

**DOKUZ EYLUL UNIVERSITY
GRADUATE SCHOOL OF NATURAL AND APPLIED
SCIENCES**

**APPLICATIONS OF ENVIRONMENTAL
MANAGEMENT SYSTEMS IN BUILDING
CHEMICALS INDUSTRY**

by
Ferhan (İÇÖZ) PIŞKİNÖZ

November, 2008

İZMİR

**APPLICATIONS OF ENVIRONMENTAL
MANAGEMENT SYSTEMS IN BUILDING
CHEMICALS INDUSTRY**

**A Thesis submitted to the
Graduate School of Natural and Applied Sciences of Dokuz Eylül University
In Partial Fulfillment of the Requirements for the Degree of Master of Science
in Environmental Engineering, Environmental Sciences Program**

**by
Ferhan (İÇÖZ) PIŞKINÖZ**

November, 2008

İZMİR

M.Sc THESIS EXAMINATION RESULT FORM

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APPLICATIONS OF ENVIRONMENTAL MANAGEMENT SYSTEMS IN BUILDING CHEMICALS INDUSTRY

ABSTRACT

Expeditious developments in science and technology, explosive population growth after the industrial revolution and inadequate environmental sensibility of manufacturers have yielded a series of environmental problems: the breakdown of the environmental balance on a global level, ozone layer destruction, global warming, acid rain, deforestation and desert expansion. They are large and urgent subjects that affect the planet. Environmental Management System is a systematic approach to dealing with the environmental aspects of an installation. ISO 14001 Environmental Management System is a guideline for organizations controlling and minimizing the environmental impacts.

In this study, the benefits, properties and requirements of ISO 14001 EMS are analyzed. The steps of applications and implementations of an environmental management system on a building chemicals industry are explained. Mass balances of the production flow, waste costs per product are explained in factory.

Keywords: Environmental Management System, ISO 14001, ISO 14000.

YAPI KİMYASALLARI SEKTÖRÜNDE ÇEVRE YÖNETİM SİSTEMİ UYGULAMALARI

ÖZ

Bilim ve teknolojinin hızlı gelişmesi, endüstri devriminden sonra nüfusun hızlı bir şekilde artması ve sanayicinin yetersiz çevre duyarlılığının ürünü olarak oluşan çevre problemleri; dünya çapında çevresel dengenin tahrip olması, ozon tabakasının delinmesi, global ısınma, asit yağmurları, ormanların tahribi ve çölleşmedir. Bu problemler dünyayı etkileyen acil ve önemli konulardır. Çevre yönetim sistemi, çevresel açılara dayalı olarak kurulmuş sistematik bir yaklaşımdır. ISO 14001 Çevre Yönetim Sistemi, çevresel etkileri azaltan ve organizasyon içerisinde kontrolü sağlayan bir rehberdir.

Bu çalışma içerisinde, ISO 14001 Çevre Yönetim Sistemi Standardının yararları, özellikleri ve gereklilikleri analiz edilmiştir. Yapı kimyasalları sektöründe çevre yönetim sistemi uygulama aşamaları açıklanmıştır. Fabrikada, üretim akışındaki kütle dengesi, birim ürün başına düşen atık maliyetleri açıklanmıştır.

Anahtar kelimeler: Çevre Yönetim Sistemi, ISO 14000, ISO 14001.

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CHAPTER ONE

INTRODUCTION

1.1 Study Overview

Environmental Management System began direct result of environmental catastrophes and governmental reaction to those catastrophes. In many countries, environmental regulations that focus on control of environmentally damaging emissions to air, discharges to water, and disposal of hazardous wastes were instituted in an effort to prevent future environmental catastrophes and to limit toxic releases to the environment. Regulations, however, too often had the effect of placing a ceiling on environmental performance. Many industrial organizations, reacting negatively to governmental environmental regulations that they view as being based on bad application, adding unnecessary costs, or making them uncompetitive in international markets, have restricted their environmental management efforts to complying with regulations and nothing more. In response, global institutions, recognizing the interconnected problems of persistent environmental degradation, growing economic divisions, and associated poverty and hunger, developed programs to begin to bring economic and social goals into balance with ecological and natural resource preservation (Schaarsmith, 2005).

Environmental Management System (EMS) is a systematic approach to the management of all of the environmental aspects of operating a business, organization or any entity that has impact on the environment. EMS is a continuous improvement process that reduces environmental impact. EMS provides opportunities for improved business performance by complementing and building on existing activities such as property management planning, best management practices, codes of practice, product certification and quality assurance schemes.

The ISO 14001 standard is an environmental management system standard not an environmental performance standard. The standard is designed to establish a

management system that evaluates and addresses how the organization interacts with the environment.

In this research, the application of an Environmental Management System at building chemicals industry is focused.

1.2 Aim of the Study

Environmental Management System (EMS) is the system that is developed to activate the environment protection movements, especially at the industrial area. Minimizing the damages to the environment by the companies is purposed by EMS. ISO 14000 Standards Series are the result of the efforts given to change the EMS into standards that are adopted at international level. The ISO 14001 has characteristic of a guide and companies take this standard as a basis during certification. Also the standard leans on voluntary basic and helps companies to make activities for environment.

The objectives of my thesis are:

- to identify the implementing environmental management system according to ISO 14000 Standard,
- to evaluate the requirements of ISO 14001 Environmental Management System in building chemicals industry and to constitute a guideline for EMS's implementation steps.

For this purpose, building chemicals industry has been chosen case study area. Applications of ISO 14001 EMS have been explained step by step and waste costs per products are determined for this facility.

CHAPTER TWO

ENVIRONMENTAL MANAGEMENT SYSTEM

2.1 Environmental Management System

An Environment Management System (EMS) is a tool for managing organization's immediate and long-term impact of its products, services and processes on the environment. EMS focuses on environmental management practices, rather than the activities themselves. The EMS provides the structure by which the specific activities can be carried out efficiently and in a manner consistent with key organizational goals, but does not specify levels of performance. The EMS allows an organization the flexibility to adapt the system to its needs and priorities, rather than forcing a "one size fits all" mentality. Implementation of an EMS is a voluntary approach to improving environmental performance.

An EMS is a continual cycle of planning, implementing, reviewing and improving the processes and actions that an organization undertakes to meet its business and environmental goals (EPA, 2008).

An EMS can benefit on the company in many ways. EMS could help company:

- minimize your environmental liabilities
- maximize the efficient use of resources and make your business more efficient
- reduce your waste
- demonstrate a good corporate image
- build awareness of environmental issues among your employees.

To contribute to improved environmental performance, a good EMS should:

- Be implemented at a strategic level and integrated into corporate plans and policies. Top-level commitment is required so that senior management understand their role in ensuring the success of EMS.

- Identify the organizations impacts on the environment and set clear objectives and targets to improve their management of these aspects as well as the organization's overall environmental performance.
- Be designed to deliver and manage compliance with environmental laws and regulations on an ongoing basis, and will quickly instigate corrective and preventive action in cases of legal non-compliance.
- Deliver good resource management and financial benefits.
- Incorporate assured performance metrics that demonstrate the above and that can be communicated in a transparent manner in annual reports (DEFRA, 2008).

2.2 What are ISO, ISO 14000 and ISO 14001?

ISO stands for the International Organization for Standardization, located in Geneva, Switzerland. ISO promotes the development and implementation of voluntary international standards, both for particular products and for environmental management issues.

ISO 14000 is a series of international standards on environmental management. It provides a framework for the development of an environmental management system and the supporting audit program.

The whole ISO 14000 family provides management tools for organizations to control their environmental aspects and to improve their environmental performance. Together, these tools can provide significant tangible economic benefits, including:

- reduced raw material/resource use
- reduced energy consumption
- improved process efficiency
- reduced waste generation and disposal costs
- utilization of recoverable resources.

The ISO 14000 standards are factor in international development and commerce for numerous reasons, three of them are keys. First, the standards facilitate trade and

remove trade barriers; second, the creations of the standards are improving environmental performance worldwide; and third, these standards build worldwide consensus that there is a need for environmental management and for a common terminology for environmental management systems (Cascio, J., & Woodside, G., & Michell, P., 1996).

ISO 14001 is the corner stone standard of the ISO 14000 series. ISO 14001 defines an Environmental Aspects as an “element of an organization’s activities or products or services that can interact with the environment.”

The ISO 14001 standard requires that a community or organization put in place and implement a series of practices and procedures that, when taken together, result in an environmental management system. ISO 14001 is not a technical standard and as such does not in any way replace technical requirements embodied in statutes or regulations. It also does not set prescribed standards of performance for organizations.

The major requirements of an EMS under ISO 14001 include:

- A policy statement which includes commitments to prevention of pollution, continual improvement of the EMS leading to improvements in overall environmental performance, and compliance with all applicable statutory and regulatory requirements.
- Identification of all aspects of the community organization's activities, products, and services that could have a significant impact on the environment, including those that are not regulated.
- Setting performance objectives and targets for the management system which link back to the three commitments established in the community or organization's policy (i.e. prevention of pollution, continual improvement, and compliance).
- Implementing the EMS to meet these objectives. This includes activities like training of employees, establishing work instructions and practices, and

establishing the actual metrics by which the objectives and targets will be measured.

- Establishing a program to periodically audit the operation of the EMS.
- Checking and taking corrective and preventive actions when deviations from the EMS occur, including periodically evaluating the organization's compliance with applicable regulatory requirements.
- Undertaking periodic reviews of the EMS by top management to ensure its continuing performance and making adjustments to it, as necessary (EPA, 2007).

2.3 British Standards (BS 7750)

BS7750 is a specification for an environmental management system. The system is used to describe the company's environmental management system, evaluate its performance and to define policy, practices, objectives and targets; and provides a catalyst for continuous improvement.

The concept is similar to the use of ISO 9000 for quality systems, with the methods to be used open to definition by the company. The standard provides the framework for development and assessment of the resultant environmental management system.

BS7750 was developed as a response to concern about environmental risks and damage (both real and potential). Compliance to the standard is voluntary for companies, and complements required compliance to statutory legislation.

The standard was first published in June 1992, and was subsequently reviewed and revised to a new January 1994 issue.

BS7750 is now designed to be compatible with the European Community's Eco-Management & Audit Scheme (EMAS) and also with International Standard ISO 14001.

BS7750 requires an Environmental Policy to be in existence within the organization, fully supported by senior management, and outlining the policies of the company, not only to the staff but to the public. The policy needs to clarify compliance with Environmental Legislation that may affect the organization and stress a commitment to continuous improvement. Emphasis has been placed on policy as this provides the direction for the remainder of the Management System (Quality Network, 2006).

2.4 The Eco Management and Audit Scheme (EMAS)

EMAS requires an Environmental Policy to be in existence within the organization, fully supported by senior management, and outlining the policies of the company not only to the staff but to the general public and other stake holders. The policy needs to clarify compliance with Environmental Regulations that may affect the organization and stress a commitment to continuous improvement. Emphasis has been placed on policy as this provides the direction for the remainder of the Management System.

The EU Eco-Management and Audit Scheme (EMAS) is a management tool for companies and other organizations to evaluate report and improve their environmental performance. The scheme has been available for participation by companies since 1995 (Council Regulation (EEC) No 1836/93 of 29 June 1993) and was originally restricted to companies in industrial sectors.

Since 2001 EMAS has been open to all economic sectors including public and private services (Regulation (EC) No 761/2001 of the European Parliament and of the Council of 19 March 2001). In addition, EMAS was strengthened by the integration of EN/ISO 14001 as the environmental management system required by EMAS; by adopting an attractive EMAS logo to signal EMAS registration to the outside world; and by considering more strongly indirect effects such as those related to financial services or administrative and planning decisions.

To receive EMAS registration an organization must comply with the following steps:

- Conduct an **environmental review** considering all environmental aspects of the organization's activities, products and services, methods to assess these, its legal and regulatory framework and existing environmental management practices and procedures.
- In the light of the results of the review, establish an effective **environmental management system** aimed at achieving the organization's environmental policy defined by the top management. The management system needs to set responsibilities, objectives, means, operational procedures, training needs, monitoring and communication systems.
- Carry out an **environmental audit** assessing in particular the management system in place and conformity with the organization's policy and program as well as compliance with relevant environmental regulatory requirements.
- Provide a **statement** of its environmental performance which lays down the results achieved against the environmental objectives and the future steps to be undertaken in order to continuously improve the organization's environmental performance (European Commission, 2008).

Benefits of EMAS are;

- quality environmental management due to the use of a highly developed scheme,
- contribution to environmental risk management of the organization,
- resource savings and lower costs according to the organization's needs,
- reduction of financial burdens due to reactive management strategies such as remediation, cleanups and paying penalties for breach of legislation,
- financial benefits through better control of operations,
- incentive to eco-innovate production processes while environmental impacts are rising world-wide,
- compliance check with environmental legislation by EMAS verifier,
- learn from good examples of other companies and organizations,
- new business opportunities in markets where green production processes are important,

- added credibility and confidence with public authorities, other businesses and customers / citizens,
- improved relations with the local community,
- improved quality of workplaces, employee morale and incentive to team building,
- marketplace advantage and improved company image by improving stakeholder relations.

2.5 Development of ISO 14000 and 14001

The ISO is a federation of non-governmental organizations established in 1947 to develop international standards, improve international communication and collaboration, and facilitate the exchange of goods and services. The federation is currently comprised of close to 100 national standards bodies (member bodies) from countries representing approximately 95 percent of the world's industrial production. The headquarters of the ISO secretariat is in Geneva, Switzerland.

The ISO 14000 family grew out of ISO's commitment to support the objective of sustainable development discussed at the **United Nations Conference on Environment and Development**, in Rio de Janeiro, in 1992.

The ISO established a Strategic Advisory Group on the Environment (SAGE) in 1991 to assess the need for international environmental management standards. Countries participating in SAGE were charge with considering the following:

- Promote a common approach to environmental management similar to quality management,
- Enhance organizations' ability to attain and measure improvements in environmental performance,
- Facilitate trade and remove trade barriers

SAGE recommended that ISO proceed with an environmental standard by 1992 and that a technical committee be established to carry it through in 1993. The

committee and its sub-committees include representatives from industry, standards organizations, government and environmental organizations from many countries.

ISO/TC 207 is the ISO technical committee responsible for developing and maintaining the ISO 14000 family of standards. The new series of ISO 14000 standards are designed to cover:

- environmental management systems
- environmental auditing
- environmental performance evaluation
- environmental labeling
- life-cycle assessment
- environmental aspects in product standards

The key factor that has propelled the ISO 14000 series of standards forward throughout the early 1990s is the increase in national environmental standards. Examples of these standards include some two dozen eco-labeling schemes worldwide, the British Standards Institute's BS 7750 (Specification for Environmental Management Systems), the Canadian Standards Association's Z750 (A Guide for a Voluntary Environmental Management System), and the EU EMAS (Eco-Management and Audit Scheme). Other similar environmental management standards have been developed by the French Standards Association, the South African Bureau of Standards and the Spanish Standards Association (Conway, 1996).

ISO 14000 refers to the series of voluntary standards and guidelines for environmental management. ISO 14001 is one of those standards.

