

**T.C.
MARMARA UNIVERSITY
INSTITUTE FOR GRADUATE STUDIES IN
PURE AND APPLIED SCIENCES**

**ENVIRONMENTAL MANAGEMENT SYSTEMS AND
IMPLEMENTATION OF ISO 14001 STANDARD**

**Çiğdem BEYAZOVA
(Environmental Engineer)**

**THESIS
FOR THE DEGREE OF MASTER OF SCIENCE
IN
ENVIRONMENTAL ENGINEERING PROGRAMME**

**ADVISOR
Prof.Dr. Erkan TÜRE**

İSTANBUL 2005

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ABSTRACT

ENVIRONMENTAL MANAGEMENT SYSTEMS AND IMPLEMENTATION OF ISO 14001

The aim of this study to investigate the implementation of environmental management system in FIRAT, which a manufacturer of plastic building materials, and resulting from the implementation of management system, to investigate the hazardous wastes, solid wastes, waste water, air pollution and noise pollution.

In the first phase of the study, the environmental pollution and environmental management underlined. In the second phase, the development and the history of environmental management are investigated and the systems developed by different organizations are explained. The International Organization for Standardization, Quality Management System ISO 9000 is briefly explained and compared with Environmental Management Systems, ISO 14000. Environmental Management System, ISO 14000, which can be integrated on Quality Management System, ISO 9000 is comprehensively investigated.

In the third phase, the implementation of the environmental management system ISO 14001 in FIRAT is investigated. The environmental impacts and aspects are determined and applications are investigated.

In the last phase, the applied system has been briefly discussed and interpreted.

June, 2005

Çiğdem BEYAZOVA

ÖZET

ÇEVRE YÖNETİM SİSTEMLERİ VE ISO 14001 UYGULAMASI

Çalışmanın amacı Türkiye’de plastik inşaat malzemeleri üretimi yapan FIRAT Plastik Kauçuk Sanayi ve Ticaret Anonim Şirketi’nde Çevre Yönetim Sistemi uygulamalarının incelenmesi, yönetim sistemi uygulaması ile, fabrika genelinde ortaya çıkan tehlikeli atıklar, katı atıklar, atık su, hava kirliliği ve gürültü kirliliği ile ilgili çalışmaların incelenmesidir.

Çalışmanın ilk bölümünde çevre kirliliği ve çevre yönetimi ele alınmış, önemi üzerinde durulmuştur. İkinci bölümde Çevre Yönetim Sisteminin tarihsel gelişimi, dünyada Çevre Yönetimi konusunda farklı organizasyonların geliştirdiği sistemler karşılaştırılmış, Uluslararası Standartlar Organizasyonu ISO 9000 Kalite güvence sistemi kısaca ele alınarak, ISO 14000 Çevre Yönetim Sistemleri ile karşılaştırması yapılmıştır. ISO 9000 Kalite Güvence sistemi üzerine entegre edilebilen ISO 14000 Çevre Yönetim Sistemi kapsamlı olarak incelenmiştir.

Üçüncü bölümde FIRAT Plastik Kauçuk Sanayi ve Ticaret Anonim Şirket’nde, ISO 14001 Çevre Yönetim Sistemi çalışmaları incelenmiştir. Tüm fabrika genelinde çevresel etkiler belirlenerek, hedefler tespit edilmiş, uygulamalar incelenmiştir.

Son bölümde Çevre Yönetim Sisteminin uygulaması ele alınarak, yorumlarda bulunulmuştur.

Haziran, 2005

Çiğdem BEYAZOVA

LIST OF SYMBOLS

ANSI	:	American National Standard Institution
BS	:	British Standard
BSI	:	British Standards Institution
EMAS	:	Eco – Management and Audit Scheme
EMS	:	Environmental Management system
EPA	:	Environmental Protection Agency
ISO	:	International Standardization for Organization
MSDS	:	Material Safety Data Sheet
OHSA	:	Occupational Health and Safety Administration
QMS	:	Quality Management System
SAGE	:	Strategic Action Group on The Environment
SC	:	Subcommittee
TVOC	:	Total Volatile Organic Carbon
TC	:	Technical Committee
TOV	:	Total Organic Vapor

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I. INTRODUCTION

Environmental pollution is the most sensitive problem that the world is facing. Since the beginning of mankind, human being profit from nature, work on nature and tried to be dominant on nature with the accumulation of information he had.

On the last 40 years, with the developing of technology; the effects on the environment originating from the population, urbanization and industrialization has become risky; and is noticed that “the most important problem is the relation with the environment”.

The environmental problems did not appeared suddenly, reached to these levels by the time being. The environmental pollution or the damage on the environment means the change on the characteristics of the components of the environment. The damage on the environment thought to be recovered by environment, itself. However, it is understood that the environmental pollution increases qualitatively and quantitatively, in opposite to the thoughts, and the environment’s ability of recovering become insufficient. After the risk of the pollution of the environmental issues become clearly noticeable, the environmental pollution has been taken into consideration (Keleş & Ertan; 2002)

The organizations are increasingly tuning their attention to the potential environmental impacts of their activities and products in order to improve the quality of environment and human health while improving the quality. Industries have become more sensitive about their environmental responsibilities together with the stricter environmental rules; started to evaluate the processes, raw materials, end products and waste handling from the environmental point of view.

On the international and national platform, environmental management formed organizational structures. Although the word “environmental management” has no specific definition, can be described as making decisions and implementation of minimizing, arranging and directing the impacts of pollutants on the environment. The main goal of the environmental management is to form a healthier and balanced environment. The management process covers mainly

- to reduce the existing pollution,
- to find solutions for the environmental problems before occurred

- to find out all the environmental impacts of all kind of processes
- to form newly methods for reducing the hazards and risks, and inform the people about,
- to improve or develop the natural resources,
- to produce newly technologies and policies for the prevention of the environment, to use and to support (Keleş & Ertan, 2002).

II. ENVIRONMENTAL MANAGEMENT SYSTEMS

Although environmental problems have been existed for thousands of years, they have been considered as a problem for only last forty years. Environmental management and the standardization are important steps in the historical evaluations for the prevention of environment. Environmental management has started in early 1960s with the industrial development. As a result of significant contaminations, enactment of many laws and regulations were prompted in 1970s and 1980s (Kuhre, 1995).

In 1980s, Deming and other quality experts started to get considerable attention on standardization. However, it took a decade to reach a considerable agreement on required quality standards, which is British Standards (BS) 5750. The standardization and environmental management movements merged in 1990s with the hard work of the organizations like International Organization for Standardization (ISO), the British Standards Institute (BSI), American National Standards Institute (ANSI), other organizations and individuals in different countries (Kuhre, 1995).

The world's first standard for Environmental Management Systems (EMS) – BS 7750– was developed and published by the British Standards Institution, in 1992. This standard was the model for the ISO 14000 Series developed by the International Organization for Standardization. ISO 14000, which establishes the requirements for an EMS, was finalized in 1996. BS 7750 was also basis for the European Union's Eco-Management and Audit scheme, known as EMAS (Sturm, 1998).

The types and dates of publication of these EMS standards are given in the Table II.1

As ISO is an international standard, must incorporate the different interests of many countries. This standard clearly has the weakest requirements. On the other hand, EMAS is the most stringent and detailed standard reflecting the high environmental standards of German interests and companies, which played a key role on developing it (Sturm, 1998). Because ISO 14001 and EMAS are both based on BS 7750, all three standards are quite similar in their approach.

Table II.1 Types and Dates of Publication of EMS Standards

Standards	Type	Date
BS 7750	Launched Certification	April 1992
EMAS	EC Voluntary Regulation	March 1995
ISO 14000	Accredited Certification	October 1996

The similarities among BS 7750, EMAS and ISO 14001 are:

- The objective understanding of environmental aspects and their impacts,
- The need for an environmental policy clarifying the environmental principles promoted by the company,
- Continuous improvement,
- Prevention of pollution,
- Compliance with relevant regulations,
- An environmental management program defining how the objectives and targets are to be realized,
- Internal audits to ensure effectiveness and compliance,
- Management review of the system to ensure that it continues in an efficient manner. (Tunca, 2001)

However, there are also some fundamental differences among these standards, especially between ISO 14001 and the other two standards (ENDS, 1995). ISO 14001 is an international standard, while EMAS and BS 7750 are regional standards; ISO is the weakest standard while EMAS has the most stringent requirements. BS 7750 and EMAS are quite similar except for the EMAS has a stronger emphasis on communication with the public and requires continuous improvement not just in management but also in environmental performance. The comparisons of the three standards are represented in Table II.2 (Sturm, 1998; Tunca, 2001).

ISO 14001, which is the most preferred certification system, has attracted interest from industry, international organizations and governments around the globe (Mohamed, 2001). ISO 14001 EMSs have emerged as a leading management tool to

address environmental degradation at the firm level and rapid adoption is occurring worldwide as evidence by the exponential increase in global registrations to the standard (MacDonald, 2004). Today, more than 57.000 companies are using standardized environmental management systems in the world and this number is expected to continue to grow steadily (Ammneberg and Sundin, 2004). Furthermore, the market forces pushing towards adoption of an Environmental Management System (EMS) and ISO 14000 include: increasing costs of environmental protection; scrutiny from financial institutions; success of the ISO 9000 standards; corporate downsizing and reengineering; rise of pollution prevention and strategic environmental management; and anti-regulatory backlash (Mohamed, 2001).

II.1 THE INTERNATIONAL ORGANIZATION FOR STANDARDIZATION: ISO

ISO is a privately funded, international standards body, founded in 1947 and based in Geneva, Switzerland with over 100 member countries. Countries are represented in ISO by designated authorities within those countries. For instance, The United States is represented by ANSI, which is a private-sector organization. Although government organizations, such as Environmental Protection Agency (EPA), Occupational Health and Safety Administration (OHSA), and Department of Energy are part of ANSI, their federal status does not confer special concessions on their membership (Tunca, 2001)

The purpose of ISO is to promote the international harmonization and development of manufacturing, product and communications standards (Borfitz, 2004). ISO is growing in a nearly geometric way as business, quality and technical organizations realize the benefits of ISO. If a business decides to obtain ISO accreditation, they are making a decision to become process-based organizations. "Process based" means every significant function in your organization must develop and adhere to documented processes, be continually prepared for audits and commit to improve your processes and documentation based on audit results (Borfitz, 2004). Comparison of ISO 14001, BS 7750 and EMAS Regulation of the European Union is shown in Table II.2.

II.2 ISO 14000 SERIES STANDARDS, MAJOR SUBDIVISIONS

ISO 14000 is a series of voluntary international standards including environmental management tools and systems. It covers different standards including everything from environmental labeling to assessing life cycles of products. (Fresner, 1998).

Because of the global consumers demand for environmentally friendly products, the Rio Summit on the Environment and international acceptance of the ISO 9000 quality management and assurance standards, the ISO formed in 1991 the Strategic Action Group on the Environment (SAGE) to make recommendations relating to environmental standards. SAGE was tasked with investigating whether an environmental standard could promote a common approach to environmental management, enhance an organization's ability to attain and measure improvements in environmental performance, facilitate trade and remove trade barriers.

In 1992, ISO Technical Committee, (TC 207) s establishment is recommended by SAGE for the development of international environmental management standards. The work of Technical Committee on environmental management system standards, more commonly referred to as the ISO 14000 series of environmental management standards, focuses on the basic elements needed to establish and maintain an effective environmental management system. Excluded from TC 207 works are test methods for pollutants, setting limit values regarding pollutants and effluents, setting environmental performance levels and standardization of products.

TC 207 is divided into six subcommittees (SC). The subcommittees are Environmental Management System, Environmental Auditing, Environmental Labeling, Environmental Performance Evaluation, Life Cycle Analysis and Environmental Aspects in Product Standards. (1)

a) Environmental Management Systems – ISO 14001 (SC1)

ISO 14001 is the first standard in this series and really heart of the entire certification effort. Standard gives specifications with guidance for the use for environmental management systems, provides the overall framework for all the rest of the specifications (Kuhre, 1995). ISO 14001 explains an organization how to:

Table II.2 Comparison of ISO 14001,BS 7750 and EMAS Regulation of European Union

	ISO 14001	BS 7750	EMAS
Type of Standards	Voluntary, consensus, private sector standard	National, voluntary standard	European Union Regulation
Applicability	Can apply to the whole organization, or part of an organization; applicable to an organization's activities, products, services in any sector; applicable to non-industrial organizations such as local government agencies and non-profit organizations.	Can apply in the United Kingdom and other developed countries; can apply to the whole organization; applicable to non-industrial organizations such as local government agencies and non-profit organizations.	Applies to European Union; applies to individual facilities; applies to site-specific industrial activities.
Focus	Focuses on EMS; indirect link to environmental improvements	Focuses on EMS, with environmental improvements emerging from the systems	Focuses on environmental performance improvements at a site and the provision of communication of improvements to the public.
Initial Review	Suggested but not required in the standard	Suggested but not specified in the standard	Required in regulation
Policy Commitment	Policy commitment to continual improvement of the EMS and to prevention of pollution; policy commitment to compliance with applicable environmental legislation and voluntary commitments.	Policy commitment to continuous improvement of environmental performance.	Policy commitment to continuous improvement of environmental performance and compliance with applicable environmental legislation.
Audits	Audits of EMS are required; monitoring and measuring of key environmental characteristics are required; frequency of audits is not specified.	Audits of EMS are required; audits for compliance or environmental performance are required; frequencies of audits are not specified.	Audits of the EMS, process, data and environmental performance are required; audits are required at least every 3 years.
Public Communication	Only environmental policy must be made available for the public; other external communications must be considered, but what is communicated is left to management.	Only environmental policy must be made available for the public; other external communications must be considered, but what is communicated is left to management.	A description of the environmental policy, program, and management system must be made available for the public; a public environmental statement and annual simplified statement including factual data are required.

- Establish a disciplined system for achieving stated environmental objectives that adhere to relevant legislative and regulatory requirements,
- Perform according to its policies and procedures,
- Audit of the system, ensuring full conformance and continual improvement.

(Fresner, 1998)

There are three SC1 documents with great importance including the specification, annexes and guidance. The specification covers the minimum requirements for achieving certification. The registration criteria's, intent, links between ISO 9000 and ISO 14000, information for small and medium enterprises, history, discussions, interpretations, definitions and clarifications to the core elements are presented in the annexes. And the guidance documents covers newer and best practices, options and suggestions.

b) Environmental Auditing – ISO 14010-14015 (SC2)

These standards specifically deal with EMS audits and the general qualification of the auditors. Environmental auditing is the most related component with the environmental management systems on the ISO 14001 certification. Environmental audits will concentrate on whether an organization has met the EMS specifications and regulatory requirements. The audits should be objective, which generally preferred to be done by third party (Kuhre, 1995). Third party auditors are probably better able to handle the detailed audit criteria than internal auditors.

c) Environmental Labeling – ISO 14020-14024 (SC3)

SC3 covers all types of environmental claims, advertising, including TV and radio commercials and marketing. Main goal of this subcommittee is to bring consistency and uniformity to environmental labeling, which differs significantly from country to country (Kuhre, 1995). The labeling recommendations cover three types of labels ranging from general to specific. The first type indicates that the product is environmentally friendly. The second type concerns a specific manufacture's claim, such as recyclable material. The third type deals with the environmental effects of the product.

d) Environmental Performance Evaluation – ISO 14031 (SC4)

The environmental performance evaluation subcommittee specifies the degree of success that is expected in various environmental management programs and includes periodic improvements in performance. The difference between environmental performance evaluation and environmental auditing is that while environmental performance evaluation applies continuously overtime, environmental auditing applies to one moment in time (Kuhre, 1995). Environmental performance evaluation is a process used to measure, analyze, and assess an organization's environmental performance.

e) Life Cycle Analysis – ISO 14041-14044 (SC5)

Life cycle assessment is a complicated process with qualitative and quantitative steps. There are three major categories of actions. The first type is the impact inventories of product and raw materials. After the identification of all impacts, different analyses occur for different impacts. The last category of action is the improvement analysis/determination of minimization of the impacts (Sturm, 1998; Kuhre, 1995).

f) Terms and Definitions – ISO 14050 (SC6)

The aim of the terms and definitions subcommittee is to coordinate the use of comprehensive and standard terminology among the subcommittees.

g) Working Group-Environmental Aspects of Product Standards – ISO 14060

The primary focus of the working group is to provide guidance for standard writers. Criteria will be developed for the writers in terms of environmental impacts. (Sturm, 1998)

II.3 DEFINITIONS OF ENVIRONMENTAL MANAGEMENT SYSTEMS

Some of the common terms and definitions used by internally recognized organizations, environmental agencies or research reports of large groups of scientists and projects are described below. For the application purposes of environmental management system requirements, the following definitions can be applied.

Certification: The procedure by which third party gives written assurance that a product, process, or service conforms to specific requirements (Sturm, 1998).

Continuous Improvement: The process of enhancing an environmental management system to achieve improvements in overall environmental performance in line with an organization's environmental policy (ISO 14004).

Emission: One or more substances released to the water, air or soil in the natural environment (Sturm, 1998).

Environment: Surroundings in which an organization operates, including air, water, land, natural sources, flora, fauna, humans, and their interrelations. This definition extends the view from a company focus to the global system (ISO 14004; Sturm, 1998).

Environmental Aspects: elements of an organization's activities, products or services, which can interact with the environment (ISO 14004). A significant environmental aspect is an environmental aspect, which has or can have a significant environmental impact (ISO 14004).

Environmental Effect: Any direct or indirect impingement of activities, products and services of an organization upon the environment, whether adverse or beneficial (BS 7750;Sturm, 1998).

Environmental Impact: Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's activities, products or services (ISO 14004). An environmental impact addresses an environmental problem (Sturm, 1998).

Environmental Management: Those aspects of an overall management function (including planning) that determine and lead to implementation of an environmental policy (BS 7750).

Environmental Management Audit: A systematic evaluation to determine whether an environmental management system and environmental performance comply with planned arrangement, and whether a system is implemented effectively, and suitable to fulfill an organization's environmental policy (BS 7750).

Environmental Management Program: A description of the means of achieving environmental objectives and targets (BS 7750)

Environmental Management Review: A formal evaluation by management of the status and adequacy of systems and procedures in relation to environmental issues, policy and regulations as well as new objectives resulting from changing circumstances (Sturm, 1998).

Environmental Management System: The part of an overall management system which includes structure, planning activities, responsibilities, practices procurements, processes and resources for developing, implementing, achieving, reviewing and maintaining an environmental policy (ISO 14004).

Environmental Management System Audit: A systematic and documented verification process to objectively obtain and evaluate evidence to determine whether an organization's environmental management system conforms to environmental management system audit criteria set by the organization, and communication of the results of this process to management (ISO 14004).

Environmental Objectives: The overall environmental goal, arising from an environmental policy, that an organization sets itself to achieve, and which is quantified where practical (ISO 14004, BS 7750).

Environmental Performance: Measurable results of an environmental management system, related to the control of its environmental management aspects. Assessment of environmental performance is based on environmental policy, environmental objectives and environmental targets (ISO 14004).

Environmental Problem: an environmental problem is a description of a known process within the environment or a state of the environment, which has adverse effects on the sustainability of the environment including society (ISO 14004).

Environmental Strategy: A plan of action intended to accomplish a specific environmental objective (Sturm, 1998).

Pollution: Residual discharges of emissions to the air or water following application of emission control devices (Sturm, 1998).

Prevention of Pollution: The use of processes, practices, methods or products that avoid, reduce or control pollution. These may include recycling, treatment, process changes, control mechanisms, efficient use of resources and material substitutions (ISO 14004).

Recycling: The process of re-using material for the production of new goods or services on the same quality level. If the quality of the goods and services produced with recycled material is lower, then the process is known as down cycling (Sturm, 1998).

Waste: An output with no marketable value that is discharged to the environment (Sturm, 1998). Normally the term “waste” refers to solid or liquid materials.

