

Environmental Management & Pollution

2.1 Introducing

Amongst the developing countries, India is the foremost nation to take note of degradation of environment. In 1972, in the world environmental conference held at Stockholm, our government declared that it is their responsibility to control pollution in India. Even during recent global conference held at Kyoto in Japan, India accepted the responsibility of reducing global warming and depletion of ozone layer by banning the use of chloro-fluoro carbons in cryogenic engineering within a stipulated period.

In a recent conference held in Rio-de-Janeiro, India declared solidarity by conforming to the standards as stipulated by United States Environmental Protection Agencies (US-EPA). Perhaps India was the foremost country in third worlds to implement rigorously pollution legislation both for air and water. We accepted the stipulated levels of the pollutants in act designated as 'maximum permissible level' to be implemented in successive stages in few years.

Within India, Maharashtra state was the front runner to enact Water Pollution and Control Act in 1962. This was followed by passing of Comprehensive Environmental Protection Bill for prevention of air pollution in 1983. Maharashtra, Gujarat, Madhya Pradesh were the first states in Indian union to have pollution control board with attached analytical laboratories. This was followed by the setting of series of laboratories in all remaining states of the nation. A legislation was passed.

The grave tragedy of Bhopal in 1984 by accidentally releasing deadly poisonous gas such as methyl isocyanate took a toll of more than 4500 people who were innocent and helpless. With the growing civilisation and with rise in traffic, auto-exhaust emission also takes a toll of people. Therefore government enacted 'PUC' act to check every vehicle periodically and control, release of hazardous gases like NO-NO_x, CO, and hydrocarbons in air.

As a matter of fact, India did much more than any other developing country could do to control pollution. Even in controlling global warming and reduction of the Green House gases we were certainly ahead of developed countries like Canada, USA, Australia. General incentives were given by our government to design and

develop indigenously pollution monitoring instruments within the country and make us self-sufficient. At moment, separate ministry looks after all problems related to pollution.

In fact, all nations have their own ministry or department to implement effectively legislation related to control of pollution. We have passed act and prevented transportation of hazardous chemicals a big offence on express highways. The abatement of noise pollution surrounding airports, hospitals was taken care by our legislation. Environmental Impact Assessment (EIA) was rigorously followed during setting of new industries and environmental modelling has been used to carry out future forecasting of pollution and resorting to effective control measures of pollution.

Basically, our environment is composed of atmosphere, earth, water and space. In absence of pollution, it remains clean and enjoyable. The interaction of the atmosphere, lithosphere, hydrosphere and biosphere is continuing for years together. On account of the various activities of man, the composition and complex nature of environment gets changed. These activities include industrialization, construction, transportation. Such activities, although desirable for human development and welfare, lead to generation and release of objectionable materials into the environment thus turning it foul, and rendering our life miserable.

The natural environment is clean, but due to multifarious activities of man it gets polluted resulting in what is called as environmental pollution. Our main aim should be to keep our environment clean, by curbing industrial activities. However, in order to keep pace with the rapid industrialisation world over, a developing country like India cannot afford to arrest its industrial growth. We can select such industrial processes, which would cause minimum or zero pollution. Further, it is necessary to undertake pollution control measures, so as to enable us to keep our environment as clean as possible.

Our environment is complex. It gets fouled when industrial activities grow. To comprehend this complex nature of environment, we need knowledge of all disciplines of chemical, physical and biological science. To devise control measures, we need knowledge of engineering and technology. Environmental Science and Engineering is inter-disciplinary in nature. To understand atmosphere we need knowledge of physics and meteorology, while for knowing hydrosphere and air we need knowledge of chemistry, the complex behaviour of living organism can be really explained with a knowledge of the life sciences.

The interaction in lithosphere can be best understood from principles of earth science, while the entire control mechanism can be devised only with intricate knowledge of engineering and technology. In the process of measurement we collect enormous data, which can be interpreted and understood only if we are conversant with statistical analysis and computer programming and environmental modelling. Some concerted effort must be made to keep our environment clean. It will lead to betterment of our lives and peaceful coexistence on the earth.