The first of the ISO 14000 series of standards, ISO 14001, was issued in September 1996. In Turkey the draft of ISO 14001 standard was published in April 1997. The Standard became certain as "TS EN-14001 Environmental Management Systems, Facilities and Guidelines". The latest version of the ISO14001 standard and Guidance document (ISO 14004:2004) have just been released as of November 15, 2004 (Erdem, 2006).

2.6 The ISO 14000 Family

The ISO 14000 family is made up of documents which are generally applied at the organizational level (documents for environmental auditing and environmental performance evaluation) and documents which are generally applied to products and services (documents for environmental declarations and claims and documents for life cycle assessment).

The table 2.1 provides further information on the application of ISO 14000 standards at the organizational level or to products and services.

Table 2.1 Application of the ISO 14000 family documents

a. at the organizational level

Implementing Environmental Management Systems (EMS)	ISO 14001; ISO 14004 These documents help an organization to establish a new or improve an existing EMS	ISO 14001 This document specifies the requirements for an EMS that may be objectively audited for self declaration or third part certification /registration purposes.	ISO 14004 This document provides guidance to help an organization establish and implement an EMS, including guidance that goes beyond the requirements of ISO 14001.	ISO/TR 14061 This document contains information that can assist in the implementation of ISO 14001 and ISO 14004 by forest management organizations and the forest products industry.	<p>ABBREVIATIONS</p> <p>CD = Committee Draft;</p> <p>TR = Technical Report;</p> <p>DIS = Draft International Standard;</p> <p>NWIP = New Work Item Proposal.</p> <p>FDIS = Final Draft International Standard</p>
Conducting environmental auditing and other related investigations	ISO 14010 This document provides the general principles common to the conduct of any environmental audit	ISO 14011 This document provides the procedures for the conduct of EMS audits, including the criteria for selection and composition of audit teams.	ISO 14012 This document provides guidance on the qualifications of internal or external environmental auditors and lead auditors.	ISO/WD 14015 This document helps an organization to identify and assess the environmental aspects of sites and entities to support the transfer of properties, responsibilities and obligations from one party to another.	
Evaluating environmental performance	ISO/DIS 14031 This document provides guidance on the selection and use of indicators to evaluate an organization's environmental performance.	ISO/TR 14032 This document provides examples from real organization to illustrate the use of the guidance in ISO 14031	Understanding terms and definitions	ISO 14050 This document helps an organization to understand the terms used in the ISO 14000 series standards	
Communicating results	ISO/WD 14063 This document provides guidance on environmental communication related to an organization's environmental aspects and performance.				

b. to products and services

<p>Using environmental declarations and claims</p>	<p>ISO 14020 This document provides general principles which serve as a basis for the development of ISO guidelines and standards on environmental claims and declarations.</p>	<p>ISO/DIS 14021 This document provides guidance on the terminology, symbols and testing and verification methodologies an organization should use for self-declaration of the environmental aspects of its products and services (Type II Environmental Labelling)</p>	<p>ISO/FDIS 14024 This document provides the guiding principles and procedures for third-party environmental Labeling certification programs (Type I Environmental Labelling)</p>	<p>ISO/WD/TR 14025 This document provides guidance and procedures on a specialized form of third-party environmental labeling certification using quantified product information labels and preset indices (Type III Environmental Labelling)</p>		
<p>Conducting life cycle assessment (LCA)</p>	<p>ISO 14040 This document provides the general principles, framework and methodological requirements for the LCA of products and services</p>	<p>ISO 14041 This document provides guidance for determining the goal and scope of an LCA study, and for conducting a life cycle inventory.</p>	<p>ISO/CD 14042 This document provides guidance for conducting the life cycle impact assessment phase of an LCA study.</p>	<p>ISO/DIS 14043 This document provides guidance for the interpretation of results from an LCA study.</p>	<p>ISO/TR 14048 This document provides information regarding the formatting of data to support life cycle assessment.</p>	<p>ISO/TR 14049 This document provides examples that illustrate how to apply the guidance in ISO 14041</p>
<p>Addressing environmental aspects in product standards</p>	<p>ISO Guide 64 This document helps the writers of product standards address environmental aspects in those standards</p>	<p>ISO/TR 14062 This document provides concepts and current practices relating to integration of environmental aspects into product design and development.</p>		<p>Understanding terms and definitions</p>	<p>ISO 14050 This document helps an organization to understand the terms used in the ISO 14000 series standards</p>	

2.7 Advantages of ISO 14001

Implementing an ISO 14000-based environmental management system, and using other tools from the ISO 14000 family, will give you far more than just confidence that you are complying with legislation. The ISO 14000 approach forces you to take a hard look at all areas where your business has an environmental impact. And this systematic approach can lead to benefits like the following:

- Reduced cost of waste management
- Savings in consumption of energy and materials
- Lower distribution costs
- Improved corporate image among regulators, customers and the public
- Framework for continuous improvement of your environmental performance.

Following are some of the actual collateral benefits to ISO 14001 implementation realized by organizations in the database:

- Identification of gaps in emergency and accident response preparedness
- Recognized logic of considering external benefits and costs avoided when making cost/benefit analyses and decisions
- Upgraded Process Safety Management programs when it was determined that the process being managed was also a significant environmental aspect
- Recognized the existence of a high heart attack risk exposure due to aging, mostly male workforce
- Need to have an emergency response plan that contemplates egress for handicapped personnel
- Recognition of a fire risk exposure that threatened the entire facility and could be easily eliminated
- Enhanced working relationships with suppliers by convening a meeting with over 50 suppliers to jointly study the issue of excess packaging
- Gained leverage in negotiating a consent agreement with a state environmental agency

- Turned environmental commitments into a marketing plus
- Working together as an organization, not as separate locations
- Recognition that some internal functions were dysfunctional and that personnel had to be replaced
- Recognition of an occupational health exposure that outweighed all of the environmental aspects
- Compelled to complete an Emergency Response Plan that had been languishing for 18 months
- Drew necessary attention to inadequately managed environmental legal requirements.

CHAPTER THREE

ISO 14001 EMS REQUIREMENTS

A functional, ISO 14001-based EMS can consist of no more than the five elements described. Any organization that implements these five elements will have started on the road to improving environmental performance and will at the same time be embedding systems management techniques that benefit other areas of organizational performance.

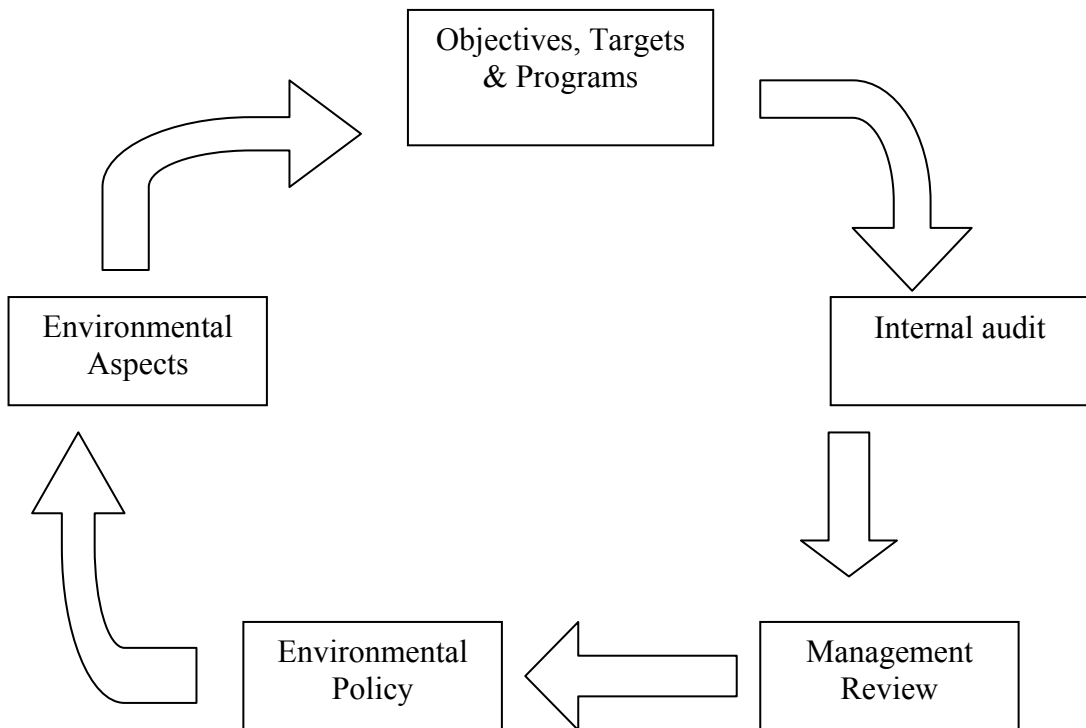


Figure 3.1 The five elements of ISO 14001 EMS

3.1 Environmental Policy

The environmental policy is the driver for implementing and improving an organization's environmental management system so that it can maintain and potentially improve its environmental performance. This policy should therefore reflect the commitment of top management to comply with applicable legal requirements and other requirements, to prevent pollution and to continually improve.

The environmental Policy statement required under ISO 14001 is the keystone upon which the entire environmental management system is constructed. It is not a public relations document that is posted on the conference room wall or handed out potentially impacted stakeholder groups. The environmental policy is the central focus of the EMS. It must contain and clearly communicate the following for the organization:

- Mission and core values with respect to the environment
- Commitments to control and improve environmental performance with respect to significant environmental aspects of the organization's products, services and/or activities.

The commitment to control and improve environmental performance with respect to the environment leads to the development of environmental objectives and targets. ISO 14001 requires that a coherent and cogent Environmental Policy be developed and implemented.

Contents requirements of the Environmental Policy are;

- Appropriate to the organization's environmental impacts
- Provides a framework for setting Environmental Objectives and Targets
- Commitment to continual improvement
- Commitment to prevention of pollution
- Commitment to comply with environmental laws and regulations, and other requirements to which the organization subscribes
- Document and implement the environmental policy
- Communicate it to all employees
- Commitment to communicate the Environmental Policy to the public.

The benefits associated with writing an Environmental Policy include:

- assuring customers of commitment to demonstrable environmental management
- maintaining good public/community relations

- enhancing image and market share
- improving cost control
- reducing incidents that result in liability
- conserving raw materials and energy
- sharing environmental solutions
- improving industry/government relations (Envirowise, 2008).

ISO 14001 requires that the environmental policy be “documented, implemented, maintained and communicated to all persons working for it or on its behalf”. ISO 14001 does not prescribe how the policy is to be communicated to all persons working on its behalf, allowing the organization to communicate to its personnel in a manner that is best for the organization.

An executive level manager must sign the environmental policy statement. All employees within the organization must understand and recognize the commitments. Also, employees of the organization should be able to relate how their job function interacts with the environmental policy statement.

The policy must be available to the public. The policy does not have to be issued publicly, but it does have to be available to the public. This requirement of public availability applies only to the environmental policy with the exception of the requirement to respond to “relevant communication from external interested parties” nothing else in ISO 14001 compels further public disclosure of EMS generated information.

3.2 Planning

3.2.1 Environmental Aspects & Impacts

Environmental aspects are elements of an organization’s activities, products or services which can interact with the environment. (For example: wastewater

discharges, air emissions, resource consumption, energy usage, ecosystem alterations, etc.)

Environmental impacts are any change to the environment, whether adverse or beneficial, wholly or partly resulting from an organization's activities, products, or services (based on the aspects, for example: air emissions impact the air by degrading the air quality).

ISO 14001 requires organizations to;

- Develop procedures to identify environmental aspects in order to determine those which have or can have significant impact on the environment
- Aspects information up-to-date (regularly, and whenever changes occur), not once and done
- Necessary records will include aspects lists, and significant aspects list

Role of the aspects in the EMS;

- Significant aspects drive the EMS and are a subset of the full list of aspects.
- EMS is designed to identify, control, manage, and improve upon the significant aspects.
- Compliance with legal and other requirements is a part of the system that does relate to the aspects.
- Elements such as operational control (procedures and work instructions), training, monitoring and measurement, emergency planning, and setting objectives all depend on significant aspects.

Every organization has unique interactions with and impacts on the environment. An organization attempting to comply with the requirements of ISO 14001 must be able to demonstrate that is fully aware of all relevant environmental issues and their potential impact and importance. The organization will need to review at a minimum the following issues:

- its operation,
- pollutant emissions and releases,
- past environmental performance,
- location,
- land use activities,
- sensitive environmental areas,
- environmental impacts from other organizations nearby,
- environmental legislation and regulation,
- community stakeholder views,
- client and/or customer views,
- etc.

No distinct list will be appropriate to all organizations. The organization must develop its own methodology to investigate relevant environmental issues and their potential impact and importance.

The identification of the environmental aspects is an ongoing process that determines the past, current and potential impact of an organization's activities on the environment. The process should consider normal operating conditions, shut down and start up conditions, as well as potential significant impacts associated with foreseeable or emergency situations. Organizations do not have to evaluate each product, component or raw material input. They may select categories of activities, products or services to identify those aspects that are likely to have a significant impact (Tekneci, 2004).

3.2.2 Legal Requirement

The organization shall establish and maintain a procedure to have access to legal and other requirements to which the organization subscribes that are applicable to the environmental aspects of its activities, products, or services.

Legal Requirements are;

- Relevant national, regional, and local laws and regulations,
- Government operating permits, licenses, and approvals,
- Relevant international standards and conventions,
- Contracts and other documents that include legal obligations.

Importance of legal and other requirements are;

- Conformance with legal and other requirements is a core commitment in the environmental policy,
- Legal and other requirements must be considered when setting environmental objectives and targets,
- Failure to comply with legal and other requirements can be very costly to the organization

In order to be in conformance with this provision of ISO 14001 an organization must be able to demonstrate three specific points. First, the organization must understand which environmental laws and regulations (federal, state and local) govern its operations. Second, it must also be able to explain how the requirements of the appropriate laws and regulations apply to the organization. Third, the organization must be able to demonstrate that it keeps up to date with the appropriate laws and regulations and their specific requirements. In addition if the organization voluntarily subscribes to any environmental guidelines and/or requirements (trade or association principles, consent orders, contracts, etc.) the same three points must be followed.

A procedure should be developed and maintained in order to meet the preceding three requirements. ISO 14001 does not require documentation for the legal and other requirements section. However, the only practical way to demonstrate conformance is to assemble in one place a list and copies of each applicable environmental law, regulation and voluntary subscription along with the supporting permits and/or contracts as evidence (Virginia Department of Environmental Quality, 2006).

3.2.3 Objectives, Targets and Programs

ISO 14001 requires organizations to set clear overall environmental goals (objectives) and detailed performance requirements (targets) at relevant functions and levels within the organization. Establishing objectives and targets is a process of taking into account legal requirements and the significant environmental aspects and considering technological options, financial, operational and business requirements, and the views of interested parties. Resulting objectives and targets must be measurable where practicable and consistent with the environmental policy, including the commitments to prevention of pollution, compliance with applicable legal and other requirements and continual improvement.

Environmental objectives are specific and defined goals that need to be achieved in order to meet the requirements of the environmental policy. Each environmental objective must be traceable back to the environmental policy statement. In order to be acceptable under the ISO 14001 standard every action, requirement procedure etc., contained within the environmental management system must have its roots in the environmental policy statement. If an environmental objective is developed that cannot be traced back to the environmental policy statement it must be assumed that the environmental policy statement is not accurate with respect to the organization's environmental aspects and impacts.

