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"Implementation plan for ISO 14001:2004 Environmental Management in Illco Factory"

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DEDICATION

This research paper is dedicated to God, the guide of my life, for giving me the opportunity to complete my studies.

To my parents, for all their efforts, love and support received, without them I would not be the person I try to be every day.

To my teachers for their love and dedication to educate me and help me become an excellent professional.

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I thank my advisor Juan Maldonado for his time and patience and for giving me guidance during the development of this study.

To the owners of Illco Factory, for giving me the necessary information and trust to develop this thesis.

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ABSTRACT

The objective of this research is to generate a plan for the implementation of ISO 14001: 2004 in Illco Factory; to fulfill this, an overview of these standards will be provided with a focus on the norm that is intended to be applied as well as inform about the activities of the company and finally propose a plan to implement an appropriate SGA.

The methodology used for the development of this research was an interview and survey with the owners of the company Engineers Patricio and Andres Pangol, a visit to the factory and the search for information necessary to propose an implementation plan of this standard.

The main reason to develop this plan is to demonstrate that the implementation of an environmental management system brings not only intangible benefits such as a positive image, but also generation of money and savings, for example, optimal use of electricity, sale of scrap, accident prevention and effective use of resources.

INTRODUCTION

Nowadays, many organizations choose to obtain quality or environmental certifications in order to create greater customer confidence and provide a positive image. One of the most common certifications has been in the field of quality that has become a basic requirement for many negotiations nowadays; gradually, awareness about the environment has gained strength and the consumer chooses products whose companies have this kind of commitment.

The objective of this research is to demonstrate that such certifications are not an expense but an investment which will substantially improve the operations of a company bringing great economic benefits in the medium and long term. This process was achieved through interviews and survey of the owners of Illco Factory and a subsequent visit to the plant.

This thesis is in three sections. The first one provides general information about the company known as the International Organization for Standardization (ISO), with a special focus on the norm that is to be applied, environmental legal regulations of the country and the city and finally, mandatory and voluntary certifications necessary to export these? the products. The second section provides information about the company and the activities that have an impact on the environment. Finally, after the visit to the plant, the third section develops the organization and implementation of an EMS according to the requirements of this standard.

CHAPTER I

ISO INTERNATIONAL STANDARDS

Nowadays, procedures and operations standardization are more important in many companies. The International Organization for Standardization offers international standards that can be applied to companies no matter their function, size or activity and can provide guidance OR guidelines to improve areas such as technology, food, environment, products and services quality, security, etc.

This chapter will mention topics related to general aspects, benefits, management system standards, and ISO 14001:2004 environmental management will be studied in more detail. Legal standards and environmental laws of Ecuador and those specific to the city of Cuenca are listed, and finally, mandatory for exporting products such as those offered by Illco Factory are voluntary certifications and seals required by the buyer.

Before starting this chapter, it is necessary to define what a standard is. According to the ISO website, it is a document which determines the requirements, specifications and characteristics that must be applied to ensure that materials, products, services and processes maintain their purpose.

1.1 Generalities

The ISO official website mentions that they cover several fields such as business, technology, health, security, etc., meaning that they are involved in almost all industries with about 19,500 international standards in order to guarantee good national and international business.

ISO is an independent non-governmental organization formed by 165 country members based in Geneva, Switzerland. (ISO.org, About ISO section, para. 1)

1.2 ISO Benefits

These standards bring technological benefits to the industry in general. The main purpose is to standardize the technical specifications of products and services internationally. Besides industry, the focus is on people by creating standards for OR about the environment, social responsibility and security. These standards are a helpful tool to improve corporate management, to make it more productive and efficient with the objective of gaining new markets. According to the ISO website, some benefits in the social and business fields are:

- The standards guide companies in order to improve their technical processes; this will achieve a cost reduction by implementing new operational methods.
- The certification of these standards is a potential tool to attract new domestic and international markets.
- Improved techniques and processes of a company have a positive impact on the environment.
- Increased productivity and competitiveness.
- One of the main beneficiaries will be the consumer as a result of better production techniques being implemented.

1.3 The certification

Achieving a certification provides confidence and credibility in a company, in this way a company will demonstrate that it meets consumer needs through its activities. It should be emphasized that ISO does not provide certifications. Its main function is to develop the international standards; this certification is granted by external certification bodies. (iso.org, Certification section, para. 2)

ISO's Committee on Conformity Assessment (CASCO) has developed a set of standards that an external certification body must certify to qualify; there is the possibility to see the list of these bodies in each country on the ISO website through the link of International Accreditation Forum. According to the Ecuadorian

Accreditation Service (SAE), these bodies can be found on its website, and they mention the following:

- Eau Veritas Ecuador S.A.
- Cergestcal America Certification Group ACG S.A.
- Calidad internacional de Certificaciones CICSA
- SGS DEL ECUADOR S.A.

1.4 Audits

An accrediting company is responsible for conducting audits in order to analyze and ensure that a company meets the requirements for getting a certification of an international standard; for this reason, ISO has published ISO 19011:2011 a guide for performing internal and external audits. (iso.org, Audits section, para. 5)

1.5 Development of an international standard

According to the ISO official website, for the development of an international standard, an organization must meet the following steps:

- Before starting the development of a standard, the organization identifies a need in the market. To identify this, the industry or a particular group (for instance consumers) communicates to the organization the need to create a standard.

- The groups responsible for developing standards are called technical committees assigned by member countries, which are made up of industry representatives, NGOs and other groups. Each committee focuses on specific areas such as technology, production, food, etc.

- All ISO members have the opportunity to choose to be active participants, this means, being part of the voting process; on the other hand, it is possible to be an observer without obligation to make comments during the development of a standard. (iso.org, ¿Who develops the standards? Section,

para. 1) The publication of an International Standard requires a consensus of 75% of the member bodies who vote. (ISO 14001, Prologue section, para. 3).

1.6 Management systems standards

This organization has developed several rules of standardization in different branches that influence the business world, the international standards are classified by fields such as environment, quality, safety, etc., and the following are:

- ISO 50001 – Energy Management: It is focused on the correct use of energy in order to save costs to businesses and also contribute positively to stop climate change of our planet through an energy management system standard. (iso.org, ISO 50001: Energy management section, para. 1, 2)
- ISO 9000 family – Quality Management: This is one of the best known worldwide used standards. This is a standard linked to consumer requirements because it provides the tools and guidance to companies in order to provide products or services according to the client needs. The ISO 9001: 2008 establishes the criteria and principles for a quality management system through continuous improvement and it can be used by large or small companies regardless of their activities. (iso,org, ISO 9000: Quality Management section, para. 1)
- ISO 22000 – Food Safety Management: According to the ISO official website, this standard helps organizations identify and prevent unsafe food.
- ISO/IEC 27001 – Information Security Management: This standard is a guide for small and large businesses to protect their financial and risk management system to meet this objective. (iso.org, ISO/IEC 27001: Information Security Management section, para. 1)
- ISO 20121 – Sustainable Events Management: As indicated in the ISO official website, this standard helps these events to be organized correctly, taking into account factors such as environment, the proper use of resources, waste and cost reduction.

Finally, the standard will be analyzed in this research: ISO 14000: environmental management.

1.7 ISO 14000: family – Environmental Management

In the ISO official article called "International Standard ISO 14001", mentions that its main purpose is environmental protection, reducing global pollution and raising awareness among people in the near future; it guides individuals and organizations to implement an environmental management system and integrate it with the objectives and goals of a company, meeting the legal requirements of each country; it is essential to mention that these are standards that guide companies, not intended to create restrictions on international or domestic trade. It also allows organizations to create an environmental policy, set goals and processes related to this policy and to have continuous control during the development of the company.

As mentioned above, international standard ISO 14001: 2004 focuses on providing environmental management systems; in addition, there are other standards within this norm main objective of which is to control the environmental impact generated by enterprises and improve their development.

1.7.1 ISO 14001:2004: Environmental Management Systems - Requirements with use guidance

On its official website is mentioned that this standard establishes the criteria to develop an environmental management system within a company or organization regardless of its size or function, with the purpose of getting the international certification through an external certification body.

Among its benefits we can mention the following:

- Costs reduction
- Cost savings in production and daily activities
- Add value to the company
- Provide a positive image both nationally and internationally

1.7.2 ISO 14004:2004: Environmental Management Systems – General guidelines on principles, systems and support techniques

This norm is a guide for implementing, controlling and environmental management systems improvement; in this way, this is applicable to any organization regardless of size, precedence and place. This standard is consistent with the ISO 14001:2004, they are not intended to provide interpretations of the requirements. (iso.org, ISO 14004:2004: Environmental Management Systems – General guidelines on principles, systems and support techniques section, para. 1)

1.7.3 ISO 14006:2001: Environmental Management Systems – Guidelines for incorporating ecodesign

This standard is part of an environmental management process and helps to implement an eco-design system. It should be taken into consideration that it applies to activities related to environment and can be controlled within an organization. (iso.org, ISO 14006:2001: Environmental Management Systems – Guidelines for incorporating ecodesign, para. 1, 2, 3, 4)

1.7.4 ISO 14064-1:2006: Greenhouse emissions

Greenhouse emissions are in the atmosphere and may be natural or manmade, for example, water evaporations and carbon dioxide. This standard determines the principles and requirements to design, measure, report and manage greenhouse emissions at an organizational level. There are three divisions of this standard which help a company to manage the greenhouse emissions. (iso.org, ISO 14064-1:2006: Greenhouse emissions section, para. 1)

1.7.5 ISO 14001:2004

According to the ISO official website, this is the second edition of the first standard known as ISO 14001: 1996, which is focused on technical improvements and provides a greater compatibility with ISO 9001: quality management. It is important to mention that this norm is based on the PDCA methodology: plan, do, check and act.