II.4 COMPARISION OF ISO 14000 WITH ISO 9000

ISO 9000 standards are first published in 1987 and revised in 1994, that are series of standards and guidelines related to quality management and quality assurance. While ISO 9000 does not specify sharply what kinds of quality processes must occur, or how, it does require that appropriate quality activities to be defined, that processes to be documented, and that proof to be supplied that the company consistently adheres to both. ISO 9000 registration does not ensure a defect free or quality product or service, but it does indicate that a basic quality system is in place and that the registered organization is at least capable of providing its customers with quality products and services. (Hutchens, 1999)

The main strength of the ISO 9000 standards, and the reason they have been adopted worldwide is that they assure customers who do business with registered firms that fundamental quality systems are in place with registered firms that fundamental quality systems are in place within those organizations. (Hutchens, 1999)

There are numbers of common elements between the ISO 9000 and ISO 14000 management system standards. Briefly, the similarities covers training requirements, management review, document control, records and internal audits. Both systems

outline a solid, traditional management approach for operating an organization. Both systems require the support of management and employee training. Both systems require companies to have a system for establishing and reviewing objectives and targets, whether quality or environmentally related and require companies to provide on going management review and have corrective action processes in place (Ochsenkuehn, 1999).

Besides, there are also basic differences between ISO 9000 and ISO 14000. With ISO 14001, the company is responding to more than just customer satisfaction while with ISO 9001/2 deals with customer requirements and expectations concerned with product quality (Ochsenkuehn, 1999).

II.5 BENEFITS OF IMPLEMENTING AN ENVIRONMENTAL MANAGEMENT SYSTEM

Involvement with environmental management has become a part of a strategy in today's business world. Since the publication of ISO 14001, many companies have implemented the standard and nearly 57 000 organizations had their EMS certified confirming to its requirements (Ammenberg and Sundin, 2003).

The benefits of implementing an EMS cover many areas, including improved environmental performance, reduced operating cost, financial performance, fewer accidents, enhanced community relations, improved customer relations, employee involvement and education (Hillary, 2004). Among others, one of the most important benefits of environmental management is protection of the environment, which is the main element of EMS to leave plants to continue to exist in the best conditions as possible (Raiborn et al, 1999).

The benefits of implementing ISO certification can be discussed in 5 major topics:

II.5.1 Protection of the Environment

Once the organization starts to think about all the environmental aspects, not because of the regulations, its approach to environmental protection will take a whole dimension. Hence, the organization can systematically examine all its processes and activities for their existing impacts on the environment (Sturm, 1998).

Table II.3 Comparison of ISO 9000 and ISO 14000 (Saraç, 1997)

ISO 9000	ISO 14000
Quality Policy	Environmental Policy
Quality Organization	Environmental Organization
Objectives and Targets	Objectives and Targets
Document Control	Document Control
Records	Records
Audits	Audits
Management Review	Management Review
Nonconformance, Corrective and Preventive Actions	Nonconformance, Corrective and Preventive Actions
Trainings	Trainings
Calibration	Calibration
High in Quality Design	Environmental Friendly Design
Purchase (Cost, Quality)	Purchase (Environmental Friendly Material)
Transportation, Storage, Packing, Distribution (Without Any Damage on Product)	Transportation, Storage, Packing, Distribution (Without Any Damage on Environment)
Service Quality (After Distribution, Guarantee)	Product Responsibility (Chain Management, Controlling Impacts of Product Life time)
Process Control (To Guarantee the Quality of Product and Continuousness)	Operating Control (Continual Control of Impacts on Environment)
Checking and Testing (Product Quality)	Monitoring And Measuring
Control of Inappropriate Product	Control of Environmental Inappropriateness
	Determination of Environmental Impacts
	Regulations
	Emergency Situations
	Internal and External Communications (Volunteers Reports)

The possible positive impacts to the environment are the reduction of hazardous materials and wastes, waste minimization. Waste minimization is a key component in the environmental management. In the system the organization will consider its significant environmental aspects and try to control them according to the related regulations. Therefore, the system will require reducing amount of hazardous waste, which in turn results in less soil and ground water pollution contributing to the protection of environment. Plastics, paper, cardboard, tires, and aluminum should be reduced, reused or recycled (Kuhre, 1995).

Reducing usage of electricity, gas and water consumption are the best ways for the conservation of natural sources. This will help the environment's improvement, also protection. (Robert, K. et al, 2002)

II.5.2 Equal Competitive Basis

At the time being there is no uniformity in the amount of time and money that organizations spend to protect the environment even for the same industrial area or for the same industries (Kuhre, 1995). The discrepancies between the organizations will be reduced with the implementation of EMS.

II.5.3 Legal Compliance

Implementation of EMS will help companies to identify the laws and regulations where the company should comply and take action.

II.5.4 Cost Savings

The reduced energy consumption, reduced raw material, resource usage, improved process efficiency, reduced waste generation and disposal cost are the main improvements effective on the long-term cost savings for the organization. (Hillary, 2004; 3)

II.5.5 Public Relations

Implementation of EMS opens up new interactions between public and organizations. The majority of public care about the environment. The environmental friendly products will be preferred besides the quality and price (Hillary, 2004).

Both internal and external benefits also discussed in three categories as on the Tables II.4 and II.5.

II.6 ELEMENTS OF ENVIRONMENTAL MANAGEMENT

ISO 14001 standard provides for elements of an effective environmental management system that can be integrated with the other management system organization. The standard is based on the following concepts:

- Establishing a strategic position;
- Defining an environmental policy and committing to a formal environmental management system;
- Designing a plan to fulfill the environmental policy;
- Developing the human, financial, technical and other capabilities to achieve the policy initiatives;
- Measuring, monitoring and evaluating environmental performance;
- Reviewing and continually improving its environmental management system (Camaroto, 1999).

ISO 14001 Standard consists of the EMS specification, clauses or general requirements in five categories. Each clause is written to apply to a wide diversity of organizations, and is therefore not specific or prescriptive.

The requirements describe general outcomes of the system, but do not prescribe specific approaches an organization must implement (MacDonald, 2004).

1. Environmental policy

2. Planning

2.1 Environmental aspects

2.2 Legal and other requirements

2.3 Objectives and targets

2.4 Environmental management program(s)

3. Implementation and operation

3.1 Structure and responsibility

3.2 Training, awareness and competence

3.3 Communication

3.4 EMS Documentation

Table II.4 Internal Benefits, Categories and Examples (Hillary, 2004)

Organizational Benefits	Financial Benefits	People Benefits
EMS enhanced quality and investor in people systems ISO 14001 possible to combine with quality systems (ISO 9000 series of standards) Improved quality of management Improved quality of trainings Improved working conditions and safety Improved quality of environmental information Legal compliance is documented and can be demonstrated Encourage innovation Review and improve procedures Stimulate process, transport, raw materials and packing changes Demonstrate environmental responsibility Provide a strategic overview of environmental performance	Cost savings from raw material, energy and waste reductions and efficiencies Improved economic conditions of company	Increased employee motivation, awareness and qualifications Improved employee morale Enhanced skills and improved knowledge in company Creates a better company image among employees Provides a forum for dialogue between staff and management

Table II.5 External Benefits, Categories and Examples (Hillary, 2004)

Commercial Benefits	Environmental Benefits	Communication Benefits
Gain new customers/business and satisfy existing customers Gain a competitive/marketing advantage Receive discount on annual insurance premiums Stay in business Develop more environmental products	Improved environmental performance Assured legal compliance Increased recycling Reduced pollution	Create a positive public image Develop better customer relationships Develop better co-operation and relationships with regulators and administrative bodies Improve communication with stakeholders Set an example for other companies in a sector

3.5 Document control

3.6 Operational control

3.7 Emergency preparedness and response

4. Checking and corrective action

4.1 Monitoring and measurement

4.2 Non-conformance and corrective and preventive actions

4.3 Records

4.4 EMS audit

5. Management Review

The EMS is a continual cycle of planning, implementing, reviewing and improving the actions with respect to the environment, including compliance with all relevant regulatory requirements (Sturm, 1998). A graphical representation of EMS implementation steps are given in Figure II.1

II.6.1 Environmental Policy

An environmental policy is a statement of the organization's overall aims and principles of action with respect to environment, including compliance with the related regulations.

The environmental policy is the first element of an EMS. The environmental policy should be written clearly and concisely to enable a layperson to understand it, and should be made publicly available (Schiffman et al, 1997). To ensure an organization's commitment towards a formulated environmental policy, it is essential that top management be involved in the process of formulating the policy and setting the priorities. Therefore the first step is to get the commitment from the highest level of management. Based on this commitment the organization should be than conduct an environmental review and draft an environmental policy. This draft should be discussed and approved by the board directors. Finally, the approved environmental policy statement must be communicated internally and made available to the public (Sturm, 1998).

It is up to the organization to decide on environmental priorities based on an initial environmental review, but these choices should be justified in the policy. To be truly effective the policy should regularly reviewed and revised and incorporated into the organization' overall corporate policy (Sturm, 1998; Kuhre, 1995).

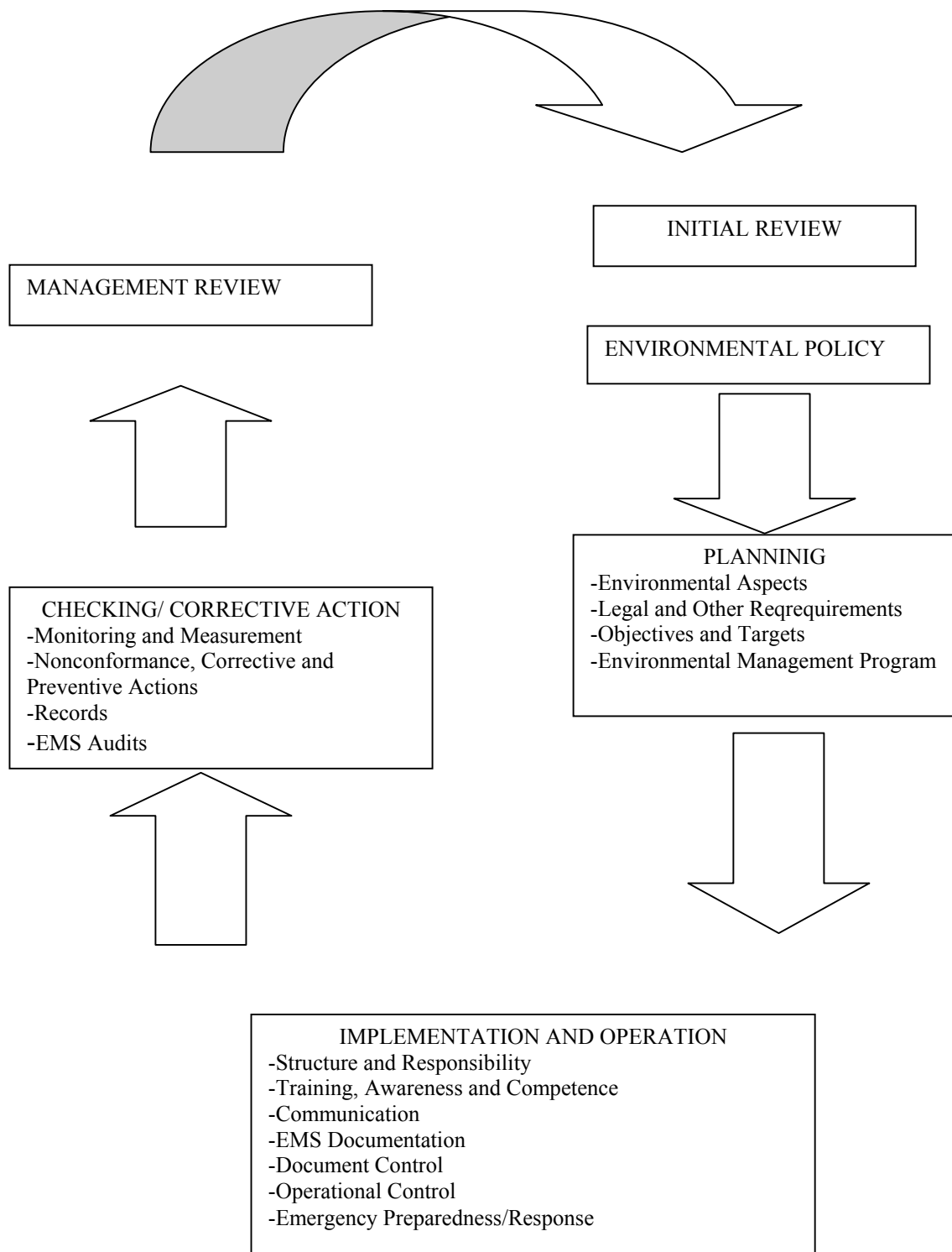


Figure II.1 A graphical representation of the implementation of the EMS (2)

II.6.2 Planning

Before the organization can plan its policies and prioritize its objectives, environmental aspects and significant environmental impacts and potential risks of the organization should be identified and considered when setting objectives (2).

The environmental policy of the organization should cover a plan including:

- Identification of environmental aspects
- Evaluation of associated environmental impacts
- Legal requirements
- Environmental policy
- Internal performance criteria
- Environmental objectives and targets,
- Environmental plans / programs (Sturm, 1998).

The initial environmental review is the source of the data's needed for the planning process. Therefore, a review is advisable which will help to identify priority environmental aspects and provide information about organizations complies with legal and other requirements (Sturm, 1998).

a) Environmental Aspects

The identification of significant environmental impacts is done by developing an environmental exposure portfolio for the organization, its activities, products and services. The evaluation of the importance of the basic environmental problems to the organization and the analyses of the cause for the problems can lead to a set of environmental aspects that are significant for the organization (Sturm, 1998; (2)) Also, the identification of environmental aspects is an ongoing process that determines positive and/or negative the past, current and potential impact of activities of the organization on the environment. This process covers potential regulatory identification, legal and business exposure affects the organization, also can cover health and safety impacts and environmental risk assessment (Von Ahsen & Funck, 2001)

The relationship between environmental aspects and environmental impacts is a cause and effect relationship. While an environmental aspect refers to an element of the activity, product or service the organization that can have beneficial or adverse impacts on the environment.

The identification of environmental aspects and evaluation of associated environmental impacts can be discussed within four steps (ISO 1996);

1. Selection of an activity, a product or service: The selected activity, product or service should be large enough for meaningful examination and small enough to be sufficiently understood,
2. Identification of environmental aspects of the activity, product or service: All aspects regarding the concerned activity, product or service should be listed,
3. Identification of environmental impacts: Potential, positive or negative, impacts associated with each identified aspect should be determined,
4. Evaluation of significance of impacts: This final stage is probably the most challenging part. It is very difficult to decide the important impact than others.

However, the evaluation can be facilitated by considering the below factors for each impact:

- Environmental Concerns:
 - The scale of the impact
 - The severity of the impact
 - Probability of occurrence
 - Duration of impact
- Business Concerns:
 - Potential regulatory and legal exposure
 - Difficulty of changing the impact
 - Effect of the change on other activities and processes
 - Concerns of interested parties
 - Effect on the public image of the organization.

b) Legal and Other Requirements

The procedures should be established and maintained in order to identify and understand the legal requirements. The legal requirements directly establishes with the environmental aspects of the facilities and products (ISO, 1996).

The regulations can be connected with;

- The activity
- The products/services of the company

- The industrial sector
- General environmental laws
- Authorizations, licenses and permits,
- Other sector specific guidelines, standards, codes of practice.

c) Objectives and Targets

Organizations must have a planning dimension so that environmental aspects and legal and voluntary obligations can be assessed, objectives and targets can be set, and a program to achieve the targets and objectives can be developed (Wall et al., 2001).

Objectives and targets should be set and established to achieve the policy of the organization. Together with the prepared objectives and targets, the impacts and the regulations should be considered, and be sure of appropriateness with the organization's strategic planning. Targets are generally numerical goals, which should be measured easily to determine the success of objectives. Besides, the objectives and targets should be established together with timetables to achieve them, should take into consideration the active environmental projects, their status and connection with the new standards, also the targets (Kuhre, 1995). In brief; the objectives reveals the environmental performance mentioned in the environmental policy.

The environmental objectives should be based on and/or should be measured with the amount of raw materials, amount of emissions, waste produced, efficiency of material and energy use, number of environmental incidents and accidents and the amount of waste re cycled.

Objectives can cover statements to;

- Reduce waste and usage of the resources,
- Reduce the pollutants released to the environment,
- Design environmental friendly products,
- Control the possible or existing impacts of raw materials,
- Control the possible environmental impacts of new developments,
- Constitute and develop the environmental awareness among employees and public (ISO, 1996).

The targets should be specific and measurable so that can help attaining the objectives. Besides, the objectives and targets should systematically be reviewed and updated.

d) Environmental Management Program

The important part of the planning effort is to define what the organization's intended in the environmental area. The action plan is the need to achieve the objectives and targets also known as environmental management program (Stapleton and Glover; 2001). Management develops a set of objectives and programs in order to measure the performance of environmental management program (Camaroto, 1999).

The environmental management program should address schedules, resources and responsibilities for achieving the organizations objectives and targets. The program helps to improve the organization's environmental performance (ISO 1996).

II. 6. 3 Implementation and Operation

The focus of this set of activities is on how the objectives, targets and programs become a reality. Management defines accountability for specific actions within the environmental management system. Besides, provides these resources to perform the actions (Camarto, 1999).

The organization should focus and organize the employees, systems, strategy, resources and structure. Implementation and operation of environmental management system should be considered in seven subsections

- Structure and Responsibility
- Training and Awareness
- Communication
- EMS Documentation
- Document Control
- Operational Control
- Emergency Preparedness and Response

a) Structure and Responsibility

For an environmental management system to be effective, roles and responsibilities must be clearly mentioned and communicated. The commitment of

all employees is needed for environmental management system to live up to its full potential.

To provide resources is a key role for top management in the implementation of environmental management system. Top management should appoint a management representative. This representative

- ensures that the EMS is established and implemented
 - reports on its performance over time
 - works with other employees to modify the EMS as needed
- (Stapleton and Glover; 2001).

For the rest of the employees in the organization, responsibilities should be clearly defined to achieve an effective management. This will reduce doubts in employees' minds regarding their specific areas of responsibility and will help establish a sense of purpose in the employees (Kuhre, 1995).

b) Training and Awareness

Top management has a key role in creating an awareness of environmental commitments on all employees in the organization. All members of the organization should be encouraged to accept the significance of achieving the environmental objectives and targets for which they are responsible.

The organization should establish and maintain procedures to make its employees aware of:

- the importance of conformance with the environmental policy and procedures and with the requirements of the EMS,
- the significant environmental impacts, actual or potential, of their work activities and the environmental benefits of improved personal performance,
- their roles and responsibilities in achieving conformance with the environmental policy and procedures and with the requirements of EMS, including emergency and preparedness and response requirements,
- the potential consequences of departure from specified operating procedures.

In briefly; the two significant reasons for training employees about environmental management and the organizations EMS:

- every employee can have potential impact on the environment,
- any employee can have good idea about improving environmental management efforts.

Appropriate training at different levels should be provided to all employees whose work may have a significant effect on human health and environment. The organization should identify environmental training needs of its employees.

Training programs should include;

- identification of employee training needs,
- development of a training plan to address defined needs,
- verification of conformance of training program to regulatory requirements,
- training of target employee group,
- documentation of training received,
- evaluation of training received (Stapleton and Glover, 2001; ISO, 1996).

c) Communication

Effective environmental management requires effective communications, both internally and externally. Effective communications will help the organization to

- demonstrate management commitment to the environment,
- deal with concerns and questions about the environmental aspects of the organization's activities, products or services,
- raise awareness of the organization's environmental policies, objectives, targets and programs,
- inform internal and external interested parties about the organization's EMS and performance as appropriate (Stapleton and Glover, 2001; ISO, 1996).

d) EMS Documentation

The organization should clearly define the various types of documents for the purpose of establishing and specifying effective operational procedures and control. The operational processes and procedures should be defined and documented accordingly. The EMS documentation should describe the system's core elements,

and how the elements relate to each other. For the ease use, the organization should consider organizing and maintaining a summary of documentation to;

- collate the environmental policy, objectives and targets,
- describe the benefits of achieving environmental objectives and targets,
- document the key roles, responsibilities and implementation procedures,
- provide direction to related documentation, and describe other elements of the organization's management system,
- explain that the EMS appropriate elements for the organization are implemented (Stapleton and Glover, 2001; ISO, 1996).

d) Document Control

To ensure that every employee in the organization comply with the proper EMS documents, it is necessity for the organization to have a procedure that describes how such documents are controlled. Implementation of the procedure should ensure that;

- EMS documents can be located, found easily,
- they are periodically reviewed, revised,
- current versions are available where needed,
- obsolete documents are removed.