ISO 14001 does not require an organization to set objectives for its significant environmental aspects; it only requires the organization to take its significant environmental aspects into account when establishing objectives. An organization for example, identifies 25 environmental aspects and determines that three of them are significant, may select to develop objectives and targets for only two of them. When organizations establish their objectives and targets, it makes sense that they consider each significant aspect individually and determines whether they want to establish an objective for it and the organization should consider establishing measurable environmental performance indicators. These indicators can be the basis for an

environmental performance evaluation system and the environmental management and the operational systems. They should cover short-and long-term issues.

ISO 14001 Objectives and Targets also say the organization shall establish and maintain documented environmental objectives and targets at each relevant function and level within the organization.

Environmental action programs should address schedules, resources and responsibilities for achieving the organization's environmental objectives and targets.

The program should include, where appropriate and practical, consideration of planning, design, production, and marketing and disposal stages. The creation and use of a program is a key element to the successful implementation of an environmental management system. Environmental management program should be dynamic and revised regularly to reflect changes in organizational objectives and targets.

3.3 Implementation and Operation

3.3.1 Resources, Roles, Responsibility and Authority

The organization has identified the positions and described the responsibilities necessary to effectively plan, implement, and maintain all parts of the EMS. Details of roles, responsibilities, and authorities have been put in writing, e.g., in job descriptions, organization chart, operating procedures, memoranda, notices. Roles, responsibilities, and authorities have been made known and are understood by everyone – those directly involved, and others who need to know how the EMS functions, i.e., everybody in the organization.

An EMS is all about people and their roles and responsibilities. It is individuals, working as part of a team, who make an EMS come alive and operational.

People work best when they have:

- Clearly defined goals and responsibilities;
- Clear reporting relationships and communications upwards, downwards, and sideways in the organization chart;
- The right kind of resources and support in terms of time, equipment, budget, and colleagues.

Ingredients of an effective EMS are;

- Clear vision and plan clearly communicated.
- People, responsibilities, resources, leadership, and structure aligned properly.
- Strong leadership from top management and the environmental management representative.
- Distributed leadership and responsibilities throughout the organizational structure, i.e., each.
- The organization fulfilling their roles and responsibilities in the EMS.

Management responsibilities are important in effective EMS. Top management has responsibility to;

- Define the environmental policy for the organization
- Lead by example in their commitments to continual improvement, prevention of pollution, and compliance with relevant environmental legislation and regulations
- Authorize adequate resources to implement and maintain the EMS
- Reward good performance in the EMS
- Conduct regular management reviews of the EMS
- Integrate environmental management principles and practices into the organizational culture.

Each organization implementing an EMS to ISO 14001 specifications must appoint one or more environmental management system representatives whose job, with input and assistance from others in the organization is to:

- Offer guidance and direction to facility management on planning, implementing, maintaining, and improving the EMS
- Monitor the performance of and progress in the EMS
- Identify problems in the EMS and initiate corrective and preventive actions if necessary
- Regularly report on progress and problems in the EMS to top management
- Recommend changes in the EMS to top management.

It takes a special combination of aptitude, know-how, and personality to be an effective environmental management system representative. The person selected must:

- be knowledgeable about environmental issues in general and in the organization in particular
- be committed to environmental improvement
- be respected and trusted inside and outside the organization
- have vision, diplomacy, tenacity, stamina, authority, organizational abilities, and motivation (i.e., both of self and for others).

Management must authorize and ensure the availability of adequate resources to enable operational personnel to put in place and maintain the necessary procedures. Resources consist of:

- People with the right training, experience, skills, and competence to carry out their responsibilities and tasks efficiently and effectively
- Time to plan, implement, and operate the EMS, in addition to regular duties and responsibilities, if necessary
- Adequate financial support, budget allocations to enable projects, improvements in procedures, training, etc. to go ahead as planned
- Tools, equipment and facilities to achieve the objectives and targets, and to maintain the EMS.

3.3.2 Competence, Training and Awareness

The key point in this element is that personnel must receive applicable training regarding the EMS. Specific requirements are itemized in ISO 14001, and include general, company-wide items such as knowing the policy, to more function-specific training on aspects and emergency response. An organization usually responds to this element with a training matrix, cross-referencing to training materials and records (OFEE, 2008).

The organization must determine overall training needs required for competence with respect to the environmental management system. The entire organization must receive training that provides a baseline understanding of the concepts underlying the environmental management system. Individuals and units that have the potential to perform activities which could cause significant impact on the environment may require specific technical and skill training related to those impacts.

The specific technical and skills training should be focused on two distinct areas. First, training should be provided for individuals and units that are responsible for activities or processes that may create significant environmental impacts. The scope and degree of training will depend upon the complexity of the process and the level of education and experience of the personnel involved. The organization must determine the necessary level of competence required. Second, the individuals and units responsible for emergency preparedness and response should be trained and competent to respond under the procedures developed to respond to those events if and when they occur (Virginia Department of Environmental Quality, 2006).

The Competence, Training, and Awareness section of ISO 14001 requires establishment, implementation, and maintenance of a procedure to make all persons working for or on behalf of the organization aware of:

- The importance of complying with the environmental policy, procedures, and EMS requirements

- The significant environmental aspects and the related actual or potential environmental impacts associated with their work activities and the benefits of improved personal performance
- Their roles and responsibilities in achieving conformance with the requirements of the EMS
- The potential consequences of departing from specified procedures (Schaarsmith, 2005).

3.3.3 Communication

The organization must establish and maintain a procedure to facilitate internal communication within the organization with respect to the overall environmental management system. The organization must establish a system for receiving and responding to communication from external parties. And the organization should determine whether it will communicate to external parties' information on its significant environmental aspects. The organization should track all external communications, and respond when it considers the question and/or communication to be "relevant" to its products, services and/or activities. It is left to the organization to determine what a "relevant" communication is.

The requirement of this section of the standard is that the organization should decide whether it will communicate information about its significant environmental aspects to outside parties. There is no specific requirement in the standard that the organization provide any information beyond its Environmental Policy statement to external parties. The organization must only "record its decision" as to whether it will communicate this information to outside parties (Virginia Department of Environmental Quality, 2006).

3.3.4 Documentation

The organization must describe the foundation elements of the environmental management system in either paper or electronic format. The preceding description must demonstrate the interaction between the foundation elements of the

environmental management system. The description must reference the related documentation (Virginia Department of Environmental Quality, 2006).

A reasonable approach would be to develop an environmental management system manual. The content of the manual might be as follows:

- Planning
 - Environmental policy statement
 - Planning details
 - Listing of significant environmental aspects
 - Listing of environmental objectives and targets
 - Work plans and timelines for each environmental objective and targets

- Environmental Management Program Overview
 - Operational work plans for each environmental objective/targets
 - Structure and responsibility charts
 - Training, awareness and competence procedures and evidence
 - Communication procedures and evidence
 - Environmental management system manual procedures and evidence
 - Document control procedures and evidence
 - Operational control procedures and evidence
 - Emergency preparedness and response procedures and evidence

- Checking and Corrective Action
 - Monitoring and measurement procedures and evidence
 - Nonconformance and corrective and preventative action procedures and evidence
 - Environmental management records procedures and evidence
 - Environmental management system audit procedures and evidence

- Management Review

Continual review of the environmental management system is recorded by top management.

3.3.5 Document Control

In order to be in conformance with this provision of ISO 14001 following specific tasks must be addressed under the Document Control section of the standard.

- the scope of the overall document control system needs to be defined,
- within the control system there must be a document authorization or approval requirement.
- the control system must maintain a revision tracking process,
- the current versions of relevant documents are available at all locations where operations essential to the effective functioning of the EMS are performed.
- obsolete documents must be promptly removed from the workstation locations.
- obsolete documents that need to be archived for historical purposes need to be maintained in a separate location.

The primary purpose of the document control system is to insure that only the current approved documents are employed in the planning and operation of the environmental management system (Virginia Department of Environmental Quality, 2006).

Documentation should be legible, dated (with dates of revision), and readily identifiable, maintained in an orderly manner and retained for a specified period. Procedures and responsibilities shall be established and maintained concerning the creation and modification of the various types of document.

3.3.6 Operational Control

Operational controls mean which an organization prevents pollution from operations like pollution control equipment such as scrubbers, filters, precipitators,

clarifiers, biological and chemical treatment, etc., alarms for gas, pH, conductance, tank level, etc., preventive maintenance practices, operating procedures.

Preventive maintenance which is a key method of controlling operations is important for preventing pollution from leaking connections, valves, pumps, lines, tanks, breakdown of machinery, pumps, pollution control equipment, incorrect instrument readings (calibration), blocked lines, pumps, valves, equipment, catastrophic failure - explosion, burst, fire. And also preventive maintenance helps to conserve energy, resources.

The purpose of operational control is to insure that the organization has established an operational plan that addresses and supports the previously developed list of Significant Environmental Aspects.

- The organization must identify the operations and activities that are directly associated with the Significant Environmental Aspects.
- The organization must develop procedures and operational criteria, including maintenance, that address the specific operations and activities associated with the Significant Environmental Aspects.
- The organization must communicate the procedures and operational criteria to suppliers of products and services that might interact with the established Significant Environmental Aspects (Virginia Department of Environmental Quality, 2006).

When written procedure or documentation is absence, it could lead to deviations from the environmental policy, objectives and targets and cause environmental problems. Documented procedures define roles, responsibilities and operating criteria. The advantages of documented procedures are;

- Help to achieve consistency between: different divisions, departments, operators, different operators doing the same activity.
- Specify consistent operating conditions, limits, targets, precautions.

- Define roles, responsibility, accountability, and reporting requirements.
- Useful when training operators.

Employees who actually work with procedures should develop new instructions and modify existing ones. Preparation of documentation to establish EMS operational Control is delegated to departmental work groups under the direction of the department manager. The department should review environmental requirements and effects within their area of operation as defined in the Aspects, Objectives and Targets. This activity is usually accomplished by the project team (Tekneci, 2004).

Some operations that may need written procedures, these are;

- Production/manufacturing
- Maintenance
- Raw material procurement
- Handling, storage of raw materials, product
- Purchasing, shipping/receiving
- Contractor, supplier management
- Waste treatment, disposal, recycling, re-use
- Transportation of raw materials and product
- Laboratory operations
- Changes to processes, equipment, or facilities
- Start-up and shut-down of processes and equipment
- Research, development, design, engineering, construction
- Decommissioning of equipment or facilities

3.3.7 Emergency Preparedness & Response

ISO 14001 Emergency Preparedness and Response requires organization to identify the possibilities for accidents and emergency situations, prepare emergency preparedness and response procedures, evaluate and revise as appropriate the procedures.

The organization must review incident reports for past five years, check statistics on incidents and emergencies at other similar operations, review environmental aspects list for potential emergencies under abnormal operating conditions, collect a group of personnel representing each function in the organization to brainstorm possible incidents and emergencies for identifying emergencies. Potential emergencies are;

- Fire, explosion
- Gas leak, spill
- Natural disasters - lightning, earthquake, flood, extreme weather tank, dam, equipment structural failure
- Electric power or gas cut
- Crash, collision
- Sabotage, vandalism, terrorist attack, riot, bomb threat, hostage incident

Emergency response plan which characterizes potential emergencies and minimizing risks should cover roles, responsibilities, resources, actions, impact mitigation, communications, training, incident investigation, and review procedures. The key elements and details that need to be covered in an emergency response plan include:

- established criteria for triggering the plan and alarm signals, with backup,
- clear reporting procedures both internally and upward in the organization, and externally to appropriate authorities,
- communications equipment that can reach all participants, such as mobile phones, pagers, short-wave radios, depending on location,
- media contacts and a media relations strategy, including relevant descriptive material of the operation,
- specialized hazard monitoring and training, such as dealing with chemical fumes or water pollution,
- adequate emergency equipment for spill containment or collection, such as additional supplies of booms and absorbent materials,

- alerting the public and coordinating evacuation using sirens or other warnings with well-rehearsed warnings, evacuation procedures and easily reached shelters,
- clear roles of participants in different areas of response, such as firefighting, community protection,
- alternative drinking water supplies in case usual supplies are contaminated,
- rapid test kits for chemical spills,
- readily available access to information on dealing with chemical hazards,
- examination of options for cleanup following the accident – both immediate actions to be taken and the approach that would be taken to a longer cleanup program (Emery, 2005).

The organization must keep the emergency preparedness and response plan up to date and hold regular drills to test the plan.

3.4 Checking and Corrective Actions

3.4.1 Monitoring and Measurement

ISO 14001 requires organization to establish a documented procedure to monitor and measure on a set frequency the activities that are related to the significant environmental aspects, ensure that the devices used to monitor and measure the activities are calibrated properly, establish a documented procedure for evaluating on a set frequency compliance with applicable environmental laws and regulations.

The purposes of monitoring and measurement are;

- Keep track of progress in the EMS,
- Catch problems quickly,
- Ensure prompt corrective and preventive action if things go wrong,
- Check performance in relation to regulatory compliance requirements,
- Due diligence, self-regulation,
- Meet commitments in Environmental Policy.

Monitoring requirements of ISO 14001 are overall conformance with the EMS, track progress towards achieving environmental objectives and targets, environmental performance indicators, operation of production/manufacturing and pollution control equipment. Emissions to air, discharges to water, and solid waste disposal, environmental impacts on air, water, land, biota, energy consumption, chemical, fuel, and hazardous waste handling, storage, and disposal, training needs, training conducted, employee awareness and competence, communications from interested parties, emergency response incidents, sampling and laboratory analysis quality assurance and quality control, effectiveness of corrective and preventive actions, environmental performance of contractors, documentation up to date are routine monitoring measurements.

3.4.2 Non – Conformance and Corrective and Preventive Action

The organization shall establish and maintain procedures for defining responsibility and authority for handling and investigating nonconformance, taking action to mitigate any impacts caused, and for initiating and completing corrective and preventive action.

Any corrective and preventive action taken to eliminate the causes of actual and potential non-conformances shall be appropriate to the magnitude of problems and commensurate with the environmental impact encountered.

The purpose of non-conformance, corrective and preventive action part of the standard is to provide a process to do the following:

- document the nonconformance,
- notify those responsible for the mitigation of the nonconformance,
- investigate the cause of the nonconformance,
- establish a corrective action to prevent reoccurrence,
- modify the existing procedure as a preventative action,

- communicate the changed procedure to the necessary activities within the system.

Non-conformances may be identified through audits, monitoring and measurement, and communications. The steps to identify and correct non-conformance are;

- Identify problem through routine inspection, monitoring, audit findings, trend analysis, employee comments, complaint, experience,
- Investigate problem and its underlying causes. Involve persons with first-hand knowledge of the issues, and authority to achieve solutions,
- Identify best solution(s) and persons responsible for implementing them.

It is important to characterize the differentiation of corrective actions from preventative actions within the organization. Preventive actions can include analysis of environmental performance indicators previously discussed to determine probabilities of non-conformance. Corrective Action will be the process changes or procedural activities that are initiated if and when the preventative actions detect a problem.

