granting EMS certification to various industrial units. Out of these 15 bodies, eleven bodies have no registration with PNAC. If we go through the history of EMS certification in Pakistan, we find that in December 1996, one industry was having ISO 14000 certification. During the next three years from 1997 to 1999, only one more certification added to the list. The number increased from two to four in December 2000 in Pakistan (ISO Report, 2000).

Industrial sector in Pakistan has disadvantage of having no or very meager certification of EMS in export of various industrial products. In 2005, as compared with 859 Indian firms and 341 Iranian firms, Pakistan has only 42 firms certified with ISO 14001-2004 (ADB Report, 2008). The number of ISO certifications in Pakistan increased from 77 in 1996 to 200 certified industries at the end of year 2008 (ISO Survey, 2008) in spite of the fact that the adoption of environmental management systems involved higher cost of ISO certification.

There are four main constraints in effective implementation of environmental policy and improving environmental performance in Pakistan. These include weak institutional design, flaws in regulatory framework and inadequate capacity besides lack of incentives and accountability (Hasaneen et al., 2008). Pakistan has developed environmental laws, even though current legislation is still not up-to-date, especially for solid waste management. Also the implementation of existing Environmental Protection Act 1997 is not ensured in its truest spirit, thus resulting in extremely increased industrial pollution. (Visvanathan and Norbu, 2007)

2.6.1 Major causes of industrial pollution in Pakistan

Pakistan is facing environmental problems of both green and brown nature. Problems of irrigated agriculture, rain-fed agriculture, forests, and rangelands are termed as green issues. Pakistan's brown environmental problems are classified in five groups; industrial wastewater pollution, domestic wastewater pollution, motor vehicle emissions, urban and industrial air pollution, and marine and coastal zone pollution. Major sources of air

pollution in Pakistan are cement manufacturing plants and brick kilns. The industrial sector consumes 16% of the total oil consumption and generates 285 tons CO, 162 tons NOx, 378 tons of SOx and 4,400 tons of particulate matter. EPA found 150 industrial units not following the National Environment Quality Standards (NEQS) to desired levels of regulatory compliance (Malik, 2002).

Major causes of air pollution in Pakistan are industrial and thermal power plants, development works, and vehicular emissions. Amount of suspended particulate matter in Lahore, Rawalpindi, and Islamabad exceeded seven times higher than WHO levels. Even higher levels of fine particulate matter were measured in Gujranwala and Faisalabad in 2003 and in Quetta in 2006. Urban air pollution is associated with the substantial increase in the number of vehicles on city roads. Highest concentrations of Nitrous oxides were recorded in Karachi, followed by Lahore, Quetta, Peshawar, and Islamabad. Industries located in urban areas are the main source of sulfur dioxide which is dangerous to human, animal, and plant life (ADB Report, 2008).

Unsustainable industrial Growth; Major cities of Pakistan (Karachi, Hyderabad, Multan, Lahore, Gujranwala, Rawalpindi and Peshawar, Faisalabad, Sialkot and Kasur) have indicated an industrial growth of 80%. Most of the industrial units lack effective emission control devices and pollution control technology, thus increasing urban air pollution problems. Highly toxic chemical industrial effluents eventually reach the rivers and resulting into contamination of groundwater besides polluting the surface river water and its associated aquatic life.

Industrial Pollution in Punjab; Industrial units in Lahore and Kala-Shah-Kaku discharge their effluents mainly into the Ravi River. River Ravi is also being polluted by more than 250 industrial units in Faisalabad which discharge their toxic wastes directly into the municipal sewers and open-surface drains, ultimately leading to Ravi River. Chenab river receives discharge from the industries in Sialkot whereas river Sutlej from major tanneries of Kasur. Most of the industrial units were found discharging their wastewater into the nearby natural stream violating the National Environmental Quality Standards (NEQS) for Suspended Solids (SS) and Biological Oxygen Demand (BOD) (Aftab *et al.,* 2000).

Industrial Pollution in Sindh Province; More than 6,000 industrial enterprises, in Karachi, constitute around 60 per cent of the country's industry. Most of the industries discharge their untreated effluent containing heavy metals and their compounds, detergents, lubricating oils, chlorine and various organic and inorganic toxic compounds into the Lyari River, the Malir River, and adjacent creeks leading to the Arabian Sea (Aftab *et al.*, 2000).

Industrial Pollution in NWFP; In North West Frontier Province (NWFP), 40 major industrial units were working in 2000. Out of these factories, only two were found equipped with appropriate and up-to-date wastewater treatment facilities for managing their toxic effluents. Remaining 38 industrial units were putting their untreated effluent mainly into Kabul River (Aftab *et al.,* 2000).

2.6.2 EMS Realization in Cement Industry

EMS in any industry or organization spots environmental impacts, lay down improvement targets, and regularly check progress. EMS is being properly implemented and maintained by the Canadian cement producing plants. This helps them better control their production operations. Indonesia planned to burn 60% of fuel in calciner below 1000 degree Centigrade to reduce the risk of toxic exposure from a cement plant. Above this temperature, NOx is generated (Avetisyan, 2009).

The cement industry's contribution is approximately 5% to global anthropogenic CO2 emissions. The limestone calcinations is main cause of portion of CO2 emissions. Other sources are kiln combustion and electricity generation required for cement production. China emits 0.88 kg CO2 per kg of cement and is the world's largest emitter. India is at the top of list in view of most carbon intensive cement producing region is (0.93 kg CO2/kg) preceded by North America (0.89 kg CO2/kg). The conventional cement process is likely to emit relatively high volumes of CO_2, NOx and SOx. The other pollutants such as CO, polychlorinated di-benzo-dioxins and di-benzo-furans, volatile organic compounds, metals and their compounds, hydrogen chloride, and hydrofluoric acid have much lower emission level and therefore, these are not considered as grave crisis (Avetisyan, 2009)

Worldwide sustainable practices in cement industry; In many cement industries, improved practices, standards and regulations are required for the sustainability keeping

in view increasing energy demand. These enhanced practices should be included into the planning and design stage of cement plant.

There is an intense need to select more environmentally friendly materials and technologies. Only those processes should be recommended so as to utilize less toxic materials, consume less energy and produce less waste. It has become a common practice in cement industry to used waste products as alternative fuels. In every type of structure projects, cement is being used. Various potential of improving the effectiveness of cement production and minimize toxic emission are being practiced all over the world (Avetisyan, 2009).