The aforesaid procedure should designate responsibility and authority for preparing documents, making revisions, and keeping them up-to-date (Stapleton and Glover; 2001).

e) Operational Control

An important discipline in improving resource productivity and reducing waste intensity is the management of operations using documented procedures and defined process controls (Camarota, 1999).

The organization should consider the different operations and activities contributing to its significant environmental impacts when developing or modifying operational controls and procedures such as;

- research and development design and engineering,
- purchasing,
- contracting,

- handling and storage of raw materials,
- production and maintenance process,
- laboratories,
- storage of products,
- transportation,
- marketing and advertising,
- customer service,
- acquisition, construction, or modification of property and facilities (ISO, 1996).

f) Emergency Preparedness and Response

Despite an organization's best efforts, the possibility of accidents and other emergency situations still exists. Effective preparation and response can reduce injuries, prevent or minimize environmental impacts, protect employees and neighbors, reduce asset losses and minimize downtime (Stapleton and Glover; 2001). Hence, the organization should define and maintain procedures for dealing with potential emergency situations, also environmental incidents. The operating procedures and controls should cover by considering of;

- health aspects of employees,
- accidental emissions to the atmosphere,
- specific environment and ecosystem effect from accidental releases (ISO,1996).

The organizations should prepare comprehensive emergency procedures for their operations before an emergency event occurs. The emergency plan should include;

- emergency organization and responsibilities,
- key personnel information
- both internal and external plans,
- possible action plan for different types of emergency situations,
- information of hazardous materials, including potential impacts on environment,
- training plans and testing for effectiveness (ISO,1996; Tunca,2001).

In order to have a continual improvement, it is important to review the emergency response performance, after an incident has occurred. This review should

also be accepted as the key factor in determining the required trainings, the revisions in emergency plans and procedures.

II.6.4 Checking and Corrective Actions

The key steps of determining the operations related with the EMS should be considered in different elements such as;

- Monitoring and Measuring
- Non-Conformance and Corrective and Preventive Actions
- EMS Records
- EMS Audit

a) Monitoring and Measuring

Monitoring and measuring enables the organization to;

- evaluate environmental performance,
- analyze root causes of problems,
- assess compliance with legal requirements,
- identify areas requiring corrective action,
- improve performance and increase efficiency (Stapleton and Glover, 2001).

Briefly, monitoring helps managing organization better. Pollution prevention and other strategic opportunities are identified more readily when reliable data is available.

The organization should develop procedures to;

- monitor key characteristics of operations and activities that can have significant environmental impacts and/or compliance consequences,
- track performances,
- calibrate and maintain monitoring equipment,
- evaluate the organizations compliance with applicable laws and regulations through internal audits.

b) Non-Conformance and Corrective and Preventive Actions

The organization is to establish and maintain procedures for initiating corrective and preventive actions, in the event of non-conformance with the company's targets and objectives. The findings, conclusions and recommendations

reached as a result of measuring, monitoring, audits and other reviews of EMS should be documented, and required corrective and preventive actions should be identified. Management should ensure that these corrective and preventive actions have been implemented and that there is a systematic follow up to ensure their effectiveness (ISO, 1996; Tunca, 2001).

c) EMS Records

A key activity supporting performance measurement is the establishment of records management system. If an environmental incident should occur, these records allow management to recreate and perform a root cause of analysis. These records should cover;

- legislative and regulatory requirements,
- permits,
- environmental aspects their associated impacts,
- environmental training activity,
- inspection calibration and maintenance activity,
- monitoring data,
- details of non-conformance; incidents, complaints and follow up actions,
- product identification
- supplier and contractor information,
- environmental audits and management reviews (Stapleton and Glover; 2001; Camarota, 1999; ISO,1996).

d) EMS Audit

Performance of EMS audit is another measurement tool. The audit reports should give the management accurate picture of process of EMS (Camarota, 1999). The environmental aspects, potential impacts and the results of the audits direct the frequency of audits.

II.6.5 Management Review

The management should review and evaluate the EMS to maintain continual improvement and effectiveness of the management system. The reviews should cover;

- results from the audits,
- environmental objectives and targets, performance,
- the continuing appropriateness of the environmental management system regarding to changing situations and information,
- concerns among relevant interested parties.

The management review points the possible need for the revisions of the policy, objectives, targets and other elements of the EMS with the environmental management audit results and in the light of changing circumstances and the commitment to continual improvement (ISO, 1996; Stapleton and Glover; 2001).

III. A REAL CASE STUDY: IMPLEMENTATION OF AN ENVIRONMENTAL MANAGEMENT SYSTEM IN PLASTIC INDUSTRY

III.1 IDENTIFICATION OF THE COMPANY

The company chosen for the case study is one of the leaders for the plastic building materials. FIRAT, which started to manufacture its products in 1972, is now manufacturing in the modern production plant in Büyükçekmece Istanbul since 1992. The company is now has a growing facility area of 290.000 m² total in Istanbul and 35.000 m² in Ankara with 1050 employees. The company's capacity is approximately 100.000 tones/year.



Figure III.1 A General view of the company - Istanbul

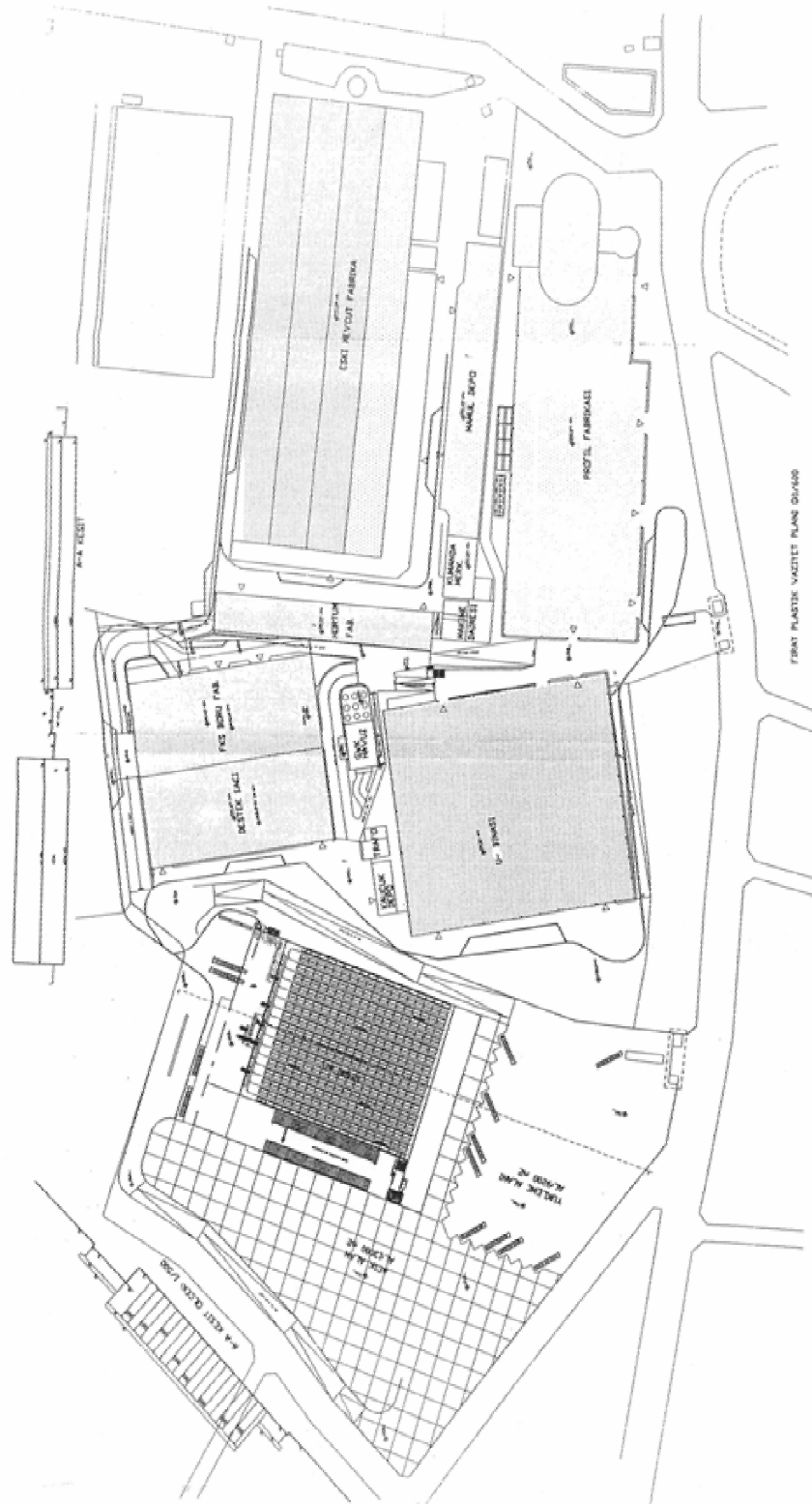


Figure III.2 The Plot Plan of The Company

The company renders services in various sectors such as construction, electric-electronic, automotive, agriculture and white goods etc. and ranks among the sector's top 5 companies in Europe with its production capacity and technology investment.

III.2 MANUFACTURING OPERATIONS OF THE COMPANY

There are 5 manufacturing buildings in the plant:

- a) PVC Plant
- b) PE-PP Plant
- c) Rubber Plant
- d) Sheet Iron Plant
- e) Hose Plant

a) PVC Plant:

The processes in the plant are divided into 4 categories

- 1- PVC Window and Door Systems process
- 2- Fittings with injections process
- 3- PVC pipe process
- 4- Mixer: The raw materials used in the production are prepared in 14 mixers. The raw materials in the form of granule and powder are mixed by feeding the mixers. The mixtures prepared in the mixers are filled to the feeding units of the extrusion machines. The dusts absorbed with the absorption canals are first caught with 1.filter and than 2.filter. The waste air is thrown with the shutters to the atmosphere.

b) PE- PP Plant:

This plant is used for the production of polyethylene and polypropylene based pipes.

c) Rubber Plant

The production of rubber gaskets and piping is done in this plant. Previously the synthetic or natural rubber raw materials are fed into the Bambury machine. The semi-manufactured rubber obtained from the mixture is passed from the machine: kalender. However, gives a shape to the product with extrusion, passes to the vulcanization. Vulcanization is a 3 line cooking process. The organic vapor takes form on the cooking lines are absorbed with single chimney and thrown out to the atmosphere. The shaped rubber band cooked in the oven No.1, is vulcanized with 240-260 °C salty baths. Vulcanization is done with microwave in ovens No.2 and 3. The emissions formed because of Bambury machine and kalender machine are thrown out with oven No.4.

d) Sheet Iron Production Plant

The metal parts for the PVC doors and windows are produced in this part of the plant. Al-Zn alloy is heated till the melting point, later formed in the injection machine. The parts taken out from the injection machine are cleaned from the oil and the burrs taken before chromate bath. The dried parts dyed in the electrostatic powder dying cabinet, cooked in the oven as a final operation. The cleaning and chromate baths are heated by 3 heaters which the gas all collected and thrown out with the chimney.

Appendix A shows the process flow schemes of the company briefly.

III.3 TYPES OF THE PRODUCTS MANUFACTURED BY THE COMPANY

The products designed, manufactured and stored in the company should be described as below:

- Polypropylene pipe extension pieces
- PVC waste water pipes and extension pieces
- PVC pressurized clean water pipes and extension pieces
- PVC deep well pipes
- PPRC polypropylene pipes and extension pieces
- High density polyethylene pipes

- Low density polyethylene pipes
- Polyethylene electro fusion fittings
- PVC door and window profiles
- PVC braided transparent irrigation hoses
- Thermo-rubber fabric hoses
- LPG hoses
- Absorber and emitter hoses
- PVC rain chutes, pieces and landing pipes
- Natural gas pipes
- Double walled cable protection pipes
- Drainage pipes
- PEX cross-linked polyethylene pipes
- Spiral winded sewer pipes
- Double walled sewer pipes
- Window profiles, sealing gaskets
- Supporting sheets
- Hinges

Table III.1 shows the products of the company.

III.4 INITIAL REVIEW

The company has established and documented, and implementing a Quality Management System in compliance with the conditions stipulated in ISO 9001:2000.

The company made progress for the fulfilling requirements for the ISO 14001 Environmental Management System and OHSAS 18001 Occupational Health and Safety (OHS) by the end of year 2002. Before the implementation of ISO 14001 and OHSAS 18001, the company was implementing an internal system based on the regulations, furthermore to the politics of the company.

III.5 ENVIRONMENTAL POLICY

The first step is to establish an environmental policy issued by the senior management by taking into account all the important environmental aspects.

The company aim to achieve the planned policy. The declared intention is as below:

Table III.1 Products of the Company

1)	PVC PIPES	- PVC High Pressure Pipes (Drinking Water Pipes), - Waste Water Pipes, -Drainage Pipes - Duct Pipes, -Deep Well Pipes
2)	POLYPROPYLENE PIPES	- Folio Polypropylene Pipes, -Polypropylene Pipes, -Fittings for PP Pipes
3)	POLYETHYLENE PIPES	- Low Density Polyethylene Pipes, -High Density Polyethylene Pipes, -PE100 Pipes - HDPE Duct Pipes
4)	PEX PIPES	- PEX Pipes
5)	FKS PIPES	- Profiled Sewer Pipe Systems
6)	NATURAL GAS PIPES	- Pipes, -Fittings
7)	ROOF DRAINAGE	- Rain Gutter and Fittings (Rectangular and Decorative Fittings)
8)	SPRINKLING PIPES	- Sprinkling Pipes and Fittings
9)	DRIP WATERING PIPES	- DW Pipes and Fittings
10)	HOSSES	- Threaded Fabricated Hose, - Butane Gas Hose, Thermo rubber water hoses -Thermo rubber oxygen and acetylene hoses, -Thermo rubber compressor hoses -Thermo rubber Pulverization Hoses, -Flex Suction and Blowing Hoses
11)	PVC PROFILES	-2001 System, -Prestige System, -700 System, -Sliding System, -Shutter System - Detail Profiles

“ENVIRONMENTAL POLICY OF FIRAT

FIRAT has established and is operating an Environmental Management System including its entire activities as well as the requirements of the ISO 14001 standard. The company manages any subjects with a high environmental risk detected as a result of the assessment of environmental aspects within the framework of the system. As FIRAT, we promise,

- To continuously improve our environmental performance by reducing our waste and increasing our productivity,*
- To adhere to national and domestic regulations pertaining to our activities as well as relevant European Community directives,*
- To prevent pollution by eliminating it at the source,*
- To assess environmental affects as preference criteria during the selection of new investments,*
- To increase the environmental awareness of our employees, customers, suppliers and dealers by informing them about our Environmental Management System.”*

III.6 IDENTIFICATION OF ENVIRONMENTAL ASPECTS AND SIGNIFICANT IMPACTS

The environmental aspects and the possible impacts are defined as a first step of implementing EMS in the company and related regulations defined in order to find solutions.

The environmental aspects and their influences and the establishment of important environmental aspects are carried on in compliance with the Environmental Aspect Assessment Procedure.

The environmental aspects of the company should be identified, discussed and the management system should be implemented by focusing on different topics:

III.6.1 Location of The Facility

Environmental management system studies are aimed to make comprehensive survey on the impacts of the facility, to find solution and to make recommendations for further applications and investments.

III.6.2 Chemicals

The determination of the chemicals used in the operations, in the control of machines is significant to provide the protection of employees from possible hazards in the plant, furthermore the environment to be affected.

III.6.3 Operations

The operations in the company will be categorized as a result of the Environmental Aspect Assessment Procedure in order to establish environmental aspects, impacts, the importance level and improvement objectives determined to be applied by taking the environmental risks into consideration.

III.6.4 Source Management

The main sources of the company will be determined in order to control the source management.

III.6.5 Waste management

The existing situations for all kinds of wastes of the company will briefly be determined and classified in different groups as

- Solid Wastes : Hazardous Solid Waste, Industrial Solid Wastes, Domestic Solid Wastes
- Wastewater
- Air Emissions
- Noise Pollution

III.7 IDENTIFICATION OF LEGAL REQUIREMENTS

The main environmental objective of the company is the compliance with the legal requirements. The related laws, regulations connected with the organization's activities, products and services are defined for the compliance of the regulations of Turkey. The list of regulations related with environmental laws is shown in Table III.2.

Table III.2 Regulations Related with Facilities of Company

	Regulations	Date of Publications	Responsible
1	Preventing Environmental Pollution Fund	17.05.1985	Quality Control Department
2	Regulation of Air Quality Protection	02.11.1986	Quality Control Department
3	Regulation of Noise Control	11.12.1986	Quality Control Department
4	Regulation of Water Pollution Control	04.09.1988	Quality Control Department
5	Regulation of Solid Wastes Control	14.03.1993	Quality Control Department
6	Regulation of Clinical Wastes Control	20.05.1993	Quality Control Department
7	Regulation of Hazardous Wastes	11.07.1993	Quality Control Department
8	Regulation of Hazardous Wastes Control	27.08.1995	Quality Control Department
9	Regulations on Non-Sanitary Institutions	26.09.1995	Quality Control Department
10	Regulation of Solid Waste Control	26.09.1995	Quality Control Department
11	Regulation of Environmental Audit	10.12.2001	Quality Control Department
12	Regulation of Discharge of Wastewater into Drainage System	05.01.2002	Quality Control Department
13	Regulation of Environmental Impact Assessment	16.12.2003	Quality Control Department
14	Regulations of Waste Oil Control	21.01.2004	Quality Control Department

III.7.1 Environmental Law

First published on 11th of August 1983, the objective of environmental law is to protect and improve the environment. The protection of natural resources, the prevention of water, air, soil and the protection of plants animals, natural and historical properties are the paramount objectives for all citizens.

Regarding to the activities of the company, the related items of the environmental law can be explained as;

- Item 8 – Preventing Pollution: Prevents all the activities that cause pollution.
- Item 9 – Protection of Environment: Prevents the changes in natural
- Item 10 – Environmental Impact Assessment
- Item 11 – Operational Permission, Information
- Item 12 – Liability of Audits
- Item 13 – Hazardous Chemicals
- Item 14 – Noise
- Item 15 – Preventing the Continuous of the Activities

III.7.2 Environmental Regulations

III.7.2.1 Regulation of Solid Wastes Control

The Regulation of Solid Wastes Control was accepted March 3, 1991. The purpose of the regulation is to control, the storage, the transportation moreover the disposal of any solid waste, which can effect the environment or public health.

According to this regulation, the company works on minimization, appropriate collection, disposal and the participation in the recycle, reuse and recover programs of the solid wastes of the company by using best available technology (www.mevbank.com).

III.7.2.2 Regulation of Hazardous Wastes Control

The Regulation of Hazardous Wastes Control was published on August 27, 1995. The purpose of this regulation is to control the hazardous wastes from production till the final disposal stage. In order to regulate the requirements, basically it is important to;

- prevent the discharge directly to the environment, with effects on environment and human health,
- control the production and the transportation,
- control exportation, prohibit the importation,
- minimize the generation at its respective source, dispose and incinerate with in the minimum distance,
- provide environmental friendly management system.

According to this regulation, the company arranged the handling, the storage conditions and the disposal methods of hazardous wastes, formed in the company with respect to the Environmental Regulation (www.mevbank.com).

III.7.2.3 Regulation of Clinical Wastes Control

The Regulation of Clinical Wastes Control was accepted on May 20, 1993. The aim of regulation is to control the handling, storage and disposal of clinical wastes without any harm on environment and public health.