3.4.3 Records

The “records” requirement of ISO 14001 requires organizations to establish and maintain a system for keeping and, at appropriate times, disposing of environmental records. Part of the reason for maintaining records is to demonstrate conformance to ISO 14001. The standard is specific as to requiring that records on training, audits, and management reviews be maintained. It is up to the organization to decide what additional records to keep, how to keep them, and for how long. Procedures for identification, maintenance and disposition of records should focus on those records needed for the implementation and operation of the environmental management system and to record the extent to which planned objectives and targets have been met.

It is not necessary to retain everything only records that add value and demonstrate an accurate and complete picture of EMS conformance need to be maintained. Environmental records may include:

- Environmental aspects and impacts,
- Legislation, regulations, permits,
- Environmental performance indicators,
- Environmental management program progress reports (i.e., achievement of objectives and targets),
- Decision on communication of significant environmental aspects,
- Communications with interested parties,
- Regulatory compliance records,
- Training records,
- Process information,
- Product information,
- Inspection, maintenance, and calibration records,
- Pertinent contractor and supplier information,
- Incident reports,
- Information on emergency preparedness and response,
- Non-conformance, corrective and preventive actions,
- Audit results,
- Management Reviews.

In addition to satisfying a requirement of ISO 14001, documentation and record keeping serve multiple interests of the organization:

- Environmental regulatory compliance personnel should be able to use the EMS records as a reference guide on facility compliance history and future compliance needs,

- EMS documentation can assist in establishing effective environmental training and awareness, environmental communication, and record keeping programs as part of monitoring and measurement,
- The EMS documentation system can ensure proper routing of questions to the correct information sources (Schaarsmith, 2005).

Environmental records shall be legible, identifiable, and traceable to the activity, product or service involved. Environmental records shall be stored and maintained in such a way that they are readily retrievable, and protected against damage, deterioration, or loss. Their retention times shall be established and recorded.

3.4.4 Environmental Management System Audit

In order to be in conformance with this provision of ISO 14001 an organization must be able to;

- the organization must develop a program and related procedures that define an audit plan of the environmental management system. In addition the program must define frequency of the audit process.
- the procedures must specify the methodology of the audit process, including the qualifications of the auditors.
- the audit reports must be submitted to top management.
- the audit reports must provide recommendations directed at correcting any reported nonconformance that was discovered in the audit process.

The organization's audit program generally accepted practice with a mature ISO 14001 systems is a total audit of the system once a year. In the implementation phase of an environmental management system a more frequent audit process might be appropriate. In addition any part of the environmental management system that has been previously determined to be in nonconformance should be audited with an increased frequency. The methodology of the audit process required by the standard requires two distinct steps:

- determine whether the environmental management system conforms to the requirements of ISO 14001,
- that the system has been managed as described in the Environmental Policy statement, the Environmental Objectives and Targets, and the related work descriptions and procedures.

It is critical that an audit report that relates a nonconformance be forwarded to top management promptly. The internal audit staff must be competent with respect to the requirements of ISO 14001 (Virginia Department of Environmental Quality, 2006).

Audits may be performed by personnel from within the organization or by external persons selected by the organization. In either case the persons conducting the audit should be in a position to do so impartially and objectively. Whether or not internal or third party auditors are used, they should possess the qualifications outlined in ISO 14012:

- Expertise in environmental science and technology,
- Expertise in the technical and environmental aspects of facilities operations,
- Expertise in environmental law, regulations,
- Expertise in environmental management systems,
- Expertise in EMS auditing techniques (Tekneci, 2004).

First, second, or third-party auditors can assess an organization's conformity to the requirements of the standard.

First-party Audits; in the first-party circumstance, the internal auditors of the implementing organization conduct an audit to determine that the EMS has been properly implemented and is being maintained. If the organization passes the internal audit, it may "self declare" its conformity to ISO 14001.

Second-party Audits; in the second-party circumstance, the audit is conducted by a representative of a party interested in the environmental performance of the

implementing organization. The “interested party” may be a customer, an environmental regulator, an insurance company, or any other organization affected by the environmental performance of the implementing organization. The second-party audit can be a condition of doing business with the auditor’s organization.

Third-party Audits; in the third-party circumstance, an external EMS auditor conducts an audit, usually at the request of the implementing organization, to determine if the organization conforms to the requirements of ISO 14001. The third-party audit is most often for the purpose of “certifying” that the organization is in conformity with the requirements of ISO 14001.

Typically, when a registration is awarded, it is for a period of three years with a provision for the periodic conduct of “surveillance” audits to ensure continuing conformity.

A principal benefit of the third-party audit is that it compels organizations to continually maintain the EMS in order to pass the follow-up surveillance audits, without this, there might be slippage in the maintenance of ISO 14001. It is not a requirement of implementing ISO 14001 that organizations have a registration audit conducted; this is a decision made by each organization based upon its determination of the commercial value or necessity of certifying. When an ISO 14001 EMS is intended to be audited, the requirements must be implemented and documented sufficiently for an auditor/registrar to be able to conduct the audit based on the finding of objective evidence that the organization has implemented an EMS conforming to ISO 14001.

Establishing objective evidence requires a higher level of documentation and record keeping than is required for mere implementation of ISO 14001. The implementation of ISO 14001 is a simpler task for the organization when it is only seeking to implement the policy and sixteen procedures than when it is implementing with the intention or expectation of being audited (Schaarsmith, 2005).

3.5 Management Review

The organization's top management shall, at intervals it determines, review the EMS to ensure its continuing suitability, adequacy, and effectiveness. The management review process shall ensure that the necessary information is collected to allow management to carry out this evaluation. This review shall be documented.

The management review shall address the possible need for changes to policy, objectives, and other elements of the EMS in the light of EMS audit results, changing circumstances, and the commitment to continual improvement.

Management reviews are major opportunities for top management to reaffirm commitment to continual improvement, demonstrate environmental leadership. Management review must be done at least once a year, preferably more frequently.

All top management and the environmental management representative must be present in management review meeting.

Management review meeting include;

- Summary of key issues in pre-meeting materials by the environmental management representative,
- Discussion by top management of continued suitability of the environmental policy and of environmental objectives and targets, taking into account business, production, legal, economic, social, and technological changes, concerns of interested parties.
- Discussion by top management of types of, and trends in, non-conformances, effectiveness of corrective and preventive actions, considering need for due diligence, resources needed to maintain the EMS, and for continual improvement in the EMS and in environmental performance, the vision for environmental management at the facility.

Management review outcomes are documented minutes of discussions and decisions reached, action plans, with responsibilities, deadlines, and required resources, date of next meeting, taking into account the current 'health' of the EMS and priorities.

Top management must allocate adequate resources to maintain the EMS and achieve continual improvement.

CHAPTER FOUR
GENERAL INFORMATIONS ABOUT BUILDING CHEMICAL INDUSTRY
AND WASTES

4.1 Building Chemicals Industry at the World and Turkey

The construction industry is the third largest contributor to the country's economy, following the textile and the food sectors. Due to the rapid growth of Turkey's population and economy, the country must accelerate the development of its urban and industrial infrastructure. Adding to the already significant housing shortage in Turkey, by 2010 the country's population will grow to 75 million, increasing the housing demand by 2.5 million units. As the population grows, family size is declining to an average of 4 persons, further worsening the shortage of housing units. To further exacerbate the current housing shortage, Turkey experienced two major earthquakes in 1999, damaging around 250,000 housing units, not to mention damage to industrial and commercial buildings in a heavily industrial area. In financial terms, this cost Turkey more than USD 6 billion.

As the economy also continues to grow, the demand for more commercial, office and professional buildings is also on the rise. The shopping mall/plaza concept is gaining popularity, and tourism development continues to generate new hotel construction projects.

Turkish contractors are very active in Russia, the Caucasus, Central Asia, Central and Eastern Europe and the Middle East. Nearly 30 percent of Turkish construction business is in the countries of the former Soviet Union. A large number of the countries in the region also rely on Turkey for the supply of building materials and construction services. These companies can serve as excellent partners for American firms to explore opportunities not only in Turkey, but in regional markets as well.

Local production of building materials (including approximately 200 different products used in the construction industry) accounts for about 10 percent of total Turkish industry.

Turkey is largely self-sufficient in conventional building materials and construction services. Imports in this sector are predominantly luxury or specialty products such as accessories, flooring, prefabricated wall panels, wall paper, doors, windows, paint raw materials, insulation specialties, and plumbing fixtures. U.S. suppliers of these products have a good chance of selling their products in Turkey provided that they appoint competent agents. Log homes also represent niche sales opportunities for U.S. suppliers. Suppliers of U.S. doors and windows are already competitive in the country's imports of these products.

During the 1990s, Turkey experienced very rapid urbanization, due in part to political instability and terrorist activity in the country's southeastern regions, concentration of wealth and industry in the country's northwestern region and some urban centers, and a decline in agricultural employment. This trend has had a tremendous impact on the construction sector.

Most building materials are manufactured domestically by more than 5,500 local producers of various sizes, but imported building materials are increasingly used. This is especially evident in newer tourist establishments, and in the country's more affluent urban areas. Products used in tourism projects are primarily imported, as the Turkish government subsidizes the tourism sector by allowing materials to be imported duty-free. The construction sector produces a mix of both low cost/low quality products and high priced/high quality materials. Wealthier consumers demand higher priced luxury products. Most of these products are imported (Industry Canada, 2008).

General information on production, export/import estimates and market prospects for main product lines in this sector follows:

Paints, Pigments, Varnishes (Coatings)

Turkey is the third largest paint producer in Europe. Turkey's current annual per capita coating consumption is only 6 kilograms, whereas the average in Europe is 25 kilograms. The country's paint production is sufficient to meet demand, but 70 percent of its raw materials are imported. Turkey's coating raw materials imports are approximately USD 600 million annually. There are 350 local producers in the market, with 10 firms accounting for 70 percent of total production.

Ceramic and Tile products

There are about 26 producers of ceramics and tiles in Turkey, manufacturing approximately 250 million square meters annually. Most are located in the country's western and northwestern regions. High quality products are imported (mainly from Italy and Spain) for luxury consumption.

Insulation Materials/ Exterior Coatings

As an outcome of rising heating costs and increasing concern for environmental protection, the demand for insulation materials is increasing dramatically in Turkey. Turkey's insulation industry is heavily dependent upon imports, especially for raw materials. U.S. suppliers may increase their market share significantly with the help of seminars and other educational programs on their insulation products.

Other Building Chemicals and Additives

The Turkish construction sector annually uses about 700.000 tons of additives worth approximately USD 350 million (in addition to insulation products, adhesives, and filling materials such as silicone, polyethylene foam etc). Turkey produces 60 million tons of cement and 1 million tons of plaster per year. Experts state that consumption of building chemicals, and especially of

concrete additives, will increase in the near future to more than twice the existing amount to comply with new earthquake-resistance requirements.

U.S. suppliers have a good chance to enter this segment of the market if they can offer technological know-how and new information on benefits to be gained from their products, since a major characteristic in this market segment is insufficient expertise among contractors.

4.2 Information about Building Chemical Factory

Building Chemicals Factory is located in İZMİR, in 1984. It was changed owners in 1998. Now, the company has many factories in different parts of the world and they are managed by head office in France. It has being managed with ISO 9001-2000 Quality Management System since 2002. 220 employees work in the company permanently.

The factory has got wastewater treatment plant which includes chemical and biological treatment system. A waste storage area was planned and constructed for all wastes generated from the factory.

The building chemicals factory is producing building chemicals products, which are powder products (tile adhesives, grouting, technical mortars), liquid products (mineral plasters, organic plasters, paints, paints undercoats). An annual production capacity of the factory is determined in table 4.1 and annual raw materials consumptions are determined in table 4.2.

Table 4.1 Annual production capacity of the factory

	Products	Amount (tons/year)
POWDER PRODUCTS	Tile adhesives	165000
	Grouting	55000
	Technical mortars	7500
LIQUID PRODUCTS	Mineral plasters	2800
	Organic plasters	5600
	Paints	4480
	Paints undercoats	1120
	TOPLAM	241500

Table 4.2 Annual raw material consumptions of the factory

Raw Materials	Amount of usage (tons/year)
Sand	120000
Cement	110000
Filler	17000
Powder additives	5000
Resin	3000
Additives	750
Pigments	1500
Solvents	150
Water	2100
Plastic buckets	600
Kraft Package	9780000 unit/year
Nylons	102,52
Palette	4375,8

4.2.1 Powder Product Manufacturing Process

Powder products group includes tile adhesives, grouting and technical mortars.

In this process, silica sands which are prepared by drying and sieving of sands in the factory are basic raw materials of the powder product process. Raw materials are loaded to the silos by transferring systems. Then raw materials and additives are loaded to the mixer automatically by automatic scale according to formulas of the products. Some small amounts of additives can be added to the mixer manual. After

mixing the materials as declared time in formula, the products are filled to the packages by automatic filling machine. The full packages are placed on the palettes and stretched for sending to the customers.

In powder product manufacturing process, waste kraft papers occur during filling processes. Mostly humid packages can cause burst paper occurring.

Nylons and palettes occur by packaging the products at last steps of the production. Dusts occur at loading additives to the mixer and filling products to the packages. Dusts are collected in cyclone by aspirated system and are recycled in powder production system by adding production process. Sometimes wrong raw materials can be added to the mixer mostly the results of personal mistakes or other reasons. So this kind of products can't be recycled and it becomes wastes.

Workflow and mass balance of the powder products manufacturing process are given below in figure 4.1.

