Chapter 7

ENVIRONMENT MANAGEMENT SYSTEMS

An Environmental Management System (EMS) is a method organisations use to establish, implement and keep track of its environmental objectives and policies. This is very much relevant to fertiliser industries in minimizing the adverse environmental impacts and ensures clean production. The concept of Cleaner Production necessitates the continuous application of an integrated preventative environmental strategy to processes, products and service to increase ecoefficiency, reduce risks to humans and the environment so as to achieve a development strategy that is sustainable (Bose S. and De Alak, 2000).

Environment Management Systems, in general, in chemical processing and particularly in fertiliser manufacturing, aim at conservation of raw materials and energy, elimination of toxic materials and reducing the quantity and toxicity of emissions, effluents and wastes, reducing negative impacts all along the life cycle of the product till its ultimate use and final disposal. It also incorporate all known environmental concerns into the design and delivery of services and a strong commitment of which will systematically reduce pollution and improve efficiency in resource use.

The United Nations Conference on Environment and Development, or Earth Summit, Rio de Janeiro, Brazil, 1992, was convened to address global environmental issues and recommend solutions. Two important results of this conference were Agenda 21 and ISO 14000. Agenda 21 is a comprehensive set of guidelines for
achieving sustainability in all areas of human intervention in nature. It was adopted by 172 nations at the conference.

ISO 14000 is a group of standards, which addresses environmental management and pollution prevention. Prior to the conference, representatives approached the International Organisation for Standardization (ISO), asking them to participate and create international environmental standards. ISO announced at the conference that they would undertake this effort. Thus, ISO 14001 was conceived to help achieve sustainable development (McIntosh D.L., 1997).

After the Earth Summit, the concept of sustainable development has been widely accepted and manufacturers worldwide have recognized that there should be a convergence between economic development and environmental protection, both now and for future generations. Ecoefficiency emphasizes value creation for business and society at large by maximizing resource productivity, achieving better bottom line benefits and reward to shareholders, rather than simply minimize wastes or pollution. Existing design philosophies for loss prevention, which concern safe and environmentally acceptable chemical plant design is extended to include environmental sustainability also as an important criterion (Lemkowitz et al., 2001).

Ecoefficiency in fertiliser production embraces all cleaner production concepts such as efficient use of raw materials, pollution prevention, source reduction, waste minimization, and internal recycling and reuse. It captures the idea of pollution reduction through process change and recycles as opposed to the earlier end-of-pipe approaches. It is thus an extension of the total quality management process and an evolving concept, which allows companies to adapt to the changing dynamics of the marketplace, remain competitive and at same time protect the environment, employee
health and safety. The EMS provides a set of practical tools to implement strategies supporting this concept.

In 1993, the International Organisation for Standardization (ISO) set up a Technical Committee on Environmental Management (TC 207), and a number of sub-committees, to develop standards on a broad range of topics related to environmental management. The International Organisation for Standardization (ISO), a non-governmental organisation established in 1947, comprises a worldwide federation of national standards bodies from each of 100 countries. The organisation aims to facilitate the international exchange of goods and services by establishing international standards and reconciling regulatory differences between countries.

In 1996, the ISO issued the first standard for environmental management systems (EMS) called ISO 14001. This standard provides for elements of an effective environmental management system that can be integrated with the other management systems of an organisation. The standard is based on the following five basic principles (Schiffman R, et al., 2001).

1. Defining an environmental policy that is relevant to the nature, scale, and environmental impacts of its activities, products and services and commitment to it through a formal environmental management system;

2. Devising an objective plan and setting targets to work for the fulfillment of the environmental policy;

3. Developing the human, financial, technical, and other capabilities including emergency preparedness and response plans to deal with even unexpected situations to achieve the policy initiatives;

4. Measuring, monitoring, and evaluating environmental performance through periodic audits and
5. Reviewing and continually improving its environmental management system to better the overall environmental performance of the organisation.

Thus the benefits of implementing an EMS include better environmental performance, reduced operating costs and better financial performance, increased access to markets, regulatory relief, increased safety, better customer and community relations and employee involvement. The goal is to establish a common approach to environmental management systems that is internationally recognized, leading to improved environmental protection.

