Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Special Issue [1]2022 : 315-320

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD

REVIEW ARTICLE **OPEN ACCESS**

The Steps to Implement an Environmental Management Program As An Approach to Minimize Detrimental Environmental Issues By Industrial Sites

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ABSTRACT

Environmental monitoring and control is a critical component of managing the environmental aspect of industrial processes for long-term environmental preservation. An Industrial is a business that conducts all types of activities and produces vital outputs such as electrical power generation, pharmaceuticals, and petrochemicals, among other things. Our current standard of living is largely due to the use of industrial items. Industry's actions, on the other hand, can have an impact on the environment, with the biggest damage coming from the release of wastes and emissions into the environment which can have a large negative impact on the environment. This protocol specifies industrial sites' obligations in environmental management for the protection of air, soil, and any source of water. The Environmental Management Program must be written with the specific conditions of the project's location in mind. The purpose of this study is to guide the management and surveillance of air emissions, wastewater discharges into water bodies, ambient noise, and waste generated by industrial activities, as well as to comply with all international regulations laws, and local requirements.

Keywords: *Waste Management, Air emission, Wastewater, Industrial process, Environmental monitoring*

Received 20.02.2022 Revised 14.03.2022 Accepted 06.04.2022

INTRODUCTION

The industry faces a huge difficulty when it comes to sustainable development. Although in the past, good financial performance was enough to secure continuity, in the future, industrial companies will have to limit environmental problems and pay close attention to social elements in addition to achieving excellent commercial achievements. As a result, environmental management has evolved into a strategic concern for businesses throughout time [1]. Environmental management for the industrial site must go over adherence to legislation and stator requirements, according to the principle of sustainable development. Environmental management is increasingly incorporating aspects such as waste minimization and life cycle analysis. Furthermore, authorities and institutions are no longer solely responsible for the environment. The environmental management program can be employed as a method for increasing industry involvement and furthering the adoption of sustainable management into monitoring systems. While immediate environmental consequences were also sought, the overall goal was to foster confidence in government-business cooperation, strengthen industry capability, involve service providers, and establish relationships [2]. The cost-benefit analysis of present environmental rules may be the most significant issue that industries face. Pollution control and treatment, as well as environmental protection methods, are all regarded to be high-cost operations [3]. Industrial waste reduction is at the top of the environmental management hierarchy because the best way to manage industrial trash is to avoid producing it in the first place. Waste reduction can also be accomplished by repurposing products. waste reduction and reuse conserves natural resources, minimizes garbage output, and lowers the costs of waste disposal [4]. Air pollutants are toxins in the atmosphere that are caused by industrial activities and cause harm to humans, plants, or animals, as well as damage to the environment, changes in weather and climate, and interference with the comfortable enjoyment of life or other human activities [5]. As a result, it is critical to create and improve evaluation criteria for assessing the environmental position of industrial companies.

METHODS AND PROCESS

Roles and Responsibilities

• Top Management

Top managers are the principal persons in charge of putting the Environment Management Program into action. Through the site environmental department, they will form an Environmental team that will ensure that all of the procedures are followed. The Top managers are responsible for ensuring that this method is evaluated and upgraded by the regulatory authority's relevant Environmental Legislation. They are overall responsible for the implementation of environmental pollution monitoring and control procedures on site.

• Environmental department

The environmental Manager is in charge of adopting Environmental Management Procedures that will reduce the impact of industrial operations on the environment, reduce waste generated, recycle waste in the industry, and comply with the Environmental Impact Assessment suggestions. He oversees ensuring that all site employees are competent in the environmental education program. He must maintain an efficient interaction with the top management while carrying out his responsibilities. The Environmental department is in charge of the environmental management system's site deployment. It will be in charge of inspections to ensure that the necessary facilities are in place to prevent an environmental incident. So when an environmental incident occurs, it will determine the proper course of action based on the circumstances. it has been given the task of providing training in the area of environmental awareness. it will work with the site supervisors to ensure that the garbage accumulated during their activity is properly disposed of. It is responsible for monitoring the gas emissions from fumes equipment as well as the sound level in the fabrication industry or any other place with a high level of noise.

• Line managers

Provide adequate direction and advice on how to implement environmental pollution monitoring and control procedures on the job. Ensure that outfall discharges and stack emission monitoring are carried out by the site Environment Management Plan, which is updated depending on applicable requirements, through the site chemistry department. Ensure environmental compliance audit carried out by third-party regularly as per legal agreement. Establishing an action plan based on the findings of a third-party audit (including observations and non-conformities to remedy environmental issues) and presenting it to plant management for implementation. Regularly, conduct environmental compliance inspections on facilities.