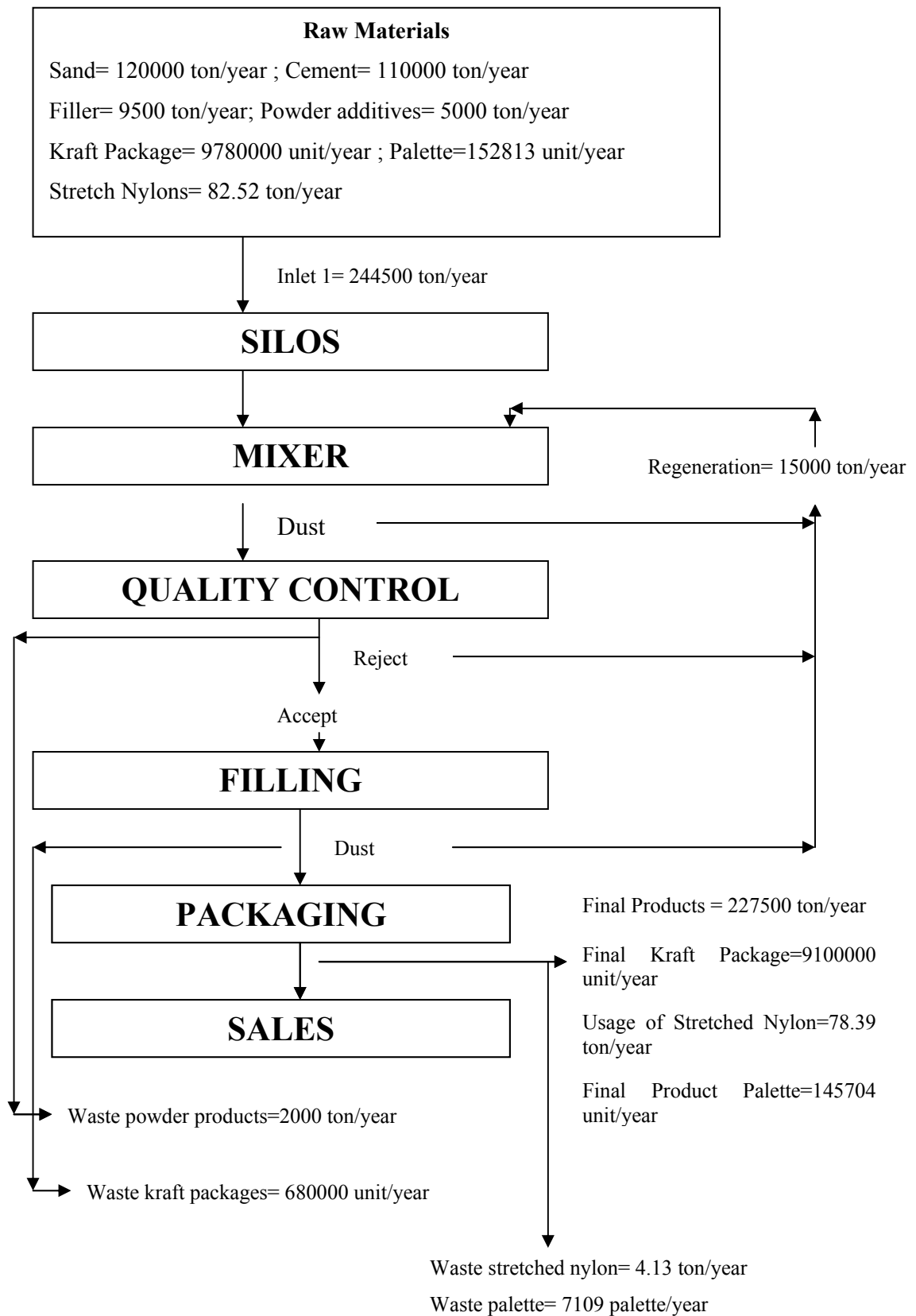


Figure 4.1 Workflow and mass balance of the powder products manufacturing process

4.2.2 Liquid Product Manufacturing Process

Liquid product group includes paints, mineral plasters, organic plasters, paint undercoats.

In liquid product manufacturing process, basic raw materials are loaded to silos by transferring system. Then these raw materials are loaded to the mixer by automatic transferring system according to the formulas. Additives and water are added to mixer manually. All raw materials are mixed in the mixer according to determined time in formula. After mixing process, products are being sent to quality control. If the products are accepted after quality control, the color adjustment is being done according to customer request. Color quality control tests are being done after color adjustment process. If quality control results are acceptable, the products are being filled to the plastic buckets. Plastic buckets are placed on the palettes and stretched for sending to the customer.

Waste plastic buckets are formed mostly the results of loading out of the regenerated products. Nylons and palettes occur by packaging the products at last steps of the production. Sometimes wrong raw materials can be added to the mixer mostly the results of personal mistakes or other reasons, so this kind of products can't be recycled and it becomes wastes.

Workflow and mass balance of the liquid products manufacturing process are given below in figure 4.2.

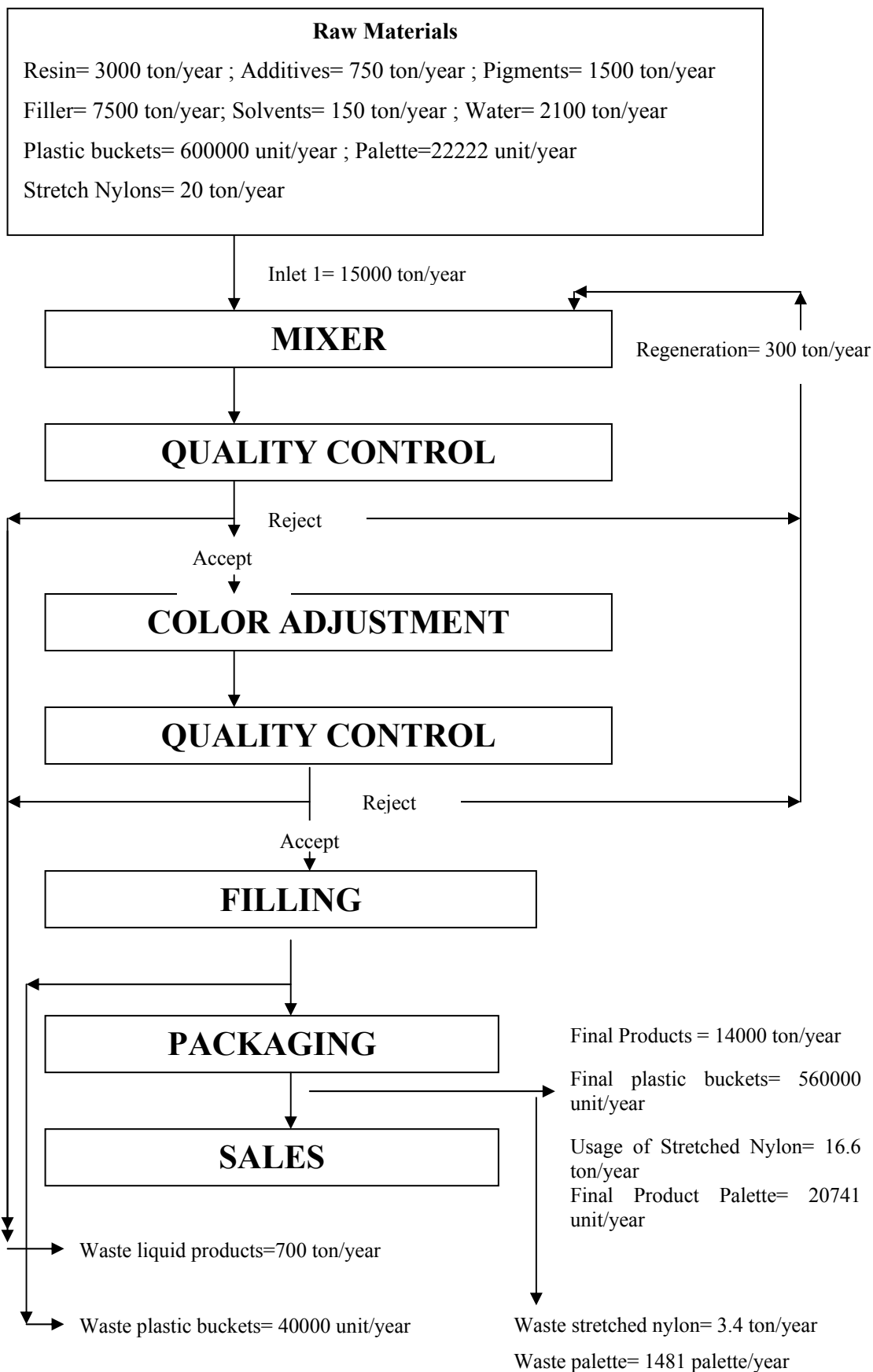


Figure 4.2 Workflow and mass balance of the liquid products manufacturing process

4.2.3 General Waste Production in the Factory

General waste production of the factory is explained below according to kinds of wastes.

4.2.3.1 Waste Papers

Waste papers which are sourced mostly in offices and departments are white papers, empty kraft packages of raw materials/products, cartons, carton packages, newspapers etc. Collected waste papers are being sold to the recycling company which has recycling license.

4.2.3.2 Waste Metals

Waste metals which are sourced from changing metal equipments, maintenance operations, are metal tanks, pipes, switches, plaque, cans etc. Collected waste metals are being sold to the recycling company which has recycling license.

4.2.3.3 Waste Barrels, Jerrycan and IBC Containers

Waste barrels, jerrycan and IBC container are empty raw materials packages. Mostly they include hazardous products for the environment and are collected at the sources separately. Collected waste barrels, jerrycan and IBC containers are being sold to the recycling company which has recycling license.

4.2.3.4 Waste Big Bags

Waste big bags are sourced the results of loading out of the powder raw materials. Collected waste big bags are being sold to the recycling company which has recycling license.

4.2.3.5 Glass Wastes

Glass wastes which are sourced in tea houses, dining hall, laboratory etc. are collected separately. Collected glass wastes are being sold to the recycling company which has recycling license.

4.2.3.6 Waste Oils

Waste oils which are sourced from changing oils of forklifts, loaders, compressors, machines etc. are collected separately. Collected wastes oils are disposed by burning methods in related authorized disposing plant.

4.2.3.7 Waste Oil Filters

Waste oil filters are sourced from changing filters of forklifts, loaders etc. Collected wastes oil filters are disposed by burning methods in related authorized disposing plant.

4.2.3.8 Waste Oakum

Waste oakum is sourced by cleaning of the oily, dyed and dirty places. Collected waste oakum is disposed by burning methods in related authorized disposing plant.

4.2.3.9 Electronic Wastes

Electronic wastes are fuses, switches, contactors, motors, computers, cables etc. Collected electronic wastes are being sold to the recycling company which has recycling license.

4.2.3.10 Fluorescent Wastes

Fluorescents are sourced the results of changing the fluorescent lamps in the factory. Collected fluorescent lamps are disposed by storage methods in related authorized disposing plant.

4.2.3.11 Waste Batteries

Waste batteries are sourced the results of changing the finished batteries of equipments. Collected waste batteries are disposed in related authorized disposing plant.

4.2.3.12 Medical Wastes

Medical wastes which are sourced in the infirmary are collected separately. Collected medical wastes are being given to waste storage area of Izmir by authorized lorry of Izmir Metropolitan Municipality.

4.2.3.13 Domestic Wastes

Domestic wastes which are sourced in offices, tea houses, dining hall etc. are collected separately. Collected domestic wastes are being taken by vehicles of Organized Industrial District.

4.2.3.14 Treated Sludge

Treated sludge which is sourced in waste water treatment plant is collected separately. Collected treated sludge is being given to waste storage area of Izmir Metropolitan Municipality.

4.2.3.15 Waste Waters

Industrial waste water is sourced the results of washing places, mixers, tanks etc. in liquid production area. Domestic waste water is sourced the results of usages of waters. Industrial and domestic waste waters are treated in waste water treatment plant in the factory.

4.2.4 Costs Calculations of Production Wastes

4.2.4.1 Cost Calculations of Waste Powder Products

The amounts of waste powder products are 2000 tons/year. The cost of powder products is 80 YTL/ton as waste.

Total cost of waste powder products= $2000 \times 80 = 160000$ YTL for the factory.

These waste powder products are sold to Construction Company for using filler. And %20 of costs becomes profit the results of selling. So,

Total profit for the waste powder product= $160000 \times 0.2 = 32000$ YTL

And,

Net waste expense for powder products = $160000 - 32000 = 128000$ YTL

4.2.4.2 Cost Calculations of Waste Liquid Products

The amounts of waste liquid products are 700 tons/year. The cost of waste liquid products is 380 YTL/ton.

Total cost of waste liquid products= $700 \times 380 = 266000$ YTL for the factory

These waste liquid products are sold to paint recycling company. And % 60 of costs becomes profit as the results of selling. So,

Total profit for the waste liquid product= $266000 \times 0.6 = 159600$ YTL

And,

Net waste expense for liquid products = $266000 - 159600 = 106400$ YTL

4.2.4.3 Cost Calculations of Waste Kraft Packages

The amounts of waste kraft packages are 680000 unit / year. If the weight of one kraft package is 300 gram, total amounts of waste kraft packages are 204 ton/year. The cost of waste kraft packages is 150 YTL/ton.

Total cost of waste kraft packages= $204 \times 150 = 30600$ YTL for the factory.

These waste kraft packages are sold to paper recycling company. And % 25 of costs becomes profit as the results of selling. So,

Total profit for the waste kraft packages= $30600 \times 0.25 = 7650$ YTL

And,

Net waste expense for kraft packages= $30600 - 7650 = 22950$ YTL

4.2.4.4 Cost Calculations of Waste Plastic Buckets

The amounts of waste plastic buckets are 40000 unit / year. If the weight of one plastic bucket is 1000 gram, total amounts of waste plastic buckets are 40 ton/year. The cost of waste plastic buckets is 2500 YTL/ton.

Total cost of waste plastic buckets= $40 \times 2500 = 100000$ YTL for the factory

These waste plastic buckets are sold to plastic recycling company. And % 20 of costs becomes profit as the results of selling. So,

Total profit for the waste plastic buckets = $100000 \times 0.2 = 20000$ YTL

Net waste expense for plastic buckets= $100000 - 20000 = 80000$ YTL

4.2.4.5 Cost Calculations of Waste Palettes

Total amounts of waste palettes are 8590 unit / year. If the weight of one palette is 25 kilogram, total amounts of waste palettes are 214.75 ton/year. The cost of waste palette is 460 YTL/ton.

Total cost of waste palettes = $214.75 \times 460 = 98785$ YTL for the factory.

These waste palettes are sold to palette recycling company. And % 20 of costs becomes profit as the results of selling. So,

Total profit for the waste palettes= $98785 \times 0.2 = 19757$ YTL

And,

Net waste expense for palettes= $98785 - 19757 = 79028$ YTL

4.2.4.6 Cost Calculations of Stretched Nylons

Total amounts of waste stretched nylons are 7.53 ton / year. The historical cost of waste stretched nylon is 4500 YTL/ton.

Total cost of waste stretched nylon = $7.53 \times 4500 = 33885$ YTL for the factory.

These waste nylons are sold to plastic recycling company as 350 YTL/ton.

Total profit for the waste stretched nylons= $7.53 \times 350 = 2635.5$ YTL

And,

Net waste expense for stretched nylon= $33885 - 2635.5 = 31249.5$ YTL

4.2.4.7 Total Expense Calculations of Production Wastes

Total production waste expense = Net waste expense for powder products + Net waste expense for liquid products + Net waste expense for kraft packages + Net waste expense for plastic buckets + Net waste expense for palettes + Net waste expense for stretched nylon

Total production waste expense = $128000 + 106400 + 22950 + 80000 + 79028 + 31249.5$

Total production waste expense = 447627.5 YTL

Summary of production wastes expenses are given below in Table 4.3.

Table 4.3 Summary of production wastes expense

TYPE OF WASTE	EXPENSE OF WASTE (YTL)
Waste Powder Product	128000
Waste Liquid Product	106400
Waste Kraft Packages	22950
Waste plastic Buckets	80000
Waste Palettes	79028
Waste Stretched Nylons	31249.5
TOTAL	447627.5

4.2.5 The Expense Calculation of General Wastes

The expenses of waste water treatment plant of the factory are 17000 YTL.