Abating Industrial pollution through EMS; EMS implementation in cement industry plays an important role in abating pollution prevent through better solid waste management. Solid waste can be controlled and disposed by the avoiding material wastage, proper collection and recycling of spilled material in clinker formation besides to recycle chromium containing refractory bricks in cement production. In addition, EMS provides the cement manufacturers necessary guidance to save their investment. It helps to reduce energy consumption, and use renewable energy as well as "alternative technologies". Hence overall process becomes more energy efficient and environment friendly at the same time. Keeping in view, handling of materials at cement plant, EMS provides a way to generate as little waste as possible and recycle more. Another very important aspect of EMS implementation in the cement industry is reduction in pollution level through better handling or/ and less toxic materials to reduce water and spatial

pollution. Heavy traffic like trucks and heavy machinery used in cement plants emits particulate into the atmosphere (Avetisyan, 2009).

2.6.3 Future Application of EMS in Pakistan

There are lots of requirements to be fulfilled by various industries working in Pakistan in order to ensure regulatory environmental compliance as per the prescribed standards of regulating agencies. It is because of the reason that many environment protection agencies are not working as per their charter of duties in the true spirit.

There is dire need to establish a system to ensure that environmental concerns of the country, especially the industrial sector, are well understood and managed in the best national interest. Within an industrial unit or organization, there must be an Environmental Committee/ Environmental Cell to study environmental aspects and their impacts on local community and environment and accordingly finalize these aspects after discussion with the manager of industrial unit and the local community. This Environmental Committee should have regular periodic meetings to discuss the environmental issues in depth and suggest their appropriate solutions besides to formulate and maintain industrial sector specific environmental policy and management program.

The training of the employees is another important requirement for effective implementation of EMS. In addition to above mentioned duties of Environmental Cell, employees' training should also be arranged in an industrial unit so that all necessary information is passed on to all the concerned stakeholders in order to ultimately reduce

the adverse impacts on local environment in the light of Environmental Management Program (EMP).

A database established to record basic information related to environmental aspects, community views and notices from the governmental regulating agencies will also facilitate in finding the feasible solution to all environmental problems besides to prepare their enforcement plan accordingly. Also on the basis of severity of impacts on community, strategies must be formulated to cope with the situation and establish a system in which industries would communicate their environmental performances and problems to get timely facilitation from government advisory bodies.

In order to improve overall OHS situation of cement industry in the country, it is imperative to establish EHS department to take care of the occupational health and safety. Key responsibilities of the department would be to survey all vulnerable industrial units and to identify the hot working areas and accident prone areas, particularly the fire hazards. Besides this, an awareness raising and safety campaigns must be initiated in which cement producers should voluntarily continue environment friendly practices. Eliminating the discharge of polluting substances to the environment, management of wastes in an environment friendly manner and safe use of wastes as raw materials, alternative fuels and also product fillings are future needs of cement industry in order to develop more environment friendly industrial operations.

It will also be fruitful to use improved and environment friendly technologies. Additionally, sprinkling of water on roads, crusher's hopper at the time of material unloading and at material storage areas be used besides to adopt flame cooling by

injecting water on flame to reduce NOx and install bag filters especially at kiln, clinker cooler, cement mill, coal grinding and milling operation (Sindh vision Report, 2007).

Chapter 3

RESEARCH METHODOLOGY

In the past few years many industries have been certified with ISO 14000 in Pakistan. In order to meet objective of the present study following few ISO 14000 certified and uncertified cement industries were to focussed:

1. Askari cement factory
2. Fauji cement Factory
3. Lucky cement Factory
4. Kohat Cement Factory

As mentioned above, four major cement industrial units were selected for research study. In order to assess the implementation status of EMS in selected cement industries and explore its basic role in abating the pollution in the factory area, a questionnaire was framed which mainly involved questions about five basic elements as given below:

1. Environmental policy
2. Planning
3. Implementation and operation
4. Checking and corrective action and
5. Management review

3.1 Environmental policy is the basic element of environmental management system in which organization develops a framework for planning and action in the form of a statement of organization's commitment to the environment. Following questions were related to Environmental policy:

Serial	Question
1.	Whether the top management is committed to address the environmental issues?
2.	Has the top management devised any environmental policy?
3.	Whether environmental policy includes commitment to continual improvement?
4.	Whether environmental policy is according to the nature, scale and environmental impacts of organizational activities, products and services?
5.	Whether environmental policy includes aspect of pollution prevention?
6.	Whether environmental policy includes commitment to comply with relevant environmental regulation and legislation?
7.	Whether environmental policy was communicated to all employees?
8.	Whether environmental policy was available for public?
9.	Is the environmental Policy being implemented and reviewed regularly?

3.2 Planning identifies environmental issues and defines the initiatives and resources needed to achieve the environmental policy. Following questions were related to Planning:

1. Whether the company has identified its major environmental issues?
2. Is there any procedure established to identify the organization's environmental aspects?
3. Whether the aspects having significant impacts on the environment have been determined?
4. Have legal requirement related to organization been identified?

5. Whether environmental objectives and targets have been established in quantitative term?
6. Whether environmental management program has been devised to achieve environmental objectives and targets?
7. Whether rules and regulation been given to concerned staff for achieving environmental objective and targets?
8. Whether each environmental objective and target has been quantified where practicable?
9. Whether environmental objectives set with a relevant timeframe?
10. Whether critical staff who may create more hazard, been identified
11. Is there any procedure to respond to emergency situations?
12. Whether new modified activities, products or services been incorporated in EMP?

3.3 Implementation & Operations describes the procedures, programs and responsibilities necessary to implement the key initiatives to achieve goals. Following questions were related to implementation and operation:

1. Whether management has defined roles and responsibilities?
2. Does the system facilitate effective environmental management?
3. Whether financial resources are made available by top management to implement environmental management program?
4. Whether training requirements have been explored?
5. Whether critical operations who may create more hazard, have been identified?
6. Is there any procedure to respond to accidents?