According to this regulation, the clinical wastes of company are stored temporarily in infirmary and are send to an off-site incineration plant with the hazardous wastes (www.mevbank.com).

III.7.2.4 Regulation of Air Quality Protection

The Regulation of Air Quality Control was accepted on November 11, 1986. The aim of the regulation is to control the discharge of emissions in the form of dust, smoke, vapor and aerosol into the air.

With respect to this regulation, the air pollution sources are defined in order to minimize the pollutants. The periodically indoor and outdoor air pollution measurements are compared with the limit values informed in the regulation (www.mevbank.com).

III.7.2.5 Regulation of Noise Control

First the Regulation of Noise Control was accepted on December 11, 1986. The purpose of the regulation is to procure the environmental development in the meaning of peace, mental and physical health of the public without noise.

In accordance with this regulation, periodic indoor and outdoor measurements show the existing noise values, the appropriateness with the regulation or inappropriateness (www.mevbank.com).

III.7.2.6 Regulation of Waste Oil Control

The Regulation of Waste Oil Control was accepted on January 21, .2004. The purpose of this regulation is to promote the safe collection and disposal of waste oils by preventing discharge of waste oil through out the environment, to store, transport the waste oil without any harm on environment also on public health.

With respect to this regulation, any discharge into inland surface water, ground water, territorial seawater and drainage systems; any deposit and/or discharge harmful to the soil and any uncontrolled discharge of waste oils are prohibited.

In this respect, the waste oils originated from operations, maintenance of machines in the processes are stored in a pool constructed in the company. Periodically, the stored oil-water mixture is sent to an off-site incineration plant (www.mevbank.com).

III.8 ENVIRONMENTAL OBJECTIVES AND TARGETS

In the scope of environmental management system, the company has set environmental objectives and targets in order to fulfill the requirements.

III.9 ENVIRONMENTAL MANAGEMENT PROGRAM

The environmental management program is the important part of the planning as mentioned previously. In order to implement the identified environmental objectives and targets the action plan is set. The projects, responsible, schedules and the approximate cost for the project are defined. Table III.3 shows the determined and targets. And Table III.4 shows The Environmental Management Program of the company briefly.

The prosecution of the project form for every project are periodically checked and documented by the responsible in order to follow the situation of the project.

Although the program addresses projects, responsible and the schedule, it also covers the following procedures;

- Environmental Aspect Assessment Procedure
- Occupational Health and Safety Danger Definition and Risk Assessment Procedure
- Solid Waste and Hazardous Waste Control Procedure
- Chemical Agent Management Procedure
- Training Procedure
- Document Control Procedure
- Purchasing Procedure
- Emergency Procedure
- Environmental and OHS Performance Tracing Procedure
- Health Checks Table
- Definition and Tracing Manual
- Checking Tracing and Measuring Devices Procedure

Table.III.3 Objectives and Targets of The Company

Nr.	Existing Situation	Objectives/Targets
1	Air emission values in mixer, PVC profile and pipe production are high	The measurement of emissions will be done and the values will be reduced as to the related regulation
2	High risk of accidents during the usage of eccentric press in the hose production area	Operating conditions will be safer
3	Unsafe usage of cutting machine in hose production area	Operating conditions will be safer
4	Domestic solid wastes and hazardous solid wastes are being collected together	Both domestic and hazardous wastes collection and disposal will be made as to the related regulation
5	Risk of leakage in all production areas	Risk of leakage will be reduced
6	Combustion process of dyed layer on hanger surface in open air	Combustion will be made directly in the oven
7	Franchisers do not have information about environmental management system	To arrange studies in order to raise the knowledge about environmental management system and environmental consciousness of franchisers and customers
8	Improvements are needed for the storage conditions	To practice the automatic storage techniques
9	Emission formed in the extrusion area in rubber plant	To measure the air emission values and to minimize to the limit values as to the related regulation
10	The consumption of the three granule lines in PE-PP breaking process	To minimize the consumption of natural resources
11	The environmental pollution and the consumption of natural resources because of the packages received from the suppliers	To minimize the environmental pollution and the consumption of natural resources
12	Risk of leakage in the paraffin lubricant tank	To eliminate the risk of leakage
13	Slippery floor in the bending area	To improve the slippery floor

Table III.4 Environmental and OHS Management Program

<u>Obj./Target No.</u>		<u>Existing Situation</u>	<u>Objective/Target</u>	<u>Projects</u>	<u>Responsible</u>	<u>-</u>		<u>App.Cost</u>
<u>OHS</u>	<u>Env.</u>					<u>Beginning</u>	<u>End</u>	
1, 4, 5	2	Risk of fire	Risk of fire will be reduced.	1.Report of existing situation will be prepared by the consultant of fire. 2. Fire engine will be bought. 3. Fire perceiving apparatus will all be checked over. 4. Every fire equipment will be checked over. 5. Fire team will be determined, trained accordingly and periodically fire practices will be arranged. 6. Flame holder will be fixed on to the exost all forklifts. 7. Electrical systems and control panels will be checked against the risk of fire.	-		March,31	110 Billion TL
2, 3, 6		Risk of falling down of employees or risk of falling of any material/product on to the employees	Risk of falling down of employees or risk of falling of any material/product on to the employees will be reduced.	1. Safety belt, steel ended shoes and hard hats will be bought. 2. Occupational health and safety lessons will be arranged for the construction and transportation employees 3. Protecting equipments will be debit to the employees to guarantee their usage.	-		April,31	5 Billion TL
7, 8	9, 10, 11	The amount of dust emission in the mixer, PVC profile, and hose production are high.	Emission values will be measured and will be reduced in according to the limit values mentioned in the regulations.	1. Profile plant will be moved. 2. Cleaning of machines with air will be forbidden. 3. Automation will be placed in mixer. 4. Dust collection unit will be designed/made.	-		Dec,31	100,000 US\$

9, 11		Insufficient preventive measures in usage of band saw in PVC pipe and PP-PE areas.	Preventive measures will be taken in order to usage of band saws in safety.	OHS lessons will be arranged for the employees using the band saws.	-		March,31	---
10		Risk of contact of glycerin with body.	Preventive measures will be taken in order to obstruct the contact of glycerin with body.	OHS lessons will be arranged for the employees and protection equipments will be bought for the employees in the bending process.	-		April,31	1 Milliard
12	18	Noise formed during breaking is high	The noise will be reduced to the level mentioned in regulations.	1. The parts breaking takes place will be insulated. 2. The usage of protecting equipments for ears will be increased.	-		July, 31	15,000 US\$
13	15, 16	The amount of organic vapor and dust in hose production plant are high.	Emission values will be measured and will be reduced in according to the limit values mentioned in the regulations.	1. Hose mixer part will be separated from production part. 2. Aeration of mixer part will be increased.	-		June,30	8 Milliard
14		High risk of accidents during the usage of eccentric press in the hose production area	Operating conditions will be safer	Press process will be considered in the automation project.	-		December,31	Budget will be set during automation process.
15		Unsafe usage of cutting machine in hose production area	Operating conditions will be safer	1. Cutting process will be considered in the automation project 2. The employees uses this machine will wear steel gloves till the project ends.	-		December,31	
16		Unsafe conditions in the threading operation in the metal injection process.	Operating conditions will be safer for the threading operation	Threading operations will be examined and protection equipment will be applied.	-		March,31	1 Billion TL
17		Metal vapor formed in the metal injection process	Emission values will be measured and will be reduced in according to the limit values mentioned in the regulations.	1. Aeration in dying and injection processes will be checked. 2. Aeration units will be applied to the two injection machines.	-		July, 31	30 Billion TL
18		Temperature drops till 5 C in sheet iron plant (e.g. 26.02.2003 14.00, Temp: 5 C)	Operating conditions will be arranged to keep the temperature around 15 C.	Suitable heating device will be set.	-		August,31	50 Billion TL

19	1, 3, 4, 5, 6, 7, 12, 13, 14, 19, 20, 21, 23	Solid and hazardous wastes are removed together with the domestic wastes	All the solid wastes will be disposed according to the Regulation of Solid Wastes Control and Regulation of Hazardous Wastes Control.	1. All the types and amounts of solid and hazardous wastes with the source of FIRAT will be determined. 2. Solid and hazardous waste storage area will be formed. 3. The responsible in the processes will follow the transportation of the solid and hazardous wastes to the storage area. 4. All of the solid and hazardous wastes will be disposed according to the to the Regulation of Solid Wastes Control and Regulation of Hazardous Wastes Control.	-		July,31	Budget will be set separately.
20	8	Risk of leakage in all production areas is high	Risk of leakage will be reduced to the level of D	1.Storage area for chemicals will be formed. 2. Fuel oil tank will be carried to a safer place. 3. LPG tank will be carried to the chemical storage area. 4. Storage conditions will be determined for the chemicals stored in the plant. 5. All the operational data's will be determined for he chemicals used in FIRAT.	-		July,31	Budget will be set separately.
21	17	Probable leakage in DIP and DOP oil tanks in hose production.	Risk of leakage and risk of possible harm to the environment will be minimized to the level zero.	All the warehouses for chemicals will be checked and the conditions according to the regulation will be provided.	-		April,31	3 Billion TL
22		Management system of OHS is not widespread and well known between the employees.	Trainings will be arranged in FIRAT.	Trainings will be arranged in FIRAT.	-		April,15	5 Billion TL
23		In emergency situations, in order to the generator could not be step in, no chargeable lamps available.	Chargeable lamps will be mounted to all critical points in the plant.	1. The exit points will be determined and defined for the emergency situations. 2. The chargeable lamps will be mounted to the points, which are described as critical.	-		May,15	15 Billion TL

24		Emergency plans are not up to date	The emergency plans will be brought up to date.	The emergency plans will be brought up to date by taking the needs of FIRAT and the risks into consideration.	-		May,15	2 Billion TL
24	24	The lead for stabilization used in PVC products.	Alternative materials for stabilization.	Tests for alternative materials for stabilization will be done.	-		During Year	5 Billion TL
25		No ambulance in FIRAT's structure	An ambulance will be bought for the emergency situations.	An ambulance will be bought.	-		June,30	60 Billion TL
	22	Combustion process of dyed layer on hanger surface in open air	Combustion will be made directly in the oven	An oven will be bought.	-		June,30	30,000 US\$
	25	FIRAT's suppliers do not have information about EMS.	Appropriate trainings will be arranged for the suppliers.	Appropriate trainings will be arranged for the suppliers.	-		During Year	---
	26	Domestic wastes are stored in specific storage areas.	Storage conditions will be better.	Central storage area for domestic wastes will be designed.	-		April,15	-
	27	The projects about improvements of storage system still goes on.	To start working with automatic storage system.	To start working with automatic storage system after the determinations and project.	-		Will be determined during project.	-

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- Developing Actions Procedure
- Record Control Procedure
- In-house Inspections Procedure
- Management Overview Procedure

Environmental aspects assessment table is prepared separately for every operation under control of management representative together with the environmental representatives of the department.

Appendix B explains the Environmental Assessment of the company. Environmental Assessments table can be interpreted with the information below;

Definition:

Operation No., Operations, Element No., Element, Aspects

Analysis:

Probability

Very rarely (Once in 5 years time)	1 point
Rarely (Once in 1 years time)	2 point
Probable (Once in a month)	3 point
Continual	4point

Results (Concerned parties+ Environment+ Employees+ Cost)

Concerned Parties

Do not cause problems	0 point
May cause problems	1 point
May cause serious problems for protestation and neighbor community	2 point
A case can be opened	3 point

Environment

No effect on environment	0 Point
Has short duration effect on environment	1 Point
May cause serious effect over the long term period on living things	2 Point

Has significant effect on environment – can have an acute effect on flora, fauna and human; can eliminate natural resources

3 points

Employees

No complaints 0 points

Complaints and sickness 1 points

Need treatment 2 points

Cost

Payable punishments related to environmental effects, expenses made for minimizing the effects on environment

No expense 0 point

<10,000 \$ 1 point

>10,000 \$ 2 point

Risk

Risk = Probability x Result

Necessity

Legal or other requirements specified in this part. (e.g. Regulation of Hazardous Chemicals Section 5)

Severity

Risk point determines the severity class. Even the result of analysis comes between 0-14, if any regulation/policy concerns with the situation directly raises to upper class.

32 – 40	A	Very Important
24 – 31	B	Reasonably Important
15 – 23	C	Important
0 – 14	D	Not important

Activity

Control

The part the activities are described to prevent the effect on environment, to minimize or to block the movement .

Aim/Target No

Describes the targets separately.

Assessments of The Results

Environmental policy determined with the evaluation of environmental aspects.

Within the direction of Environmental policy and the environmental aspects, the senior management reviews the objectives and targets at the end of every year.

Accidents, complaints and/or protestation of concerned parties, any cases related with the effect of company's on environment, employee's complaints and new investigations are also the reasons to review the environmental aspects assessment table.

III.10 IMPLEMENTATION AND OPERATION

III.10.1 Location of The Facility

Environmental management system studies are aimed to make comprehensive survey on the impacts of the facility, to find solution and to make recommendations for further applications and investments.

Accordingly the location of the facility is examined if it has a role in terms of having an impact on the environment. The location of the facility is evaluated for waste management alternatives, emergency situations, shipping of raw materials.

Although, the company has a health clinic, a workplace physician, nurse and a health official, because of the location of the company, the management decided to have an ambulance in case of a significant accident or situation is a necessity. Besides, the management also focused on the necessity of fire department and the fire engine. The company gives to the neighborhood the opportunity of benefiting from ambulance and the fire engine.

III.10.2 Chemicals

The determination of the chemicals used in the operations, in the control of machines is significant to provide the protection of employees from possible hazards in the plant, furthermore the environment to be affected.

Material Safety Data Sheets (MSDS) of the chemicals used in the plant are obtained, if missing. According to MSDS information of the chemicals a database is generated, in order to determine the hazard identification for the chemicals. In order to reach easily, the MSDSs simplified and are placed in the entire plant, where the

employees easily reach, and easily understand. In addition to the MSDS information, this simplified MSDSs provides the employees to find out

- Chemical names used in the operations
- Storage conditions
- Hazard identification
- Personal protection
- First aid measures
- Possible environmental impacts
- Disposal considerations.

A model for the simplified MSDS is shown in the Table III.5 and the mainly used chemicals and quantities are mentioned on the Appendix C.

III.10.3 Operations

The operations in the company categorized as a result of the Environmental Aspect Assessment Procedure in order to establish environmental aspects, impacts, the importance level and improvement objectives determined to be applied by taking the environmental risks into consideration.

Results of the assessments are described in Table III.6

III.10.4 Source Management

Electricity and natural gas are the main sources of the company.

Electricity: The mostly used energy in the plant is the electricity: in production and in the lightning. The reason for the increase in the electricity consumption is because of the growing constructions and the increase of the production capacity. The improvements for the lightning are existing operations in plant.

Natural Gas: Natural gas is the second energy source in the plant.

III.10.5 Waste management

The wastes are generated during various operations and are classified as different groups. With respect to Solid Waste and Hazardous Waste Control Procedure, the solid wastes and hazardous wastes are collected and stored accordingly.

Table III.5 A Simplified Material Safety Data Sheet

MATERIAL SAFETY DATA SHEET		
GLYCERIN		
MATERIAL		
	Trade Name: Glycerin Physical Properties: Pale yellow liquid	
TOXICOLOGY		
Contact cause dehydration of skin Contact can cause irritation in eyes Irritating to respiratory system		
PROTECTION		
Employees	Minimize contact Do not breathe vapor Fresh air is necessary for closed area	
Environment	Avoid release to the environment, canalization	
FIRST AID MEASURES		
advice.	In case of Inhalation	Get a fresh air; seek medical advice
	In case of Contact with Skin	Rinse immediately with plenty of water; seek medical
	In case of Contact with Eye	In case of Swallow
	In case of Swallow	Drink plenty of water and seek medical advice.
PERSONNEL PROTECTION		
	Protection for Inhalation Necessary Protection for Eyes Necessary Protection for Hands -	
EMERGENCY RESPONSE METHODS AND FIRE PREVENTION MEASURES		
	Flammable. May form hazardous gasses if burns. Wear suitable protective clothing and respiratory equipment Can be extinguished with dust, foam and CO2	
STORAGE CONDITIONS		
Keep in a well-ventilated, cool and dry area Keep away from fire and heat sources Keep away from acids, halogens, hydrogen peroxides and strong oxidants		

Table III.6 Environmental Aspects of Operations

<u>Operations</u>		
Offices	Domestic Wastes from the dining hall	Ground Contamination
	Food packages from the dining hall	Ground Contamination
	Domestic Wastewater of Plant	Water Contamination
	Official wastes (paper vs.)	Ground Contamination
	Medical Wastes from infirmary	Ground Contamination
	Emissions caused by the vehicles, services and transport vehicles of Firat	Water contamination, usage of natural resources
Warehouses	Raw material packages (wooden pallets, plastic packages, paper packages)	Ground Contamination
	The fire risk of the stored raw materials and technical materials	Air pollution, ground contamination, usage of natural resources.
	Probable leakage should be caused from the storage of the chemical materials	Air pollution, ground and water contamination
Transportation	Probable leakage should be caused from the carriage of the chemical materials	Environmental Pollution
	Packages of materials	Ground Contamination
Auxiliary Operations	Noise in the auxiliary operations and workshops	Noise Control
	Usage of underground water	Usage of natural resources.
	Sludge in the base of the cooling water basin	Ground and water contamination
	Fire and leakage risk in the LPG and diesel fuel storage areas, transmission lines of natural gas.	Ground contamination, air pollution
	The chemicals used in the cooling water basin.	Probable water contamination after cleaning the basin
Maintenance	Solid wastes formed during usual and land maintenance (filters, black tubes)	Ground Contamination
	Liquid wastes formed during usual and land maintenance and during the operations (oil)	Ground and water contamination
	Oily wastes formed during the cleaning of machines	Water contamination
Construction Areas	Wastes formed in construction areas (stone-like materials, excavations and other wastes)	Ground Contamination
	Wasted formed during dying and similar operations.	Ground and water contamination
	Noise formed in construction areas.	Noise Control
Laboratories	Chemicals used in PVC, PE-PP and rubber laboratories (Xylem, Toluene, Dichloromethane)	Water contamination, air pollution
Production (General)	Wastewater formed during cleaning production area	Water contamination

	Noise formed during production	Noise Control
	Formation of HCl gas in extruders	Air Pollution
	Contaminate waste packages	Ground Contamination
	Usage of lubrication grease, form protection oil, corrosion remover, acid, acetone, silicon	Ground contamination, air pollution
	Probable leakage during the storage of the chemicals in production areas	Air pollution, ground and water contamination
Mixer	Dust emission in mixer area	Air Pollution
Pipe Production	Dust emission in PVC pipe production	Air Pollution
Profile Production	Dust emission formed in PVC profile production	Air Pollution
Bending	Wastewater (with glycerin)	Water Contamination
	Organic vapor	Air Pollution
Lamination	Wastes formed from glue mixture and surface cleaning	Water Contamination
	Organic vapor	Air Pollution
	Folio wastes	Environmental Pollution
PE-PP Production	Silicon Spray Emission	Air Pollution
	PEX pipe wastes	Ground Contamination
	LPG emission	Air Pollution
Hose Production	Organic vapor formed during hose production	Air Pollution
	Dust emission	Air Pollution
	Probable leakage in DIP and DOP oil tanks	Ground and water contamination
	Probable leakage of chemicals like tin, soybean and DOP oil used in hose production	Ground and water contamination
Plastic injection	Vapor formed during moisturizing of polyamide material	Decrease of moisture in the environment
Breaking Process	Gasses formed during granule production	Organic emission (Air Pollution)
	Noise formed during breaking	Noise Control
Rubber Production	Combustion gasses formed during extrusion	Air Pollution
	Emission formed in Bambury production area	Air Pollution
	Waste packages of carbon black	Ground Contamination
	Organic vapor formed during production	Air Pollution
	Risk of leakage in paraffin grease tank	Ground and water contamination
	Rubber wastes which can not be recycled	Ground Contamination
Metal injection	Organic vapor formed during production	Air Pollution
	Dye wastes	Ground Contamination
	Combustion process of dyed layer on hanger surface	Air Pollution
	Chemical bath wastes	Water Contamination
Sheet Iron	Shrinkage	Ground Contamination
PVC products	Lead stabilizations used in PVC products	Probable health effects of lead

The waste generation and amounts in 2003 during various processes is described in Table III.7 and Table III.8 shows the methods for handling the wastes in the plant.