- Plan: Establish objectives and processes based on the environmental policy of a company
- Do: Implement this processes
- Check: Measure and control that all activities are carried out as planned
- Act: Make decisions focused on improving organizational performance and environmental management system.

This methodology helps companies to implement an effective system that helps improve their development in any field they would like to grow.

1.7.5.1 Requirements for implementing an environmental management system

In a general perspective, the company must establish, determine, maintain and control an environmental management system.

1.7.5.1.1 Environmental policy

It is necessary that the organization determine and document its environmental policy, this must be consistent with their activity or function. (International Standard ISO 14001, A.2 Environmental Policy section, para. 3)

The environmental policy will be defined by senior management. It is important to consider that this drive the implementation and improvement of environmental management system and for this purpose, the following must be considered:

- Should be applicable in line with activities and products offered
- Should be communicated to all internal and external clients
- Should be defined, documented and updated if necessary
- Should comply with the environmental legislation of each country
- Should comply with the commitment of continuous improvement

1.7.5.1.2 Planning

An article called “International Standardization ISO 14001” indicates that for proper planning it is necessary to consider three areas: environmental aspects, legal requirements and business objectives.

In environmental aspects, the company should identify those factors or processes that generate a significant impact on the environment and can be controlled. It is important that this information is documented in order to keep it updated and controlled.

- The organization must take into account legal requirements to be met regarding environmental aspects and apply them correctly to avoid future problems with government agencies.

- The definition of goals and objectives related to the environment should be clear, consistent, and measurable and mainly congruent with the environmental policy and activities in which the company is engaged.

1.7.5.1.3 Implementation and operation

According to the article mentioned above, it is indicated that to have a successful implementation of an operating system the following is required:

- **Resources and responsibilities:** To have a proper environmental management system within an organization, it is necessary that partners, manager or director, ensure the resources required such as human, technological, financial and infrastructure. The person responsible for the environmental department must be defined and known throughout the company in order to manage the information to the right people in a fast and efficient way.

- **Competence, training and awareness:** To have a proper environmental management system, it is essential that the entire company is involved; in

some cases it is necessary to hire competent and experienced people, and to have training courses to acquire knowledge and awareness. In this way, the environmental management system will considerably improve.

- **Communication:** This factor must be carried out correctly to avoid confusion and incorrect management, therefore, it is a requirement to document all procedures, and have a system of efficient internal and external communications.

- **Documentation:** it is of main importance that the implementation process of this environmental management system is documented, and includes the following:

    - ✓ Policies, objectives and goals.
    - ✓ Scope of the environmental management system.
    - ✓ Description of the main elements of the environmental management system.
    - ✓ Documentation of the required records, those necessary for the environmental management system.

- **Document control:** All documents and records of the environmental management system of a company should have a procedure for proper control. It is necessary to approve and keep them updated, and provide continuous monitoring of changes that may occur, and also that they are legible.

- **Operational control:** All environmental operations of a company, must be identified and planned according to their policies, objectives and goals; this requires that the environmental management system is documented to assure that the daily activities of the company are consistent with these policies and goals.

- Emergency preparedness and response: Organizations should have identified the procedure for an emergency or accident related to the environment, in this

way, the company can respond quickly to unexpected situations. These plans should be reviewed periodically, and any changes implemented if needed.

1.7.5.1.4 Verification

To conduct a proper environmental management system, it is necessary to have an effective control to improve this system continuously; according to one article from the International Standard ISO 14001 the following should be considered:

- Monitoring and measurement of operations and legal requirements: The organization must implement or establish a procedure for monitoring and measuring business operations that can impact the environment, and in the same way fulfill any legal requirements.
- Nonconformity, corrective action and preventive action: The company should develop a procedure for the purpose of defining and identifying nonconformities in order to mitigate the environmental impact, create preventive actions to avoid future problems and corrective actions to improve environmental management system.
- Control of records: All records that lead the organization in relation to this standard shall have a procedure for storage, security and maintenance.
- Internal audit: It is essential to carry out an internal analysis in order to verify whether the environmental management system that the organization has complies with the international standard and if it is implemented as planned; it should be emphasized that this audit should be recorded and reported internally.

1.7.5.1.5 Management Review

Shareholders, partners and authorities of a company should be involved in the implementation of environmental management systems, this requires a periodic review in order to improve the system, environmental policy, planning and objectives and goals if necessary. To do this information from internal audits, opinions from suppliers or customers, level of environmental performance, operations that generate

environmental impact and employees need to be collected. These revisions must be documented and recorded by the authorities.

1.8 Legal Framework

The environmental management system and the preliminary environment evaluation suggested in this study must be done under local and national laws; here are some of the ones that Illco Factory has to consider:

At a national level:

From the Constitution of Ecuador

This is the supreme law in the country in which the existence of Ecuador and its government and the relations among its citizens are based. These laws are the most important in Ecuador and are above any other law.

Title II: RIGHTS, Chapter Second: Right to good living, second section: Healthy environment

Art. 14.- determines that "The people have the right to live in a healthy and ecologically balanced environment, which guarantees the sustainability and good living principles, suma Kawsay. The preservation of ecosystems, biodiversity and the integrity of the genetic patrimony of the country has been declared of public interest for the country, so too the prevention of environmental damages and the recovering of degraded natural spaces".

Art. 15.- determines that "The State will promote, within the public and private sectors, the use of technologies which are environmentally clean and alternative nonpolluting energy with low impact. The energy sovereignty will not be reached through the detriment to the food sovereignty, nor affect the right to water…"

Title II: RIGHTS, Chapter Second: Right for good living, section seventh: Health

Art. 32.- determines that "Health is a right which the State guarantees, and its

performance is linked with the exercise of other rights, among others the right to water, food, education, social security, healthy environment and others which are the base for good living".

Title VII: REGIMEN OF GOOD LIVING, Chapter second: Biodiversity and natural resources, section first: Nature and environment

Art. 395.- determines that "The Constitution recognizes the following environmental principles: 1. The State guarantees a sustainable model of development, environmentally balanced and respectful of cultural diversity, which preserves biodiversity and the capacity for natural regeneration of ecosystems which assure the satisfaction of needs of current and future generations. 2. Environment management policies will apply in a horizontal axle and will be mandated by the State at all its levels and by any and all people and companies within the national territory. 3. The State will guarantee the active and permanent participation of people, communities, groups and nationalities affected, in the planning, execution and control of all activities which generate environmental impacts.

Art. 396.- The State will adopt policies and measures to avoid negative environmental impacts when there is the possibility of damage. In case of doubt about the environmental impact of any action or omission, even if there is no scientific evidence of damage, the State will adopt efficient and timely protective measures. The responsibility for environmental damages is objective. All environmental damage, beside the corresponding sanctions will imply the obligation to totally restore the ecosystems and compensate the affected people and communities.

Environment Management Law

TITLE I SCOPE AND PRINCIPLES OF ENVIRONMENT MANAGEMENT

Art. 1.- The current Law establishes the principles and guides for environmental policies; it determines the obligations, responsibilities, levels of participation of the public and private sectors regarding environment management and establishes the

acceptable limits, controls and sanctions regarding this matter.

TITLE IV ON THE PROTECTION OF ENVIRONMENT RIGHTS

Art. 41.- In order to protect the individual and collective environment rights, any natural person, company or human being is entitled by this means to present a claim on the violation of environmental standards, without prejudice of an action of constitutional protection established in the Political Constitution of the Republic.

Art. 42.- Any natural person, company or human being would be heard in a criminal, civil or administrative case, which begins due to infractions related to the environment scope, even if their own rights have not been affected.

Organic Law of health

UNIQUE TITLE, CHAPTER II ON DISPOSAL OF COMMON, INFECTIOUS, SPECIAL AND RADIOACTIVE IONIZING AND NON IONIZING WASTE

Art. 98.- determines that "The national sanitary authority, in coordination with public or private agencies, will promote programs and campaigns of information and education on the management of waste and residues".

Art. 100.- determines that "The collection, transportation, treatment and final disposition of waste is responsibility of the municipalities who will perform this according to the laws, regulations and requirements given for these purposes, observing at all times bio safety and control standards determined by the national sanitary authority. The State will transfer the required resources for the fulfillment of this article."

CAPTER III QUALITY OF AIR AND SOUND POLUTION

Art. 112.- determines that "The municipalities will develop programs and activities to monitor the quality of the air and prevent its pollution due to emissions from fixed

or mobile sources and natural phenomena. The monitoring results will be reported periodically to the corresponding authorities to implement information and prevention systems addressed to the community.

Art. 113.- determines that "All labor, productive, industrial, commercial, and recreating activities, and those related to housing and other installations and means of transportation must fulfill the corresponding standards and regulation on prevention and control in order to avoid pollution caused by noise, which affects the health of human beings".

CHAPTER V HEALTH AND SATETY AT WORK

Art. 117.- determines that "The national sanitary authority in coordination with the Ministry Labor and Work and the Ecuadorian Institute of Social Security will establish the health and safety standards at work to protect the health of all workers".

Unified Text on Environment Legislation
BOOK IV ON ENVIRONMENT QUALITY

Attachment 4. Standard on Quality of Environment Air:

The current technical standard establishes:

The quality objectives of environment air. – The acceptable limits of critical polluters and nonconventional polluters in environment air. – The methods and procedures to determine polluters in the air.

1 Object

The current standard has as a main objective the preservation of people's health, the quality of the environment air, the wellbeing of ecosystems and the environment in general. To fulfill this objective, the standard establishes the maximum acceptable limits of polluters in the environment air at a ground level. The standard also provides methods and procedures aimed to determine the levels of polluters in the environment air.

Attachment 5. Maximum Acceptable Levels of Environment Noise for Fixed Sources and Vibrations

The current technical standard determines or establishes:

The acceptable levels of noise in the environment from fixed sources. The acceptable limits of emissions of noise from motor vehicles.