7. Whether human resources and specialized skills, technology resources are available?
8. Has top management has appointed any environmental Manager?
9. Have all personnel whose work may create a significant impact upon the environment received appropriate training?
10. Have contractors been included in the implementation of EMS?
11. Whether the organization maintains procedures for Internal communication between the various levels and functions?
12. Whether external interested parties are coordinated on environmental aspects for effective EMS implementation?
13. Whether the procedures are reviewed after the occurrence of any accidents or emergency situations?
14. Whether the contents of regular trainings are focused on significant impact upon the environment?
15. Whether controlled documents are periodically reviewed, revised and approved?
16. Whether the information on environmental issues is kept up-to-date?

3.4 Checking and Corrective Action is to regularly monitor and assess the effectiveness of environmental management activities. Following questions were related to checking and corrective action:

1. Is there any procedure to measure risk level of critical operations (that may have significant environmental impacts)
2. Has the organization assigned the responsibility for handling and investigating non-conformances?
3. Does procedure for checking and corrective action include the recording of information to monitor performance?

4. Whether EMS audit is carried out or not?
5. Whether organization established and maintained procedures to mitigate any impacts caused?
6. Whether EMS audit records are kept for future references and continual improvement?
7. Whether causes of actual and potential non-conformances are being eliminated through checking and corrective action?

3.5 Management Review is 5th major element of Environmental Management System. It involves a high-level evaluation of the management system as a whole to determine its overall effectiveness in terms of driving continual improvement and achieving business goals. Management review involves arrangement of meetings to review procedures for document control, review environmental policy; environmental management plans and revises them for continual improvement. Following questions were related to Management Review:

1. Whether documented control procedure has been established?
2. Has timeframe been set to review environmental management system?
3. Whether review meetings are documented?
4. Whether new changes are made in existing policy after management review?
5. Whether achievements of already set targets, are monitored during management review?
6. Whether management considers the EMS audit results for continual improvement?

There were 50 questions; response to each question was coded by two (2) numbers, totaling 100 for all questions. For question's with undefined and unclear response, coded

value was considered half. After finalization of questionnaire, each selected industry was visited and the questionnaire was got filled through interviewing key personal. In addition to get the response to questionnaire, other information regarding significant environmental aspects and pollution control devices installed at the industry was also collected to examine the continual maintenance of environmental policy.

Chapter 4

DATA ANALYSIS, RESULTS AND DISCUSSIONS

In Pakistan, very meager efforts have been taken at government level to promote and implement Environmental Management Systems. Few organizations are established but the level of their institutional capacity to flourish EMS practice in the country is very weak. Pakistan National Accreditation Council (PNAC) working under the Ministry of Environment was visited consistently for three days to seek some support regarding the present study. It was quite strange to note that the staff of PNAC, being the apex body in Pakistan to promote EMS, could not provide, "only" the total number of industries certified in Pakistan. Only information received from PNAC was that there are four certified bodies having registration of PNAC and authorized to grant EMS certification to industrial units. There is a dire need to promote capabilities of institutions working for promoting EMS in the country.

In general, 15 certified bodies linked to ISO are presently working in Pakistan for granting EMS certification to industrial units; of these 15 bodies, 11 have no certificate by PNAC. There are approximately half million small and medium sized industries working in Pakistan. EMS in Pakistan has flourished at very slow rate. There were only two EMS certifications in 1999 which increased to four in 2000 and 115 in 2007 in

Pakistan (ISO Report, 2007). As per ISO report for the year 2008, there are 200 certified industries in Pakistan (ISO Report, 2008).

4.1 Askari Cement Factory

Of the selected industries, Askari Cement Ltd showed admirable implementation of EMS at the plant site. It is located in Wah Cantt near Taxila. The plant is presently producing 3800 tones cement per day. Askari Cement Company established this cement plant in 1921 with designed capacity of 120 tones per day. In 1991, name of the plant was changed to Wah Cement Company. The status of implementation of EMS at the plant site is depicted in the Table 5.1 (Detail given in Appendix A).

Table: 4.1 Status of EMS implementation in Askari Cement Factory

EMS Element	Response received/ Response required	Percentage Implementation
Environmental Policy	16/18	88.88%
Planning	22/24	91.66%
Implementation and Operation	27/32	84.37%
Checking and Corrective Action	14/14	100%
Management Review	06/12	50%
Total	85/100	85%

It was observed that EMS has been implemented in a very suitable manner. Maximum response of questionnaire (85%) was achieved. Environmental policy of the firm duly takes into account the aspects of pollution prevention, legal compliance and continual improvement. Environmental policy is communicated to all employees and available for

public. For continual improvement it is necessary to review the policy regularly. Top management of the company only mentioned about review the policy but it was observed that environmental policy is not being reviewed and maintained properly due to the reason that there was no environmental manager appointed in the firm.

Company identified all its major environmental issues because they have proper procedure to identify the environmental aspects. Therefore they established objective and target in quantitative term and relevant timeframe. Company also includes the new modified activities in environmental management program. Top management of the company was also found dedicated to address all environmental concerns apart from proper preparation for any sort of emergency plant at the plant. Company only identified legal requirements related to organization but was not following this legislation properly. Therefore, each environmental objective and target has not been quantified where practicable. EMS was implemented in Askari cement factory in a better way. Top management was made available all the financial resources which are necessary for the implementation of environmental management program. Therefore management has defined roles and responsibilities, as well as training requirements have been explored. Organization also maintains the procedures for internal communication between the various levels and functions. There were proper procedures concerning the accidents investigations or critical operation response.

Top management has not appointed any environmental management representative in the firm for the proper implementation of EMS. Contractors were not included in the implementation of EMS either. Similarly controlled documents were not reviewed

periodically, revised as necessary and approved. EMS audit is carried out and its records were also kept for future references and continual improvement. It was observed that audit results were not being properly taken into account for incorporating them into environmental policy as required for continual improvement. Also already set targets, were not being monitored during management review. No significant environmental issue was observed except some sort of dust smokes seen during the unloading operation of raw materials.

4.2 Fauji Cement Factory

Fauji Cement Company operates a cement plant at Jhang Bahtar, Tehsil Fateh Jang, and District Attock in the province of Punjab. The cement plant has an annual production capacity of 1.165 million tons of cement. The quality cement produced at this plant is the best in the country and is preferred in the construction of various structures and is fundamental to Pakistan's economic vitality and quality of life. Per day cement production of the plant is 3700 tons per day. Coal and CNG are major fuels used at the plant. Solid waste is also being considered to be used as an alternative fuel. The status of implementation of EMS at the plant site is represented in table 4.2 (Detail given in Appendix B):

The percent EMS implementation response received from the cement plant was 79. The company has devised its environmental policy which considers control of emissions, minimization of solid waste and training requirements of employees. Health and safety consideration were also incorporated. Environmental policy was successfully being implemented at the factory area. For continual improvement it is necessary to review the

policy regularly. Top management of the company only mentioned about reviewing the policy However, it was observed that top management did not review environmental policy regularly for continual improvement.