The 14001 standard can be used as a valuable set of practical, certifiable tools to implement an environmental strategy for any fertiliser manufacturing company. As with any good overall business strategy, the fundamental focus of the environmental strategy needs to be the position of the firm and its products and services vis-a-vis its stakeholders such as customers, suppliers, employees, public community etc. Moreover, environmental strategies require some special considerations deviating from the traditional strategic planning processes. Effective environmental strategy implementation requires a proactive stakeholder management interaction, which support sustainable development and provide for reconciliation of differing and sometimes conflicting stakeholder interests.

The International Institute of Sustainable Development stipulates that, for the business enterprise, sustainable development means adopting business strategies and activities that meet the needs of the enterprise and its stakeholders while protecting, sustaining, and enhancing the human and natural resources that will be needed in the future.
An ISO 14000 Environment Management System, thus, provide the tools to monitor and improve organisation's impact on the environment and help assure customers, manufactures' commitment to environmental management; improve cost control; reduce incidents that result in liability; reduce consumption of materials and energy; obtain permits and authorizations; reduce the cost of complying with environmental regulations; maintain good public relations; enhance social image and market share and improve industry-government relations (UNEP, 1998).

Stakeholders

Different groups of people are involved in the environmental management of an organisation involved in fertiliser production are agriculturists, employees, shareholders, banks and financial institutions, government and the public. Hence it is necessary to integrate the interests of all stakeholders and management with the corporate strategy and vision and environmental management systems (Camarota A.G., 2000).

Let us analyse as to how this can be achieved.

The parties who have a primary interest in the financial performance of any organisation are shareholders, lenders, and insurers. The three basic principles organisation should focus are growing sales and increasing profitability, reducing costs and improving productivity and keeping asset utilization as high as possible.

Agriculturists

The farmers are important in ensuring the ultimate success of any fertiliser product. Customer perceptions of a product or service are shaped not only by its specific environmental attributes, but also by the reputation of the company as an
environmental leader. Market research has shown that the environmental properties of products and services, while important in the minds of consumers, mean much less than price, quality, convenience, style, and ease of use. In managing customers points to be borne in mind include developing products that are environmentally benign while maintaining competitive cost, function, style, ease of use, and performance, minimizing the environmental impacts of product use and disposal and educating the customer about the environmental benefits of the products.

Employees

The primary internal stakeholders for any organisation who are concerned with the degree of internal environmental excellence are the management and the employees. The environmental focus of employees is on the production processes that create value for customers, produce acceptable financial results, and integrate the organisation with the communities, public policy-making bodies, and ecosystems with which it interacts.

Pollution prevention and process reengineering are the two primary methods used to refine production processes and minimize environmental impacts at the point of generation. The organisation and employees need to know how much of the different types of resources it consumes in order to produce a given unit of product. Resources include energy, capital equipment, information, people, money, raw materials, water, and supplies. Conversely, the organisation needs to know how much waste (hazardous, solid, liquid, and gaseous) it emits per unit of production. Only with this complete picture can the organisation establish a meaningful baseline of performance.
The organisation should reduce the specific consumption of resources in making a given unit of product; reduce the amount of wastes generated from making a given unit of product; encourage product and process innovation; and measure and communicate the results of these efforts.

Public

The stakeholders in this area are local, national and sometimes even international communities. They are external to the organisation, and hence pose a special challenge to management. The key question management must answer with regard to these stakeholders is whether the organisation is environmentally responsible member of the communities in which it operates. The fundamental effort with the public is to manage the ongoing relationships in an open and transparent manner. With the community of competing firms, the organisation can look for opportunities to form joint ventures, share technology, or develop integrated partnerships.

The basic principles in managing community and public policy stakeholders are establishing an open communications policy through efficient public relations using a variety of communication methods, such as fruitful interaction with different segments, mediation, arbitration, participatory planning, focus groups, and strategic alliances, establishing a proactive and participatory role in the lives of communities, establishing a process for self-audit and disclosure of environmental aspects and impacts; and ensuring accurate perceptions of environmental risks posed by its activities.
The organisation should use land in a sustainable manner that preserves naturally occurring ecosystems; engender ecosystem integrity, including maintaining biodiversity, preserving habitats, and optimizing flora and fauna health; maintain water quality for drinking, recreational, and wildlife use; and maintain air quality.