The acceptable values for vibration levels in buildings. The methods and procedures aimed to establish the levels of noise.

1 Object

The objective of the current standard is to preserve the health and wellbeing of people and the environment in general through the establishment of the maximum acceptable levels of noise. The standard also establishes the methods and procedures designated to control the levels of noise in the environment and the general dispositions regarding prevention and noise control.

4.1.1.8 Measures for prevention and mitigation of noise:

a) Industrial processes and machines which produce noise levels of 85 decibels A or higher, established in the work environment must be properly isolated in order to avoid transfer of vibration towards the exterior of the place. The operator or owner will evaluate the processes and machines and will have the proper isolation devises for vibrations depending on the cases.

Attachment 6. Environment Quality Standard for Handling and Final Disposition of Non-Hazardous Solid Waste

The current technical standard is given under the Law of Environment Management and the Regulation to the Law of Environment Management for the Prevention and Control of Environment Pollution and its guidelines, its application is mandatory and covers the entire national territory.

This standard establishes the criteria for the handling of non-hazardous solid wastes from their generation until their final disposition. The current Technical Standard does not regulate hazardous solid waste.

At a local level:

The Committee for Environment Management of Cuenca

On the web page of the Municipality of Cuenca states that this is a non centralized public agency of the Local Government, which manages, coordinates, leads the environment management and executes the competences of the Environment Authority for the Responsible Application within the Cuenca canton. The environment law of Cuenca:

- Reforms and codifies the laws for the Creation and Functioning of the Committee for Environment Management.
- Municipal Regulation for the application of an Evaluation Subsystem of Environmental Impact within the Jurisdiction of the Cuenca Canton.
- Ministry Agreement 068 Reforming the Unified Text of the Secondary Legislation on Book VI, Title I of the Unique System for Environment Management (SUMA).

The Committee for Environment Management and the Municipality of Cuenca have ordered the following Regulations and Guides for the different activities. Among them we find the Regulations for the Environmental License.

Municipal Regulations

- Municipal Regulation to control the environmental pollution caused by noise emissions.
- Municipal Regulation for the application of an evaluation subsystem for environmental impact, within the jurisdiction of the Cuenca canton.
- Municipal Regulation controlling the total handling of waste and solid residues within the Cuenca canton.

- Municipal Regulation controlling the management models for water and environmental cleaning within the Cuenca canton.

1.9 International Certifications

The International Certification Guide prepared by the Direction of Services of Integral Counseling for Exports (SAE) and the Institute of Promotion of Exports and Investments (PRO ECUADOR) states that certifications are the system established to identify a product with certain specific characteristics. There is a huge number of governmental, international and private agencies dedicated to these certifications.

Mandatory certifications verify that the product fulfill all the required standards to be exported.

According to the Ministry of Foreign Commerce, PRO ECUADOR and the Ministry of Non-renewable Natural Resources the mandatory requirements established by Ecuador to export products of metal and non-metal origin are four:

1. Have a mining license: register granted by the Vice Ministry of Mines.
2. Obtain the title of property and mining rights: Obtain a special permission for mining exports.
3. Sales license: This license is issued by the Vice Ministry of Mines and is valid for 3 years.
4. Register activities: Register on the Agency of Mining Regulation and Control (ARCOM) for purposes of statistics and control.

Voluntary certifications are those required by the purchaser which guarantee that a specific product or service fulfill the requirements of each country.

There are several certificates that must be obtained to be able to export a product depending on each country. To mention some examples of certifications and private stamps, the most important ones within the metal sector are *Ethical Trade Initiative* (ETI), OHSAS Occupational Health & Safety Advisory Services and ECOLABEL. (proecuador.gob.ec, International Certifications Guide section, para. 23)

- ETI: Innovative joint venture among companies, unions and voluntary organizations with the objective of improving the quality of life of poor and vulnerable workers around the world. (proecuador.gob.ec, International Certifications Guide section, para. 21)
- OHSAS: OHSAS:2007 this certification is for a management system for health and labor safety acknowledged worldwide, developed by a group of international certification agencies. (proecuador.gob.ec, International Certifications Guide section, para. 21)
- ECOLABEL: Ecological label from the European Union which helps identify products and services with a reduced environmental impact during their life cycle. (proecuador.gob.ec, International Certifications Guide section, para. 16)

Conclusions

This international organization is focused on several areas and the environmental standard is increasing in strength internationally. It has been mentioned that the benefits this standard would bring such as cost reduction, procedures and operations improvement. Obtaining the certification will help companies to improve their image nationally and internationally. The active participation of all employees of a company with the aim of providing information and creating a conscience for environmental care, and consequently, the benefits that the certification would bring is considered of vital importance. Many companies should take the initiative to implement this standard because this helps running a diagnostic on the current situation, to identify the mistakes that have been made, and to take positive actions. In this way, it contributes itself to the environment and improvement of its operations.

Before obtaining an international certification, it is important that Illco Factory verifies compliance with the legal laws of the city and country for proper operation and prevent future problems.

From an international perspective, there are many requirements required by government agencies that must be met before exporting a product with an Ecuadorian brand. These are the mandatory certifications while the voluntary ones

are those required by each country; this Guide of International Certifications issued by PRO ECUADOR and SAE is a potential tool to guide potential exporters in order to expand the market.

CHAPTER II

ILLCO FACTORY

The company analyzed in this research study will be Illco Factory, a company dedicated to the production of metal furniture that has existed in the city of Cuenca for several years. The purpose of this chapter is to provide an overview of Illco Factory and identify activities that have an impact on the environment. The required information will be collected through observation during visits to the company and surveys and interviews with the owners of the company: Engineer Patricio Pangol and his son Andres.

These interviews were intended to find out about the products offered, production process, history, mission, vision, values and organizational structure of the company, suppliers, customers, materials used for its products, etc. In this way, general information about this company was obtained. In addition to collecting this data, the aim was to also identify the environmental impact of the company. In order to achieve this, it was necessary to develop questions related to these factors.

2.1 Business Overview

The company was founded in 1984 by Engineer Patricio Pangol, who before creating this company was engaged in the field of safety equipment production and had the vision to create Illco Factory due to the absence of a supplier in Cuenca. He began the company activities with 4 workers, but over the years and its positive growth, saw the need to increase its staff to 10 workers both in plant and stores.

Through time, the company grew and its founder took the initiative to expand their operations. Today, there are three companies managed by the founder, Engineer Patricio Pangol and his son Andres. Multilineas and Tecnimadera are companies focused on the development of wooden office furniture products such as desks, workstations, sideboards, cabinets; Illco Factory offers metal products such as safes,

metal cabinets and chairs.

2.2 Mission, vision and values of the company

The mission and vision of the company are the following:

- Mission: “To become the leading company in the production and distribution of effective solutions for the industry in the area of safety equipment and office furniture, supported by professional partners, and a full technical service to customers of sales and after sales.”
- Vision: “Exceeding the expectations of our clients through professional and motivated employees with efficiency and effectiveness:”

    - ✓ With the quality of service we offer
    - ✓ With the products and services we sell

Values: their business values are:

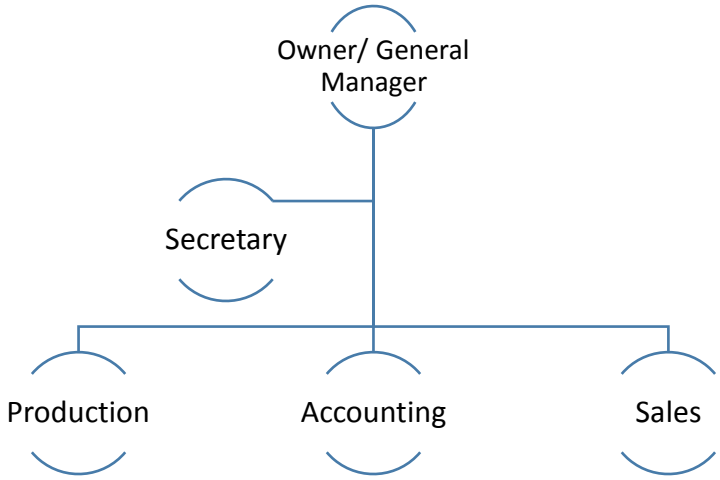
- Punctuality
- Honesty
- Responsibility and,
- Total Quality

2.3 General Objectives

Provide quality products
Provide training to employees
100% satisfy their customers

2.4 Structure of the Company

Graphic 2.1 Structure of the company



Source: Author

Illco Factory is organized as follows:

The three companies are led by the founder Engineer Patricio Pangol and his son Andres; the secretary is a general assistant and also she is in charge of customer support. The administrative offices are beside the factory. The plant is located in Rumiloma Street and Calle Vieja Street and has an area of two thousand square meters.

In this chart we can see that there are three areas: production, accounting and sales; each department is headed by one person. The first one is the production department, working with the staff in charge of design, product processing, monitoring, storage area, safety equipment area, and upholstery and furniture area. The second is the accounting department which is managed by one person, and finally, the sales department integrated by a salesperson. In addition to these three areas the company has a messenger and a driver.

It should be noted that in case of any unforeseen staff, management is responsible for taking the necessary decisions.

2.5 Products offered by the Company

Illco Factory is dedicated to the manufacture of metal products such as metal and armored cabinets, safes, vault doors and chairs, among some of its products and models are:

- Safes and vault doors
- Milano Chairs
- Saturno Chairs
- Metal Cabinet 4 Drawers

2.6 Suppliers and customers

For the development of its products, the factory has national and international suppliers who supply raw materials and other inputs. One of its main local suppliers is IPAC, a company that operates in countries such as Colombia, Peru, Chile and Ecuador; it is certified by INEN and ISO Quality and Environment; also the supplier called DIPAC, a national company with 28 years of experience in the market.