• Supervisors

Supervisors must be charged with keeping a healthy environment in their authority. To avoid any environmental incident, it must adhere to an adequate standard. They are tasked with creating their periodic maintenance based on the findings of the regular inspections. When a release of any type occurs in their area, they are expected to manage the containment and recovery effort, as well as the appropriate

Process Map

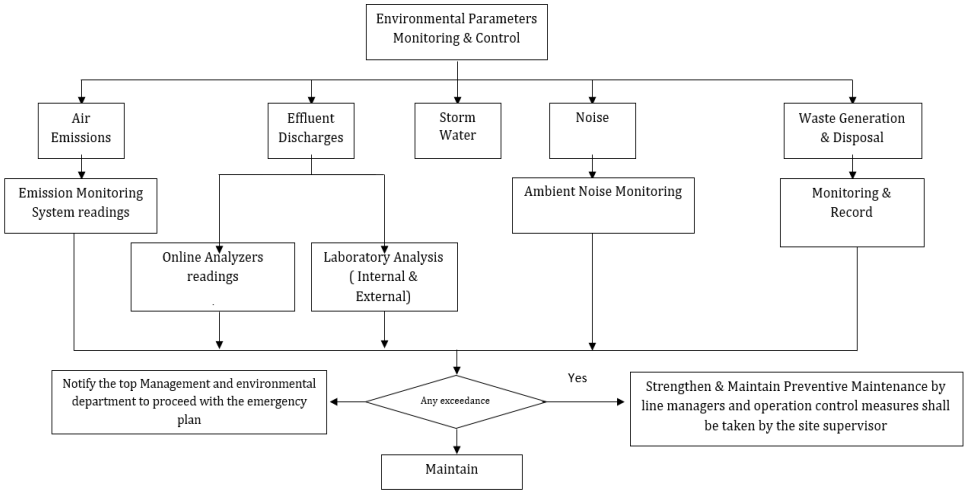

Figure 1. Environmental Monitoring Process Flow

Waste management

This waste management strategy will be provided as a clear guideline for identifying and managing all wastes generated by the industrial site [6]. This strategy aims to ensure that the industrial wastes had the best possible environmental impact with the goal of achieving and maintaining environmentally sound

sanitation and environmental conservation practices. Industrial should focus on the following (but not limited):

- Ensure that applicable environmental laws and regulations are followed and monitored.
- Make the most of materials by maximizing their use and repurposing them.
- Examine the effects of all job activities on the environment.
- Collect and dispose of rubbish as soon as possible.
- Strict housekeeping requirements
- Environmental compatibility is ensured by monitoring and inspecting all industrial activities.
- Accurate record-keeping
- Waste recycling/recovery by the conversion of wastes into usable resources and/or the extraction of energy or materials from wastes, such as scrap metal recycling.
- Assess and prioritize novel waste reduction, recycling, and disposal technology or methods.
- Raise knowledge of waste-saving strategies among employees and subcontractors.

Analyze the industrial Waste

Waste must be analyzed based on both its physical and chemical features; accurate waste analysis is the foundation for waste segregation, disposal, and containment. They are two main kinds of waste:

✓ **Hazardous Waste**

When waste materials display one or more of the qualities listed below or are dangerous by definition, they are designated as hazardous wastes. Hazardous waste handling regulations may differ from non-hazardous waste handling regulations [7]. Hazardous wastes have one or more of the characteristics listed below.

- Explosive
- Flammable
- Potential for spontaneous combustion
- Oxidizing Potential
- Toxic
- Corrosive.

The hazardous characteristic of hazardous waste can be removed to make it non-hazardous. Oily wastes can thus be rendered non-hazardous by burning the oil, provided that the ash is also non-hazardous. If pH is the only harmful characteristic, wastes with too high or too low pH can be neutralized and made non-hazardous.

✓ **No- Hazardous Waste**

All wastes that are not hazardous wastes or inert industrial wastes are classified as non-hazardous wastes. This comprises trash, office waste, combustible construction waste like boxes, and treated sewage effluent and sewage sludge [8].