Ministry of Environment licensed transportation companies does the disposals of hazardous wastes. On every transport, with respect to Turkish Regulations on the Control of Hazardous Wastes, “The Waste Transportation Form” is filled out, and by the end of every year, is sent to Ministry of Environment.

III.6.4.1 Solid Wastes

In plastic industry, it is so common that most of the plastic shrinkages can be reused. However, the wastes have different characterization. The solid wastes of the company can be discussed in three categories, which are hazardous, industrial and domestic.

The existing and future applications, environmental problems were examined.

- **Hazardous Solid Waste:** The hazardous wastes consists of mainly the laboratory chemicals, damaged PEX material, glycerin oil, packages of carbon black, waste sludge accumulated in pools, contaminated wastes, gas tubes, car batteries and forklift wheels. Table III.9 shows the hazardous wastes in the company in 2004
- According to the Turkish Regulations on the Control of Hazardous Wastes, the wastes in this category are classified and collected accordingly and are sent to an off-site incineration plant, İzmit Waste and Residue Treatment Incineration and Recycling Co. Inc. (İZAYDAŞ).
- **Industrial Solid Wastes:** Most of the plastic shrinkages are recycled in the company as mentioned previously. As the plastic wastes are non-biodegradable in the environment, the wastes, which cannot be recycled, dirtied with a chemical or oil, are accepted as hazardous solid wastes and sent to İZAYDAŞ.
- **Domestic Solid Wastes:** Office wastes such as papers; kitchen wastes and detergent boxes are categorized as domestic wastes. The papers are collected periodically and sold to be recycled.

Waste diversity of the facility is an important step in determination of environmental aspects. Beginning from today, data obtained by time will be the important step in environmental solutions. The increase or decrease tendencies of the

Table III.7 The Waste Generation and The Amounts in 2003

	Unit	January	February	March	April	May	June	July	August	September	October	November	December
Dining Hall Wastes	Container	0	0	0	145	150	0	0	0	0	0	0	0
Metal Wastes	Kg	0	1.400	6.300	0	9.860	0	0	0	0	0	840	580
Metal Filings	Kg	14.280	520	7.660	9.600	13.880	11.120	5.940	2.480	3.600	7.160	2.810	5.540
Scrap Cables	Kg	0	0	0	0	520	720	0	1.140	0	0	1.600	0
Damaged PEX	Kg	0	0	0	2.140	0	0	0	0	0	890	0	1.140
Scrap Rubber	Kg	7.780	7.600	8.080	6.900		15.420	14.180	11.080	8.200	20.940	9.120	25.040
Scrap Sack	Kg	0	0	0	0	15.260	70.380	69.480	41.400	70.900	53.980	35.080	30.780
Scrap PE	Kg	0	0	1.360	180	0	0	0	0	0	3.543	4.520	0
PVC Chocks	Kg	21.840	24.100	35.200	31.340	34.840	17.160	39.660	17.320	17.260	13.460	13.840	20.380
Wooden Palette	Kg	3.200	3.300	3.400	3.440	3.600	0	0	0	0	0	0	0
Packaging Paper	Kg	37.100	31.180	35.320	51.000	14.540	20.380	13.420	8.760	10.860	15.020	2.100	2.720
Packaging Plastics	Kg	18.180	6.220	19.260	18.440	13.300	6.400	0	740	880		580	5.400
Scrap Plastic Bags	Kg	2.380	0	15.320	6.000	9.280	0	0	5.240	15.160	1.420	0	4.140
Office Wastes	Kg	0	0	0	1.800	2.000	0	0	0	0	0	0	0
Scrap Polyamide	Kg	0	0	0	11.400	0	0	0	2.000	0	0	0	0
Clinical Wastes	Kg	0	0	0	2	3	0	0	0	0	0	0	0
Waste Oil	Kg	420	1.580	1.680	1.580	1.080		1.220	2.340	1.420	3.840	5.620	0
Cleaning Cloths	Kg	0	0	0	245	0	0	0	0	0	0	0	0
Laboratory Chemicals	Kg	0	0	0	20	0	0	0	0	0	0	0	0
Gas Tubes	Kg	0	0	0	1.000	0	0	0	0	0	0	0	0
Carbon Black Packages	Kg	0	0	0	220	0	0	0	0	0	0	0	0
Chemical Material Barrels	Kg	0	0	0	0	0	0	150	0	0	0	0	0
Filters	Kg	0	0	0	80	0	0	0	0	0	0	0	0

Table III.8 Methods of Handling the Wastes of the Company

CONTROL OF SOLID WASTES				
	Solid Wastes	Handling	Storage Conditions	Disposal Methods
1	Domestic Wastes	Garbage Container (In the control of department responsible)	Container	Taken by the responsible of Municipality
2	Metals (Formed during maintenance)	Temporary Storage in maintenance	Barrels	Sold to Scrap-Iron Dealer
3	Damaged PEX	Temporary Storage in Production Area	Storage in Scrap PEX Area	Off-site Incineration
4	Scrap Rubber	Temporary Storage in Production Area	Storage in Scrap Rubber Area	Sold to Scrap Dealer
5	PVC Chocks	Temporary Storage in Production Area	Storage in Scrap PVC Chocks Area	Sold to Scrap Dealer
6	Wooden Pallets	Sent to Storage Area After Use	Storage in Pallet Area	Sold to Scrap Dealer
7	Packaging Paper	Sent to Storage Area After Use	Storage in Packaging Papers Area	Sold to Scrap Dealer
8	Packaging Plastics	Sent to Storage Area After Use	Storage in Packaging Plastics Area	Sold to Scrap Dealer
9	Office Papers	Collected by Cleaners	Storage in Packaging Papers Area	Sold to Scrap Dealer
10	Metal Filings	Temporary Storage in Production Area	Storage in Metal Filings Area	Sold to Scrap Dealer
11	Construction Wastes	Trucks	No Storage in FIRAT	Storage in Areas Pointed by Municipality
CONTROL OF HAZARDOUS WASTES				
	Solid Wastes	Handling	Storage Conditions	Disposal Methods
1	Clinical Wastes	Collected in Infirmary	Temporary Storage in Infirmary	Off-site Incineration

2	Oils	Collected in Barrels with label of "Oil"	Temporary Storage (Preventing Leakage)	Off-site Incineration
3	Cleaning Cloths	Collected in Barrels with label of "Contaminated Waste"	Temporary Storage in Barrels with label of "Contaminated Waste"	Off-site Incineration
4	Laboratory Chemicals, Containers	Collected in Laboratory	Temporary Storage in Laboratory	Off-site Incineration
5	Tires of all kinds of Vehicles in the Plant	Temporary Storage in Specified Area	Temporary and Separate Storage in Specified Area	To provide alternative usage. Off-site incineration for the useless part.
6	Gas Tubes	Collected by the Responsible of Auxiliary Operations	Temporary Storage in the area specified by the Responsible of Auxiliary Operations	Off-site Incineration
7	Batteries	Collected by the Responsible of Managerial Operations	Temporary Storage in the area specified by the Responsible of Managerial Operations	To provide alternative usage. Off-site incineration for the useless part.
8	Carbon Black Packages (Sacks of 1 tone)	Stored by Tying To Prevent Dust	Temporary Storage in a container in the waste area	Off-site Incineration
9	Fluorescent, dry battery	Collected in an Area Specified by responsible of Managerial Operations	Temporary Storage in a container in the waste area	Off-site Incineration
10	Chemical Material Barrels	Sent to Waste Area	Temporary Storage in the contaminated waste part of the waste area.	Sent back to producer; Sold to scrap-dealer for recycle; Used for storage of hazardous wastes and sent to off-site incineration plant; Used for storage of storage of recyclable wastes
11	Filters	Collected in an Area Mentioned by Auxiliary Operations	Temporary Storage in an Area Specified by the responsible of Auxiliary Operations	Off-site Incineration
12	Silicones	Collected in Barrels	Temporary Storage in PP-PE Buildings	Used for silicone gasket in Pipe, PP-PE Buildings
13	Chemicals in Electrostatic Powder Dying	Collected in Steel Barrels During Change of Chemicals	Temporary Storage for the chemicals in their original barrels	Chemicals stored in Barrels are sent to off-site incineration plant.

Table III.9 Hazardous wastes in the company in 2004

Hazardous waste classification and amounts		
Wastes	Amounts	Disposal
Damaged PEX Contaminated Wastes Carbon Black Automobile Wheel Batteries Empty Sacks of Chemicals	17.240 kgs	İzaydaş
Glycerin oil	7.250 kgs	Ataberk

wastes will direct the reuse, recycle of wastes. In case of making no progress, the new projects can be considered instead of existing.

III.10.5.1 Wastewater

The main wastewater sources of company are water from the cooling baths, which are collected in the glycerin-water mixture formed in the PE-PP plant. The wastewater from kitchen, toilets and pools and the infirmary are considered as domestic wastewater with the water from the pools after settling is directly given to the city sewerage. In order to define wastewater characterization from the pools, wastewater is analyzed for certain periods to verify the compliance with the “Water and Wastewater Authority of İstanbul” (İSKİ). The results of routine analysis are compared with the standards and reported.

Besides, the characterization of sludge settled in the pools is also determined to verify compliance with the Turkish Regulations on the control of Hazardous Wastes. Although the results comply with the regulations, according to management decision, the settled sludge is decided to be sent to İZAYDAŞ, with the hazardous wastes, periodically.

III.10.5.2 Air Emissions

The potential sources of inside air pollution in the entire plant are found as lamination and bending, rubber plant, metal injection, dying process. The determinations of the sources are based on the chemicals used, and the material safety data sheets for air emission

These points, the inside measurements done and the parameters are given on the Tables from 10 to 15 and Appendix D and can be described as;

TableIII.10 Air Emission Parameters in Lamination and Limit Values, 2003

No	Unit	TVOC (mg/m3)	Limit Values (mg/m3)
1	Lamination Unit	38	1800
2	Lamination Unit	288	1800
3	Lamination Unit	230	1800
4	Lamination Unit	77	1800
5	Lamination Unit	38	1800
6	Lamination Unit	192	1800
7	Lamination Unit	230	1800
8	Lamination Unit	77	1800

Table III.11 Air Emission Parameters in Bending Process and Limit Values, 2003

No	Unit	TVOC (mg/m3)	Limit Values (mg/m3)
1	Bending Process	96	1800
2	Bending Process	116	1800

Table III.12 Air Emission Parameters in Rubber Plant and Limit Values, 2003

No	Unit	TVOC (mg/m3)	Limit Values (mg/m3)
1	Rubber Plant	<19	1800
2	Rubber Plant	<19	1800
3	Rubber Plant	<19	1800
4	Rubber Plant	<19	1800
DUST (mg/m3)			
1	Rubber Plant	1,1	1800
2	Rubber Plant	0,76	1800
3	Rubber Plant	0,41	1800
4	Rubber Plant	0,1	1800

Table III.13 Air Emission Parameters in Lamination and Limit Values, 2004

No	Unit	TVOC (mg/m3)	Limit Values (mg/m3)
1	Lamination Unit	42	1800
2	Lamination Unit	238	1800
3	Lamination Unit	214	1800
4	Lamination Unit	86	1800
5	Lamination Unit	37	1800
6	Lamination Unit	245	1800
7	Lamination Unit	221	1800
8	Lamination Unit	82	1800

Table III.14 Air Emission Parameters in Bending Process and Limit Values, 2004

No	Unit	TVOC (mg/m3)	Limit Values (mg/m3)
1	Bending Process	98	1800
2	Bending Process	109	1800

Table III.15 Air Emission Parameters in Rubber Plant and Limit Values, 2004

No	Unit	TVOC (mg/m3)	Limit Values (mg/m3)
1	Rubber Plant	12	1800
2	Rubber Plant	10	1800
3	Rubber Plant	5	1800
4	Rubber Plant	8	1800
DUST (mg/m3)			
1	Rubber Plant	1,13	1800
2	Rubber Plant	0,62	1800
3	Rubber Plant	0,39	1800
4	Rubber Plant	0,17	1800

a. Lamination Unit: In this unit the bands are stuck on to the profile with hot process results with the organic vapor formed from the organic compounds. The pollutants are measured as Total Volatile Organic Compounds (TVOC) closer to the Lamination Plating Machine.

b. Bending: The profiles are heated with glycerin bath to give a shape to the product. The organic vapor is spread out to the environment as TVOC.

c. Rubber Plant: Synthetic or natural rubber sulfur and calcite are fed into the Bambury machine to form the mixture. Pollutants are measured as dust and organic vapor formed during grinding operation.

d. Metal Injection and Dying Unit: Al-Zn alloyed metal parts are formed in the injection machines. After the burrs cleaned from these metal parts, they are dyed in electronic powder dying cabinet. The dust measurement is done closer to these injection and dying machines.

The measurement points are mentioned in Appendix-E, based on Report of Istanbul Technical University on June 2003 and Report of Artek Engineering June 2004.

Besides inside air emission measurements, 18 air emission sources are described. Table III.16 shows the sources and Table III.17 shows total emissions for the entire facility briefly.

Based on the Regulation of Air Quality Protection, the company facilities are classified according to the processes and the type of fuel used, found as is subject to permission as Class B Emission facility.

Appendix F shows the characteristics of sources, results of measurements and the limit values for some of the measuring points.

III.10.5.3. Noise Pollution

The interior part, where the machines operate, warehouses, offices, the outside of the plant, the open areas in the plant and the closest residential areas are considered as potential noise pollution sources.

Table III.16 The Source Of The Pollutants in The Plant

Nr.	Source of Pollutant	C.G.	Dust	F/A	TVOC	W.V.
1	1st common bag filter chimney in mixer		X			
2	2nd common bag filter chimney in mixer		X			
3	3rd common bag filter chimney in mixer		X			
4	4th common bag filter chimney in mixer		X			
5	Common chimney in hose production (suction lines of mixer machines)		X			
6	Ventilation chimney in extrusion machines in rubber plant				X	
7	Ventilation chimney of bambury machine		X		X	
8	Dust collecting bag filter chimney of bambury machine		X			
9	Common chimney of bending machines				X	
10	Common chimney of lamination machines				X	
11	Common chimney of metal injection machine		X			
12	Drying oven chimney of dye-house					X
13	Drying oven thermo block boiler chimney of dye-house	X	X	X		
14	Common chimneys of heaters (3 pcs) in dye-house	X	X	X		
15	Powder dying oven thermo block boiler chimney	X	X	X		
16	1st Chimney of central heating unit boiler	X	X	X		
17	2nd Chimney of central heating unit boiler	X	X	X		
18	3rd Chimney of central heating unit boiler	X	X	X		

C.G: Combustion Gases, F/A: Formaldehyde, TVOC: Total Volatile Organic Carbon, W.V: Water Vapor

*Report of Artek Engineering - 07-08 June 2004

Table III.17 Total Emissions for The Entire Facility

Nr.	Source of Pollutant	CO (kg/st)	SO2 (kg/st)	NO2 (kg/st)	Dust (kg/st)
1	1st common bag filter chimney in mixer	-	-	-	0,0053
2	2nd common bag filter chimney in mixer	-	-	-	0,0041
3	3rd common bag filter chimney in mixer	-	-	-	0,0050
4	4th common bag filter chimney in mixer	-	-	-	0,0050
5	Common chimney in hose production (suction lines of mixer machines)	-	-	-	0,0084
6	Ventilation chimney in extrusion machines in rubber plant	-	-	-	0,0299
7	Ventilation chimney of bambury machine	-	-	-	-
8	Dust collecting bag filter chimney of bambury machine	-	-	-	0,0079
9	Common chimney of bending machines	-	-	-	0,0674
10	Common chimney of lamination machines	-	-	-	-
11	Common chimney of metal injection machine	-	-	-	-
12	Drying oven chimney of dye-house	-	-	-	0,0061
13	Drying oven thermo block boiler chimney of dye-house	0,0030	0,000	0,0012	-
14	Common chimneys of heaters (3 pcs) in dye-house	0,0007	0,0005	0,001	0,000
15	Powder dying oven thermo block boiler chimney	0,0019	0,000	0,0012	0,000
16	1st Chimney of central heating unit boiler	0,0138	0,0000	0,0018	0,000
17	2nd Chimney of central heating unit boiler	0,0807	0,000	0,0149	0,000
18	3rd Chimney of central heating unit boiler	0,0012	0,000	0,0004	0,000
Total		0,1013	0,0005	0,0196	0,1341
Limit Values		1000	60	40	15

*Report of Artek Engineering - 07-08 June 2004

The noise pollution parameters are evaluated according to “The Tolerable Noise Levels for Industries and Residential Areas” based on Regulation of Noise Control.

Table III.18 shows the summary of measurements in the entire plant and Figure III.3 shows the results of measurements in the plant on the general view.

III.11 STRUCTURE AND RESPONSIBILITY

The successful implementation of environmental management program depends on the participation of all employees of the organization. In the company, the commitment begins at the highest level of the management and continuous with all employees. The key EMS responsibilities are well defined in order to communicate to the relevant personnel.

The company assigned a senior management, managerial representative, human resources director, maintenance director, worker health and occupational safety committee, workplace physician and emergency team for the purpose of dividing and distributing the responsibilities. Briefly the responsibilities are defined below:

Senior Management shall be liable,

- *To provide the necessary resources to ensure that the environmental management system is operated in an efficient and productive manner.*
- *To approve and update environmental policies.*
- *To organize management overview meetings,*
- *To determine the companies environmental objectives,*
- *To pursue the management program,*

Managerial Representative shall be liable,

- *To establish, operate and improve environmental management systems,*
- *To report the efficiency and productivity of environmental management systems to senior management,*

Table III.18 Measured Noise Levels in The plant

Unit	Measured Noise Level Leq dB(A)	Limit Values Leq dB(A)
1-Profile Plant	74,9 - 84,7 dB(A)	85,0
-Metal Injection	75,3 - 88,5 dB(A)	85,0
-Reimelt Unit	71,1 - 83,9 dB(A)	85,0
-Lamination	67,8 dB(A)	85,0
-Bending	59,9 dB(A)	85,0
-Warehouses	72,9 dB(A)	85,0
2-PVC Plant	73,8 - 94,6 dB(A)	85,0
-Mixer	79,4 - 83,0 dB(A)	85,0
-Breaking Process	92,6 - 94,6 dB(A)	85,0
-PE	84,2 dB(A)	85,0
-Boiler Room	63,0 dB(A)	85,0
3-Sheet Iron	69,1 - 82,8 dB(A)	85,0
4-FKS Pipe Plant	Under Construction	-
5-U Building / Ground Floor	75,3 - 86,6 dB(A)	85,0
-Krah	76,5 - 77,8 dB(A)	85,0
-Breaking	79,1 dB(A)	85,0
-Boiler Room	67,6 dB(A)	85,0
-Offices	56,9 - 57,7 dB(A)	85,0
6-U Building / Rubber	67,9 - 73,2 dB(A)	85,0
-Laboratory	67,0 dB(A)	85,0
-Dining Hall	71,4 dB(A)	85,0
-Offices (Upper Floor)	53,3 dB(A)	85,0
7-Technical Workshop	64,8 - 78,4 dB(A)	85,0
8-Cooling Groups		
-GWK 1	86,0 - 87,5 dB(A)	85,0
-GWK 2	80,0 - 81,8 dB(A)	85,0
-GWK 3	86,1 - 89,2 dB(A)	85,0
9-Hose Plant		
-Basement	44,5 dB(A)	85,0
-Ground Floor	56,6 - 76,8 dB(A)	85,0
-Upper Floor	71,4 - 85,5 dB(A)	85,0
10-Control Building		
-Upper Floor	58,7 - 59,0 dB(A)	85,0
-Electric Workshop	56,4 dB(A)	85,0
11-Management Building		
-Human Resources Dept.	54,9 dB(A)	85,0
-Personnel Room	60,7 dB(A)	85,0
-Purchasing Dept.	66,3 dB(A)	85,0
	53,7 - 55,9 dB(A)	85,0

* 85,0 dB(A) is the limit Leq value causes permanent damage of 8 hours of continuous working mentioned in the National International Standards.