In order to align the existing environmental management systems of fertiliser production units with the international standards EMS the following methodology may be adopted.

**Establishing a Strategic Position**

The current position of the organisation with regard to the environmental interests of stakeholders should be established by performing an initial review. The initial review is essentially a data-gathering exercise that includes identification of applicable legislative and regulatory requirements; financial requirements; environmental aspects and impacts of the organisation's current products, services, and activities; customer perceptions of the environmental characteristics of the organisation's products, activities, and services; current performance with regard to internal criteria, external standards, codes of practice, and sets of principles and guidelines; existing environmental management processes, including procurement and contracting; feedback from investigations of previous incidents of non-compliance; opportunities for technology sharing, joint ventures, and strategic alliances; current community perceptions of the organisation's environmental aspects and activities; and other existing management systems that could either enable or impede environmental performance.
Once this information is gathered and organized, it can be used as inputs to a positional analysis, which will indicate areas of management priority based on stakeholder concerns.

**Defining a Vision and a Policy**

The key to defining a comprehensive vision of the organisation's environmental commitment is to include the views, perceptions, and requirements of the stakeholders. This can be easily accomplished by using the results of the initial review to determine the guiding principles and values to which the organisation should ascribe. Active communication with stakeholders can help to clarify their interests and perceptions. Top management should then codify their environmental commitment and values in a documented policy. The policy should be relevant to its activities, products, and services, while taking into account the data from stakeholders. Management should then make this documented policy available to all interested stakeholders, thus ensuring an accurate perception of the organisation's commitment to environmental excellence.

A typical Environmental Policy of a Company may be stated as follows:

“Achieve excellence in the protection of the environment, health and safety of our employees, contractors, users of our products and the communities in which we operate;
Anticipate and incorporate future Health, Safety and Environment requirements into business objectives;
Assure compliance with laws and company policies; and
Make a step-change in employee awareness and ownership of Health, Safety and Environment processes and performance.” (UOP, 1999).
Developing a Plan to Implement the Policy

Once the policy commitments have been established, management then draw up plans necessary to fulfill the policy commitments. This analysis is by using the stakeholder information from the initial review. It is based on the environmental aspects of its activities that the organisation can control and over which it has an influence. These aspects and their associated environmental impacts are prioritized according to the stakeholder criteria obtained from the initial review. Management develops a set of objectives, targets, and programs, which serve as milestones against which the performance of the environmental management systems can be measured.

Developing the Capabilities and Support Mechanisms

The focus of this set of activities is on how the objectives, targets, and programs become translated into literal reality. Management defines the accountability for specific actions within the environmental management system, and provides the resources to perform these actions.

The actions required by the EMS include reporting on its performance to top management, as well as ensuring the interests of specific stakeholder groups are adequately addressed. Management also creates an awareness of the environmental commitments it has made to all personnel in the organisation, thus ensuring motivation to achieve stakeholder interests. This awareness is usually coupled with a training program that is related to the prioritized environmental impacts defined in the planning activities. Each person in the organisation is required to know their roles and responsibilities in achieving the environmental policy and satisfying stakeholder interests.
Communication

An important EMS activity is establishing communication procedures with stakeholders, both internal and external. The communication program ensures that stakeholder requirements and perceptions are actively monitored, and that management is given the opportunity to positively influence perceptions.

When communicating with lenders, insurers, local communities, and activist groups, it can be especially important to ensure that they understand clearly the environmental risks posed by the organisation's activities and products. A central component of this risk communication can be the description of what emergency preparedness and response procedures are in place to identify the potential for and respond to accidents and emergencies.

An important discipline in improving resource productivity and reducing waste intensity is the management of operations using documented procedures and defined process controls. These two elements ensure that a documented performance baseline is defined, clearly described, and revised when processes change. They give management a disciplined, engineering-based approach to controlling its operations and knowing exactly what happens when the organisation moves from its defined baseline. Procedures and process controls ensure that internal stakeholders obtain accurate knowledge related to operational performance.