Due to the years of existence in the market, this company has a wide portfolio of clients who trust their quality and price. Within the group of customers are some banks, schools, universities and companies engaged in activities such as appliances, jewelry, beverages, car sales, etc. can be named.

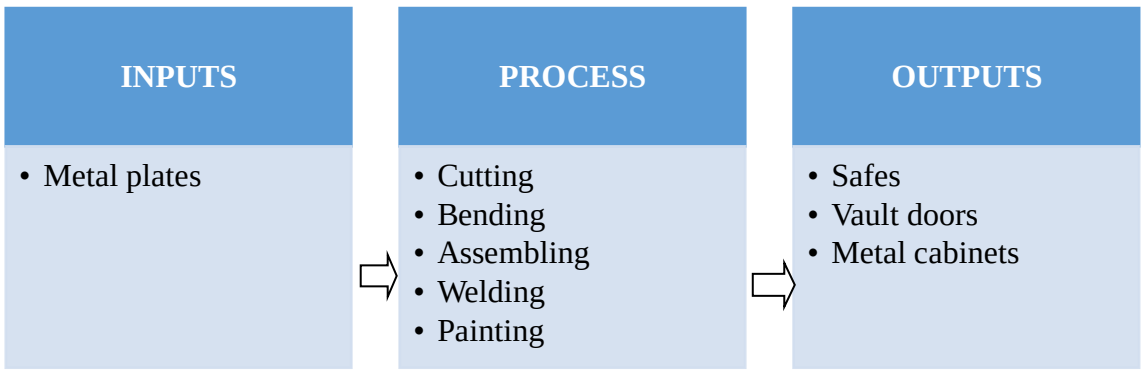
2.7 Production Process

Its production is based on work orders, this means that production is based on demand; this factory produces what is already sold.

2.7.1 Manufacturing process of safes, vaults doors and metal cabinets

In the following chart, the production process of safes, vault doors and metal filing cabinets will be discussed.

Graph 2.2 Flow chart of the Manufacturing process for safes and metal cabinets



Source: Author

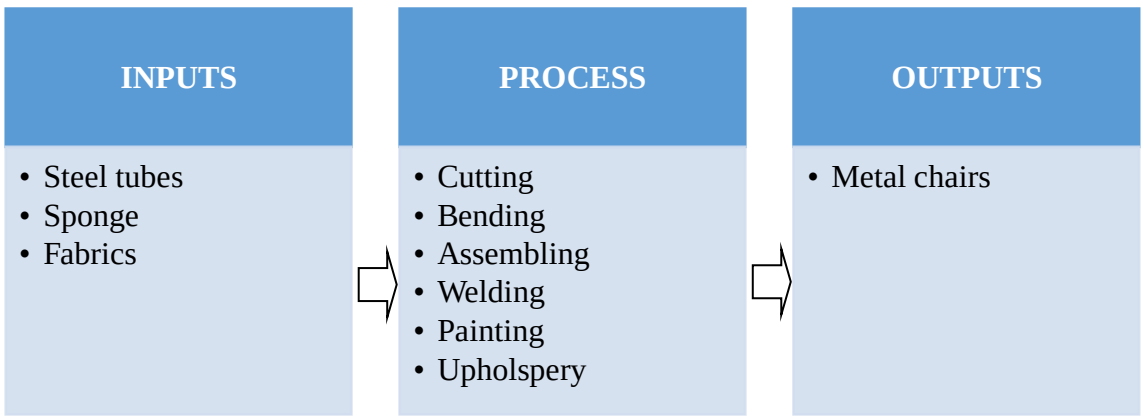
The main materials for producing these products are metal plates the measurement of which can be two millimeters, three millimeters and six millimeters. The thickness of the plates depends on the type of article that is required to produce. The 2 mm plates are used to embed safes for homes and offices; 3mm plates produce safes for the industrial area and 6mm are used to create vault doors. In addition to the plates, screws are used to seal the doors of the safes.

During the assembling process, steel is smelted; this operation involves subjecting this material to high temperatures within a mold made of concrete in order to shape it. Finally, the safety system is incorporated: the manual or electronic keys. The main factors to develop this product are the welding of the material and the security keys. The metal cabinets have the same procedure as safes production, with the exception of the smelting step.

2.7.2 Manufacturing process for chairs

The chairs are made of metal tubes; according to the type of chair the thickness of the material varies, the process of a chair is the following:

Graphic 3.2 Production Process Flow for chairs



Source: Author

There are two methods of painting. The electrostatic paint or powder paint process is carried out in special facilities that is a booth with electrostatic guns where the employee wears appropriate work clothing including gloves, mask and earmuffs. Then the item enters an oven at temperatures around 160 degrees Celsius to be "cooked". The second method is paint with an air compressor. The method used will depend on the finish desired by the customer. Granulated paint is used with an air compressor and smooth paint with an electrostatic system.

2.8 Storage of raw materials

In this area the products used in the production process are stored. The materials are controled by keeping a minimum and maximum stock level. It should be emphasized that the spare parts are also in this warehouse. This factory does not have a specific and defined inventory due to time and space; as mentioned above, this company produces what is already sold.

2.9 Stores

The company has two stores located in Cuenca. The first store is located in the Historic Center on Sucre Street between Hermano Miguel and Mariano Cueva, an area where you can find other stores dedicated to selling furniture. The second store is Tecnimadera located on Gil Ramirez Davalos Av. and Turuhuaico Av.; it is important to mention that Tecnimadera is a store and also a wooden furniture factory. These stores are strategically located for the convenience of clients.

2.10 Installation

During the interview Engineer Pangol mentioned that they have all the necessary facilities both for the production area and offices, but the factory is not automatic; it means that about 60% of its production process is developed manually. As indicated, the total area is 2000 m2 and Illco Factory and Multilineas have 900 m2 each plant.

2.11 Technology

Engineer Pangol indicated that they are not updated in terms of technology, but the factory is well informed and they work under a Spanish rule known as UNE - EN 1143-1: 2012 - "Security storage units. Requirements, classification and methods for testing resistance to theft. Part 1: Safes, ATM, doors and vaults". Engineer Pangol indicated that this standard establishes certain quality specifications for proper development of safes, for example, a safe should withstand two hours of electric drilling in order to know whether the product is being developed efficiently. On the official website of AENOR, in an extract of the above standard, it is indicated that this is a European standard that establishes the basis for testing and classifying safes, armored doors and armored cameras with or without doors, according to their theft resistance.

2.12 Control of public entities

In this interview, Engineer Pangol, mentioned that the Municipality of Cuenca, through their department of environmental management, inspects the factory once a year in order to check that the facilities and the operation of devices such as extractors, paint cab, air purifiers, noise control, meet the requirements of this public entity. The Municipality of Cuenca grants the permission for environmental management for these factories in order to operate correctly within the city. He also said that Social Security Administration is another entity that controls the activities of Illco Factory, but the company is primarily responsible for the safety of employees.

2. 13 Waste Control

Engineer Pangol pointed out they are aware of the importance of waste control. One of the main factors that might impact the environment is powder paint, the residues of which are reused in order to paint the products again; and they are painted in a closed cab to control the contact with external air. Production and administrative waste such as steel plates, batteries, paper, etc. are disposed correctly, for example, the steel plates are classified as scrap and are given to people dedicated to selling this kind of material; the batteries are disposed according to the requirements of EMAC - Empresa Pública Municipal de Aseo de Cuenca (Municipal Public Enterprise for Cleaning of Cuenca) and paper is reused.

2.14 Staff Training

Engineer Patricio Pangol expresses that staff receive courses given by Social Security Administration in order to take precautions when using products such as paint or glue; these courses are focused on industrial safety, not environmental safety. On the other hand, there is not an initiative of the company to give proper training or courses in order to create awareness in employees about the importance of the environment and the impact its products have on it.

2.15 Machinery Maintenance

Engineer Pangol indicated that maintenance is performed every six months; this is an easy process because most of their production processes are done manually. During the maintenance period, workers weld pieces when necessary or change parts such as rotors, rollers, grinders whose wastes are considered scrap.

2.16 The Environment and Illco Factory

Engineer Patricio Pangol commented they did not have an environmental impact study nor an environmental management system for its production process, but they were based on the Municipality of Cuenca requirements. On the other hand, his son Andres mentioned that they do not have policies, objectives, targets, handbooks or procedures that identify those activities that may cause an environmental impact and they are not updated on the environmental requirements of ISO. In terms of the Illco Factory staff, there is not a responsible person for environment or employees to provide information about the importance of operating correctly the machinery in order to minimize the environmental impact.

After the visit to the company and the survey made to the owners, it is considered important to mention the activities that can cause an environmental impact in Illco Factory.

2.16.1 Management Area

Infrastructure

The Illco Offices are located on the side of the plant and cover a small area. In a separate area the General Manager office is located, and in the other side there are 3 additional offices for engineer Andres Pangol, the salesperson and the assistant manager. In the illustration below the current status of the offices can be seen.

Ilustration 2 .1.- Offices

Source: Author

The offices require order and organization to create an enabling environment for work. It can be seen there are machines and tools that can obstruct the passage or cause tripping.

Generation of waste

The offices do not have trash cans to help classify the waste correctly whether caused by administrative activities or waste caused by their employees.

Invoicing

Work orders and quotes are not printed documents, but the final bills are. Currently, the Internal Revenue Service (SRI in Spanish) has implemented an electronic invoicing system. According to the SRI website, the electronic invoice is a digital document and replaces paper invoices in order to guarantee the authenticity of their origin and tax truthfulness. (Sri.gob.ec, e-vouchers section, para. 1). This new method has been implemented by several companies in Ecuador, and must be applied by the factory to reduce the printing processes which ends reducing costs and wastes.