2.2 What is Environmental & Management

An Environmental Management System (EMS) is a systematic approach for incorporating energy and environmental goals and priorities (such as energy use and regulatory compliance) into routine operations. While some sort of *de facto* system is inherent to any organization that must meet energy and environmental requirements as part of daily operations, it is generally accepted as a valuable step to formalize the approach by documenting it. Not only does documentation of the system ensure consistency over time and across employees, there is a growing body of evidence indicating that there is considerable value in defining a systematic approach to managing energy and environmental goals.

Energy and Environmental” in many locations, it is understood that an EMS encompasses a wide perspective, including the consumption of natural resources such as water, air and various energy sources, as well as the more traditional concepts of waste generation and disposal, pollution and use of human resources.

The US EPA defines an EMS as “a set [or system] of processes and practices that enable an organization to reduce its environmental impacts and increase its operating efficiency.” This focus on processes and practices is common to all EMSs, which are generally founded on the “Plan, Do Check, Feedback” cycle¹ of continuous improvement.

2.3 EMS Models

More than one model or conceptual framework for an EMS exists. Probably the most well-known of EMS models is the ISO 14001 international standard. Other models include the following:

- European Eco-Management and Audit Scheme (EMAS);
- Responsible Care model developed by the American Chemical Council (ACC);

- US Department of Justice (DOJ) “Seven Key Compliance Program Elements;” and
- EPA National Enforcement Investigation Center (NEIC) “Compliance Focused” EMS.

In the United States, the most commonly accepted model is that set forth by the ISO 14001 standard. There are also variations of the ISO 14001 model that have been developed for organizations that do not wish to certify to the ISO 14001 standard, such as the DEP EMS for Colleges and Universities, and the National Bio-solids Partnership EMS. As noted above, all EMS models are based on a “Plan, Do, Check, Feedback” cycle that is primarily concerned with the *process* an organization uses to incorporate environmental concerns into routine operations and not the operations themselves.

Complementary Systems and Tools

Growing industrial and government interest in energy and environmental management has led to the development of a number of concepts and tools that enable organizations to understand, evaluate and manage the environmental implications of their operations, services and products. Some tools are:

- ❖ Green procurement;
- ❖ Sustainable community planning;
- ❖ Life cycle management;
- ❖ Life cycle assessment; and
- ❖ Sustainable design.

In practice, many of these tools can be applied within Environmental Management Systems as well as existing quality, energy, or health and safety management systems such as:

- ✓ ISO 9001, QS 9000;
- ✓ ANSI/MSE 2000 - Management System for Energy;
- ✓ OHSAS 18001 – Occupational Health and Safety

Assessment Series - In addition several management systems are emerging that are more encompassing of multiple business issues such social, ethical, stakeholder, accountability and reporting performance. Some of these "*sustainable management systems*" are:

- ◆ SA8000 - Social Accountability Management System;
- ◆ AccountAbility 1000 Framework The “plan, do, check, feedback” cycle is often common to these systems. In addition many of these systems are designed to be compatible with ISO 9000, QS 9000 and ISO 14001.

Whether an organization adopts one of these more encompassing systems depends largely on the nature of their organizational activities and risks associated with specific issues. An organization with a range of risks and issues across an number of these areas, including environmental, may consider these systems as a means towards more comprehensive risk management and continuous improvement. On the other hand, municipalities with some social, ethical or accountability risks that overlap with their environmental issues may choose to address these within their existing management practices or an EMS.

The ISO 14001 EMS Model

According to the international standard, ISO 14001, an Environmental Management System (EMS) is “the part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy.” While this is a more complex definition than previously provided, it still implies the same cycle of “Plan, Do, Check, Feedback.” The ISO 14001 EMS standard consists of five sections, Environmental Policy, Planning, Implementation & Operations, Checking and Corrective Action, and Management Review.