Measuring and Monitoring Performance

Once the environmental management system is in place, it is necessary to continually monitor its progress. This can be done through various means, but in general there will be daily measurement of the measurable impacts and an annual
audit of the system in general. This process of monitoring will alert the concerned to conditions that require corrective actions. It will also point out where real improvements have been made. Top management should review all of this information so that they can update and revise the strategic environmental plan. The idea is to promote the continuous improvement of the system and the environmental friendliness of the company.

Fact-based decision-making enables management to avoid the trap of making decisions based on inaccurate perceptions of what is going on, which can often worsen the problems the organisation it is seeking to solve. The data gathered and reported internally can also often be used directly for regulatory compliance and financial reporting, as the basis for customer education, and for developing environmental labeling background information.

Documentation

A key activity supporting performance measurement is the establishment of a records management system. If an environmental incident should occur, this system allows management to recreate the data and perform a root cause analysis, again supporting fact-based decision-making and accurate communications to stakeholders. Summary reports can be generated from verified records, ensuring the integrity of reporting and communication activities. Effective records management processes can greatly assist management when they define stakeholder strategies by providing a documented historical record of communications with the stakeholders as well as other relevant information.
Another measurement tool is the performance of EMS audits. The audit reports give management an accurate picture of how well the EMS is fulfilling its function and managing stakeholder interests, and provide an "early warning" system before significant issues arise that could negatively impact the perceptions of stakeholders.

**Reviewing and Improving the Systems**

In order to close the EMS loop, management reviews the EMS performance at predefined intervals. These reviews look at the internal strengths and weaknesses of the EMS, as well as the opportunities and threats resulting from the changing perceptions and requirements of its external stakeholders. This review can result in a complete revision of the original set of stakeholder data based on what information the EMS has generated. The fundamental concept underlying this exercise is that it re-establishes the strategic position of the firm, and sets the stage for possible revision of the policy, development of new plans, and movement around the circle of continual improvement. The review is the essence of proactive stakeholder management, as it requires a redefinition of stakeholder requirements and perceptions at regular intervals.

ISO 14001 promises to foster innovative solutions to pollution problems at the facility level. The standard requires that all employees be made aware of their environmental responsibilities and trained to exercise care when performing duties with environmental consequences. By instilling environmental awareness in all employees, firms can harness the technical know-how of employees on the production floor to help find creative strategies to minimize or reduce their environmental impacts. Often, it is these employees, the ones most familiar with a given firm's
production processes, who are in the best position to identify creative strategies for improving environmental performance.

**Merits and Demerits**

ISO 14001 as an important policy tool for encouraging proactive environmental management and fostering cooperation between industry and the regulatory authority. It provides a systematic framework for incorporating environmental protection into overall management strategy. It encourages a holistic approach to improving environmental performance, and establishes a framework for continual improvement. ISO 14001 calls for a high level of involvement of top-level management. Given that ISO 14001 is a system built for business by business, it's crafted in a language that management understands and is therefore more likely to capture and retain upper management's attention. ISO certification could be used as a public relations tool to boost a firm's image in the eyes of consumers. Using life cycle analysis and assessment and other tools for comparing environmental impacts, an organisation can examine the cradle to grave impacts of its products. It can question suppliers about contents of materials and even methods of delivery. This holistic approach can help foster preventative solutions by encouraging an organisation to identify opportunities for doing things in new ways, for finding new products from "waste", and for going beyond the traditional view of environmental problems as being the sole domain of the environmental health and safety manager. Many companies that have instituted a thorough EMS have benefited by becoming aware of inefficiencies that were not apparent beforehand; generating cost savings and reduced environmental liabilities. Another important feature of ISO 14001 is its provisions for continual improvement in a firm's environmental management system. The standard
requires firms to create specific timelines for designating responsibilities and implementing strategies to reduce environmental impacts. Also, periodic compliance and EMS audits are required to assess procedural improvements and identify needed system improvements. Such a mechanism for improvement is completely absent in command and control regulations such as BAT (Best Available Technology) standards and emission standards. Standards such as these give firms no incentive to go beyond what is necessary for compliance. It should be noted, however, that the requirement for continual improvement applies to the management system, not environmental performance.