2.16.2 Production Area

Water consumption

Water is an element used in production activities in a non-regular manner, so it is not an essential factor in the environmental management system. This resource is mainly used for bathing, workers' hygiene and cleaning of the plant. After visiting the

factory, it was found that water is not a resource used in the production process. In the illustration below you can see the rain water canal, which is significantly damaged.

Ilustration 2.2.- Rain Water Canal

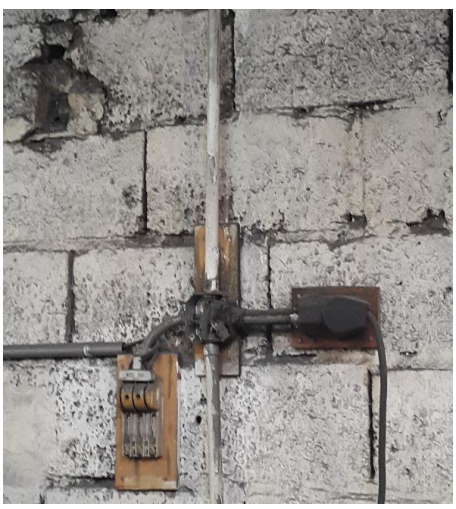
Source: Author

The rain canal is saturated with fungus and trash which can cause clogging drains resulting in flooding.

Electricity consumption

Electricity is a resource considerably used in the production process, mainly in the welding area. In the following illustrations, the current status of some of the electrical installations in Illco Factory can be seen:

Illustration 2.3.- Distribution box



Source: Author

Illustration 2.4.- Plates

Source: Author

The illustrations show that they are not in good condition and can cause energy leaks and accidents.

Infrastructure and plant layout

Illco Factory infrastructure is about 30 years old and most likely needs repairs and restorations. The current situation can be seen in the following illustrations:

Ilustración 2.5.- Outside Plant

Source: Author

Ilustración 2.6.- Assembling Area

Source: Author

The first illustration shows that there are materials outside the plant. The Multilineas plants and Illco are located in the same piece of land, but it is not correct to mix up products from both lines, neither of them have the materials on the outside as they can be contaminated and damaged. In the second illustration a worker doing his job can be seen, he is treading tubes making chairs.

Raw material of safes and metal cabinets

Steel is the main material for the manufacture of safes, vault doors and metal cabinets. This steel is known as ASTM A36, which is purchased from national suppliers. Engineer Gabriela Pangol, daughter of the owner of Illco Factory mentioned that this type of steel is the most common for construction and manufacturing of these products due to its low cost in the market and also because it offers excellent resistance and strength despite being a low carbon steel and alloy,

but prone to rust. This steel is composed of 98% to 99% iron, 0.18% carbon, 0.2% copper and between 0.8% and 0.9% manganese in order to increase strength and endurance; besides minimum percentages of phosphorus (0.04% maximum) and sulfur (0.05% maximum); This steel is easy to weld, as such, it is used in Illco Factory for the manufacturing of its products. This material is most suitable, because their larger composition is iron and its additional components such as phosphorus, sulfur, carbon, copper and manganese are minimal, whereas the A36 is an ideal material for their products with less impact on the environment.

Illustration 2.7.- Safes

Source: Author

Raw material of chairs

The main elements used for chairs are metal tubes, textiles and sponge; this chair making area is located on the second floor. One of the materials used is contact cement used when gluing the fabric to the sponge. The workers do not wear masks to avoid breathing the gases emitted by this glue, additionally the area does not have extractors, fans or air purifiers. It is noteworthy that the glue is used approximately once a year as indicated by engineer Pangol, this material is used for gluing wood to formica.

Suppliers' company

The main suppliers of steel plates and metal tubes are Commercial Zonametal and DIPAC. Through consultation with Commercial Zonametal the prices for steel plates were obtained:

- 2mm Thickness: $ 45.00
- 3mm Thickness: $ 77.30
- 6mm Thickness: $ 150.00

DIPAC does not have any certificate despite being a company located in Chile and Ecuador according to information provided by Gissella Zambrano, sales executive of the company; and finally a company called Aluminox located in the city of Cuenca which does not have any certifications either.

Equipment

Machinery used in Illco Factory does not generate any significant impact on the environment. However, cutting and bending steel plate machines are tools that do not need electricity, do not generate dust and emissions, but generate scrap.

There are two methods used to weld products in the plant:

- Electric welding equipment to weld heavy pieces like angles.
- MIG (Metal Inert Gas) welding used to weld parts used such as metallic cabinets.

The welding machine called MIG works with electric energy and CO2, a process based on gas where no slag is created (a layer that is formed when welding), and few pollutants and toxic gases are emitted. In this area it was possible to see that they do not have the necessary facilities such as ventilation, air purifiers or extractors.

In the following illustrations the welding and cutting area in the conditions in which they are working these days can be seen.

Illustration 2.8.- Welding area

Source: Author

Illustration 2.9.- Cutting machine

Source: Author

Another machine that generates a negative impact on environment is the iron polisher, in the following illustration it can be seen that it leaves residue when polishing, which is scattered throughout the machine and polishing area.

Illustration 2.10 Polishing area

Source: Author

This machine is used for making safe handles. When steel is polished, it generates waste that can be harmful to the environment and health of employees.

Personnel

Illco Factory has 10 employees for the administration and production area. It has been seen through the illustrations in this chapter that employees do not wear safety equipment, such as masks, ear plugs, steel toed shoes, gloves and belts for the back. When loading heavy boxes, workers do not wear personal protections and sometimes they have minor accidents affecting their hands. Additionally, some waste plastic

bottles were observed in areas where employees work, due to the lack of trash cans on the ground.

Manufacturing process

During the production process of safes, vault doors, and metal cabinets, some aspects that impact the environment were identified.

During the process of cutting and bending, scrap is generated. This element needs to be placed in a specific area and then be delivered or sold to the person who processes this scrap.

Building the safes and vault doors, the semi finished products are placed in concrete in order to acquire the desired shape; unfortunately, a foundry was not possible to see as one of the workers mentioned that this is done in periods of 8 days. Furthermore, it was observed that the concrete does not have an accurate place and there is no space assigned to execute this task.

The following illustration shows where the concrete is placed.

Illustration 2.11 Concrete

Source: Author

The concrete is in the polishing area, and in the illustration it can be seen that a package is open; this situation causes the powder to be dispersed in the air that is harmful to the environment and health of employees.

The painting area is one of the areas that can generate greater negative impact on the environment, but can be responsibly controlled. During the visit to the factory, some practices were not performed correctly, for example, the booth where the electrostatic painting was done had the door open; and painting with air compressor did not have a specific workplace.

During the fabrication of chairs, the upholstery area is saturated with waste from fabrics and sponges and when using contact cement employees do not wear masks.

Floor

The ground surface is formed by a casting of cement, which can result in accumulations of dust and liquid wastes causing possible inconvenience when people are working.

Noise

There are two machines that cause high noise in the plant. The first one is the polishing machine used for making handles for the safes and vault doors; and secondly, the air compressor used for activities related to painting.

Ilustration 2.12 Air Compressor

Source: Author

The air compressor is located on the outside of the plant causing noise for both people in the offices and houses close to it. Furthermore, it appears that the company has sound insulation, but the acoustic sponges need to be changed.

According to the World Health Organization, the recommended volume sound should not exceed 85 dB with a maximum of 8 hours. Staff at the plant operates with noise up to 90 dB according to information provided by the engineer Pangol when using the above mentioned machines.

Source: World Health Organization

Waste management and scrap

There are many areas with elements that are no longer used that have remained immobile for a considerable time; they are even covered in dust. In the illustration below can be appreciated the above mentioned.

Ilustration 2.13 Scrap

Source: Author

Delivery

The environmental impact generated in the process of delivering the orders to customers is minimal. Actually, for packing, employees use the same packaging of raw materials; this means that this type of cardboard is reused. In addition, the company owns a truck to make deliveries to customers, this transport can have a negative impact on the environment from the emission of gases into the atmosphere as well as fuel consumption, but also irrelevant as they have only one unit.

Conclusions

Illco Factory is a company within a group of factories dedicated to wood and metal furniture manufacturing. It can be said that it is a small company dedicated to the development of three products that are mainly safes, within this group can be considered vault doors, and also metal cabinets and chairs.

Having obtained the information from the managers, Engineer Patricio and Andres Pangol, it can be concluded that the company works according to the Municipality of Cuenca requirements in order to obtain the Environmental Permit and correct observations and changes needed. This company has not tried to implement or get an International Standard ISO, specifically the one that is studied at this moment, ISO 14001: 2004.

As mentioned above, Illco Factory does not have policies, manuals, objectives, environmental targets and specialized staff in this field; it is necessary that the

factory considers the importance that implementing ISO 14001: 2004 could have. After the visit to the company, there are areas and activities that have an impact on the environment due to improper practices the ones with small changes and actions can be controlled positively.

CHAPTER III

Implementation Plan for ISO 14001:2004 ENVIRONMENTAL MANAGEMENT

The development of this chapter seeks to design and present an environmental management system. According to ISO 14001:2004, every requirement needed for its compliance must be applied. The requirements of this standard are indicated in the ISO document known as "International Standard ISO environmental systems management -Requirements with training for its use." Factors such as environmental policy, planning, implementation and operation, verification and revision by management will be developed throughout this chapter.

3.1 General Aspects

As mentioned previously ISO 14001: 2004, focuses on establishing necessary requirements in order for a company to have an environmental management system. This system does not necessarily seek to eliminate or reduce aspects which impact the environment in a negative way; however, it is possible that the implementation processes develop practices that help to systematically decrease the environmental impact. Certain company activities can be improved with the purpose of achieving its environmental goals and objectives, but it is important to keep in mind the cost-beneficial relationship, in other words techniques that reduce the environmental impact but that do not affect company finances.