- *To ensure that efforts are used to assess the environmental aspects and to define the OHS dangers, to cause the management program to be issued within the framework of said efforts, and to submit this program to senior management for approval,*
- *To cause the documentation needed to efficiently operate the environmental management systems to be prepared, to control any documentation already in force,*
- *To plan in-house environmental inspections,*
- *To cooperate with the Human Resources Director to increase the environmental awareness of employees.*

Human Resources Director shall be liable,

- *To preside over the Worker Health and Safety Committee,*
- *To conduct researches and issue reports in case of any occupational accidents,*
- *To use efforts necessary to rectify any work environments found to be deficient from an environmental viewpoint,*
- *To conduct the organization procedures necessary to allow the personnel to perform efficient first aid and emergency procedures, and to train relevant personnel,*
- *To secure and operate solid waste and hazardous waste storage areas.*
- *To take the competence, conscious and the training of personnel into consideration during the recruitment of personnel,*
- *To pursue the Environmental legislation of the Turkish Republic and to announce the changes in-site,*
- *To plan the health checks of the personnel and to make them applied,*
- *To have the licensed intuitions make the noise, emission... etc. measurements.*

Maintenance Director shall be liable,

- *To maintain and control all kinds of machinery and equipment used within the plant within the framework of minimum legal requirements,*
- *To store the wastes formed after the maintenance of the equipments in suitable conditions,*

- *To make the control of the protecting equipment and emergency equipment during the maintenance,*
- *To make the necessary controls during and after the emergency conditions.*

Worker Health and Occupational Safety Committee shall be liable,

- *To fulfill all liabilities stipulated in the Regulations for Worker Health and Occupational Safety Committees.*

Workplace Physician shall be liable,

- *To perform the initial and periodical physical examination procedures on employees,*
- *To conduct first aid organization and emergency treatment procedures in case of any accidents,*
- *To administer protective vaccinations,*
- *To train the first aid team,*
- *To fulfill the liabilities of workplace physicians stipulated in the Regulations for the Working Conditions, Duties and Authorities of Workplace Physicians.*

Emergency Team shall be liable,

- *To fulfill the liabilities stipulated in the Emergency Procedure in cases listed in the said procedure. (FIRAT, EMS And OHS Manuel,2003)*

III.12 AWARENESS AND TRAINING

The basic step is to inform every employee about the effects of the facility on environment, also on human health.

The type of trainings for production department employees and the engineers differs in content and in period. The training programs covers general environment, health and safety, working with chemicals, MSDS information, personal protective equipment information, forklift operation, environmental awareness, waste minimization.

In the end of every year, the training program is prepared by the human resources department and become effective with the approval of general management. Performance ratings, demands from the different departments taken

into consideration firstly, while the training programs are prepared. The trainings of employees that have significant effect on environment are evaluated accordingly. Besides, the employees, who have responsibilities in internal environmental audits, are trained accordingly. Both internal and external environmental trainings are based on environmental policy of the company and environmental management system necessities.

The employees are informed about environmental effects, competence, responsibilities about environment and the possible impacts of their job on environment during the orientation.

In order to raise the environmental consciousness, “Environmental, Occupational Health and Safety Personnel Information Brochure” is prepared, and can be easily reached by employees and subcontractors, also. The brochure includes quality policy and the environmental policy of the company, basic environmental definitions, possible effects of wastes to environment and human life and simple solutions to prevent (Appendix G).

III.13 COMMUNICATION

The methods specified in the “In-house Communication Instructions” are the basic tools of in-house communication together with the media. The assigned employee is responsible for

- Receiving and responding from/to suggestions of employees,
- The results from the environmental management system monitoring and the environmental performance,
- The results of environmental management audits and management reviews to related employee.

While having commitments in the inside communication, the company has no outside communication commitments about the Environmental Management System applications and performance other than answering requests and complaints about environmental issues and providing replies to the demands of public institutions and organizations.

Communication procedures including the national-international standard conditions, European Community Directive conditions and the environmental

requests of customers shall be jointly managed by the Quality Control Director and the R&D Director.

III.14 EMS DOCUMENTATION

In order to implement the environmental management system in the company, an integrated documentation system with quality management system is set. Various types of documents are defined and some integrated into the existing system. Related documents such as environmental policy, environmental objectives, and operational procedures, emergency plans are reference for implementation of environmental management system.

Environmental management system manual is prepared to address the main elements of the environmental management system and the documentation drawn up within the mentioned framework.

III.15 EMERGENCY PREPAREDNESS AND RESPONSE

The company has prepared detailed emergency plan and procedures in order to minimize the possibilities of accidents and other emergency situations as the effective preparation and response can reduce injuries, prevent or minimize environmental impacts, protect employees and neighbors. These emergency response plans cover basically the structure of emergency organization, a detailed list of key personnel and their responsibilities.

Fire, explosion, accidents that can cause harm and/or fire, natural disaster and sabotage are accepted as emergency situations. Briefly the steps of actions are mentioned before and at the time of any of these conditions, furthermore the responsibilities.

As it is inefficient to specify one place for the emergency conditions, different points, responsible are selected for different buildings; the fire teams, some of the employees are trained accordingly to interfere in any dangerous situation, like fire.

For both fire engine and ambulance, trained drivers, and a nurse for the emergency conditions are set to be present in the company.

After emergency control form is set to control the probable consequences as shown in Table III.19

Table III.19 After Emergency Control Form

AFTER EMERGENCY CONTROL FORM				
Points To Be Checked	Situation	Determinations (Environmental)	Corrective and Preventive Actions	Priority
Natural Gas Lines	☐ Available ☐ Inconsiderable Operating Conditions/Available ☐ Unavailable			
Water Lines	☐ Available ☐ Inconsiderable Operating Conditions/Available ☐ Unavailable			
Energy Lines	☐ Available ☐ Inconsiderable Operating Conditions/Available ☐ Unavailable			
Compressed Air Lines	☐ Available ☐ Inconsiderable Operating Conditions/Available ☐ Unavailable			
Warehouses	☐ Available ☐ Inconsiderable Operating Conditions/Available ☐ Unavailable			
Buildings	☐ Available ☐ Inconsiderable Operating Conditions/Available ☐ Unavailable			
Generators	☐ Available ☐ Inconsiderable Operating Conditions/Available ☐ Unavailable			
Fuel Oil Tanks	☐ Available ☐ Inconsiderable Operating Conditions/Available ☐ Unavailable			
Boilers	☐ Available ☐ Inconsiderable Operating Conditions/Available ☐ Unavailable			
Transformers	☐ Available ☐ Inconsiderable Operating Conditions/Available ☐ Unavailable			
Ambulance/Fire Engine	☐ Available ☐ Inconsiderable Operating Conditions/Available ☐ Unavailable			

III.16 MONITORING AND MEASURING

Within the context of the Environmental Management System, environmental performance, causes of problems, compliance with legal requirements and improvements are briefly analyzed. Furthermore, the legal proceedings direct the company about the necessities about the environment.

In the company, periodically measurements and the forms helps to specify the performance of EMS, to control the points need improvements. Besides, with the specified target numbers mentioned on the environmental management program as seen on Appendix H, the monitoring of long term projects.

III.17 NON-CONFORMANCE AND CORRECTIVE AND PREVENTIVE ACTIONS

Any incompatibilities and potential incompatibilities within the framework of the Environmental Management System or any environmental accidents, events occurring is organized to be recorded and corrective actions shall be initiated and monitored in compliance with the Corrective and Preventive Actions Procedure.

The said corrective or preventive actions shall be assessed from the viewpoints of environmental aspects, furthermore OHS dangers before making any changes.

III.18 EMS RECORDS

For the effective control of keeping the records, controlling if records are implemented in effective way, Controls of Records Procedure is prepared. The said procedure briefly describes the place of the procedures kept, responsible, retention period and disposal method and period.

III.19 EMS AUDITS

In order to control whether the company complies with the necessities of EMS, periodically internal audits arranged.

Internal audits are planned and implemented based on previous internal audits and the processes. Scope, period and methods are applied so as to implement internal audits under effective and efficient way.

The personnel, takes place in the internal audit, are selected independent from the process. The determined inappropriate actions improved with the coordination of the responsible of the said process. The verification, and reporting of the audits are controlled and documented by the independent personnel who make the audits.

III.20 MANAGEMENT REVIEW

The senior management of company conducts overview studies at least twice annually to determine the efficiency and productivity of the environmental management system and to adopt and implement decisions to constantly develop the said systems.

During the management overview procedures, the following items can be discussed;

- Environmental and OHS decisions adopted during the previous management overview meeting,
- Accidents, events, incompatibilities, corrective and preventive actions,
- Environmental policy,
- Environmental objectives and management program,
- Environmental management system performance measurement results,
- In-house environmental inspection results.

The said overview procedures shall be performed in compliance with the Management Overview Procedure.

IV. RESULTS

The environmental performance of the company arises along with the implementation of the environmental management system.

As a result of the implementation of an environmental management system in the plastic industry, the following discussions are made;

- **Location of The Facility:**

Evaluation of the location of the facility with respect to the distance from other companies, emergency situations, waste management alternatives, shipping of raw materials and end products bring up the necessities.

Since the company is located out of the city and on a large area, found that shipping of raw materials, products or disposal of wastes are easier. The storage areas for raw materials and products are re-organized, moreover the waste storage area.

Not only for the solid wastes, a tank for the waste oil from the operations is designed.

- **Chemicals in The Plant:**

For the chemicals used in the plant MSDSs are obtained, evaluated and a database is generated in order to determine hazard identification. MSDSs are also simplified in a form employees easily understand, reach and found out what to do under emergency conditions for both on human health and environment.

- **Waste Management:**

In plastic industry, it is so common that the shrinkages can be recycled.

Recyclable shrinkages are collected accordingly. Periodically non-recyclable solid wastes such as damaged PEX, contaminated wasted, carbon black, automobile wheels, batteries, empty sacks of chemicals and waste oil are sent to İzmit Waste and Residue Treatment Incineration and Recycling Co. Inc.

(İZAYDAŞ) in order to eliminate any harm to the environment, also on human health.

Among the offices, paper is the major waste source. While reusing of the office documents minimizes the paper waste, collecting in paper collection boxes is also an important solution for minimizing/recycling of paper wastes.

▪ **Air Pollution:**

The company discussed and evaluated operations, which had the potential source of air pollution.

As a result of measurements done in the company, the values above the limits are determined. As is discussed previously in the management program, for the possible improvements projects prepared by the responsible of specified operation and the management representative. Process modifications resulted in the significant air emission reduction, in extrusion, mixer, hose production.

As it can be seen in Tables from 12 to 23 the results of the air emission analysis indicate that the company is in compliance with the air emission limits.

▪ **Noise Control:**

The company also discussed and evaluated operations, which had the potential source of noise pollution.

According to the results of measurements found that the process machines in some parts of the plant causes high noise levels, than mentioned in the regulations.

To minimize the effects of noise on employees some of the machines with high noise level are covered. The warnings about high noise level are stick up to the key points in the plant. In the processes such as breaking, usage of personal protection equipments are encouraged.

▪ **Objectives and Targets:**

Documented environmental objectives and targets are established at all relevant levels within the organization. Specific targets are established for the

identified objectives and the continuance of targets are provided by the mentioned responsible.

- **Environmental Management System:**

In addition for identifying the objectives and targets means and a timetable to implement the management program is prepared.

- **Structure and Responsibility:**

Environmental roles and responsibilities are clearly defined, documented and communicated for more effective EMS.

- **Training Programs:**

The company organized environmental awareness trainings for the key employees. Trainings in waste management, waste paper collection and waste management awareness are also conducted. Besides, training needs for the employees in different departments reviewed and consolidated.

- **EMS Audit:**

Since the system needs to be evaluated to determine the status of current applications, initiate corrective and preventive actions and the improvement of management system efficiency, implementation of EMS should be periodically externally audited.

The internal audits will support to minimize the deficiencies of the environmental management system.

- **Management Review:**

Management reviews include the changes in procedures resulting from the improvement of system, results from audits, the extend to which objectives and targets have been met, the continuing suitability of the environmental management system in relation to the changing conditions and information, concerns among relevant interested parties.

Briefly in the company:

- Storage area for raw materials designed,
- Storage area for solid wastes designed,
- Tank for waste oil built,
- MSDS Database for chemicals prepared,
- Usage of personnel protection equipment encouraged,
- Recycle of office wastes increased,
- Recycle of shrinkages increased,
- Hazardous wastes sent to Izaydas ,
- Air pollution measurements done periodically,
- Improvements in aeration systems designed,
- Noise pollution measurements done periodically,
- High-noise machines covered,
- Environmental roles and responsibilities briefly defined,
- Periodical trainings for employees arranged ,
- Internal audits arranged.

V. DISCUSSIONS AND EVALUATIONS

Technological development is key element in today's world; besides its benefits it has many environmental problems. In global market, the quality and the price are not the only factors for determining the product; its effects during and after production on human and environment are another important factors.

The basic standards that are well known for the quality, environment and health and safety issues are strongly interrelated with each other. It is very important to integrate the systems with another, even though they have different standards. The increase in the performance of the system cannot be disregarded.

Environmental management system is a voluntary action, which can be applied in all sectors. Although every requirements of ISO 14001 standards are provided, the commitment of the management together with the employees directly effect the performance of the environmental management system.

In FIRAT, environment, health and safety issues are integrated into each other in many ways, and into the existing quality system. Together with the implementation of the environmental management system, a clear environmental consciousness on the employees and top management became visible.

The effects of the facilities on the environment are clearly discussed, before all else. The solutions are determined according to the regulations and practicability among the employees. After the implementation studies of Environmental Management System in the company, a vitally important continuous process started.

In the consequence of substantiation of the aforementioned procedures and steps, it is clearly found that implementation of environmental management provided a continuous improvement on the environmental performance of the company.

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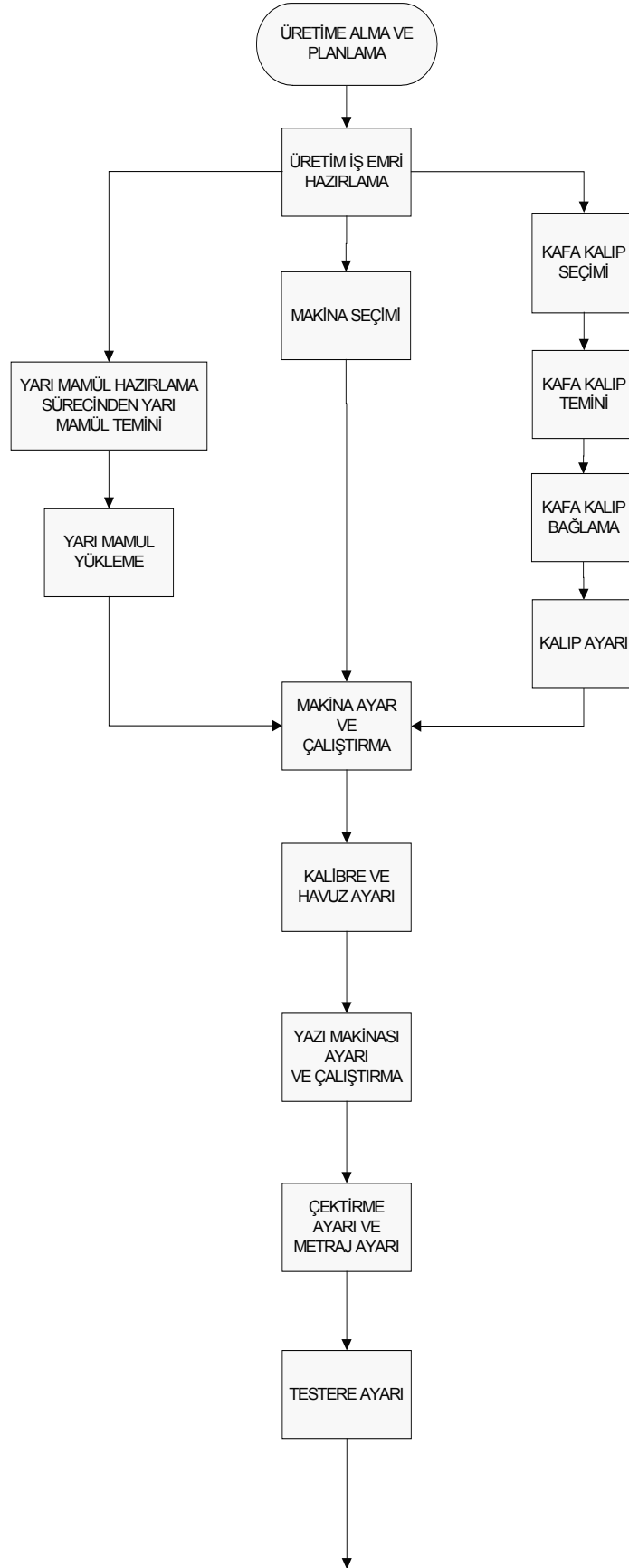
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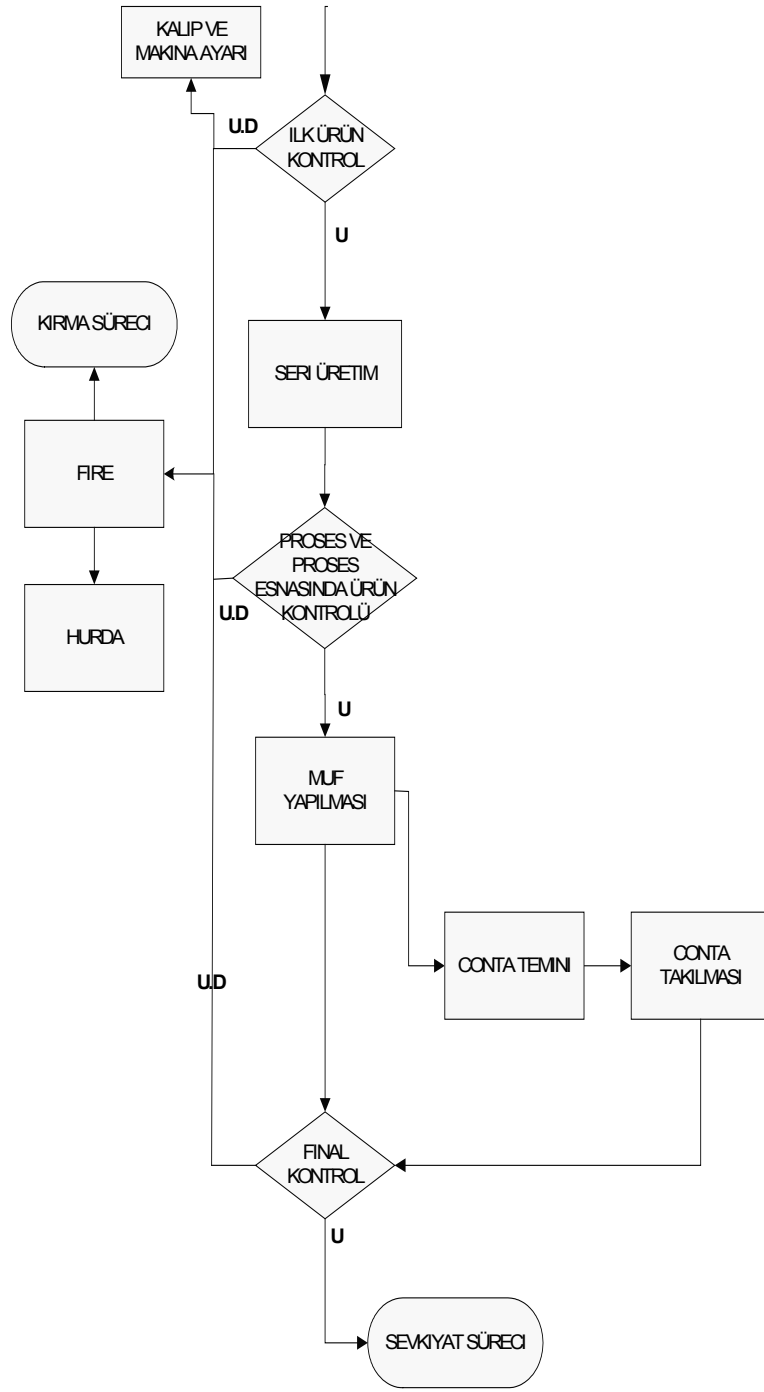
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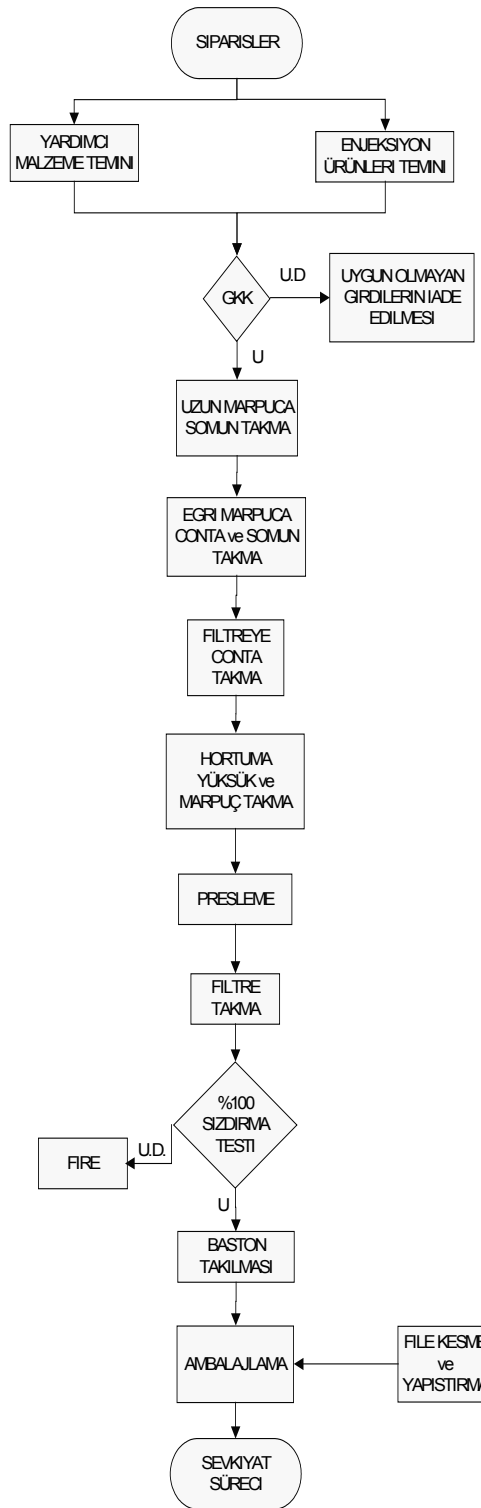
APPENDIX