✓ **Inert construction Wastes**

Inert industrial wastes are solid wastes that are unlikely to undergo physical, chemical, or biological changes that would result in the production of compounds that could be harmful if disposed of in a landfill. Demolition debris, concrete, asphalt, glass, ceramic materials, unpainted scrap metal, and dried timber are examples of such wastes.

Waste Management and Disposal

This approach will be followed to collect and manage all wastes created during all phases of all industrial projects, ranging from the most inert to the most dangerous.

✓ **Inventory of Waste**

The environmental department will keep track of the types and quantities of trash on the job sites by keeping a waste inventory. This document shall be used to monitor the effectiveness of the waste management program. If desired, the waste inventory will be sent to the line management regularly.

✓ **Segregation of Waste**

Due to the garbage's complexity, industrial sites shall conduct a waste segregation exercise that will involve sorting and segregating waste based on its characteristics. Colored and tagged (with universal symbols) receptacles for storing waste materials must be provided at the source.

✓ **Collection and Storage of Waste**

All waste generated on-site will be taken to the waste disposal facility as soon as possible. All waste-producing sites must have a sufficient number of colored and labeled collecting receptacles. Each of these containers must be equipped with a tight-fitting lid. Waste collection bins must not be permitted to overflow before being emptied, and damaged waste storage containers must be replaced as soon as possible.

Hazardous wastes must be separated from non-hazardous wastes and stored in a locked enclosed area.

- ✓ **System of Waste Transportation**

Solid trash will be collected regularly and transferred to a suitable disposal facility. Wherever practicable, sanitary wastes will be conveyed to a designated sewage plant via an underground sewer collecting system. Contaminated soils will be gathered by earth-moving equipment, loaded onto trucks, and transferred to remediation or disposal site.

- ✓ **Waste Disposal Alternatives**

All disposal solutions will be outsourced to trash contractors that have been approved by the right organizations and are well-known by the client. This can take the form of the landfill, Neutralization/stabilization, or reclaiming/re-use.

- ✓ **Waste management, training, and monitoring.**

Industrial sites shall create and deploy a waste tracking system that will trace garbage from generation to final disposal. This monitoring technique will be checked regularly to guarantee that all waste created on a given day is properly tracked, collected, and processed. The environmental training that every employee will get will include environmental policy and concerns, including waste management. The staff assigned to the environmental management team will get further training in project environmental processes and regulations. All staff will receive annual environmental awareness training, and all personnel who will be working with or near hazardous substances will receive bi-annual training.

WASTEWATER AND WATER MANAGEMENT

For a certain industry, significant physicochemical qualities, organic pollutants, inorganic pollutants, and biological pollutants, such as BOD, COD, DO, TOC, TSS, Floatables, etc. pH, temperature, oil and grease, residual chlorine, total coliform, sulfate, sulfide, sodium, and heavy metals must all be measured [9] and tested by regulatory standards and applicable restrictions to verify that effluent is properly treated before being discharged. Physicochemical-biological contaminants in effluent must be minimized by preventive maintenance of wastewater treatment plants. Controlling environmental factors with an operational environmental management plan [10]. To ascertain the levels, all samples must be returned to the laboratory and examined using documented laboratory analysis protocols, including instrument calibration. The liquid waste from the industrial site will be sampled and analyzed by local legislation and/or contractual requirements [11]. If occurrences occur that cause wastewater discharges and/or air emissions to exceed applicable regulatory restrictions, the frequency may increase. Laboratory waste must be collected separately and disposed of by applicable laws.

About water quality and waste management, liquid wastes, and wastewater (including hydrocarbons, lubricants, solvents, and descants) must be properly disposed of.

Dust Pollution Caused by Industrial Sites

To prevent or minimize dust, industrial sites must adequately spray the region, particularly the road under construction, with water. Water spraying construction areas should be done regularly.

Erosion of the Soil

Soil erosion is most likely to occur in excavated or embanked areas, shoulder on side slopes, or borrow pits following heavy rain. To prevent soil erosion, all exposed surfaces must be regressed or covered with stone pitching, as well as lining concrete, spillways, and embankment compaction.

Refrigerants that deplete the ozone layer

If the refrigerants are ozone-damaging, all subcontractors will gradually phase them out. Any new refrigeration equipment should only use Ozone-friendly refrigerants. All subcontractors should submit a refrigerant inventory, including the camp and office, and inform top management of their plans.