3.2 Preliminary Environmental Evaluation

During an interview made with the owner of the factory, it was explained that the company does not have an environmental management system at the present time nor has it conducted an environmental impact study; it is therefore proposed that the

company conducts a Preliminary Environmental Evaluation considering the following aspects:

3.2.1 The Legislation of Ecuador

In addition to complying with environmental regulations required by the Municipality of Cuenca, it is necessary that Illco Factory updates its practices according to the guidelines of the environmental security legislation of Ecuador, in order to fulfill all the legal requirements and avoid possible drawbacks during factory operation.

3.2.2 Use of Electric energy

Considering that Illco Factory has operated for many years in the same location, it is deemed appropriate that an inspection of the electrical installations has been conducted with the purpose of identifying aspects that can be improved; such as the distribution system, electrical structure, production devices, etc. to take advantage of the use of this resource avoiding the existence of an electrical leak and the occurrence of possible accidents, in addition it will help saving money and minimizing environmental impacts.

3.2.3 Consumption of Drinking Water

Drinking water is a resource consumed primarily for the cleanliness of the plant, employees' hygiene and bathroom maintenance; in other words, water is not a primary factor in the productive process, Management should consider the construction of water reserve tanks with the purpose of optimizing the use of this resource as long as the result is economically viable. Additionally, it is advisable that the installations of drinking water are inspected with the purpose of determining whether a new pipeline or drainage installations are necessary in order to prevent leakages or waste.

3.2.4 Atmospheric Emissions

The primary factor that can cause this type of contamination is the Painting Operation. There are two methods in use. The first, mentioned in chapter II, is Electrostatic Painting, a powder paint that coats the entire product that is later deposited into a metal oven in order for the powder to convert to liquid and adhere to the product. The second method uses an air gun that is connected to a compressor. This procedure is executed in an adequate, ventilated place, while the previous method is executed in a secluded place in a painting cabin.

3.2.5 Ground

The surface of Illco Factory is constructed with two different materials: cement in the branch of operations and ceramic in the offices. These surfaces are subjected to residue accumulation, bacteria and waste, therefore continual sanitation is necessary to avoid proliferation of bacteria. In addition, the use of an antiskid floor and trap solid and liquid waste will contribute to a better cleaning of the place.

3.2.6 Noise

In an interview made with Engineer Pangol it was determined that noise is the main cause of constant complaints from people living in the vicinity of the factory. For this reason the company has an acoustic sponge in order to alienate the noise and avoid this inconvenience. Additionally, it has been found that this factor is caused primarily by the use of compressors. This machine is located outside the factory causing noise levels of 90 decibels approximately.

3.2.7 Administrative Office Area and Administrative Procedures

Offices are located in the lateral sector of the production plant, consequently affected by noise directly. Employees' workplace should be situated in a pleasant and quiet

environment; one in which work functions can be executed properly providing added space for recycling and garbage bins. The executive assistant is responsible for creating electronic quotes which are delivered to clients via email; it is also the responsibility of the assistant to print out invoices. In order to minimize the consumption of paper, the last action can be done electronically and printing out only what is necessary.

3.2.8 Receipt of Raw Materials

The factory operates under work orders, keeping very little inventory, therefore its warehouse contains only what is strictly required for each lot of production; this means that Illco Factory produces only what has already been sold.

3.2.9 Production Process

The company must identify resources and raw materials used in the process and the factors that cause an impact on the environment is determined.

3.2.10 Management and Disposal of Waste

Steel waste and pieces of machinery that have served their purpose are considered scrap; therefore it should be sold or given away to a scrap dealer. The paper used in offices is recycled and later disposed in garbage bins; all waste should be classified according to EMAC's regulations and given to garbage collectors according to a factory schedule.

3.2.11 Categorization of Impacts

Illco Factory has not yet identified procedures or activities that cause an impact on the environment. This categorization could be based on the knowledge and experience of people specialized in this field and could help this company:

- Irrelevant Impact: Damage to resources with immediate recovery or low intensity impact.
- Moderate impact: Damage to resources with possible mid-term recovery, in other words, low intensity impact.
- Severe Impact: Damage to resources with medium-term recovery or significant environmental impact.
- Critical Impact: High intensity loss impact with no possibility of recovery.

3.2.12 Risk Management

The factory must consider the development of instructional material in order to act properly upon emergency situations and identify security zones; instructional material for emergency care and implementation of alert systems must also be developed.

3.3 Environmental Management Manual-ISO 14001:2004

Points to be taken into account will be raised so that Illco can consider the option of getting an ISO 14001:2004 certification.

3.3.1 Objective

This manual attempts to describe the characteristics and conditions under which Illco Factory operates, the aim is to comply with ISO 14001-2004 requirements.

3.3.2 Scope

Before specifying the scope of this manual it must be stressed that this point was defined during the interview with engineer Pangol and the visit to the company; that is, the factors set out in Chapter II.

It seeks to minimize or reduce environmental impact caused by the production activities at Illco Factory in order to implement an EMS. The aspects that will be analyzed are:

- Improper use of materials and tools used in the production process
- Generation of waste
- Scrap
- Noise
- Failure to use work clothes for workers

These factors can vary based on changes that occur in the environment and the company.

3.4 Environmental Management System Requirements

The organization must establish, document, implement, maintain and continually improve the environmental management system in accordance to International ISO Standard requirements. (International Standard ISO 14001, 4.1 General Requirements section, para. 5)

3.5 Environmental Policy

Illco Factory has no environmental policy, which is why its definition is important. The following is proposed as an environmental policy for Illco Factory:

"Illco Factory, a company dedicated to the manufacturing of metal products guarantees the quality of its products and as a strategic factor ensures respect for the environment in all its activities. The purpose of the company is to minimize the environmental impact based on the continuous improvement and the fulfillment of the environmental legal requirements."

To do so it is necessary to consider the following:

- Maximize the use of resources and tools used in the production process to minimize the environmental impact they cause.
- Dispose of waste and scrap as required by government agencies.
- Minimize noise caused during the production process.

- Train and educate all staff of the company in the field of environment.

This policy should be understood by all the staff of Illco Factory and will be available to anyone interested in becoming familiar with it.

Management is responsible for reviewing this policy annually and updating it if necessary in accordance to its activities, environmental impact and general strategy of Illco Factory.

3.6 Plan

3.6.1 Environmental Aspects

Objective

Define a procedure to identify environmental aspects that can occur in the company.

Scope

It applies to the activities of the company that generate an impact on the environment.

Procedure to identify these environmental aspects

The situation of the company can be changed, this procedure should be updated once a year. The method for identifying new environmental aspects is as follows:

- Those responsible for the environment area use two methods to identify these aspects: arrange meetings between all staff of the company and observe the daily activities of the employees.
- Identify the environmental aspects observed or obtained in each meeting.
- Make a list of all environmental aspects that were identified.
- Those responsible will classify this list on significant or insignificant environmental aspects.
- Approve the list of identification of the environmental aspects.
- Communicate to all staff of the factory

Procedure to identify significant environmental aspects:

To identify the significant environmental aspects will depend on the knowledge and experience of the people who are involved the company. Additionally, the level of damage to the environment, air emissions, water discharges, waste management, soil contamination, use of resources in the production process and other issues depends on the judgment of those responsible for environmental area should be considered.

3.6.2 Legal requirements and other requirements

Objective

Determine a process for identifying environmental and legal requirements related to the operation of Illco Factory.

Scope

Applies to local and national requirements related to environmental aspects of Illco Factory.

Identification of legal requirements

This process is created in order to help Illco Factory meets the environmental legal requirements issued by public entities and local laws related to environmental legal compliance, keeping them updated and documented. This is understood as legal requirements issued by public entities and Ecuadorian norms that refer to environmental legal compliance, among these could be mentioned:

- Ecuadorian Legislation
- National and international regulations
- Official Decrees
- National or international treaties and conventions
- Permits and licenses
- Environmental Policies

In addition, Illco Factory is required to meet the following:

- Agreements with private or non-governmental organizations
- Agreements with suppliers and contractors
- Agreements with customers
- Codes of conduct
- Local requirements

Process of identifying legal requirements

It is essential that a company has knowledge and access to environmental requirements that need to be met for its operation. For this reason, it is necessary to establish a process to identify and implement these requirements.

- In case of any new requirements or modifications, management should be informed and updated.
- Analyze if the new or updated legal requirement applies to the company.
- Identify the activity or process that would be affected.
- Name the person or the team in charge of implementing the new or updated legal requirement.
- Implement the new requirement.
- Communicate the implications of this implementation to the internal clients. If required, it should be also communicate to external clients.
- Monitor the update to ensure that it is met by all employees.
- Non-compliances and the nonconformities should be corrected with a warning or corrective measure.

Table 3.1 Process for the compliance of legal requirements

Date of Application	Issuing Authority	Environmental policy	Responsible	Applied Area	Obligations to comply	Follow up date	Complied? Yes or No?	Corrective action

Source: Author

3.6.3 Objectives, goals and programs

Objective

Establish goals enabling the company to implement an efficient environmental management system.

Scope

Applies to the items detailed in the scope of this manual.

The following table detailing the environmental policies, objectives and goals of the Illco Factory.