APPENDIX A

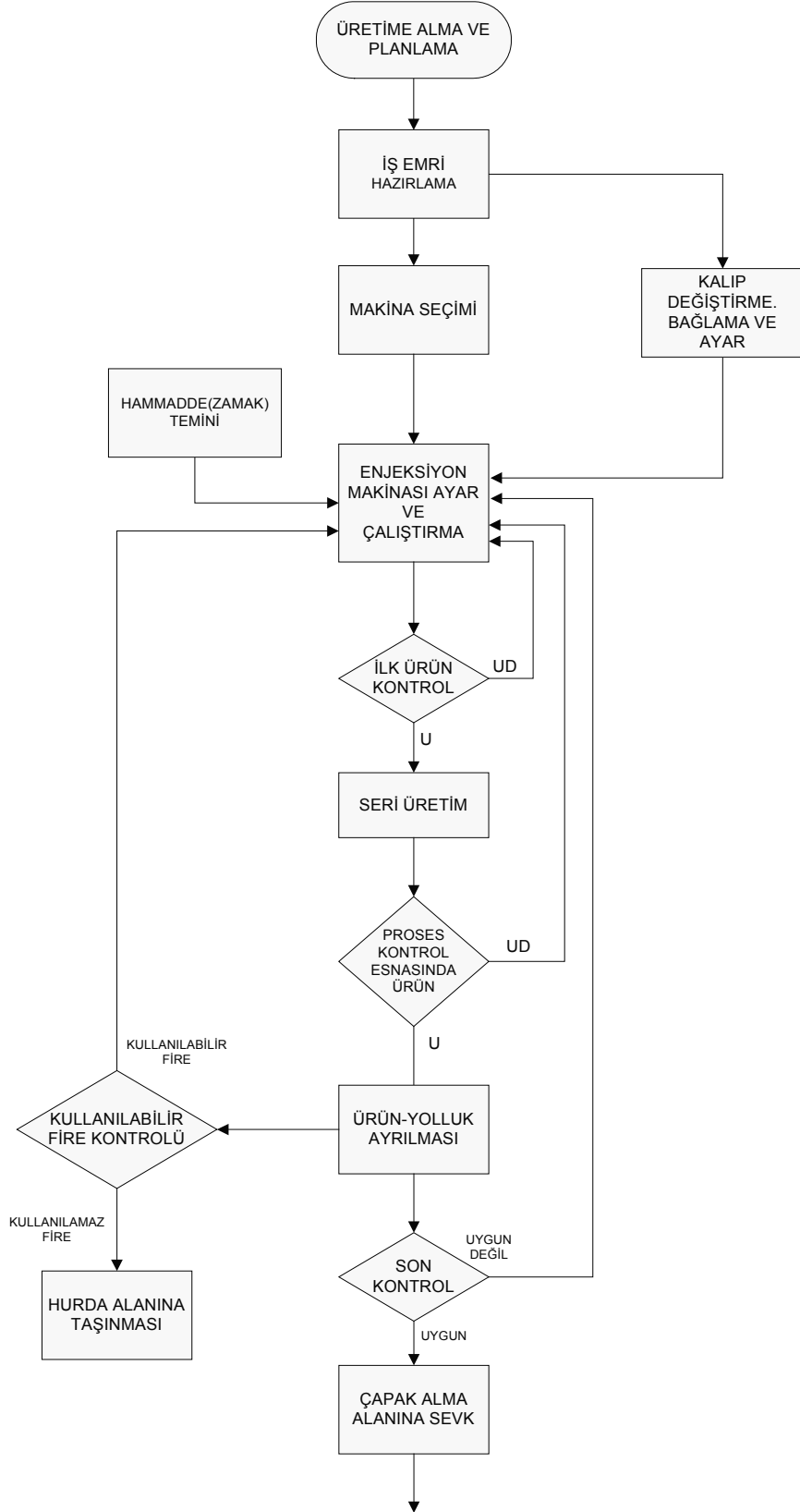


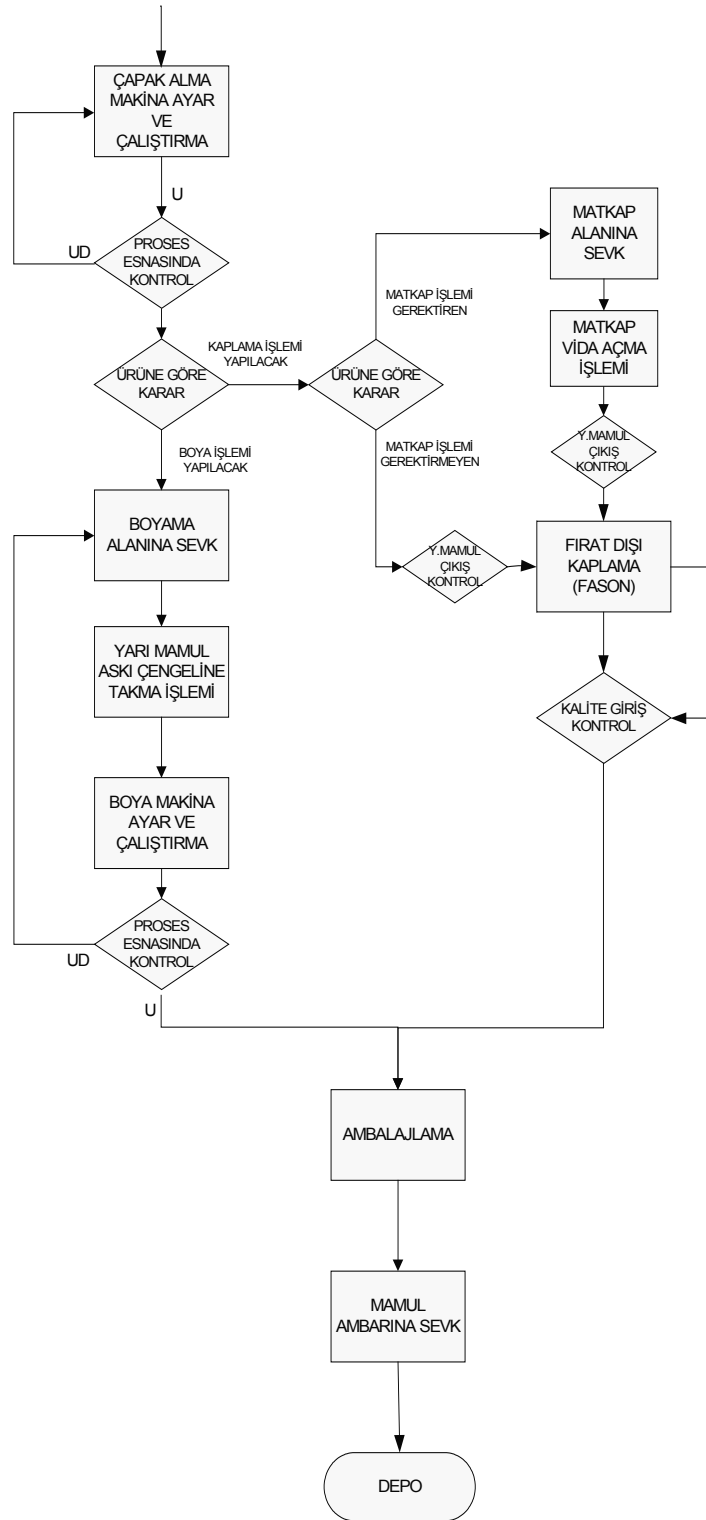


Appendix A.1 Process Flow Scheme of PVC Pipe Production

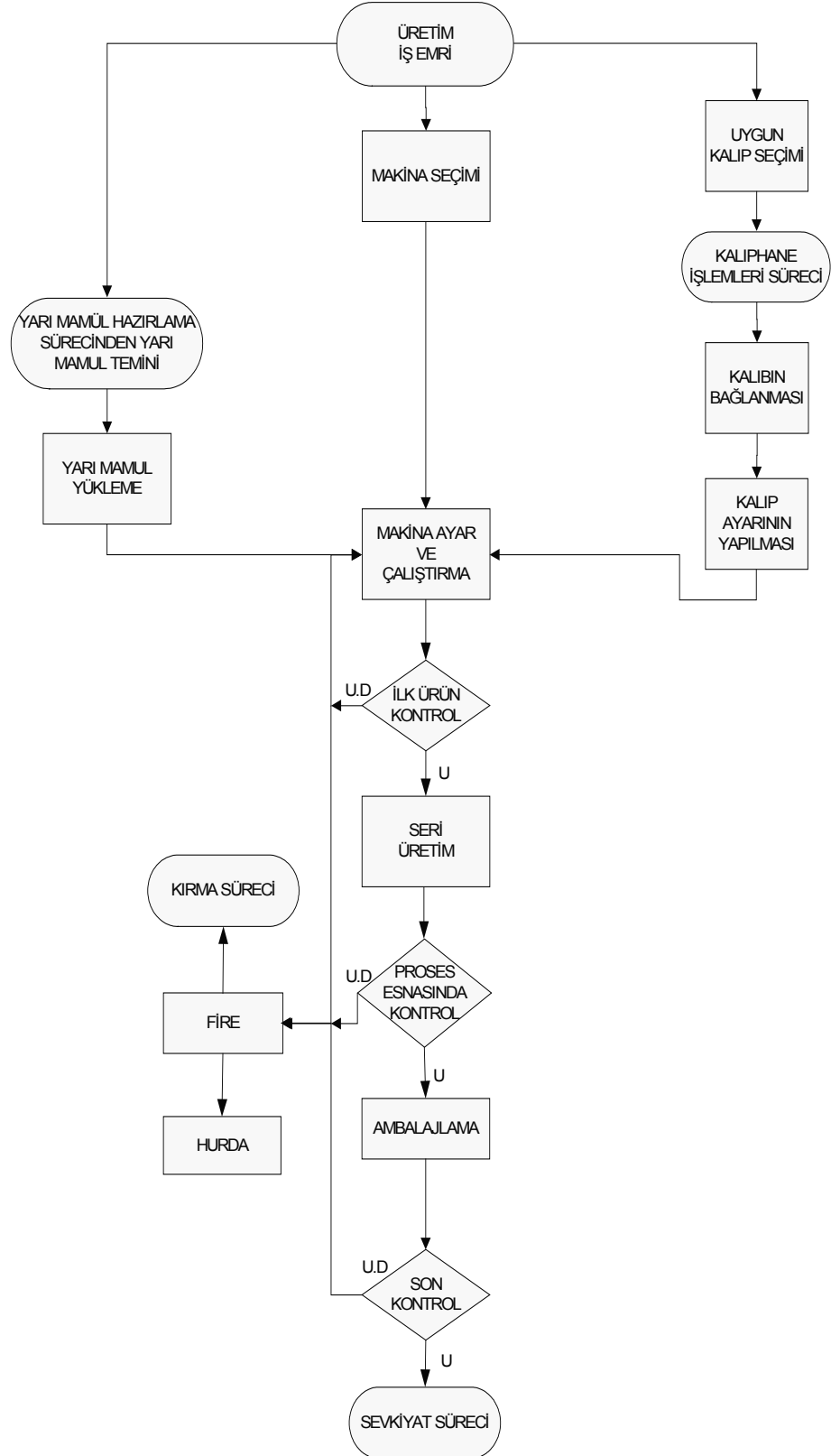


Appendix A.2 Process Flow Scheme of Hose Montage of Water Entry

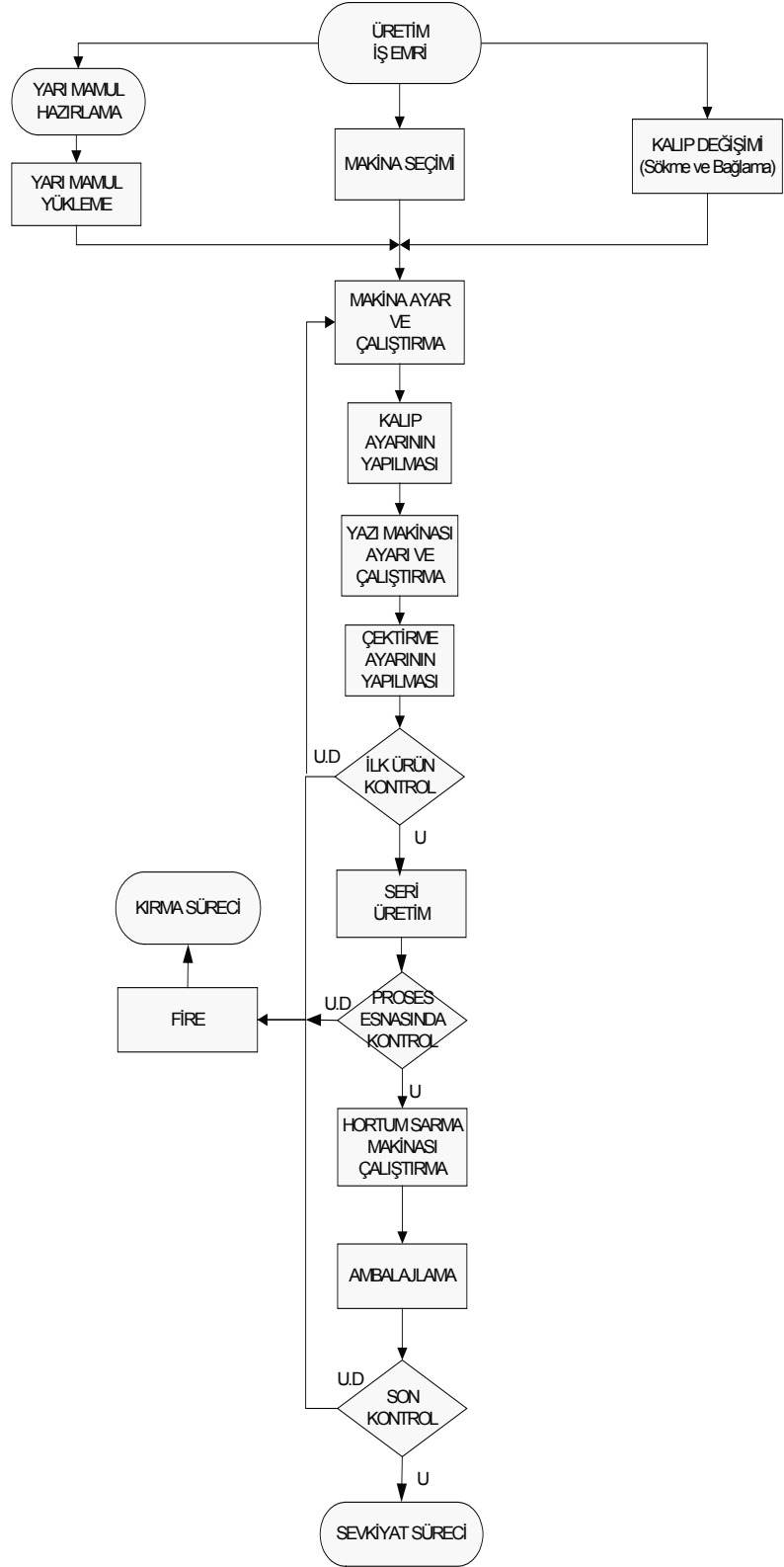




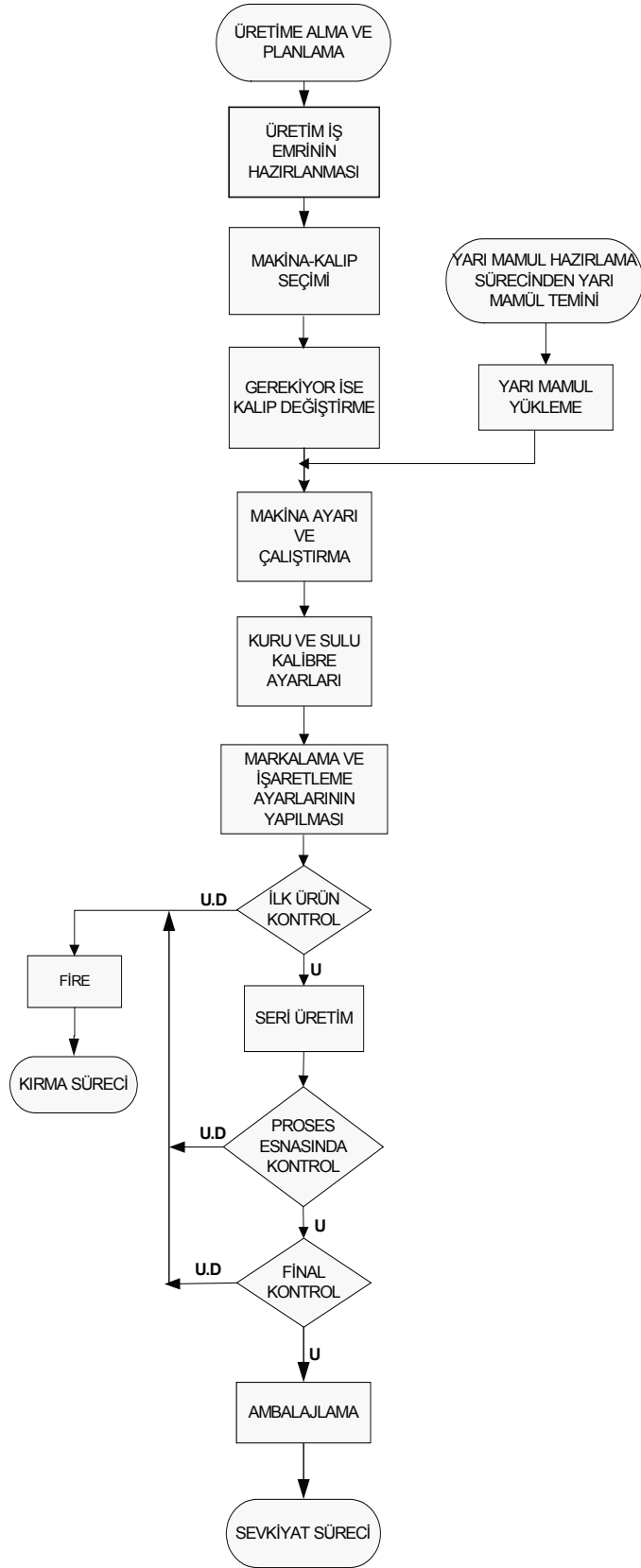
Appendix A.3 Process Flow Scheme of Metal Injection