The five major sections of the ISO 14001 EMS Model, and are described in the standard as follows:

- 1) ***Environmental Policy*** – Establishes and communicates an organization’s position and commitment as it relates to energy and the environment.
- 2) ***Planning*** – Identifies energy and environmental issues and requirements, and defines the initiatives and resources needed to achieve the environmental policy and economic goals.
- 3) ***Implementation & Operations*** – Describes the procedures, programs and responsibilities necessary to implement the key initiatives to achieve goals.
- 4) ***Checking and Corrective Action*** – Regularly monitors and assesses the effectiveness of energy and environmental management activities.
- 5) ***Management Review*** – 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.

2.4 The ISO 14001 Seventeen Elements

The ISO 14001 standard then breaks the five major sections down into seventeen elements described below:

- 1) *Environmental Policy* – The policy drives the commitment of the municipality to maintain and potentially improve its environmental performance. By documenting and publicizing the policy, the municipality demonstrates a commitment to the management of environmental issues from the highest management levels.
- 2) *Environmental Aspects* – Environmental aspects are the municipal activities that have the potential to interact with the environment in some way, potentially posing a risk if they are not managed appropriately.
- 3) *Legal and Other Requirements* – The legal and other requirements are those requirements the municipality is expected to comply with on a continual basis. Besides legal requirements, these could be the expectations of the local community or other local municipalities.
- 4) *Objectives and Targets* – Objectives and targets form the goals of a municipality's EMS. Drawing on the information gained in the Aspects study, a municipality develops goals for improving its performance in regard to specific activities.
- 5) *Environmental Management Programs* – These programs define the methods a municipality will use to achieve its objectives and targets.
- 6) *Structure and Responsibility* – Much like an organizational chart, the structure and responsibility of the municipality defines the authority structure in place. The definition of responsibility takes it another step further, defining who is responsible for what within municipal operations.
- 7) *Training, Awareness & Competence* – This element of an EMS defines what training and minimum competence levels are required to ensure that environmental risks are managed appropriately, who receives the training, and how often.
- 8) *Communications* – The communications element of an EMS defines how internal and external communications with respect to environmental issues

are handled. This can be quite useful in regards to requests for information from the local community.

- 9) ***EMS Documentation*** – The documentation element defines the structure of the EMS itself. This is typically only needed if a full EMS is implemented.
- 10) ***Document Control*** – This element focuses on the maintenance and control of EMS documents required to maintain the EMS.
- 11) ***Operational Control*** – The operational control element focuses on the level of operation control that is applied to environmental risks within the municipality. Many municipalities find this element particularly useful in the documentation of standard operating procedures that have previously not been written down.
- 12) ***Emergency Preparedness and Response*** – This EMS element outlines the procedures by which the municipality responds to environmental emergencies, and the maintenance of a minimum level of preparedness.
- 13) ***Monitoring and Measurement*** – This element describes how a municipality monitors its environmental performance, what procedures are used to measure the appropriate data sources, and how often they are measured.
- 14) ***Nonconformance & Corrective and Preventative Action*** – This EMS element outlines how a municipality investigates and corrects non-conformances.
- 15) ***Records*** – The EMS records element describes how the municipality handles and controls the larger scope of documents related to the EMS, such as training records, compliance reports, and letters to regulators.
- 16) ***EMS [internal] Audit*** – The auditing element of the EMS outlines how a municipality audits its environmental performance.
- 17) ***Management Review*** – This element of the EMS describes how the municipality coordinates performance reviews by top management and drives the process of continual improvement.

2.5 Levels of EMS Implementation

While one of the most common levels of EMS implementation is through third party certification, other levels of EMS implementation exist. For example, a municipality may wish to forego the cost of certification and self-declare that it has met the ISO requirements without seeking certification through a third party audit. Alternatively, a municipality may implement a complete EMS but have a third party provide independent verification that it has meet the ISO requirements. Finally, some municipalities may decide that only certain elements of an EMS need to be implemented to improve their performance or reduce risks. It is important to recognize however, that full, long-term benefits such as on-going risk management and continuous improvement can only be realized if all of the EMS elements are implemented. These three levels of EMS implementation are described below in more detail.