In its present form, ISO 14001 has several potential shortcomings that may reduce its effectiveness in encouraging pollution prevention and limit its ability to spur improvements in environmental performance. To begin with, the standard is a management system standard, not a performance standard. A firm, therefore, is not actually required to improve its environmental performance, and may be able to point to ISO certification as "proof" of its commitment to protecting the environment. The standard does not promote inefficient "end-of-pipe" strategies as pollution prevention. The standards have been developed without sufficient input from the environmental community and public interest organisations, and the standard does not require sufficient public disclosure of a firm's environmental impacts.

ISO 14001 defines "prevention of pollution" as the "use of processes, practices, materials or products that avoid, reduce or control pollution, which may include recycling, treatment, process changes, control mechanisms, efficient use of resources and materials substitution." The definition recognized by the National Pollution Prevention Roundtable and US. Environment Protection Act (under the
Pollution Prevention Act of 1990) is source reduction, or any process that reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) prior to recycling, treatment or disposal. ISO 14000 is a management standard, and does not mandate any specific requirements for improved environmental performance. Instead, the requirement is more obliquely stated, requiring firms to identify their environmental impacts; prioritise those impacts; set targets and objectives for reducing those impacts; select activities to achieve the identified targets and then to use a continuous improvement cycle to evaluate and re-approach the system. ISO certification in no way absolves an organisation from compliance with existing environmental regulations. However, since regulators are looking at the possibility of granting regulatory flexibility to ISO certified firms, this issue is critical.

Increasingly, business leaders around the world are recognizing the importance of developing an environmental strategy that supports sustainable development and integrates stakeholder issues, concerns, and requirements. The ISO 14001 standard for environmental management systems offers a set of practical and certifiable tools to implement stakeholder management processes, and to ensure stakeholder satisfaction. As business moves into the information age, this set of tools will emerge as the dominant management technology supporting a sustainable global economy. The best way to look at an environmental policy is to think in terms of conservation of resources. In other words, if we reduce waste as little as possible, it automatically results in lesser environmental impacts and better profits.
ENVIRONMENTAL IMPACT ASSESSMENT OF FERTILISER PLANTS

Environmental Protection and Sustainable Development have been the cornerstones of the policies and procedures governing the industrial and other developmental activities in India. This is very much relevant to the fertiliser sector as it involves massive consumption of a wide variety of raw materials, energy, handling of large quantities of toxic and hazardous cargo, involve thermodynamic operations at high temperature, pressure, all having a great potential for environmental impacts and risk and also require huge investments.

Ministry of Environment and Forests (MoEF) has taken several policy initiatives and enacted environmental and pollution control legislations to prevent indiscriminate exploitation of natural resources and to promote integration of environmental concerns in developmental projects. One such initiative is the Notification on Environmental Impact Assessment (EIA) of developmental projects issued under the provisions of Environment (Protection) Act, 1986 making EIA mandatory for 30 categories of developmental projects including fertiliser plants (MoEF, 2000).

EIA is a valuable, inter-disciplinary and objective planning tool that is now generally accepted as an integral component of sound decision making with respect to alternate routes for development, process technologies and project sites. The objective of EIA is to foresee and address potential environmental problems and concerns at an early stage of project planning and design. EIA is expected to assist planners and policy makers in the decision making process by identifying the key impacts and formulating mitigation measures. The role of Environmental Impact Assessment
(EIA) is to contribute to the planning of a new operation or major alterations of an existing one. The systematic consideration of environmental impacts, which is the main feature of EIA, often leads to the identification of alternative engineering or siting options and or mitigating measures. As a result, EIA can have a major positive influence on the project design.

EIA is a legal requirement for a company before it can receive planning permission or a permit to operate a major installation. A major benefit of a formal EIA is that it provides environmental baseline information and prediction of impacts against which future operations can be periodically audited.

The final planning permit or site license for the plant will usually reflect the results of an EIA. Such a license will specify a number of conditions concerning site preparation, layout, and equipment. Day to day management requirements are more likely to be specified in an operating permit. Carrying out an EIA requires some environmental expertise and insight in addition to technical knowledge concerning the project itself. For major projects a multi-disciplinary team is usually assembled to research further information, evaluate impacts, and propose practical alternative options. Local public authorities are often good sources of information and should be involved in the EIA.