Table 3.2 Objectives, goals and programs

SCOPE: improper use of materials and tools used in the production process							
Objective	**Goal**	**Indicator**	**Frecuency**	**Responsible**	**Short and long term actions**	**Term**	**Result**
Optimize energy consumption	Reduce by 30% of electricity consumption in the first year	Monthly review of the forms of electricity	3 months	Owner or environmental chief	Use savers or motion sensors spotlights	6 months	In this field it indicates in % the fulfillment or not.
					Purchase of Energy-saving machinery	2 years	
					Have new electrical installations	1 year	
Redistribute the plant according to the needs of the production process	Implement the thought: "everything in its place and a place for everything" immediately	Observe and check that there are not elements out of place	3 months	All staff in their respective jobs	Post signs in strategic areas	Inmediate	
	Restore the infrastructure of the plant within five years	Ensure that the infrastructure has been restructured by the deadline.	Once done during the reconstructión	Owner	Hiring an architect for the restoration and installation of these elements	5 years	
					Install fans, air purifiers and extractors	1 year	
	Reduce 40% of unused áreas	Identify all unused areas and determine those to be renovated	6 months	Owner or environmental chief	Organize cleaning committees	1 year	
	Relocate the concrete used for melting within a year	Identify the área intended to place this material	6 months	Owner or environmental chief	Find an area to this material and seal the product once opened	1 year	
Select suppliers with environmental awareness	Increase with 30% with suppliers that have environmental certifications and reduce the same % to those without	Analyze the portfolio of suppliers and identify those who have certifications	1 year	Owner	Look for in the market this kind of suppliers	2 years	

Improve the painting process of the products	Reduce the 30% of contamination because of the painting	Use indicators or professionals specialized in this field	1 year	Owner	Find an area for painting and opérate with materials that are friendly to the environment	2 years	
SCOPE: Generation of waste and scrap							
Improve the management system of waste and scrap	Reduce the 50% of waste and scrap which has been on the ground for several years	Identify the total amount of this material in tons or pounds	4 monthsc	Owner and environmental chief	Sale or give away all the scrap	6 months	In this field it indicates in % the fulfillment or not
					Dispose of waste according the the EMAC requirements	6 months	
					Put trash cans	Inmediate	
					Hire a cleaning Company	1 year	
SCOPE: Noise							
Minimize the noise caused in the plant	Operate under the maximum levels allowed by the WTO and TULAS (85 dB)	Decibels measured with special equipment or outsourcing for this measurement	1 year	Owner	Renew acoustic sponges	1 year	In this field it indicates in % the fulfillment or not
					Enclose the machines that cause noise or relocate a specific area to activities that cause noise	6 months	
					Purchase machines that minimize noise	3 years	
					Use hearing protectors	Inmediate	
SCOPE: Failure to use work clothes for workers							
Provide staff the clothing and industrial safety	Operate the 100% of the workers with appropiate cloth and industrial safety	Daily visual check to know that the staff is using the cloth and safety equipment	4 months	Owner or environment chief	Look for suppliers that offer this kind of products	Inmediate	In this field it indicates in % the fulfillment or not

Source: Author

3.6.4 Implementation and operation

3.6.4.1 Resources, Roles, Responsibility and Authority

Objective

Identify those responsible and their functions in the Environmental Management System.

Scope

Applies to all member of Illco staff.

General Considerations

Illco Factory ensures the availability of resources to establish, implement, maintain and improve the Environmental Management System. These include human resources and specialized skills, infrastructure, and financial and technological resources.

- Human resources and specialized skills: Train personnel to be responsible for this area.
- Organizational infrastructure: Reorganize the plant to optimize the use of space, relocating production areas and materials that do not have a specific place, eliminating waste and unused items.
- Financial resources: investment made by owners of Illco Factory.
- Technological resources: implementation of a system for waste control during the production process.

EMS representatives must fulfill the following functions:

- Ensure that the EMS is met as it was established.
- Keep management informed on the operation of EMS.

- Ensure that continuous improvement is applied to EMS.
- Ensure that daily activities and production processes meet environmental regulatory requirements.
- Daily control of all activities are carried out as required.
- Take corrective measures in case of non-conformities.
- Create awareness and environmental awareness throughout the company.
- Conduct internal audits in the established periods.

Illco Factory will have one or more representatives for the EMS, or the owners, depending on time and monetary resources, but it is essential to delegate responsibilities at all levels of the company so that employees are committed to respecting and protecting the environment.

The authority within this area will be the owner of the company.

3.6.4.2 Competence, training and awareness

Objective

Identify training needs, education and awareness workshops for the staff of Illco Factory.

Scope

Applies to all administrative and productive staff whose activities may generate an environmental impact.

General Considerations

The training required for the personnel on environmental issues should be identified in administrative and production processes. Among the issues to be addressed the following can be found, emphasizing that these can be changed or increased:

- Waste management from production and administrative areas.
- Casting of safes and vault doors.
- Metallic products painting process.
- Noise generation.

Those responsible for the EMS should know the areas and activities that create an impact on the environment, and must be advised by institutions that provide training and education on topics related to this subject. Once the topics or classes to be taken have been identified, the number of people taking those classes should be defined. Finally, a report of the activities that must be changed to minimize the environmental impact should be issued.

Among training these options should be considered:

Sensitization: the awareness of the environment and its preservation in all employees is responsibility of the owners. Everyone should be aware and responsible in their daily activities.

Training and professional education: Train the staff with courses related to the environment. If there are any human resources who do not have significant influence on the environmental impact, they must receive general training for the purpose of generating responsibility and commitment and those who have influence should receive specific and specialized training.

Activities within the company: inform employees about this manual and the EMS, the environmental aspects identified, their functions and responsibilities for a correct EMS and the consequences in case of non-compliance.

Procedure

- Identify the company's requirements
- Organize these requirements according to importance or urgency

- Define objectives of capacitation, this must be clear and measured in order to know if they can fulfill the results
- Look for capacitation according to the objectives
- Execute the capacitation program
- Evaluate results

3.6.4.3 Communication

Objective

Establish an adequate communication system for all the staff in order to accomplish an efficient environmental management system.

Scope

Applies to all the administrative and operative personnel.

General considerations

One of the most useful tools for the administrative area is email. Through this tool the current situation of every office will be communicated. Also the following should be considered:

Internal communication by:

- Monthly meetings
- Team work
- Information boards in strategic areas
- Weekly or monthly newsletters

After each work meeting, a minute detailing all the addressed issues should be elaborated. It must include the identified problems and the corrective actions or decisions. These meetings will be scheduled depending on the needs of the company.

The flow of internal communication would be as follows:

- Those responsible will receive the external message.
- This message is analyzed and the final decision is made and latter communicated to staff.
- The decision is executed.
- The decision is documented.

External Communication:

The management or representatives of the environmental area have the responsibility to communicate their suppliers, contractors and external customers about any changes. The means to be used for this matter will be email or official letters.

Employee Involvement:

The personnel of Illco Factory will be involved in identifying and assessing hazards associated with routine and non-routine activities. These records will be retained for a period of two years after which they will be reviewed and updated. The personnel will be expected to participate in the investigation of incidents, the development and review of policies, etc.

3.6.4.4 Documentation

Objective

Document and keep the EMS updated.

Scope

Applies to documents and records related to the environmental management system.

General Considerations

This process is focused on documenting all records of the environmental management system electronically or physically. As the operating personnel do not have a computer, the EMS will be physically documented including all the changes. The documentation shall register the EMS described in this manual plus the following:

- Statement of policy, objectives and goals.
- Documentation of ISO 14001: 2004 and OHSAS 18001: 2007.
- Documentation determined by Illco Factory.
- Municipality of Cuenca Permits to be fulfilled
- Internal and external procedures and standards

3.6.4.5 Document Control

Objective

Establish a procedure for proper control of EMS documents

Scope

Applies to all documents generated in this EMS.

Procedure to control these documents

Production of documents: any activity or procedure to be documented must fulfill a format defined by the company and be enumerated. This control could be done under a computer system like a Word document.

Review and approval of documents: note that the documents are described according to the guidelines of this manual and make sure they are in line with the actual practices of each procedure. This document is intended for the person responsible for their approval.

Documentation Changes: before the need for changes to the documentation they must be reviewed and approved by those responsible for the environmental management system and document each update indicating the date and reasons for the change.

Final approval and publication of documents: the head is responsible for the approval and signature of the owner of the company and finally publish on the web or intranet of Illco Factory.

3.6.4.6 Operational Control

Objective

Control the environmental aspects identified in the manual of environmental management system.

Scope

Applied to environmental issues analyzed in this manual.

General considerations

The environmental aspects identified in Table of Objectives, Goals and Programs specify the activities and procedures that have an impact on the environment and the recommendations to be taken. Each activity must be planned to assure that it operates effectively, for this document procedures and operations of the administrative and production departments should be prepared.

Below are the steps to fulfill the operational control:

- Identify the significant environmental aspects in the productive process
- Document the operational process
- Control documents for procedures, instructions, manuals and the environmental management system

- Ensure controls, for this purpose operations will be regularly evaluated to make sure they were done and performed as agreed. Registering nonconformities if there are any.

This operational control should guarantee:

- Accomplishment of the environmental laws
- Accomplishment of the environmental policy
- Continuous improvement
- Minimize the impact on the environment

3.6.4.7 Preparation and emergency response

Objective

Have a contingency plan for immediate emergency response

Scope

Applies to all emergencies that arise in Illco Factory

General considerations

The development of a contingency and risk plan for emergencies is recommended. This plan mainly seeks to deal with emergencies, accidents and extreme measures in case of an earthquake, flood, fire, explosion and general emergencies as bruises, cuts, etc.; the management is responsible for installing and maintaining the alarm systems and fire extinguishers that are considered in the plan.

This is a small factory, so it is suggested that consideration be given to the option of creating squads integrated by two persons from the personnel, whom must be trained for emergency response. Each group should act within the following steps:

Fire Squad:

- Use of firefighting equipment (portable fire extinguishers)
- Be trained to react immediately

- Inform the company about the use of emergency alarms

First Aid Squad:

- Know the location of first aid kits and keep them properly
- Provide first aid in case of accidents
- Transport injured personal to nearby health centers
- Be trained and aware at all times

Evacuation Squad

- Recognize the safe areas, risk zones and evacuation routes
- Evacuate staff
- Be trained to deal with emergencies
- Dispose of an emergency exit

Squad for leaks and spills

- Adopt appropriate measures to fight leaks or spills
- Report actions taken by the Fire Department when they arrive and collaborate with them if necessary.