Profit and deficit situation of general solid wastes are summarized in table 4.3. Explanation of the unit operational cost column, total operational cost column and net profit/deficit column of table 4.3 are;

Unit operational cost column = unit waste expense cost + unit transportation costs
+ unit work power costs + unit energy costs

Total operational costs column = unit operational cost * waste amounts

Solid waste profit/deficit column = (waste amounts*recycling price) - total operational cost

Table 4.4 Profit and deficit situation of general solid wastes

Type of General Solid Waste	Waste amounts ton/year	unit waste expense cost YTL/year	unit transportation cost YTL/year	unit work power cost YTL/year	unit energy cost YTL/year	unit operational cost YTL/year	Total operational cost YTL/year	unit recycling price YTL/Ton	Solid waste profit/deficit YTL/year	Situation
Waste Paper	8.5	0	0	2	0.5	2.5	21.25	40	318.75	Profit
Glass wastes	1.2	0	0	2	0.5	2.5	3	40	45	Profit
Waste Metals	80	0	0	2	0.5	2.5	200	330	26200	Profit
Waste Barrels	3.95	0	0	2	0.5	2.5	9.875	100	385.125	Profit
Waste IBC Container	2.2	0	0	2	0.5	2.5	5.5	690	1512.5	Profit
Waste jerrycan	1.3	0	0	2	0.5	2.5	3.25	100	126.75	Profit
Waste big bag	42.6	0	0	2	0.5	2.5	106.5	220	9265.5	Profit
Domestic Waste	260	20	0	2	0.5	22.5	5850	0	-5850	Deficit
Treated sludge	350	25	22	2	0.5	49.5	17325	0	-17325	Deficit
Waste Oil	3	1000	60	2	0.5	1063	3187.5	0	-3187.5	Deficit
Waste oakum	1.5	160	60	2	0.5	222.5	333.75	0	-333.75	Deficit
Waste oil filters	1.4	225	0	2	0.5	227.5	318.5	0	-318.5	Deficit
Electronic wastes	0.68	0	0	2	0.5	2.5	1.7	320	215.9	Profit
Waste batteries	0.05	310	50	2	0.5	362.5	18.125	0	-18.125	Deficit
Medical wastes	0.1	250	0	2	0.5	252.5	25.25	0	-25.25	Deficit
Fluorescent wastes	0.4	1000	60	2	0.5	1063	425	0	-425	Deficit
TOTAL Amount of Waste	756.9								10586.4	Total income YTL

Solid waste incomes \approx 10600 YTL/year

4.2.6 Calculation of Waste Costs Per Product

Total wastes cost balance for whole plant = Total production waste expenses + waste water treatment plant expenses + solid waste incomes

Total wastes cost balance for whole plant = expenses (447627.5 + 17000) - incomes (10586.4) = 454041 YTL waste expenses for all products

The calculation of total product costs without profit is explained below;

If 1 ton powder product costs without profit are 250 YTL/ton and total powder production amount is 227500 ton/year,

If 1 ton liquid product costs without profit are 1250 YTL/ton and total liquid production amount is 14000 ton/year,

Total income becomes $((250 \times 227500) + (14000 \times 1250)) = 74375000$ YTL for all products.

The ratio of waste cost per product is $((454041/74375000) \times 100)$.

Finally, wastes cost per product is **% 0.6**.

CHAPTER FIVE
CASE STUDY:
APPLICATIONS OF ENVIRONMENTAL MANAGEMENT SYSTEMS IN
BUILDING CHEMICALS INDUSTRY

5.1 Environmental Policy

There is no standard content for an Environmental Policy, although policies normally ensure that it;

- includes commitment to continuous improvement and prevention of pollution,
- includes recognition of compliance with relevant environmental legislation as a minimum level of performance,
- provides the framework for setting and reviewing environmental objectives and targets,
- includes the education and training of employees in environmental issues and the environmental effects of their activities,
- includes the monitoring of progress and review of environmental performance on a regular basis,
- is documented, implemented and maintained and communicated to all employees, is available to the public.” (International Organization for Standardization, 2004).

After the environmental performances are considered in building chemicals industry top management should prepare an environmental policy. The Policy is published and communicated to all employees. The environmental policy of building chemicals factory is shown in figure 5.1.

ENVIRONMENTAL POLICY

Be responsible for environment in the knowledge that, we contract to do preventing environmental pollution, constant improvement of our performance in all working area according to following principles below:

- To reduce the waste formation by our activities, promote recycling or reuse and manage the disposal of waste in accordance with best standards,
- To reduce harmful materials usage during design and production and search less polluting materials,
- To apply minimum wastes producing technology by considering environmental impacts in design and investment process,
- To consider effects of raw materials on environment and people in product design and processes,
- To save energy, water and natural sources by encouraging increase on productivity and usage of technology,
- To create dialog and communication system about environmental performance of our factory with workers, suppliers, sub contractors, customers, public authorities according to transparency and willingness principles,
- To carry out laws, regulations and customer requests for implementing our production and other activities,
- To train workers for generalizing environmental conscious in all activities,
- To carry out ISO 14001 Environmental Management System continuity and improvements according to objectives and targets.

General Manager

Figure 5.1 Environmental policy of building chemicals factory

5.2 Organizational Structure of EMS

To provide the understanding of environmental management system better and to spread EMS requirement promptly, an organizational structure has been formed.

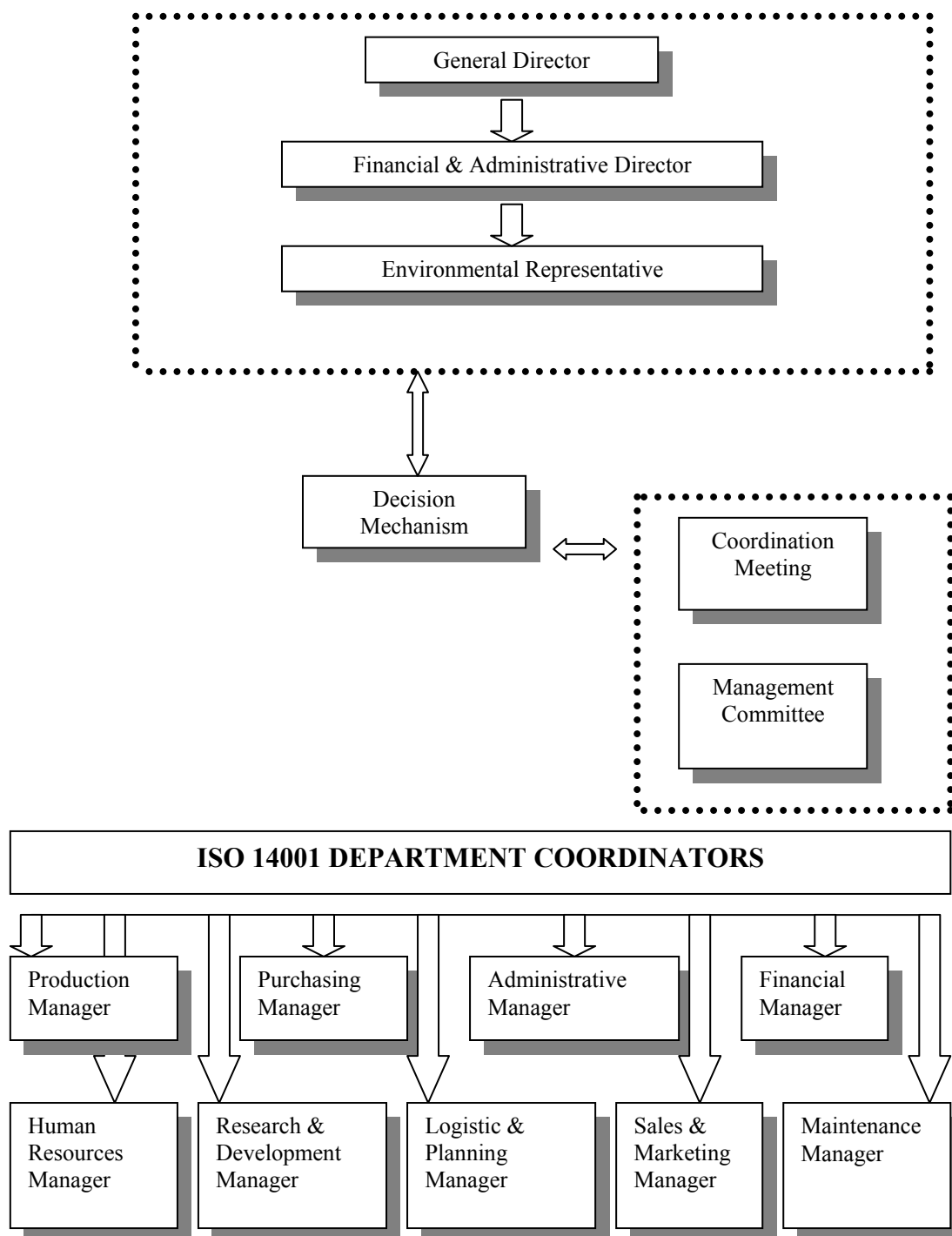


Figure 5.2 Organizational structure of EMS

5.3 Planning

5.3.1 Environmental Aspects & Impacts

The aim of environmental impact evaluation is determining major and minor environmental effects from the first stage of production process is supplying raw material to the last stage of production process is shipping and determining activities to minimize or eliminate of minor and major environmental effects. Environmental impacts evaluation is being prepared by environmental committee and owners of related department.

Environmental impacts are considered under the topics of natural resources consumption, environmental precautions, prior environmental accident and probability of emergency state and legal obligations.

Each environmental aspects and risk points are calculated in the environmental impact evaluation form. The sample of environmental impacts evaluation form format and the calculation method is given below in table 5.1;

Table 5.1 The sample environmental impact evaluation form format of the factory

NO	ENVIRONMENTAL ASPECTS	DEPARTMENT	RECEIVING ENVIRONMENTS	RESOURCES CONSUMPTION	PRECAUTIONS	EMERGENCY STATE PROBABILITY	LEGAL OBLIGATIONS	TOTAL POINT
			Air					
			Water					
			Soil					
			Flora					
			Fauna					
			Human					

The criteria of the environmental impact evaluation are below.

Point Natural resources consumption which is considered air, water, soil, flora, fauna and human (NRC)

- 0 If there is no harmful impacts on the environment.
- 1 If there is exiguous harmful impacts or remediable impacts on the environment.
- 2 If there is potential impacts and needs control.
- 3 If there is harmful impacts on the environment or human's health and safety.

Point Environmental precautions (EP)

- 0 If all precautions are being taken about related environmental aspects.
- 1 If precautions are being taken partially about related environmental aspects and need improvement.
- 2 If there is no precautions about related environmental aspects.

Point Prior environmental accidents and emergency state probability (ESP)

- 1 If there is no environmental accidents
- 2 Even though there are no environmental accidents in the past, present environmental precautions are sufficient.
- 3 There are emergency risks; it needs to be taken precautions.
- 4 There is environmental accident, precaution must be taken and essential results can occur.

Point Legal obligations (LO)

- 0 If there is no legal obligation about related aspects.
- 1 If related aspect is suitable to the legal obligations.
- 2 If related aspect is not suitable to the legal obligations and it needs control.

The formulation of the environmental impact evaluation is given below.

Environmental aspect= air (NRC*EP*ESP*LO) + water (NRC*EP*ESP*LO) + soil (NRC*EP*ESP*LO) + flora (NRC*EP*ESP*LO) + fauna (NRC*EP*ESP*LO) + human (NRC*EP*ESP*LO)

The steps after evaluating of environmental impacts are establishing of environmental data set. While forming environmental data set the matter that named as important aspects are arranged from bigger to smaller according to their risk point and environmental priorities are determined.

If total point of the related environmental aspect is 10 (ten) or more, this environmental aspect is accepted important and environmental management program is prepared about this aspect, management program continues until total point becomes lower than 10 (ten).

Environmental impact evaluation forms are approved by responsible or manager of related departments and environmental representative.

The sample environmental impact evaluation form of the factory is given in table 5.2 below.

Table 5.2 The sample environmental impact evaluation form of the factory.

NO	ENVIRONMENTAL ASPECTS	DEPARTMENT	RECEIVING ENVIRONMENTS	RESOURCES CONSUMPTION	PRECAUTIONS	EMERGENCY STATE PROBABILITY	LEGAL OBLIGATIONS	TOTAL POINT
1	Occurring of dust the results of preparation of additives and fillers, loading products to the mixer, filling products to the packages.	Production	Air	1	0	1	1	12
			Water	1	0	1	1	
			Soil	1	0	1	1	
			Flora	1	0	1	1	
			Fauna	1	0	1	1	
			Human	2	1	3	2	
2	Occurring of the waste powder products.	Production	Air	1	0	1	1	0
			Water	2	0	1	1	
			Soil	2	0	1	1	
			Flora	2	0	1	1	
			Fauna	2	0	1	1	
			Human	2	0	1	1	
3	Occurring of the waste kraft packages, stretched nylons, palettes.	Production	Air	1	0	1	1	30
			Water	2	1	3	1	

			Soil	2	1	3	1	
			Flora	2	1	3	1	
			Fauna	2	1	3	1	
			Human	2	1	3	1	
4	Leakages and spillage of raw materials which include hazardous chemicals like solvent, pigment etc.	Production / Warehouses	Air	1	0	1	1	90
			Water	3	1	3	2	
			Soil	3	1	3	2	
			Flora	3	1	3	2	
			Fauna	3	1	3	2	
			Human	3	1	3	2	
5	Occurring of waste liquid products.	Production	Air	1	1	1	1	24
			Water	3	1	3	1	
			Soil	3	1	3	1	
			Flora	2	1	1	1	
			Fauna	2	1	1	1	
			Human	2	1	1	1	
6	Occurring of waste waters the results of cleaning mixers, tanks, floors.	Production	Air	0	0	1	1	16
			Water	2	2	3	1	
			Soil	1	1	1	1	
			Flora	1	1	1	1	
			Fauna	1	1	1	1	
			Human	1	1	1	1	
7	Noise from working machines	Production	Air	0	0	1	0	0

			Water	0	0	1	0	
			Soil	0	0	1	0	
			Flora	0	0	1	0	
			Fauna	0	0	1	0	
			Human	3	0	2	1	
8	Oil usages for the equipments, forklifts, loaders, compressors etc. and occurring oakum.	Maintenance	Air	0	0	1	0	0
			Water	3	0	2	1	
			Soil	3	0	2	1	
			Flora	3	0	2	1	
			Fauna	3	0	2	1	
			Human	3	0	2	1	
9	Usages of electrical energy	All departments	Air	2	1	3	1	30
			Water	2	1	3	1	
			Soil	2	1	3	1	
			Flora	2	1	3	1	
			Fauna	2	1	3	1	
			Human	2	1	3	1	
10	Treated sludge	Waste water treatment plant	Air	0	0	1	1	0
			Water	1	0	1	1	
			Soil	1	0	1	1	
			Flora	1	0	1	1	
			Fauna	1	0	1	1	
			Human	1	0	1	1	

5.3.2 Objectives and Targets

Environmental objectives and targets of the factory are determined according to the environmental aspects & impacts and environmental legislations.

Objectives and targets of facility are;

a) Objective 1

To reduce electric consumption.

- *Target 1.*

Totally save % 25 energy in unit production.

Save % 20 electrical energy at lightening systems.

b) Objective 2

To manage all kind of wastes in every process.

- *Target 2.1.*

To classified wastes and collect separately.

- *Target 2.2.*

To provide %15 increase of recycling ratio.

c) Objective 3

To reduce hazardous materials amounts in products.

- *Target 3.*

To produce water based paints which include % 1 solvents.

d) Objective 4

To reduce water uses as %30.

- *Target 4.*

To reuse treated water for washing mixers, tanks and floors.

e) Objective 5

To organize training about increasing environment-conscious all staffs.