Table 4.2 Status of EMS implementation in Fauji Cement Company

EMS Element	Response received/ Response required	Percentage Implementation
Environmental Policy	15/18	83.33%
Planning	21/24	87.5%
Implementation and Operation	24/32	75%
Checking and Corrective Action	12/14	85.71%
Management Review	6/12	50%
Total	79/100	79%

Company identified all its major environmental issues because they have proper procedure to identify the environmental aspects. It was observed that the company did not include the new modified activities in environmental management program. Top management of the company was also found dedicated to address all environmental concerns besides making an emergency response plan. Company only identified legal requirement related to organization but was not following legislation properly. Therefore each environmental objective and target has not been quantified where practicable. Top management was provided with all financial resources which were necessary for implementation of environmental management program. Therefore management has

defined roles and responsibilities as well as training requirements have been explored. Organization also maintains the procedures for internal communication among the various levels and functions but external interested parties were not coordinated on environmental aspects for effective EMS implementation. In the company, there were proper procedures to respond to any accidents or critical operations that may create hazards.

Top management had not appointed any Environmental Management Representative in the firm. Contractors were not included in the implementation of EMS either. Similarly documents were not periodically reviewed or revised. EMS audit were carried out and records were also kept for future references and continual improvement. It was observed that audit results were not being properly taken into account by the management for incorporating them into environmental policy as required for continual improvement. Also already set targets, were not being monitored during management review. No significant environmental issue was observed except some sort of dust smokes seen during the unloading operation of raw materials. Emission of toxic smoke clouds and air pollution due to heavy transport vehicles of the factory were observed as significant environmental issues, to be managed properly at the plant site.

4.3 Lucky Cement Factory

Lucky Cement located at Pezu operates four cement manufacturing units with total number of 2000 employees. The plant was installed in 1996 with a daily production capacity of 4200 tons par day. At present, Lucky Cement is a supreme cement plant of Pakistan and rated amongst the few best plants in Asia. Current production capacity of

the cement plant is 13,000 tones per day. It is worth mentioning that this industrial unit was not ISO 14000 certified.

Questionnaire response (Given in Appendix C) was collected in order to assess the existence of environmental considerations already in place prior to implementation of EMS. This was to facilitate the top management in identification of potential environmental aspects and go far their effective solutions. Major findings made during the visit of cement plant are given in Table 4.3:

Table: 4.3 Status of EMS implementation in Lucky Cement Factory

EMS Element	Response received/ Response required	Percentage Implementation
Environmental Policy	01/18	5.55%
Planning	10/24	41.66%
Implementation and Operation	09/32	28.12%
Checking and Corrective Action	03/14	21.42%
Management Review	03/12	25%
Total	26/100	26%

It was observed that around 26% EMS considerations were already being observed without suitable planning manner due the fact that top management was interested to little extent for addressing the environmental issues. There was no environmental policy formulated and maintained at site. Lucky cement industry is uncertified industry, top management was not committed to establish and implement the environmental policy

practically. Company has identified its major environmental issues because they have established the procedure to identify all those environmental aspects of the organization which have significant impacts on the environment. There was also procedure to respond to the accidents and emergency situations. Environmental management program was not developed to achieve the environmental objectives and targets because the top management had not established the environmental objectives and targets.

The top management was not providing the financial resources for the implementation of environmental management program. No critical operations were identified due to lack of human resources and specialized skills, technological resources. In the company there was no environmental Manger being appointed by the top management. Contractors were not included in any activity related to environment. Similarly the external interested parties were not coordinated on any environmental aspects. Documents of the company were not periodically reviewed, revised as necessary.

Pollution control devices were installed to trap toxic dust emissions. Health and safety considerations were not properly in place. Top management was not found to be committed to consider implementation of EMS as the major issue, rather their priority concerns were based on the economy. It is worth mentioning that a safety manager was appointed at the plant. Air pollution due to dust and other toxic emissions were significant environmental problems. The dust spread in the nearby community is the major problem causing serious health problems

4.4 Kohat Cement Factory

Kohat Cement Company Limited (KCCL) was established in 1980 under the State Cement Corporation of Pakistan. The company was privatized in 1992. The company has recently installed a white cement plant with 0.135 million tones per annum capacity. Per day cement production is 7500 tones. This plant is not ISO 14000 certified and data was collected in order to assess environmental contemplations already in practice prior to implementation of EMS. Major findings made during the visit to cement plant are given in table 4.4 (Detail given in Appendix D):

Table: 4.4 Status of EMS implementation in Kohat Cement Factory

EMS Element	Response received/ Response required	Percentage Implementation
Environmental Policy	01/18	5.55%
Planning	11/24	45.83%
Implementation and Operation	09/32	28.12%
Checking and Corrective Action	03/14	21.42%
Management Review	03/12	25%
Total	27/100	27%

Around 27% implementation of major EMS considerations was observed which need to be improved in suitable manner. Like Lucky cement plant, at this plant site also, there was no environmental policy formulated and maintained. Kohat cement industry is

uncertified industry therefore top management was not committed to establish and implemented the environmental policy.

Environmental management program was not developed to achieve the environmental objectives and targets because the top management had not established the environmental objectives and targets. There was no procedure to incorporate the modified activities, products or services in environmental management program. The top management was not providing the financial resources for the implementation of environmental management program. No critical operations were identified due to lack of human resources and specialized skills, technological resources. In the company, there was no environmental manger appointed by the top management. Contractors were not included in any activity related to environmental management program. Documents of the company were not periodically reviewed, revised as necessary. Top management has fulfilled the training requirements; therefore, the company has a proper procedure to respond the accidents and emergency situations. If any accidents or emergency situations occurred, they have procedures to respond. There was no audit carried out in the company, therefore, they had no procedure for checking and corrective action including the recording of information to monitor environmental performance. As the company is uncertified, therefore, there was no time frame set to review environmental management system. Effective pollution control was experienced at site to trap toxic dust emissions. Personal protective equipments were not properly used by the staff though they were issued to each employee by the top management. Air pollution due to heavy traffic used

in transport of raw material was major environmental issue. Other environmental problems were improper management of solid waste and coal dust spread in the factory.