The objectives of EIA are to assess the level of environmental protection achieved so far, identify shortfalls in statutory requirements, identify emergency situations that may arise and check implementation of mitigatory actions. It will review the progress of implementation of environment related policies and decisions recognize good practices and forcing changes wherever necessary to improve performance. EIA aim at demonstrating management’s commitment to environmental
protection and motivating all for improvement. It provide information on achievements in environmental protection to public authorities and neighboring communities and use them as input into the company's education and training activities.

The steps involved in conducting EIA of a fertiliser project are screening, scoping and consideration of alternatives, base line data collection, impact prediction, public hearing, environmental management plan, decision making and monitoring the clearance conditions.

As all fertiliser projects require environmental clearance as per statutory notifications, screening has little relevance. Scoping is to specify the terms of reference to the EIA study. It identifies major environmental issues to be addressed, range of alternatives to the project to be examined and set the geographical boundaries of the study. The next step is to establish a baseline data, which is an environmental profile of the site proposed for the project. Then project activities including the raw materials, products, process employed, discharges, wastes and emissions are described.

The likely environmental impacts of project activities on climate and air quality, water, including groundwater, geology and soils, ecologically sensitive areas and habitats, land-use and surrounding activities, noise, vibration and radiation, visual quality are noted down.

The impacts on socio-economic factors such as population and demographic impacts, land-use and settlement, cultural and historical features, local economic structure, transport aspects are also studied. The environmental services proposed in the project such as wastewater treatment facilities, safe landfill, competent disposal
teams etc., are also reviewed. Data used for environmental assessments should be concise, limited to significant environmental issues, and aimed at informing project designers and decision-makers.

A public hearing is to be held involving local residents, local associations, active environment groups in the area and the community that is likely to be affected by the project in which all the reasonable queries from the people will be explained with all facts and figures.

A well-defined and workable Environmental Management Plan (EMP) is to be developed addressing all the likely scenarios and containing mitigatory measures.

Based on the EIA and EMP and involving the project proponent and impact assessing authority a decision is taken on the project proposal.

Upon completion of fertiliser projects and commissioning the same all these installations are subjected to a periodical environmental impact review to see that the commitments made are complied with and to see whether the prediction made in the EIA report were correct or not. The frequency of the evaluation is established either by law or by internal company regulations.

The EIA process may be taken up in-house by the safety or environmental department of the company, by a task force composed of the operational staff, safety staff, and maintenance staff under the responsibility of a technical manager or may be contracted to a specialized auditing company.

In all cases the group should be given access to all technical documentation, environmental reports, and regular water and air analysis results, reports of technical deviations, accident reports, and all legislative background related to factory
operations. Group members during the period of EIA preparation should be freed from their everyday functions and responsibilities.

The EIA report shall contain the following sections:

1) A brief description of the proposed development containing:
   - Details of the plant and processes
   - Key siting criteria
   - Alternate sites and project designs
   - Infrastructure requirements
   - Employment generation
   - Environmental changes—effluents, emissions and disposals and
     Emergency service requirements

2) A brief description of the local area

3) Review of the legislation and internal company rules.

4) Potential impacts and benefits

5) Irreversible and irretrievable commitment of resources

6) Mitigating actions

7) Projections of the likely situation without the development

8) Recommendations for monitoring.

EIA as conceived in the country is only as a project level planning tool and does not address to developmental programmes at the policy and planning level. Major issues resulting in deficiencies in EIA are lack of land use planning, information on socio-economic aspects of the projects, alternate technologies, public participation, integrated approach to environmental management and rural development, sufficient and reliable environment data, historical information on environmental components and monitoring facilities. Certain policy initiatives sometimes fall outside the environmental review and overshadow the
importance of EIA. It should have been ideally undertaken at the policy and planning levels as the environmental consequences of projects arise due to high-level decisions. EIA shall also incorporate elements of strategies for preventive environmental intervention such as resource conservation, by-product recovery, optimized plant operation etc., as its explicit goals.