- *Target 5.*

To train all staffs 20 hour/person during the year.

f) Objective 6

To prevent pollution caused by chemical leaking and spilling of hazardous materials % 90.

- *Target 6.*

To improve storage conditions in chemical materials warehouse and chemicals where are used in process.

g) Objective 7

To reduce dust amounts in process as % 80.

- *Target 7.*

To repair dusts aspirated systems and renovate where are needed in plant.

5.3.3 Legal Requirements

Environmental laws, regulations and other legal requirements must be determined and followed by factory according to environmental impacts and required permission in our country is considered.

Laws and legislations which are applied by the factory are determined and followed by environmental representative. Supplying and updating of the laws and legislations are under liability of environmental representative.

Laws, regulations and legislations are supplied and updated by special company with signing a contract yearly. If new laws or regulations which are related by environment are published, this laws and regulations are informed by special company to environmental representative. Firstly, this laws and regulations are analyzed by environmental representative, and then action is planned by environmental committee together. Related environmental laws and regulations of the factory are given in table 5.3.

Table 5.3 Related environmental laws and regulations of the factory

NO	LAWS / REGULATIONS	O.G. DATE	O.G. NO
1	Environmental Law	11.08.1983	18132
2	Solid waste control regulation	14.03.1991	20814
3	Hazardous chemicals regulation	11.07.1993	21634
4	Environmental audit regulation	05.01.2002	24631
5	Environmental impact evaluation regulation	16.12.2003	25318
6	Waste oil control regulation	21.01.2004	25353
7	The control of excavation soil, building and wreckage wastes regulation	18.03.2004	25406
8	Package wastes control regulation	24.06.2007	26562
9	The control of waste battery and accumulator regulation	31.08.2004	25569
10	Water pollution control regulation	31.12.2004	25687
11	Hazardous waste control regulation	14.03.2005	25755
12	Vegetable waste oil control regulation	19.04.2005	25791
13	Soil pollution control regulation	31.05.2005	25831
14	Environmental noise evaluation and management regulation	07.03.2008	26809
15	Medical wastes control regulation	22.07.2005	25883
16	Open a business regulation	10.08.2005	25902
17	Air pollution control that is sourced by industrial facility regulation	22.07.2006	26236
18	End of life tire control regulation	25.11.2006	26357

5.3.4 Environmental Management Program

In order to reach targets, the decided time period and the sources for reaching targets, responsible people of Environmental Management Program and the responsibilities must be described in environmental management program.

The sample environmental management program for building chemicals factory according to policy, objectives and targets is in table 5.4.

Table 5.4 Environmental management program of building chemicals factory

PROG. NO	POLICY	OBJECTIVES	TARGETS	PROGRAM	DEADLINE	BUDGET	RESPONSIBLE
ÇP-01	Saving natural resources.	To reduce electric consumption.	Totally save %25 energy in unit production.	To use bucket elevator instead of pneumatic conveyor in silica transfer system.	8 months	40000 €	Maintenance Manager
ÇP-02	Saving natural resources.	To reduce electric consumption.	Save %20 electrical energy at lightening systems.	To change all lightening systems with a new technology.	10 months	50000 €	Maintenance Manager
ÇP-03	Preventing pollution	To manage all kind of wastes in every process.	To classified wastes and collect separately.	To buy containers for all kinds of wastes.	3 months	7000 €	Environmental Engineer
ÇP-04	Preventing pollution	To manage all kind of wastes in every process.	To provide % 15 increase of recycling ratio.	To buy a new computer program which manages all documents in computer without printing reduce waste paper.	10 months	25000 €	Information Technology Manager, Environmental engineer
ÇP-05	Reducing harmful materials usage during design and production	To reduce hazardous materials amounts in products.	To produce water based paints which include % 1 solvents.	To produce water-based paints after producing last orders.	5 months	10000 €	Research Development Manager, Production Manager

ÇP-06	Saving natural resources.	To reduce water uses as %30.	To reuse treated water for washing mixers, tanks and floors.	To lay out treated water lines to the process.	6 months	6000 €	Maintenance Manager
ÇP-07	Training workers to increase environmental conscious.	To organize training about increasing environment-conscious all staffs.	To train all staffs 20 hour/person during the year.	To train employees on planned days.	1 year	20000 €	Human Resources Manager
ÇP-08	Preventing pollution	To prevent pollution caused by chemical leaking and spilling of hazardous materials % 90.	To improve storage conditions in chemical materials warehouse and chemicals where are used in process.	To buy collecting systems for leakage of chemicals. To classified storage of chemicals according to properties of chemicals.	6 months	15000 €	Maintenance Manager
ÇP-09	Reducing wastes	To reduce dust amounts in process % 80	To repair dust aspirated systems and renovate where are needed in plant.	To buy equipments which have to be used for repairing and renovating dust aspirated systems.	8 months	13000 €	Maintenance Manager

5.4 Implementation and Operation

5.4.1 Structure and Responsibility

In order to implement Environmental Management System, Environmental Management Committee is established in Building Chemicals Factory.

The workers who are in charge of Environmental Management Committee and responsibilities are below.

a) General Manager

- To find budget for the environmental management investment.
- To develop environmental policy.
- To follow the results of environmental management program and to organize reaching the objectives and targets.
- To be responsible for approving policy, procedures and related documents.
- To consider environmental aspects when deciding new investment projects.

b) Financial Manager

- To organize all resource and energy saving practices and to consider the results in responsibility area.
- To perform the budget and investment organizations about environment.
- To work practices belonged to financial manager according to environmental objectives and targets, to review the results.

c) Environmental Representative

- To control works of environmental management committee.
- To analyze environmental aspects action plan after determining environmental aspects and environmental program.

- To follow applying of environmental management action plans and environmental program.
- To inform top management about works of environmental management committee.
- To follow legal requirements up-to-date and adapt modifications to the factory if necessary.
- To plan and organize and manage environmental management review meeting and follow the results and decisions.
- To organize internal EMS audits in factory, make them regularly and follow and review audit results.
- To provide environmental policy, objectives, targets, procedures, instructions, forms environmental program up-to-date and decide revisions necessity.
- To follow preventive and corrective actions requests and internal audit results and bring them successful conclusion with related department managers.
- To organize storage, disposal, recycling methodology of hazardous, medical and recycling wastes.
- To provide internal and external communication about EMS.
- To organize emergency preparedness with environmental committee and train workers for increasing conscious of emergency cases.

d) Environmental Committee

- To determine environmental aspects in related department by the owners.
- To establish priorities level of significance of environmental aspects after determining environmental aspects.
- To determine environmental aspects action plans according to their level of significance and to put into effect.
- To observe the problems in their departments and apply corrective/preventive actions.
- To collect process wastes separately and store appropriately.
- To work their departments according to environmental policy, objectives, targets and program.

- To take into account environmental aspects before purchasing new equipments / processes with related department's managers.
- To contribute providing of internal and external communication.
- To make periodical measurements regularly under the responsibilities areas.
- To organize all natural resources and energy saving applications and to consider results in responsibility area.
- To organize trainings according to environmental training plan for increasing environmental conscious.
- To take role in emergency preparedness plan.

5.4.2 Training, Awareness and Competence

Company trainings contain course, seminar, internal/external education programs for efficiency of personals, improving information and technique in business, preventing personal's faults.

Company trainings are grouped in four headings.

- Quality trainings
- Occupational trainings
- Orientation trainings
- Environment, health and safety trainings.

When budget is prepared annually, each department gives their training demands with reasons. Human resources department makes training plans according to training demands. While training plan is being prepared, tasks and responsibilities, qualification, experiences, performances of personal and personal needs according to preventive/corrective actions are taken into account.

Training plan includes training subjects, date, duration, place, the number of the contributors; educator company/person, training costs, list of contributors.

Internal environmental trainings are given by environmental engineer. If personal who starts to job new, personal who appoints new position, trainings are repeated by environmental engineer.

External training organizations like record, accommodation, and intercommunication etc., internal training organization like finding suitable place, ensuring tool are being done by human resources departments.

Evaluation of training is being done six months later. Performances of training are being followed by manager of the personal. Targets of the human resources department are %90 sufficiency of training and actualizing of % 85 scheduled trainings.

5.4.3 Communication

Each department is responsible for making their communication coordination and using communication tools according to their aims.

At the factory, internal communication is provided by the tools below;

- Telephone/mobile telephone
- Fax
- Letter
- Cargo
- E-mail
- Announcements
- Internal communication bulletin
- Meetings and trainings
- Intranet system
- Internal writing
- Communication clipboards
- Idea offering box

Providing of external communication is being done by environmental engineer. Public authorities' reports and documents, all kinds of environmental reports and environmental complaints are evaluated under external communications.

5.4.4 Documentation

In order for providing conformation and efficiency of environmental management system, documentation is formed. Environmental engineer is responsible for implementing of documentation and making effective documentation.

Each department is responsible for preparing documents, making controls and distribution of documents, keeping documents decipherable and usable, hiding documents within time specified.

Documents which are given below are managed by environmental engineer.

- Environmental management system hand book,
- Environmental policy
- Environmental objective and targets
- Environmental management program
- Environmental procedures and instructions,
- Management review meeting records
- Internal audit plan, audit results
- Corrective/preventive actions.

These documents are the basic elements of EMS and they are preparing according to documentation control rules. All documents are reviewed and revised by environmental engineer and related departments.

5.4.5 Operational Control

Operational control is providing to reach environmental objectives and targets. For that reason operational control procedure is written. Also, operational control procedure gives information to all workers about EMS rules and makes workers obey the EMS rules.

Operational control procedure of factory is given below.

LOGO	ENVIRONMENTAL MANAGEMENT SYSTEM PROCEDURES	Document Number PR.GM.001/00	
	KONU: Operational Control	Page Number	1/3

a) Purpose

This procedure encloses methodology of controlling environmental aspects which are sourced by activities, products and services of factory.

b) Application

This procedure is applied in every departments of factory.

c) Related Documents

- Monitoring and measurement procedure of environmental performance
- Corrective and preventive actions procedure
- Carriage, storage, packaging, keeping and distribution procedure
- Hazardous chemicals control instruction
- Medical wastes control instruction
- Solid wastes management instruction
- Hazardous wastes control instruction
- Air pollution and protection instruction
- Noise control instruction
- Wastewater control instruction

- Energy management instruction

d) Responsibilities

Preparation : Environmental Engineer

Approbation: General Manager

Application : All departments

Revision : Environmental engineer

e) Procedure

i. Solid Wastes.

Reducing of solid wastes is essential in the factory. Waste containers are placed for collecting recycled solid wastes separately in the factory. Recycled wastes are evaluated as reusing in the plant or selling to the recycled pants.

Recycled solid wastes which are paper, nylons, plastic jerrycan and pail, glass, metals, woods, big bags are sold to recycling company which has recycling license from T.C. Environment and Forest Ministry. Domestic wastes which are given to Organized Industrial District Area storage plants are collected at the source in the containers.

Solid wastes map which shows where solid wastes are produced, how recycled wastes are collected at source and how to transport to waste storage area are explained in solid waste management instruction.

The collection of solid wastes is managed by each department of the manager. The picking up of waste storage area is managed by administrative manager. Disposing of solid wastes is directed by environmental engineer.

ii. Hazardous Wastes.

Hazardous wastes which are waste oils, oakum, florescent, paints, oil-filters, contaminated barrel, tanks and jerrycan, batteries, electrical equipments are collected at source and transported to the hazardous waste storage area. Hazardous wastes are disposed by combustion, storage by related disposal firms or recycled by related recycled company according to the regulation. Hazardous wastes are transported to disposal or recycled company by vehicles which have hazardous waste transporting license from authorized company.

Collection, storage, transporting and disposing methods of hazardous wastes are directed by environmental engineer according to the hazardous waste management instructions.

iii. Medical Wastes.

Medical wastes are fallen out in infirmary. Medical wastes are collected separately in special bags and transported to the waste storage area by sanitary servant or doctor according to the Medical Waste Control Regulation. Medical wastes are taken from factory by medical waste truck which belongs to Izmir Municipality.

iv. Waste Waters.

Industrial and domestic waste waters are treated in waste water treatment plant in the factory. Chemical, biological treatment and sedimentation are being applied to waste waters for treatment. Treated water is stored in a pool for using fire fighting and washing the floor in the factory. Surplus treated water which is irrigation water according to Water Pollution Control Regulation is discharged to the river. Operating of water treatment plant is explained in waste water control instruction. Environmental engineer is responsible for operating water treatment plant. Treated

water is analyzed in authorized laboratory monthly according to the Water Pollution Control Regulation.

v. Gas Wastes.

Chimneys of boiler systems, generators and production process produce gas emissions in the factory. These gas emissions are measured by authorized laboratory annually and controlled according to the periodical measurement. If nonconformity is found accord to results of gas emission report, corrective actions are started. Production manager is responsible for applying gas measurements periodically.

Periodic exhaust control for all vehicles is being done and followed by administrative departments.

vi. Noise.

In order for providing workers and neighbors' health and safety, personal noise measurement and environmental noise measurement are being done annually. Preventive actions are done according to noise measurement for reducing high noise level and also personal protective equipments are used by workers.

vii. Energy Usage.

The energy resources of factory are;

- Electric
- Water
- Gasoline
- Natural gas
- Liquid petroleum gas (LPG)

Electric is used for production, lightening, ventilation, working of office equipments (computer, fax, photocopy etc.). Electric is supplied by Organized Industrial District Area.

Water is used for production, garden watering, and supplying water demands of workers. Water is supplied by three wells.

Water and electric consumption amounts are followed by production manager who reports electric consumption amounts to financial manager and environmental engineer.

Gasoline is used for tractor and shovel and LPG is used for forklifts. Natural gas is used for production and central heating system. Administrative manager follows gasoline, LPG and natural gas consumption amount and reports them to financial manager and environmental engineer. Reducing of energy usage works are explained in energy management instruction.

viii. Hazardous Chemicals.

Used all harmful and hazardous chemicals in the factory, hazardous level and storing conditions of these chemicals according to Material Safety Data Sheet (MSDS) are listed in chemicals list. Also safety information cards which include usage of chemicals are prepared. Safety information cards are put up to where chemicals are used.

Purchasing manager is responsible for supplying MSDSs of all chemicals from related company. Research and development manager is responsible for keeping MSDS and preparing chemicals list and safety information cards.

5.4.6 Environmental Preparedness and Response

In order for minimizing impacts on environment, human health, facilities; intervention methods, prevention actions of environmental accidents and abnormal operational conditions are determined with written procedure for emergency states. Emergency states are determined under four heading as fire, explosion, war and earthquake.

i. Fire and Explosion

If the fire occurs, all personals are responsible for calling their supervisor besides interfering to the fire or ought to call out the fire brigade.

Fire zones, fire teams (extinguishing, recovery, safety, first aid etc.) and responsible personals are determined in the list of emergency states teams.

Emergency trainings and practices are planned annually. Training and practicing records are saved by safety manager (administrative manager). To be in good working orders of fire installations and equipments and to make periodical controls of fire equipments are under liability of Safety manager. Damages of fire/explosion on humans (workers, neighbors), environment and facilities are assessed by safety team and situation report is written after fire/explosion. Water, air and soil pollution are determined after fire/explosion. Actions which reduce the environmental impacts are planned and financial budget are decided by top management.