4.5 Overall Implementation Status of EMS in Selected Industries

The comparison of individual implementation status of four ISO 14000 certified & uncertified cement industries reveals that certified industries are successfully practicing EMS to control all those environmental aspects which create serious impact on environment. These industries have proper environmental policy which gives the direction to control their various environmental risks associated with their activities, products and services. Subsequently employees, public and other stakeholders of these industries have no health concerns due to controlled emmissions.

Conversely, uncertified cement industries have no environmental policy which is basic requirement of EMS; hence, various environmental factors are not given proper alternatives. Uncontrolled emmissions of these industries are cearting serious health hazards for the local poupalation. Dust emmission is main problem affecting health of nearby locales. Due to poor health & safety measures at site, serious injuries and accidents were reported by the staff of uncertified industries. There had been some hue and cry from the affectee but the local adminstration is not paying full attention to address public health issues of common people perhaps because of influential probing of rich business community.

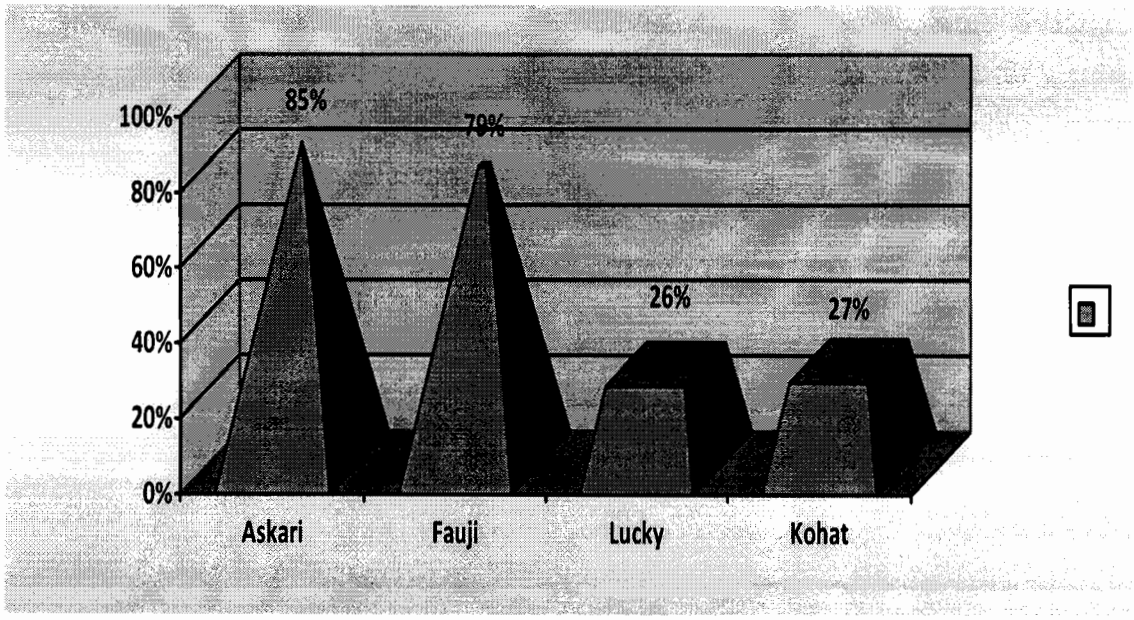
In quantitative terms, overall practical applications of provisions of ISO 14000 guidelines in four cement industries; Askari (certified), Fauji (certified), Lucky (uncertified) and

Kohat (uncertified) is given in table 4.5 which is based on the questionare's response received from four industries.

Table 4.5 Overall Status of EMS implementation in selected industries

EMS Element/ Cement Plant	Askari	Fauji	Lucky	Kohat
Environmental Policy	88.88%	83.33%	5.55%	5.55%
Planning	91.66%	87.5%	41.66%	45.83%
Implementation and Operation	84.37%	75%	28.12%	28.12%
Checking and Corrective Action	100%	85.71%	21.42%	21.42%
Management Review	50%	50%	25%	25%
Total	85%	79%	26%	27%

Figure 4.1 Comparison of EMS implementation of four selected cement industries



Chapter 5

CONCLUSIONS & RECOMMENDATIONS

In Pakistan, environmental protection is given less importance due to poverty, corruption and weak enforcement mechanisms of regulation. Certification to ISO 14001(EMS) is an indicator of environmentally sustainable development. Comparatively higher costs are involved in getting the certificate of EMS. This leads to less number of certifications in the country. In an attempt to implement EMS and get it certified successfully, companies often seek external assistance which is also a financial burden on the company. In the developing countries, like Pakistan, qualified consultancy services are usually not available at national level as a result, foreign companies are hired which come with equipments to test effluent and emission levels and charge huge expenditure. This also discourages EMS implementation in Pakistan.

5.1 Conclusions

The present study was based on assessing the role of EMS implementation in abating pollution in cement industry. It was concluded that major environmental concerns of cement industry are dust emissions, CO_2, SOx and NOx as well as particulate matter. Water pollution is also of primary concern and needs attention for appropriate solution. EMS certified industries are somehow maintaining their environmental management

program at appropriate level in conformity with ISO 14000 standards. However uncertified industries need to improve a lot for better managing their environmental concerns. They must be aware of the potential and competitive advantages of adopting EMS. Certified industries involve very less maintenance expenditures as compared to uncertified industrial units which are often susceptible to various operational problems associated with the decreased check and balance over the process and procedure in place.

At Askari cement Plant, some dust smokes were seen during the unloading operation of raw materials however there was no significant environmental issue observed at site. Dust smokes were also seen during the unloading operation of raw materials at Fauji Cement Plant. Another significant environmental issue was toxic smoke of heavy transport vehicles adding to the problem of air pollution at the plant.

Inspite of pollution control devices installed to trap toxic dust emissions, air pollution due to dust and other toxic emissions was observed at Lakki Cement Plant as most significant environmental problem. The dust spread in the nearby community is resulting into the serious health problems. Serious injuries to employees of the cement plant were reported due to poor safety measures as the personal protective equipments (PPEs) were not properly used by the workers. At Kohat Cement Industry, major environmental issues were improper management of solid waste and air pollution caused by coal dust spread in the factory.area. Vehicular exhaust of heavy traffic used in transport of raw materials was also the main air pollutant besides causing noise problems to populations located near the plant site.