3.6.5 Verification

3.6.5.1 Monitoring and measurement

Objective

Implement procedures to monitor and measure operations or activities that generate a significant impact on the environment.

Scope

Applies to all operations of Illco Factory that generate a significant impact on the environment.

General considerations

The activities that have an impact on the environment are registered in this manual in the Table of objectives, goals and programs. The goals defined in this manual will be the main parameter to measure and monitor environmental considerations.

3.6.5.2 Evaluation of compliance

Objective

Implement a procedure to periodically evaluate the fulfillment of the environmental legislation.

Scope

Applies to the activities and operations that must be accomplished within the environmental legislation.

Procedure definition

The procedure to verify legal compliance will be:

- The management will be responsible for maintaining copies of environmental requirements and regulations that the company must fulfill, as well as maintaining an active communication with the public entities of the environmental area in order to stay updated.
- The management and the responsible party will carry out an annual internal audit to identify if EMS is fulfilled or if there is any non conformities.
- This evaluation will be done by an internal auditor within a scope defined in this paragraph and a report will be issued specifying the results. These records should be handled according to the control requirements of this manual.
- The management or auditors should communicate legal changes if they exist through meetings or printed documents.

3.6.5.3 Nonconformity, corrective and preventive actions

Objective

Identify nonconformities, implement corrective and preventive actions, record and review the results.

Scope

Applies to non-conformities identified in Illco Factory.

Procedure

The management and responsible parties of the environmental management system will define procedures, identify nonconformities, implement corrective and preventive actions, modify the procedure if necessary and record and review the results.

To identify a non-conformity, Illco Factory might consider the following factors:

- Non-fulfillment of environmental policy
- Deviations of environmental objectives and targets
- Non-fulfillment of environmental legal requirements
- Light or severe national or international standards fouls.

The procedure to be fulfilled is the following:

- Plan internal audits, to do this, the requirement of internal audits should be accomplished as specified in this manual.
- Identify an existent or possible non-conformity
- Analyze the probable or real nonconformity
- Identify and define preventive or corrective actions
- Apply actions
- Analyze if the actions taken are effective
- Document results
- Approve and document actions
- Communicate with the whole staff

3.6.5.4 Control of records

Objective

Establish and implement a procedure for the control of records.

Scope

Applies to all records related to the environmental system of Illco Factory.

Procedure

The procedure of this requirement is the following:

• Create records: All actions, procedures, manuals, changes, incidents, emergency notifications, implementations and environmental approvals must be registered.

• Protection of records: Records must be kept in a safe place either in physical or electronic media.

• Maintain or delete records: Define an appropriated time to demonstrate the effectiveness of the EMS.

Management and the responsible party of the environmental management system will take full responsibility for this requirement.

3.6.5.5 Internal Audit

Objective

Define and implement a procedure for conducting internal audits of the environmental management system.

Scope

Applies to all areas and activities involving a potential impact on the environment and are capable of being audited.

Procedure

The party responsible for leading internal audits will be the management and representatives of the environmental area of the company. These audits must determine if the EMS requirements are being accomplished and if this system is effective. The audit procedure is the following:

- Define the area to be audited.
- Form the audit team
- Study records: before starting the audit, the team must know the procedures, documents and records of the area to be analyzed.
- Perform the audit: interviews, document review, activities, evaluation of facilities, etc., this means using all methods for effective internal evaluation.
- Close the audit: record the results and identify nonconformities in case of existence.
- Communicate to staff the results of the audit.

3.6.6 Management review

Objective

Periodic management review of the EMS

Scope

It applies to all environmental management system of Illco Factory.

General Considerations

During the preparation of this manual, the participation of the management to ensure and guarantee an effective EMS, according to the environmental policy of the company must be considered. It is the management's responsibility to participate in the development of all EMS procedures identifying and ensuring the accomplishment of requirements of International Standard ISO 14001: 2004. To fulfill these standard

requirements, annual meetings will be organized. These reviews should be documented and modified if there are any changes in the policy and the EMS.

Aspects to be considered in the review by the management are those described in the manual ISO 14001:2004 requirements with guidance for use:

a) The results of internal audits and evaluations of compliance with legal requirements and other requirements to which the organization subscribes.

b) Communications from external interested parties, including complaints.

c) The environmental performance of the organization

d) The degree of compliance with the goals and objectives

e) The status of corrective and preventive actions

f) The follow-up actions resulting from previous reviews conducted by management;

g) Changing circumstances, including developments in legal and other requirements related to its environmental aspects requirements; and

h) Recommendations for improvement. (2004)

3.7 Obtaining the certification ISO 14001:2004

After the consultation with one of the accredited certification bodies: Bureau Veritas Ecuador S.A., specifies the following:

Procedure to achieve certification

1. The company must have the EMS implemented
2. Once the EMS implemented, it means with the documents required by the norm such as the quality manual, documents and records, it can begin the certification.
3. Once accepted the offer, it starts the auditing process

Certification process

Pre Audit (optional): It is a pre test between the accrediting agency and the client, not an internal audit, the major non-conformities that may arise in the certification

process are estimated, and the benefit is that there is not a determined time for closing non-conformities if they arise.

Initial Audit: it is a Documentary audit that the certification process is started, the legal part of the company is reviewed. If non-conformities were found, there is a time of 90 days to close them to move immediately to the main audit, if not closed at this time should begin the process again.

Main Audit: in this process audit the service is reviewed. If there are non-conformities, there is a maximum time of 90 days in order to close them. This audit closes the certification stage and with the final report the decision is taken by the technical department and accrediting bodies. It proceeds with the certification with a maximum of three months to deliver it.
Follow-up audit: Once the company is certified, it must conduct audits to monitor the EMS certified. It could be once a year or biannual audits depending on the customer.

The certification lasts three years, the monetary values are canceled once the service is provided. This cost depends on whether a pre audit is conducted, scope, the follow-up audits, number of employees and number of places to be certified. According to information provided by a business consultant of Bureau Veritas indicated that the certification cost is about $5000 for Illco Factory.

On the other hand, information provided by a EMS implementation consultant recommended by Bureau Veritas del Ecuador indicated the cost of implementing an EMS depends in the first place on the number of employees, second, compliance with the environmental legal requirements, and third, the complexity of the production process. The time to implement an EMS is about eight months and its cost would be between $8.000 and $10.000 for a company like Illco Factory.

Conclusions

During the preparation of this chapter, it was possible to observe some factors that Illco Factory could change and improve. It is recommended to implement an

environmental management system to improve activities and operations in order to optimize product quality, eliminate potential accidents, potentiate the plant operation and minimize negative environmental impact. It can be observed that the participation of the employees is the basis for an effective EMS, but the commitment is the responsibility of all the staff especially the management.

Any company or system must have their correct process, as in this case the creation of an environmental policy, to keep focused and avoid unnecessary deviations.

During the preparation of this chapter, it was possible to notice the importance of a constant monitoring in order to improve this system, it means, continuous improvement is always present in the requirements of this standard. To refine the environmental management system, the possibility of implementing the Japanese technique called 5S might be implemented in each workstation. Many companies have adopted this concept, so the question arises, why not apply this in the Illco Factory . This method consists of 5 steps that can be applied either in work or personal life:

- Sort: Discard useless spaces and eliminate unnecessary items or materials
- Set in order: Everything in its place and a place for everything
- Shine: A work area free of impurities and waste
- Standardize: Good working practices
- Sustain: Commitment of the whole Illco's staff

This technique is not part of the International Standard ISO, but it is appropriate to obtain positive results with the EMS of the plant.

4. FINAL CONCLUSIONS AND RECOMMENDATIONS

This implementation plan was prepared according to ISO 14001:2004 requirements that identified activities and operations of Illco Factory which have an environment impact, and the ability to improve certain areas that could involve cost reductions.

During the interview with the manager of Illco Factory, it was noted that the commitment to the environment is not an important factor in their daily activities. They comply with the Municipality and IESS requirements, but have not implemented the initiative to obtain an international certification, either in quality, environment or any other field in order to potentiate the company's performance. Many people consider that international certifications implies high costs but do not realize this is an investment which can increase sales and bring benefits in the long term.

The process of implementing an environmental management system helped to identify not only environmental factors, but also money savings and other benefits. Some examples are that recycling and an electronic invoicing process would help saving paper and as a consequence, money savings. Selling or giving away all the scrap would save unused space creating a better workplace with higher productivity and motivated employees; the fact of creating awareness about environmental issues would generate partnership and teamwork within the production process; renewing the electricity installations would avoid electricity leakage and accidents, once more, money savings. Working with suppliers with environmental responsibility and competitive prices would be attractive for many current and potential clients. It is clear that every action generates a reaction (cause-effect), every positive change that Illco Factory proposes will obtain great advantages in the short or long term.

In the last chapter "Implementation Plan for ISO 14001:2004 ENVIRONMENTAL MANAGEMENT", the activities and operations that generate an environmental impact and its detailed recommendations are enumerated. As the author of this study,

it is recommended to analyze this plan in order to check those aspects that might be improved.

Obtaining an international certification, not only can improve the company, but also create a positive perception within the corresponding market. After analyzing each requirement of this norm, many benefits are present which can improve production. On the other hand, Illco Factory has been a company that has worked in the Cuenca market for nearly 30 years, and therefore, it is necessary to renew its image in order to ensure its market positioning with the vision to become an international organization.

If the company makes the decision to implement an EMS, it is recommended to look for external advice in order to identify the environmental aspects and the actions to be taken to minimize the environmental impact.

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