The causes of the fire/explosion are determined by security team. Old audit results, situation reports which are written after fire/explosion, periodical cards which are belong to fire extinguisher, equipments and other documents are analyzed, eye witnesses are interviewed. The report is written and represented to the top management by security team. Top management is decided corrective actions for putting down the fire/explosion again.

ii. War

When the war is informed by public authorities, meetings are held by top management and security team. Security precautions like darkening, entrances and exits controls of factory etc., strategic decisions like continuation of a production, reduction or stoppage of production etc., transporting critical machines/devices or personals are decided and executed as decrees by safety manager. Decisions are enounced and taken related public authorities opinions.

Providing safety of lives, setting asylum for minimizing loss of life, allocation of resources for getting materials/equipments are under top management's liability.

iii. Earthquake

Area where factory takes place is in first degree seismic belt and earthquake is evaluated critical natural disaster for factory. While facilities of the factory were building, endurance to the earthquake, water flood etc. had been considered. Earthquake-proof materials and techniques are used when new premises are needed for building. If there will be emergency cases, top management makes meeting and takes decisions about precautions.

Generally, first aid kits, alarm buttons, fire extinguishers and emergency exits are maintained, are on the alert for emergency and trainings are being given to the employees about them according to emergency training program.

The emergency preparedness are reviewed and revised, the emergency plan is updated and first aid trainings are given to all personals periodically. Also, factory makes arrangement with fire brigades and ambulances for coming on time in emergency cases.

5.5 Checking and Corrective Action

5.5.1 *Monitoring and Measurement*

Monitoring and measurement methods are described for systematic control of environmental impacts of processes. Periodic measurements, monitoring lists and parameters are given below;

a. Waste Production

Parameters which are monitored;

- Hazardous wastes
- Medical wastes
- Recoverable wastes
- Disposable wastes

Measurement methods;

- Monthly wastes amounts
- Rate of recycle
- Medical wastes following form

b. Waste Waters

Parameters which are monitored;

- Performance of waste water treatment plant
- Discharges

Measurement methods;

- Monthly waste waters and treated waters analyzes results
- Analyze results of treatment plant sludge
- Chemical material consumptions in waste water treatment plant.

c. Energy Management

Parameters which are monitored;

- Energy consumptions

Measurement methods;

- Electrical energy consumption
- Water consumption
- Natural gas and LPG consumptions

d. Emissions

Parameters which are monitored;

- Processes emissions
- Chimney gas emissions

Measurement methods;

- Emissions following forms
- Emission measurement reports

e. Raw Materials

Parameter which is monitored;

- Raw materials consumptions

Measurement method;

- Raw materials consumptions following form

f. Environmental Accidents

Parameters which is monitored;

- Fires, unplanned discharges and emissions, chemical material spillage

Measurement method;

- Environmental accident reports

g. Noise:

Parameters which is monitored;

- Noise parameters

Measurement method;

- Noise measurement report

Departments which are responsible for monitoring and measurement parameters given below,

WASTE PRODUCTION	: Administrative Manager
WASTE WATERS	: Environmental Engineer
ENERGY MANAGEMENT	: Production Manager
EMISSIONS	: Production Manager
ENVIRONMENTAL ACCIDENTS:	Related departments/ Environmental Engineer
NOISE	: Environmental Engineer
RAW MATERIALS CONSUMPTIONS:	Research & Development Manager / Purchasing Manager

Monitoring and measurement reports are being prepared by related departments monthly and reports are sent to environmental representative. Environmental representative collects reports which have information and inconvenience situations for discussing in management review meeting.

Convenience situations in reports are determined according to environmental policy, objectives, targets and environmental legislations. If reports have inconvenience situations, they are followed in corrective actions.

5.5.2 Non Conformance & Corrective & Preventive Actions

In order to remove present nonconformities and prevent or reduce occurring problems again, corrective actions are started. In order for preventing potential nonconformities, preventive actions are started.

Present or potential nonconformities are determined according to parameters which are given below;

- Breaking of bounding by law, regulations etc. of factory.
- Deviating from environmental policy and program determination.
- Fortuitous events which impact environment.
- Not to apply methods and instructions which are determined environmental management systems
- Emergency states like chemical spillages, spreading, fire, explosion, earthquake etc.
- Environmental complains and accidents etc.
- Audit results
- Environmental aspects evaluation results
- Surveys, request/complain boxes

Nonconformities can be found by customers, suppliers, workers, neighbors, visitors etc. When present nonconformities which are determined by customers, suppliers, neighbors are transmitted to related department of factory, present nonconformities are converted to corrective actions by related departments with filling I, II and III parts in corrective action form. Corrective action form which is shown in figure 5.3 is transmitted to environmental representative. Environmental representative provides to follow and accomplish corrective action.

If workers find nonconformities, they fill I part of the corrective action form and give the form to their manager. Manager who takes the corrective action form makes root-cause analyzes and writes planned precautions.

Preventive actions are started for potential nonconformities. Potential nonconformities sources are filled by person who starts potential nonconformities in preventive action form which is shown in figure 5.4. Then preventive action form is given to environmental representative. Environmental representative provides to follow and accomplish preventive action form.

Preventive/corrective action forms are numbered according to starting date by environmental representative who makes statistic analyzes about preventive/corrective actions.

CORRECTIVE ACTION FORM	
I	
Nonconformity	:
Explanation of nonconformity	:
Place / Date	:
Person who reports	:
II	
Root causes of nonconformity	:
Related meeting note	:
Date	:
III	
Planned precautions	:
Related meeting note	:
Planned completion date	:
Following of precautions	:
Following date	:
Results of precautions	:
Date	:

Figure 5.3 Corrective action form of the factory

PREVENTIVE ACTION FORM	
I	
Potential nonconformity sources :	
Causes of nonconformity :	
Place / Date :	
Person who reports :	
II	
Planned precautions :	
Related meeting note :	
Planned completion date :	
Following of precautions :	
Following date :	
Results of precautions :	
Date :	

Figure 5.4 Preventive action form of the factory.

5.5.3 Records

Records of EMS must be established and maintained with retention system for all the necessary supporting documentation. Document retention timeframes for the records must be established. Records which are traceable and identifiable should be created and archived in the factory.

The purpose of this section of the standard is to ensure that the organization maintains in an organized fashion all the necessary documentation that is required by ISO 14001. This section of the standard specifically references training records, audits results, and results of reviews. The records retention system should focus on a larger universe of documents:

- Legal and other requirements,
- Permits,
- Environmental aspects and impacts,
- Environmental training,
- Inspection and calibration information,
- Monitoring data,
- Nonconformance reports and follow-up information,
- Environmental audits,
- Management reviews,
- Emergency preparedness response information (Virginia Department of Environmental Quality, 2006).

Types of the records, where and how long they are kept are determined in table 5.5 below. All electronic forms are backed up by information technology departments everyday. All back up records are saved during 10 years in bank.

Table 5.5 Records of the factory

NO	TYPE OF THE RECORDS	RESPONSIBLE	SAVING PLACE	RETENTION PERIOD
1	Environmental policy, objectives and targets	Environmental Representative	In electronic form	5 years
2	Legal and other requirements	Environmental Representative	In electronic form	5 years
3	Meeting minutes of management review meeting results	Environmental Representative	In electronic form	3 years
4	Reports of environmental accidents	Environmental Representative	In electronic form	10 years
5	Permission which is related with environment	Environmental Representative	On paper	Until validation period
6	Environmental impact evaluation forms	Environmental Representative	In electronic form	5 years
7	Agreements and related documents	Related departments	On paper	5 years
8	Material safety data sheets	Research & development manager	On paper and in electronic forms	10 years
9	Suppliers selection and evaluation records	Purchasing manager	On paper and in electronic forms	3 years
10	Machine, equipments maintenance records	Maintenance manager	On paper	3 years
11	Production plans	Production manager	Special computer program	5 years
12	Monitoring and measurements records	Environmental Representative	In electronic form	10 years

13	Emergency state plans	Administrative manager	On paper and in electronic forms	3 years
14	Periodical measurements and analyzes	Environmental Representative	On paper and in electronic forms	10 years
15	Corrective/preventive action records	Related departments and environmental representative	On paper and in electronic forms	5 years
16	EMS audit procedure, plans, results and reports	Environmental Representative	In electronic form	3 years
17	Annual training plans, forms	Human resources departments	On paper	3 year
18	Internal and external communication	Environmental Representative	On paper	5 years

5.5.4 EMS Audit

EMS audit is being done for evaluating adequacy, appropriateness, and efficiency of Environmental Management System, reporting nonconformities, making corrective actions, following and recording EMS results.

The targets of EMS audit are;

- To provide necessity of Environmental Management System,
- To provide working according to general rules and elements,
- To determine technical and organizational tender points,
- To follow applying of procedures, instructions and other documents which impact performance of EMS system.

Making plans of internal EMS audit, applying audit, reporting of audit results, saving of corrective actions are being done by environmental representative.

Internal EMS audits are being done by environmental committee once a year as planned. If organizational changes, environmental accidents and new environmental impacts occur, off-beat audits can be done.

Internal audits are being done by two auditors who have environmental audit training and one observer who wants to have audit experience.

Internal audit plan which has audit date, time, name of the auditors and other details are prepared by environmental representative and published to auditors by e-mail fifteen days before audit dates.

Internal audit questions are prepared before audit date by auditors. Auditors take into account documentation, corrective/preventive actions, last audit report of department and related reference number of ISO 14001 EMS Standard.

Auditors write audit results after audit together. If they can find any nonconformity, they start corrective action for related nonconformity after internal audit. Nonconformities must be written clearly and included EMS standard headings. Corrective/preventive actions are followed by environmental representative. Internal EMS audit results are interviewed in management review meeting.

External EMS audits are being done once a year by external auditing company. Environmental representative organizes external audit plan.

5.6 Management Review

Top management, environmental representative and EMS committee review the system after operational control and corrective/preventive action to maintain and improve the EMS performance. The EMS reviewing meetings are planned periodically every six months. In this meeting the information presented below are considered.

- Preview management review and audit results
- Performance results of the environmental objectives and targets and environmental management program.
- New or changed environmental regulations.
- New investment on environment.
- Changes in applicable technology, including production and process.
- Environmental accidents or incidents.
- Non-conformance, corrective and preventive actions.
- Necessity revisions are decided for sustainability and progress of EMS.

CHAPTER SIX

RESULTS AND DISCUSSION

The ISO is a federation of non-governmental organizations established in 1947 to develop international standards, improve international communication and collaboration, and facilitate the exchange of goods and services. The ISO 14000 family grew out of ISO's commitment to support the objective of sustainable development discussed at the United Nations Conference on Environment and Development, in Rio de Janeiro, in 1992. ISO 14000 refers to the series of voluntary standards and guidelines for environmental management. ISO 14001 is one of those standards and it includes pollution prevention.

ISO 14001 specifies a guideline for designing an EMS based on a commitment to pollution prevention, regulatory compliance, and continual improvement of the organization's EMS. If it is designed appropriately to an organization's business activities and environmental impacts, it can help to reduce environmental expenditures and improve environmental performance.

While ISO 14001 EMS is being established and implemented, all environmental aspects of organization must be identified carefully and the control mechanisms for preventing and minimizing of the significant environmental impacts must be established. Then the environmental management programs that include the environmental action plans and time schedules are prepared. The environmental responsibilities in EMS and the impacts of work activities must be understood clearly by all employees and managers of organizations. It is very important for improving an effective EMS.

During this study, expenses of solid wastes, production wastes and waste waters are calculated. Profit and deficit situation of wastes in the factory are summarized below in Table 6.1.

Table 6.1 Profit and deficit situation of wastes in the factory

TYPE OF WASTE	EXPENSE OF WASTE (YTL)	SITUATION
Waste Powder Product	-128000	Deficit
Waste Liquid Product	-106400	Deficit
Waste Kraft Packages	-22950	Deficit
Waste Plastic Buckets	-80000	Deficit
Waste Palettes	-79028	Deficit
Waste Stretched Nylons	-31249.5	Deficit
Waste Paper	318.75	Profit
Glass Wastes	45	Profit
Waste Metals	26200	Profit
Waste Barrels	385.125	Profit
Waste IBC Container	1512.5	Profit
Waste Jerrycan	126.75	Profit
Waste Big Bag	9265.5	Profit
Domestic Waste	-5850	Deficit
Treated Sludge	-17325	Deficit
Waste Oil	-3187.5	Deficit
Waste Oakum	-333.75	Deficit
Waste Oil Filters	-318.5	Deficit
Electronic Wastes	215.9	Profit
Waste Batteries	-18.125	Deficit
Medical Wastes	-25.25	Deficit
Fluorescent Wastes	-425	Deficit
Waste Water	-17000	Deficit
TOTAL	-454041	Deficit

Waste costs per products are calculated the results of waste expense calculation. Waste amounts and product costs are taken into account while calculating waste costs per products which are % 0.6.

But in addition to waste amounts and costs of all organization should be reduced by following elements to increase performance of EMS.

- Establishing recycling systems and disposing systems should be supported by government for minimizing waste amounts.
- Environmental conscious must be increased and budget should be reserved by all organization for supporting visual and written publicity.
- Organized industrial district should establish own waste collection, recycle and disposing systems. If waste collection, recycle and disposing companies are close to the organization, waste transporting costs are reduced.
- Sanctions must be deterred. All organizations should be clamped down by authorized managers. Inputs and output activities must be fettered.

Following activities must be taken into account for increasing EMS performance and minimizing waste amounts of factory.

- EMS works don't espouse by employees. They think that requirement of EMS are not their responsibility. Environmental responsibilities should be part of everyone's job, should not be environmental committee's and engineers'.
- Environmental protection groups should be formed from each department that includes competition and awards systems.
- Digital systems should be supported by organization for preventing paper consumption.
- Supports of research and development department should be provided for using eco-friendly raw materials and producing eco-friendly products. Suppliers should be informed about requirements of EMS and eco-friendly raw materials.
- While choosing supplier which has ISO 14001 EMS should be preferential.
- Related brochure, CD, training programs etc. should be prepared for increasing environmental conscious of customer and workers.

- Controlling and preventing pollution seems an expense, not an investment for some managers of organizations. If an organization wants to realize significant cost saving from an EMS, its environmental policy needs to clearly state that the top priority of the EMS is to prevent the generation of waste and pollution.
- The requirement of EMS, waste properties, waste collection/reduction methods etc. trainings should be increased and departments must be spared the time, also trainings must be supported by top management.

CHAPTER SEVEN

CONCLUSION

ISO 14001 Environmental Management System has five basic requirements that are environmental policy, planning, implementation and operation, checking and corrective action and management review was presented in this study.

At this study mass balances and waste costs per products were calculated of factory. The requirements of ISO 14001 Environmental Management System were evaluated in building chemicals factory because of no implementation of ISO 14001 EMS in this sector. Our aim was to establish implementation guideline that includes step by step approach to implement Environmental Management System for building chemical organizations.

This research provided ISO 14001 Environmental Management System approach. I wish all companies pursue to ISO 14001 Environmental Management System and maintain business excellence while protecting the earth and our quality.

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