5.2 Recommendations

Enforcement of environmental legislation is a problem in Pakistan. Drastic improvements are required in the national environmental policy to ensure strict enactment of rules in the country. It is imperative to increase the number of accredited entities in order to encourage EMS certification in the country. Following recommendations are made to promote EMS in cement industries of Pakistan.

1. A preliminary environmental review should be carried out in each cement industry to assess existing facilities, processes, products, services, and stakeholders. This will identify the gaps between existing practices and new requirement for implementation of EMS. On the basis of which, environmental policy may be devised to achieve objectives and targets.
2. It is pertinent to seek use of alternative fuels (for example waste solvents, old tires or waste plastics). It will help reduce the toxic emissions like carbon dioxide, SOx and NOx etc and subsequently environmental impacts will be reduced to minimum. Solid waste produced by the factory itself can be used as a fuel for cement production.
3. Raw material quarrying operations and the mining operations should be made environment friendly and effective compliance of existing environmental regulations and laws must be ensured.
4. Cement industries should publish their environmental performance report clearly describing operational data, objectives, targets, and results of EMS implementation.Annual performance report of all ISO14001 certified companies

should be available on line as secondary data to be used by researches and as investment motivation.

5. Most of the cement industry lack EMS certification due to lack of interest on part of the top management. It is suggested that top management must be willing and able to use opportunities for improving environmental performance. Pollution prevention is the heart of EMS process. It should be increasingly recognized by the top management that prevention costs are less than corrective measures.
6. Potential environmental risks of each cement industry must be truly addressed by proper implementation of EMS. In this context cement production process may be reviewed for reducing toxic emissions from cement plants besides to install advanced pollution control devices.

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APPENDIX A: STATUS OF EMS IMPLEMENTATION IN ASKARI CEMENT FACTORY

ENVIRONMENTAL POLICY				
Serial	**Question**	**Yes**	**No**	**Coding**
1.	Whether the top management is committed to address the environmental issues?	√	X	2
2.	Has the top management devised any environmental policy?	√	X	2
3.	Whether Environmental policy includes commitment to continual improvement?	√	X	2
4.	Whether environmental policy is according to the nature, scale and environmental impacts of organizational activities, products and services?	√	X	2
5.	Whether Environmental policy includes aspect of pollution prevention?	√	X	2
6.	Whether Environmental policy includes commitment to comply with relevant Environmental regulation and legislation?	√	X	2
7.	Whether Environmental policy communicated to all employees?	√	X	2
8.	Whether Environmental policy available for public?	√	X	2
9.	Is the Environmental Policy being implemented and reviewed regularly?	X	√	0
PLANNING				
10.	Whether the company has identified its major environmental issues?	√	X	2
11.	Is there any procedure established to identify the organization environmental aspects?	√	X	2
12.	Whether the aspects having significant impacts on the environment have been determined?	√	X	2
13.	Have legal requirement related to organization been identified?	1	1	1
14.	Whether Environmental objectives and targets have been established in quantitative term?	√	X	2
15.	Whether environmental management program has been devised to achieve environmental objectives and targets?	√	X	2

16.	Whether roles and regulation been given to concerned staff for achieving environmental objective and targets?	√	X	2
17.	Whether each environmental objective and target been quantified where practicable?	1	1	1
18.	Whether environmental objectives set with a relevant timeframe?	√	X	2
19.	Whether critical staff who may create more hazard, been identified	√	X	2
20.	Is there any procedure to respond to emergency situations?	√	X	2
21.	Whether new developments/ modified activities, products or services been incorporated in EMP?	√	X	2
IMPLEMENTATION AND OPERATION				
22.	Whether Management has defined roles and responsibilities?	√	X	2
23.	Does the system facilitate effective environmental management?	√	X	2
24.	Whether financial resources are made available by top management to implement environmental management program?	√	X	2
25.	Whether training requirements have been explored?	√	X	2
26.	Whether critical operations who may create more hazard, been identified?	√	X	2
27.	Is there any procedure to respond to accidents?	√	X	2
28.	Whether human resources and specialized skills, technology resources are available?	√	X	2
29.	Top management has appointed any Environmental Manager?	X	√	0
30.	Have all personnel whose work may create a significant impact upon the environment received appropriate training?	√	X	2
31.	Have contractors been included in the implementation of EMS?	X	√	0
32.	Whether the organization maintains procedures for Internal communication between the various levels and functions?	√	X	2
33.	Whether external interested parties are coordinated on environmental aspects for effective EMS implementation?	√	X	2
34.	Whether the procedures reviewed after the occurrence of any accidents or emergency situations?	√	X	2
35.	Whether the contents of regular training are focused on significant impact upon the environment	√	X	2
36.	Whether controlled documents are periodically reviewed, revised as necessary and approved?	1	1	1
37.	Whether the information on environmental issues is kept up-to-date?	√	X	2

CHECKING AND CORRECTIVE ACTION				
38.	Is there any procedure to measure risk level of critical operations (that may case significant environmental impacts)	√	X	2
39.	Has the organization assigned the responsibility for handling and investigating non-conformances?	√	X	2
40.	Does procedure for checking and corrective action include the recording of information to monitor performance?	√	X	2
41.	Whether EMS audit is carried out?	√	X	2
42.	Whether organization established and maintained procedures to mitigate any impacts caused?	√	X	2
43.	Whether EMS audit records are kept for future references and continual improvement?	√	X	2
44.	Whether the causes of actual and potential non-conformances being eliminated through checking and corrective action?	√	X	2
MANAGEMENT REVIEW				
45.	Whether documented control procedure been established?	√	X	2
46.	Has time frame been set to review environmental management system?	1	1	1
47.	Whether review meetings are documented?	√	X	2
48.	Whether new changes are made in existing policy after management review?	X	√	0
49.	Whether achievements of already set targets, is monitored during management review?	1	1	1
50.	Whether Management considers the EMS audit results for continual improvement?	X	√	0
			Total	**85%**