ENVIRONMENTAL AUDIT OF FERTILISER PLANTS

An Environmental Audit (EA) is a systematic, documented, periodic and objective evaluation of how well the environmental organisation, management and systems are performing. It is a formalized procedure to provide the management the vital knowledge of its compliance to environmental laws and procedures towards environmental protection and their social acceptability. Audits are one of the key elements of an environmental management system in fertiliser plants and they can be considered as management tools to collect and analyze information on operating plants, which could be compared over several years and measure environmental performance (Krishnan K.S., 1995).

The environmental audit (EA), like any other audit, is not an attempt to find fault with or lay blame for failures but is an examination of the system to determine why failures occur, and then encourage participation to improve the system. Most companies keep the results confidential and for internal use. Audit procedures have been developed by several companies, consultants and national authorities to meet varying requirements and specific needs. At the international level, the ISO 14000 series provides guidelines on environmental auditing. ISO 14010 provides the general principles of environmental auditing, applicable to all types of environmental audit. ISO 14011 establishes audit procedures. ISO 14012 provides guidance on
qualification criteria for environmental audits. It is applicable to both internal and external auditors. Audits are helpful in facilitating management control of environmental practices, assessing compliance with company policies, including meeting regulatory requirements.

**Benefits of an Audit**

The benefits of environmental audits are many. It include, enhanced employees awareness of environmental policies and responsibilities of the organisation, identification of avenues for potential cost savings and waste reduction, evaluation of environmental training programmes, effective emergency preparedness, achievements for good environmental performance, good compliance to statutory obligations and better insurance coverage for environmental impairment liability.

One of the important aspects of an audit is to monitor regulatory compliance. Compliance audits include a comparison of the current operation with applicable laws and regulations (standards) that is sometimes required for amendment of permits and licensing etc. In addition to regulatory compliance and management system auditing, specific technical audits of energy consumption, waste and pollution sources, and site contamination are possible. Each technique has its own application and method, which is described in appropriate operations manuals and procedures.

**Audit Procedures**

Audits may be carried out in-house by a company audit team, or by external auditors familiar with environmental issues of fertiliser plants. External auditors are practically unable to effectively recommend solutions to operating problems since they do not have sufficient exposure to the plant as well as employees. On the other
hand, they are often able to bring a fresh approach and additional technical experience to the problem. A large number of companies already carry out internal audits, and the requisite training is provided by several agencies specialised in this work.

**Preparing the Audit**

The audit is conducted by a competent team under the responsibility of an environmental manager who assigns the tasks to be performed by each audit team member. The managers establish an audit plan for every plant to be checked and which concentrates on the environmental risk areas in the plant. The plan shall contain, environmental risk areas and high priority items, audit scope, objectives and criteria, details of units and individuals to be visited and interviewed, important reference documents, time, duration, places of the audit and meetings, language and confidentiality requirements, reporting issues and document retention requirements.

**Executing the Audit**

A formal opening meeting between the audit team and the plant managers offers an occasion to discuss the audit plan and the audit procedures. The plant managers shall provide essential information on improving working conditions and preventing accidents (Cascio, 1996). Then the audit team collects and compiles data from the company internal documents. The information obtained should be completed and verified by a site visit and inspection. The audit findings are then submitted again to the plant managers to obtain acknowledgment about the factual basis.
Audit Reporting

The report may include the following details such as the audit team, audit period, the scope, objectives, criteria, reference documents, the audit plan, summary of audit process, the period covered, confidentiality, distribution list and the audit findings. According to the conclusions, existing plans and targets may be revised and adapted. It is up to the management to decide on the follow-up of the audit. The frequency of the audit will depend on the size and complexity of the operations. For example for a high-risk operation, one where the management system is new, it would be appropriate to audit the system annually. For a low risk operation, a full audit may be undertaken every three years.

Systems approach to environmental protection, in addressing day-to-day operation of facilities, assessing impact on the environment right at the planning stage and systematically and regularly auditing the associated environmental aspects, are important in the fertiliser industry. The net effect of such an effort is that manufacturers are under increasing pressure to develop and implement environmentally sensitive fertiliser production technologies and more efficient pollution abatement processes and installations. Environment management systems, therefore, enhance the human potential to maximize the effective utilization of resources while minimizing environmental impacts of operations and thus contribute to sustainability in fertiliser production.
REFERENCES