Noise impact

Although industrial noise in the neighborhood does not constitute a health concern or harm people's hearing, it can hurt people's quality of life. industrial noise can contribute to the deterioration of someone's health to some extent since it can irritate and stress people and disrupt their sleep, all of which can lead to increased blood pressure, anxiety, and sentiments of hostility toward the persons or agencies responsible for the noise. In truth, industrial noise can be related to numerous classical definitions of "noise" . industrial noise can be perceived as, or regarded as, a nuisance [12]. Any industrial project involving the building of any project can result in noise problems. While the degree of construction noise's impact on a neighborhood may not be known until later in the project development process, measures can be put in place during the design phase to help mitigate the expected noise impacts at sensitive receptors. The following strategies can be used to effectively control industrial noise in the same way that they can be used to regulate operational traffic: Alternative design possibilities. Mitigation at the source, mitigation throughout the path, and mitigation at the receiver are all examples of mitigation.

Air Emission

Industrial activities can induce fugitive dust emissions due to a combination of on-site excavation and earth material movement, industrial machinery interaction with bare soil, and wind exposure of bare soil and soil piles. A secondary source of pollutants may include exhaust from diesel engines of earthmoving equipment, as well as from open burning of solid waste on-site. Consider the following techniques for reducing and controlling air pollutants from industrial sites. [13]. Minimizing dust from material handling sources by using covers and/or control equipment (water suppression, baghouse, or cyclone) Minimizing dust from open area sources by using control measures such as installing enclosures and covers, and increasing the moisture content. Before demolition, selectively eliminating possibly harmful air pollutants, such as asbestos; managing emissions from mobile sources; and avoiding open burning of solid waste. Periodic ambient air quality monitoring (NOx & SOx) at the identified sensitive receptors should be carried out to ensure that applicable ambient air quality are not exceeded. Dust levels and wind conditions should be monitored regularly at the site to ensure that on-site industrial operations are not contributing to any potential increases in dust levels. To minimize volatile emissions, refueling must be done in a controlled manner as needed and with appropriate equipment. Industrial activities may result in a large increase in the movement of heavy trucks for the delivery of materials and equipment, increasing the risk of traffic-related environmental issues, the incidence of traffic involving personal vehicles should be reduced and replaced by collective transportation.

Environmental impact assessment

An Environmental Impact Assessment (EIA) must be completed, and it may be coupled to a cost-benefit analysis. The Environmental Impact Assessment goal is to ensure that environmental concerns are addressed and possible problems are anticipated at the right stage of the industrial project. EIA should be considered an inherent element of the planning process and should be started at the project level from the beginning. There are several EIA guidelines accessible. The main steps that will be used are as follows [14] [15]. The appointment of an EIA coordinator and the gathering of background information are among the preliminary operations. As soon as a project has been identified, this should be done. Impact identification entails a broad examination of the effects of project operations to identify those that need further investigation. A baseline study involves gathering extensive information and statistics on the state of the project region before its implementation. Impact assessments should be conducted in quantitative terms if possible and should include the development of suitable mitigating strategies. Impact evaluation cannot begin until the project alternative has been specified, but it should be done as soon as possible to allow for fast judgments.

Containment and monitoring of spills

On-site spill monitoring shall be done by a supervisor or a local operator. Oil slicks at the intake will be monitored regularly. At the intake, an oil boom should be installed. Oil booms, oil leak detectors, oil slick floaters, and oil skimmers must all be kept in good working order in case of an emergency. Line Managers shall monitor and control oil storage tank seal inspections and other relevant oil leaks parts [16]

CONCLUSION

The goal of this environmental management program is to verify that the industrial business does not harm the environment and to determine the effectiveness of environmental management systems. The monitoring program will demonstrate the effectiveness of environmental procedures and remedial actions, allowing for the re-definition of the environmental strategy if necessary, to suggest ongoing improvements in the management program based on the monitoring, and to devise new monitoring, to improve environmental quality through proper implementation of suggested mitigation measures; To meet the requirements of the existing environment. The program sets out the management framework to ensure that legal, contractual requirements are fulfilled and respected by the industry. It aims to avoid contaminating the environments and worksite with hazardous substances that may result from industrial processes activities.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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CITATION OF THIS ARTICLE

A Abdeljalil, S Nabil, M Rachid. The Steps to Implement an Environmental Management Program As An Approach to Minimize Detrimental Environmental Issues By Industrial Sites. Bull. Env.Pharmacol. Life Sci., Spl Issue [1] 2022 : 315-320