APPENDIX B STATUS OF EMS IMPLEMENTATION IN FAUJI CEMENT COMPANY

COMMITMENT & ENVIRONMENTAL POLICY				
Serial	**Question**	**Yes**	**No**	**Coding**
1.	Whether the top management is committed to address the environmental issues?	√	X	2
2.	Has the top management devised any environmental policy?	√	X	2
3.	Whether Environmental policy includes commitment to continual improvement?	√	X	2
4.	Whether environmental policy is according to the nature, scale and environmental impacts of organizational activities, products and services?	√	X	2
5.	Whether Environmental policy includes aspect of pollution prevention?	√	X	2
6.	Whether Environmental policy includes commitment to comply with relevant Environmental regulation and legislation?	√	X	2
7.	Whether Environmental policy communicated to all employees?	1	1	1
8.	Whether Environmental policy available for public?	√	X	2
9.	Is the Environmental Policy being reviewed regularly?	X	√	0
	PLANNING			
10.	Whether the company has identified its major environmental issues?	√	X	2
11.	Is there any procedure established to identify the organization environmental aspects?	√	X	2
12.	Whether the aspects having significant impacts on the environment have been determined?	√	X	2
13.	Have legal requirement related to organization been identified?	1	1	1
14.	Whether Environmental objectives and targets have been established?	√	X	2
15.	Whether environmental management program has been devised to achieve environmental objectives and targets?	√	X	2
16.	Whether roles and regulation been given to concerned staff for achieving environmental objective and targets?	1	1	1
17.	Whether each environmental objective and target been quantified where practicable?	1	1	1
18.	Whether environmental objectives set with a relevant timeframe?	√	X	2
19.	Whether critical operations / staff who may create more hazard, been identified	√	X	2

20.	Is there any procedure to respond to accidents and emergency situations?	√	X	2
21.	Whether new developments/ modified activities, products or services been incorporated in EMP?	1	1	1
	IMPLEMENTATION AND OPERATION			
22.	Whether Management has defined roles and responsibilities?	√	X	2
23.	Does the system facilitate effective environmental management?	√	X	2
24.	Whether financial resources are made available by top management to implement environmental management program?	√	X	2
25.	Whether training requirements have been explored?	√	X	2
26.	Whether critical operations / staff who may create more hazard, been identified?	√	X	2
27.	Is there any procedure to respond to accidents and emergency situations?	√	X	2
28.	Whether human resources and specialized skills, technology resources are available?	√	X	2
29.	Top management has appointed any Environmental Manger?	X	√	0
30.	Have all personnel whose work may create a significant impact upon the environment received appropriate training?	√	X	2
31.	Have contractors been included in the implementation of EMS?	X	√	0
32.	Whether the organization maintains procedures for Internal communication between the various levels and functions?	√	X	2
33.	Whether external interested parties are coordinated on environmental aspects for effective EMS implementation?	X	√	0
34.	Whether the procedures reviewed after the occurrence of any accidents or emergency situations?	√	X	2
35.	Whether the contents of training are focused on significant impact upon the environment	√	X	2
36.	Whether controlled documents are periodically reviewed, revised as necessary and approved?	√	X	2
37.	Whether the information is kept up-to-date?	X	√	0
	CHECKING AND CORRECTIVE ACTION			
38.	Is there any procedure to measure risk level of critical operations (that may case significant environmental impacts)	√	X	2
39.	Has the organization assigned the responsibility for handling and investigating non-conformances?	1	1	1
40.	Does procedure for checking and corrective action include the recording of information to monitor performance?	√	X	2
41.	Whether EMS audit is carried out?	√	X	2
42.	Whether organization established and maintained procedures for mitigate any impacts caused?	√	X	2

43.	Whether EMS audit records are kept for future references and continual improvement?	√	X	2
44.	Whether the causes of actual and potential non-conformances being eliminated through checking and corrective action?	√	X	2
	MANAGEMENT REVIEW			
45.	Whether documented control procedure been established?	√	X	2
46.	Has time frame been set to review environmental management system?	√	X	2
47.	Whether review meetings are documented?	√	X	2
48.	Whether new changes are made in existing policy after management review?	X	√	0
49.	Whether achievements of already set targets, is monitored during management review?	X	√	0
50.	Whether Management considers the EMS audit results for continual improvement?	X	√	0
			Total	**79%**

APPENDIX C: STATUS OF EMS IMPLEMENTATION IN LUCKY CEMENT PLANT

COMMITMENT & ENVIRONMENTAL POLICY				
Serial	**Question**	**Yes**	**No**	**Coding**
1.	Whether the top management is committed to address the environmental issues?	1	1	1
2.	Has the top management devised any environmental policy?	X	√	0
3.	Whether Environmental policy includes commitment to continual improvement?	X	√	0
4.	Whether environmental policy is according to the nature, scale and environmental impacts of organizational activities, products and services?	X	√	0
5.	Whether Environmental policy includes aspect of pollution prevention?	X	√	0
6.	Whether Environmental policy includes commitment to comply with relevant Environmental regulation and legislation?	X	√	0
7.	Whether Environmental policy communicated to all employees?	X	√	0
8.	Whether Environmental policy available for public?	X	√	0
9.	Is the Environmental Policy being implemented and reviewed regularly?	X	√	0
	PLANNING			
10.	Whether the company has identified its major environmental issues?	√	X	2
11.	Is there any procedure established to identify the organization environmental aspects?	1	1	1
12.	Whether the aspects having significant impacts on the environment have been determined?	√	X	2
13.	Have legal requirement related to organization been identified?	X	√	0
14.	Whether Environmental objectives and targets have been established?	X	√	0
15.	Whether environmental management program has been devised to achieve environmental objectives and targets?	X	√	0
16.	Whether roles and regulation been given to concerned staff for achieving environmental objective and targets?	1	1	1
17.	Whether each environmental objective and target been quantified where practicable?	X	√	0
18.	Whether environmental objectives set with a relevant timeframe?	X	√	0
19.	Whether critical operations / staff who may create more hazard, been identified	√	X	2