Level One - Third Party Certification to ISO 14001 - In order to demonstrate conformance to the ISO 14001 standard, many organizations choose to implement and then certify their EMS using a third-party auditor (or “registrar”). The auditor performs an independent validation that the EMS conforms to the ISO 14001 standard, and that it is *“in place, complete and sufficient.”* A number of auditing firms provide this service, all of which must be certified as qualified auditors.

Level Two – Complete EMS Implementation Without Certification - The second level is full EMS implementation without choosing to certify the EMS through a third party audit. In this case, the municipality typically chooses to self-declare that its EMS is in conformance to the ISO standard. Self-declaration allows a municipality to demonstrate and communicate its environmental commitment to regulators and the public without incurring the additional costs of certification. However, a third party might be used to strengthen the self-declaration by providing some level of independent verification and/or advice.

A municipality with an extremely large number of dispersed facilities may rule out certification because the registrar costs outweigh the benefits. However, choosing not to certify does not reduce the internal benefits that a municipality can realize through an EMS. It may allow for increased flexibility in implementation. For example, some organizations may identify priority sites or activities that require a complete EMS, while other sites or activities only require an implementation of specific EMS elements (e.g. training but no operational controls). This approach allows a municipality to quickly realize the full benefits of having an EMS for these sites or locations where it is appropriate and giving them a longer period to

assess whether or not the other sites require additional elements. Limiting the initial investment in EMS implementation also makes it easier to modify plans in the future.

The major weakness of non-certification is that it removes the confirmation inherent in the regular, biannual review and assessment that a third party registrar provides. Many organizations see this external review as the "*boot*" that kicks them into action and guards against complacency.

Non-certification is un-common in industry because most companies desire the additional benefits gained from certification to the ISO standard (e.g. meeting customer expectations). However, in a municipal setting, self-declaration or full implementation without certification may be a desirable and cost-effective option.

Level Three - Partial EMS Implementation Strategies - While a complete EMS is recognized as the most effective manner to integrate environmental concerns into daily work activities, an organization does not always possess the resources to implement a complete EMS. Furthermore, a complete EMS does not always make sense for every municipality. In these cases, partial implementation of an EMS through some of the elements – such as training programs and/or assessment of legal and other requirements – can be a desirable alternative for municipalities.

Even if a municipality determines that a complete EMS is not appropriate, it is still recommended that they consider the first two phases of implementation that involve policy development, management commitment, planning and information management. Municipalities may find it particularly helpful to assess the aspects of their operations that have the potential to impact energy use and the environment.

(Phase 2) This assessment will often indicate whether the municipality has adequately protected the environment from any risks presented by its operations. Often, the municipality identifies one or two aspects of its operations that need attention, but do not warrant the implementation of a complete EMS. Municipalities often choose to:

- 1) Enhance training programs around those aspects to increase employee awareness and participation;
- 2) Implement standard operating procedures around those operations to ensure they are managed appropriately;
- 3) Define the structure and responsibility of the environmental group in order to ensure that all staff understand the tasks they are responsible for;

- 4) Develop an emergency response and preparedness plan to prepare for unanticipated catastrophic events; and/or
- 5) Define how it deals with notices of violations and implements corrective actions in response to them.

Note that while it is recommended that a municipality perform an analysis of its significant impacts (to determine which activities have the biggest environmental risk), it is possible that they already understand those risks, and can proceed directly with implementation of the appropriate EMS element.

Historically, municipal environmental departments have been driven by both statutory requirements and the requirements of the local community – possibly due to the “tradition” of environmental law being set most broadly by the highest (Federal) level of government and then being made increasingly more restrictive by lower levels of government (State, County, Township, Borough, etc.) to insure that the overall environmental objectives of the law are achieved.

In order to develop a concrete understanding of those requirements, the municipality may wish to develop and maintain a register or database of all “Legal and Other Requirements” to which it is subject. This register can then be used as an internal auditing tool to determine if the municipality is, in fact, maintaining compliance with all of those requirements, and stay up to date on additional requirements that may develop over time.