20.	Is there any procedure to respond to accidents and emergency situations?	√	X	2
21.	Whether new developments/ modified activities, products or services been incorporated in EMP?	X	√	0
	IMPLEMENTATION AND OPERATION			
22.	Whether Management has defined roles and responsibilities?	1	1	1
23.	Does the system facilitate effective environmental management?	X	√	0
24.	Whether financial resources are made available by top management to implement environmental management program?	X	√	0
25.	Whether training requirements have been explored?	1	1	1
26.	Whether critical operations / staff who may create more hazard, been identified?	X	√	0
27.	Is there any procedure to respond to accidents and emergency situations?	√	X	2
28.	Whether human resources and specialized skills, technology resources are available?	X	√	0
29.	Top management has appointed any Environmental Manger?	X	√	0
30.	Have all personnel whose work may create a significant impact upon the environment received appropriate training?	1	1	1
31.	Have contractors been included in the implementation of EMS?	X	√	0
32.	Whether the organization maintains procedures for Internal communication between the various levels and functions?	1	1	1
33.	Whether external interested parties are coordinated on environmental aspects for effective EMS implementation?	X	√	0
34.	Whether the procedures reviewed after the occurrence of any accidents or emergency situations?	√	X	2
35.	Whether the contents of training are focused on significant impact upon the environment ?	1	1	1
36.	Whether controlled documents are periodically reviewed, revised as necessary and approved?	X	√	0
37.	Whether the information is kept up-to-date?	X	√	0
	CHECKING AND CORRECTIVE ACTION			
38.	Is there any procedure to measure risk level of critical operations (that may case significant environmental impacts)	X	√	0
39.	Has the organization assigned the responsibility for handling and investigating non-conformances?	1	1	1
40.	Does procedure for checking and corrective action include the recording of information to monitor performance?	X	√	0

41.	Whether EMS audit is carried out?	X	√	0
42.	Whether organization established and maintained procedures for mitigate any impacts caused?	1	1	1
43.	Whether EMS audit records are kept for future references and continual improvement?	X	√	0
44.	Whether the causes of actual and potential non-conformances being eliminated through checking and corrective action?	1	1	1
	MANAGEMENT REVIEW			
45.	Whether documented control procedure been established?	1	1	1
46.	Has time frame been set to review environmental management system?	X	√	0
47.	Whether review meetings are documented?	√	X	2
48.	Whether new changes are made in existing policy after management review?	X	√	0
49.	Whether achievements of already set targets, is monitored during management review?	X	√	0
50.	Whether Management considers the EMS audit results for continual improvement?	X	√	0
			Total	26%

APPENDIX D: STATUS OF EMS IMPLEMENTATION IN KOHAT CEMENT PLANT

COMMITMENT & ENVIRONMENTAL POLICY				
Serial	**Question**	**Yes**	**No**	**Coding**
1.	Whether the top management is committed to address the environmental issues?	1	1	1
2.	Has the top management devised any environmental policy?	X	√	0
3.	Whether Environmental policy includes commitment to continual improvement?	X	√	0
4.	Whether environmental policy is according to the nature, scale and environmental impacts of organizational activities, products and services?	X	√	0
5.	Whether Environmental policy includes aspect of pollution prevention?	X	√	0
6.	Whether Environmental policy includes commitment to comply with relevant Environmental regulation and legislation?	X	√	0
7.	Whether Environmental policy communicated to all employees?	X	√	0
8.	Whether Environmental policy available for public?	X	√	0
9.	Is the Environmental Policy being implemented and reviewed regularly?	X	√	0
	PLANNING			
10.	Whether the company has identified its major environmental issues?	√	X	2
11.	Is there any procedure established to identify the organization environmental aspects?	1	1	1
12.	Whether the aspects having significant impacts on the environment have been determined?	√	X	2
13.	Have legal requirement related to organization been identified?	1	1	1
14.	Whether Environmental objectives and targets have been established?	X	√	0
15.	Whether environmental management program has been devised to achieve environmental objectives and targets?	X	√	0
16.	Whether roles and regulation been given to concerned staff for achieving environmental objective and targets?	1	1	1
17.	Whether each environmental objective and target been quantified where practicable?	X	√	0
18.	Whether environmental objectives set with a relevant timeframe?	X	√	0
19.	Whether critical operations / staff who may create more hazard, been identified	√	X	2

20.	Is there any procedure to respond to accidents and emergency situations?	√	X	2
21.	Whether new developments/ modified activities, products or services been incorporated in EMP?	X	√	0
	IMPLEMENTATION AND OPERATION			
22.	Whether Management has defined roles and responsibilities?	1	1	1
23.	Does the system facilitate effective environmental management?	X	√	0
24.	Whether financial resources are made available by top management to implement environmental management program?	X	√	0
25.	Whether training requirements have been explored?	1	1	1
26.	Whether critical operations / staff who may create more hazard, been identified?	X	√	0
27.	Is there any procedure to respond to accidents and emergency situations?	√	X	2
28.	Whether human resources and specialized skills, technology resources are available?	X	√	0
29.	Top management has appointed any Environmental Manger?	X	√	0
30.	Have all personnel whose work may create a significant impact upon the environment received appropriate training?	1	1	1
31.	Have contractors been included in the implementation of EMS?	X	√	0
32.	Whether the organization maintains procedures for Internal communication between the various levels and functions?	1	1	1
33.	Whether external interested parties are coordinated on environmental aspects for effective EMS implementation?	X	√	0
34.	Whether the procedures reviewed after the occurrence of any accidents or emergency situations?	√	X	2
35.	Whether the contents of training are focused on significant impact upon the environment	1	1	1
36.	Whether controlled documents are periodically reviewed, revised as necessary and approved?	X	√	0
37.	Whether the information is kept up-to-date?	X	√	0
	CHECKING AND CORRECTIVE ACTION			
38.	Is there any procedure to measure risk level of critical operations (that may case significant environmental impacts)	X	√	0
39.	Has the organization assigned the responsibility for handling and investigating non-conformances?	1	1	1
40.	Does procedure for checking and corrective action include the recording of information to monitor performance?	X	√	0
41.	Whether EMS audit is carried out?	X	√	0
42.	Whether organization established and maintained procedures for mitigate any impacts caused?	1	1	1

43.	Whether EMS audit records are kept for future references and continual improvement?	X	√	0
44.	Whether the causes of actual and potential non-conformances being eliminated through checking and corrective action?	1	1	1
	MANAGEMENT REVIEW			
45.	Whether documented control procedure been established?	1	1	1
46.	Has time frame been set to review environmental management system?	X	√	0
47.	Whether review meetings are documented?	√	X	2
48.	Whether new changes are made in existing policy after management review?	X	√	0
49.	Whether achievements of already set targets, is monitored during management review?	X	√	0
50.	Whether Management considers the EMS audit results for continual improvement?	X	√	0
			Total	27%