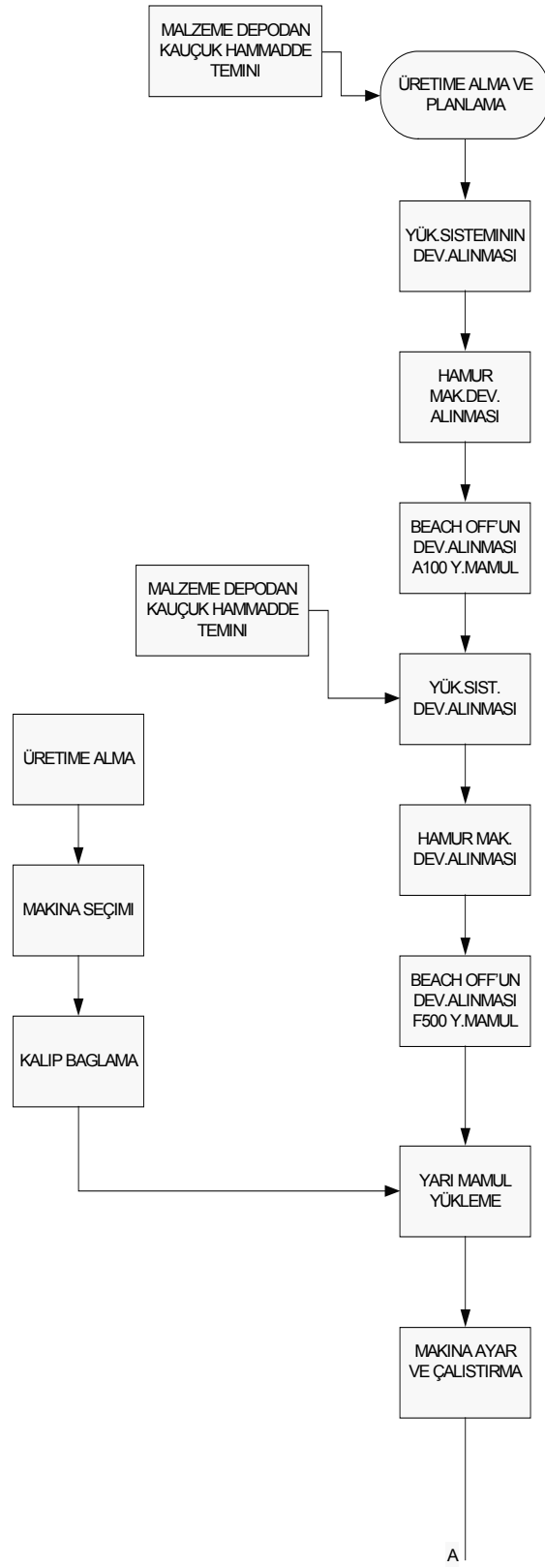
Appendix A.4 Process Flow Scheme of PVC Injection

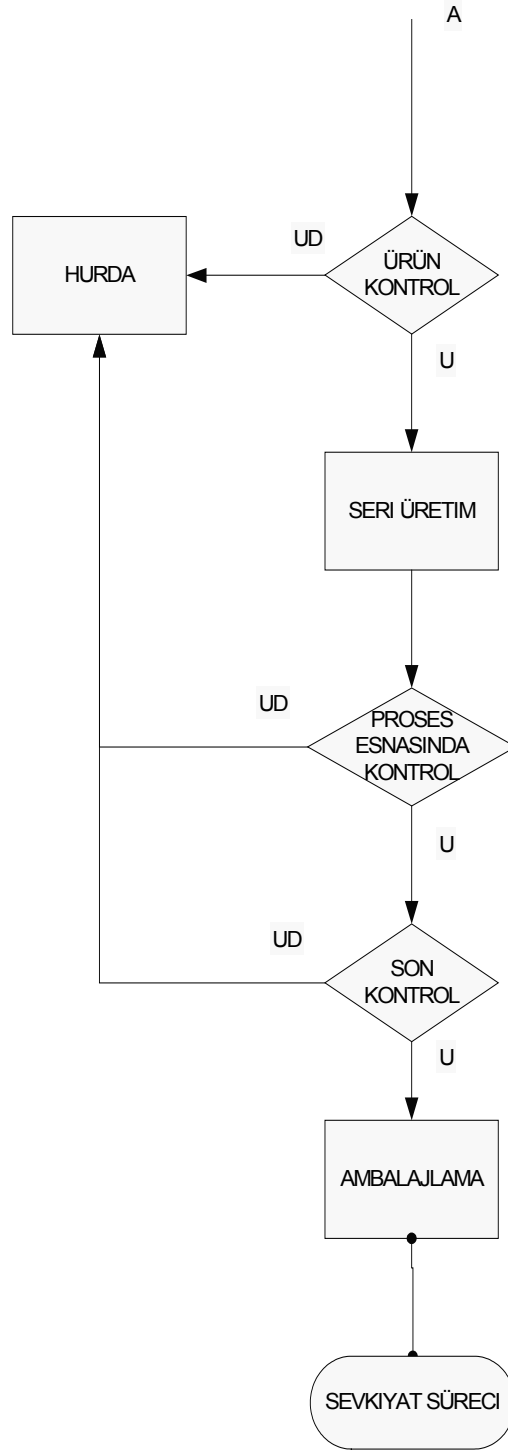


Appendix A.5 Process Flow Scheme of Hose Production

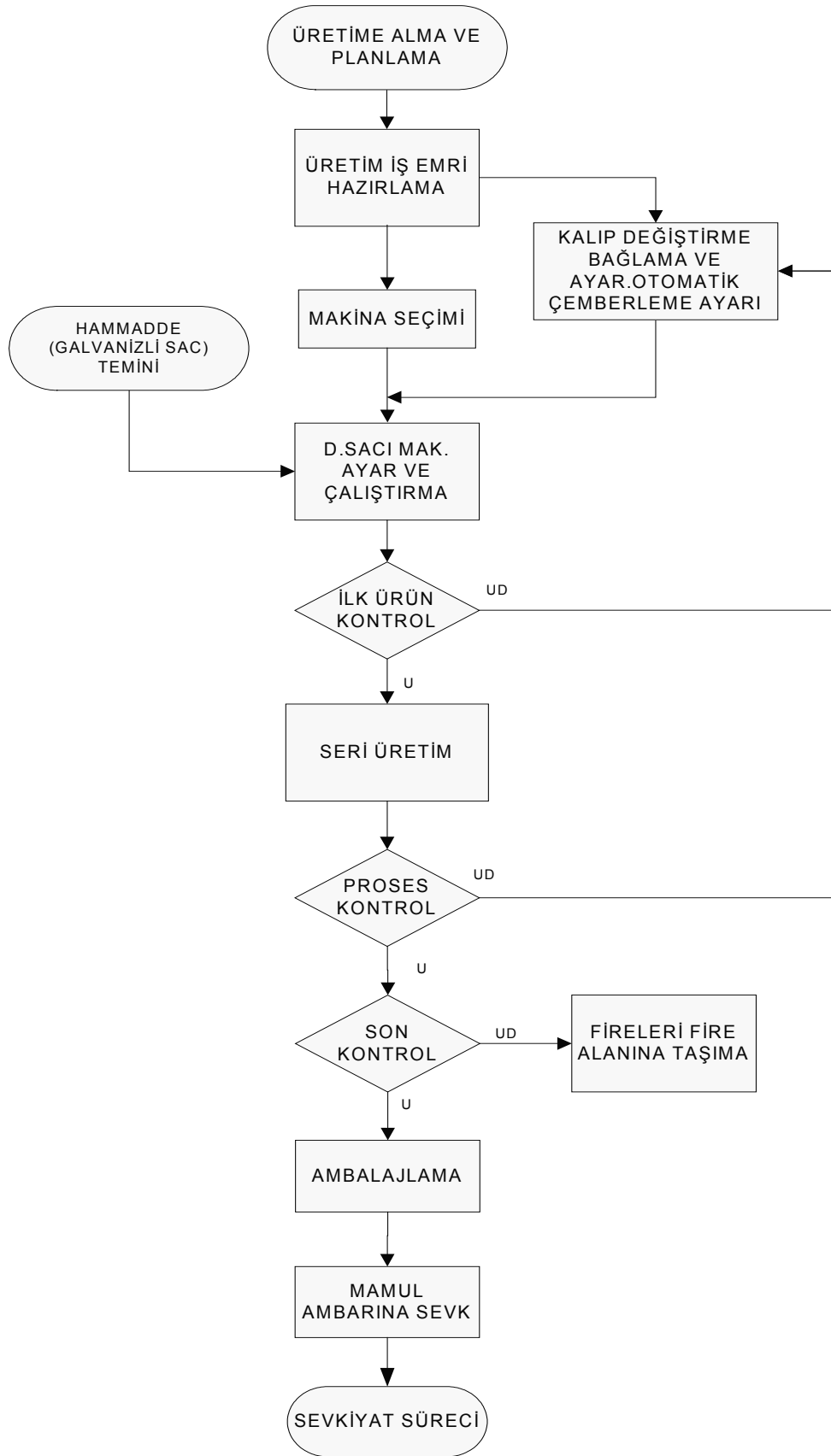


Appendix A.6 Process Flow Scheme of PVC Profile Production





Appendix A.7 Process Flow Scheme of Rubber Production



Appendix A.8 Process Flow Scheme of Sheet Iron Production

APPENDIX B

Appendix B.1 Environmental Aspects Assessment Table

<u>DEFINITION</u>					<u>ANALYSIS</u>								<u>ACTIVITY</u>	
<u>Operation No.</u>	<u>Operations</u>	<u>E.No</u>	<u>Element</u>	<u>Aspect</u>	<u>Probability</u>	<u>Results</u>				<u>Risk</u>	<u>Necessity</u>	<u>Severity</u>	<u>Control</u>	<u>Aim/Target No</u>
						<u>Concerned Parties</u>	<u>Env.</u>	<u>Employees</u>	<u>Cost</u>					
1	Offices	1-1	Domestic Wastes from the dining hall	Ground Contamination	4	1	1	0	0	8	—	D		-
		1-2	Food packages from the dining hall	Ground Contamination	4	1	1	0	0	8	—	D		-
		1-3	Domestic Wastewater of Plant	Water pollution	4	0	2	0	1	12	—	D		-
		1-4	Official wastes (paper vs.)	Ground Contamination	4	1	1	0	1	12	—	D		-
		1-5	Medical Wastes from infirmary	Ground Contamination	3	1	1	0	0	6	Z-1	C		1
		1-6	Emissions caused by the vehicles, services and transport vehicles of Firat	Water pollution, usage of natural resources	2	0	1	0	0	2	—	D		-
2	Warehouses	2-1	Raw material packages (wooden pallets, plastic packages, paper packages)	Ground Contamination	4	1	1	0	0	8	—	D		-
		2-2	The fire risk of the stored raw materials and technical materials	Air pollution, ground contamination, usage of natural resources.	2	1	2	0	1	8	—	D		2
		2-3	Probable leakage should be caused from the storage of the chemical materials	Air pollution, ground contamination and water pollution	4	1	1	0	1	12	Z-2	C		-

3	Transportation	3-1	Probable leakage should be caused from the carriage of the chemical materials	Environmental Pollution	2	1	1	1	0	6	Z-3	C		-
		3-2	Packages of materials	Ground Contamination	4	1	1	0	1	12	—	D		-
4	Auxiliary Operations	4-1	Noise in the auxiliary operations and workshops	Noise Control	4	1	0	1	0	8	Z-4	C		-
		4-2	Usage of underground water	Usage of natural resources	4	0	1	0	0	4	—	D		-
		4-3	Sludge formed in the cooling tank.	Ground Contamination, water pollution.	2	1	1	0	1	6	—	D		-
		4-4	Fire and leakage risk in the LPG and diesel fuel storage areas, transmission lines of natural gas.	Ground contamination, air pollution	1	2	3	3	2	10	—	D		-
		4-5	The chemicals used in the cooling water basin.	Probable water pollution after cleaning the basin	1	0	1	0	1	2	—	D		-
5	Maintenance	5-1	Solid wastes formed during usual and land maintenance (filters, black tubes)	Ground Contamination	4	1	1	0	1	12	Z-5	C		3
		5-2	Liquid wastes formed during usual and land maintenance and during the operations (oil)	Ground contamination and water pollution	4	1	2	0	1	16	Z-6	C		4
		5-3	Oily wastes formed during the cleaning of machines	Water pollution	3	1	1	0	2	12	Z-7	C		5
6	Construction Areas	6-1	Wastes formed in construction areas (stone-like materials, excavations and other wastes)	Ground Contamination	3	1	1	0	2	12	—	D		-

		6-2	Wasted formed during dying and similar operations.	Ground contamination and water pollution	3	0	1	0	1	6	Z-8	C		-
		6-3	Noise formed in construction areas.	Noise Control	4	0	1	1	0	8	Z-9	C		-
7	Laboratories	7-1	Chemicals used in PVC, PE-PP and rubber laboratories (Xylem, Toluene, Dichloromethane)	Water and air pollution	1	1	1	1	1	4	—	D		-
8	Production Areas (General)	8-1	Wastewater formed during cleaning production area	Water pollution	4	0	2	0	1	12	—	D		-
		8-2	Noise formed during production (Except breaking process)	Noise Control	4	0	0	2	1	12	Z-10	C		-
		8-3	Formation of HCl gas in extruders	Air Pollution	4	0	2	1	0	12	Z-11	C		-
		8-4	Contaminated waste packages	Ground Contamination	3	1	2	0	0	9	Z-12	C		6
		8-5	Usage of lubrication grease, form protection oil, corrosion remover, acid, acetone, silicon	Ground contamination, air pollution	4	0	1	2	1	16	Z-13	C		7
		8-6	Probable leakage during the storage of the chemicals in production areas	Air and water pollution, ground contamination	3	1	2	3	2	24	Z-14	B		8
9	Mixer	9-1	Dust emission in mixer area	Air Pollution	4	0	2	2	0	16	Z-15	C		9

10	Pipe Production	10-1	Dust emission in PVC pipe production	Air Pollution	4	0	2	1	0	12	Z-16	C		10
11	Profile Production	11-1	Dust emission formed in PVC profile production	Air Pollution	4	0	2	1	0	12	Z-17	C		11
12	Bending	12-1	Wastewater (with glycerin)	Water Pollution	4	0	1	0	0	4	—	D		12
		12-2	Organic vapor	Air Pollution	3	1	2	0	1	12	Z-18	C		-
13	Lamination	13-1	Wastes formed from glue mixture and surface cleaning	Water Pollution	4	1	2	0	1	16	Z-19	C		13
		13-2	Organic vapor	Air Pollution	4	1	1	0	1	12	Z-20	C		-
		13-3	Folio wastes	Environmental Pollution	3	1	2	0	1	12	—	D		-
14	PE-PP Production	14-1	Silicon Spray Emission	Air Pollution	3	0	1	1	0	6	—	D		-
		14-2	PEX pipe wastes	Ground Contamination	4	2	3	0	1	24	Z-21	B		14
		14-3	LPG emission	Air Pollution	4	0	1	1	1	12	Z-22	C		-
15	Hose Production	15-1	Organic vapor formed during hose production	Air Pollution	4	0	2	2	1	20	Z-23	C		15
		15-2	Dust emission	Air Pollution	3	0	1	2	1	12	Z-24	C		16
		15-3	Probable leakage in DIP and DOP oil tanks	Ground contamination and water pollution	2	1	2	0	1	8	Z-25	C		17

		15-4	Probable leakage of chemicals used for hose production.	Ground contamination and water pollution	2	0	0	0	1	2	Z-26	C		-
16	Plastic injection	16-1	Vapor formed during moisturizing of polyamide material	Decrease of moisture in the environment	4	0	0	0	1	4	-	D		-
17	Breaking Process	17-1	Gasses formed during granule production	Organic emission (Air Pollution)	4	1	1	0	1	12	Z-27	C		-
		17-2	Noise formed during breaking	Noise Control	4	1	2	1	1	20	Z-28	B		18
18	Rubber Production	18-1	Combustion gasses formed during extrusion	Air Pollution	4	1	1	1	0	12	Z-29	C		-
		18-2	Emission formed in Bambury production area	Air Pollution	4	1	2	1	0	16	Z-30	C		19
		18-3	Waste packages of carbon black	Ground contamination	4	1	1	0	1	12	Z-31	C		-
		18-4	Organic vapor formed during production	Air Pollution	4	0	1	1	1	12	Z-32	C		-
		18-5	Risk of leakage in paraffin grease tank	Ground contamination and water pollution	2	1	2	1	0	8	Z-33	C		-
		18-6	Rubber wastes which can not be recycled	Ground contamination	4	0	2	0	1	12	Z-34	C		20
19	Metal injection	19-1	Organic vapor formed during production	Air Pollution	4	1	2	0	0	12	Z-35	C		-
		19-2	Dye wastes	Ground contamination	2	1	2	0	0	6	Z-36	C		21
		19-3	Combustion process of dyed layer on hanger surface	Air Pollution	3	2	2	0	0	12	Z-37	C		22

		19-4	Chemical bath wastes	Water Pollution	2	1	2	1	1	10	Z-38	C		23
20	Sheet Iron	20-1	Shrinkage	Ground contamination	4	1	1	0	0	8	–	D		-
21	PVC products	21-1	Lead stabilizations used in PVC products	Probable health effects of lead	4	1	0	1	0	8	Z-39	C		24

Z-1	Regulation of Hazardous Wastes Control Appendix 6	Z-14	Regulation of Hazardous Chemicals Section 5	Z-27	Regulation of Air Quality Protection Section 2
Z-2	Regulation of Hazardous Chemicals Section 5	Z-15	Regulation of Air Quality Protection Section 2	Z-28	Regulation of Noise Control
Z-3	Regulation of Hazardous Chemicals Section 5	Z-16	Regulation of Air Quality Protection Section 2	Z-29	Regulation of Air Quality Protection Section 2
Z-4	Regulation of Noise Control	Z-17	Regulation of Air Quality Protection Section 2	Z-30	Regulation of Air Quality Protection Section 2
Z-5	Regulation of Hazardous Wastes Control Appendix 6	Z-18	Regulation of Air Quality Protection Section 2	Z-31	Regulation of Solid Wastes Control Section 2
Z-6	Regulation of Hazardous Wastes Control Appendix 6	Z-19	Regulation of Hazardous Wastes Control Appendix 6	Z-32	Regulation of Air Quality Protection Section 2
Z-7	Regulation of Hazardous Wastes Control Appendix 6	Z-20	Regulation of Air Quality Protection Section 2	Z-33	Regulation of Hazardous Chemicals Section 5
Z-8	Regulation of Hazardous Wastes Control Appendix 6	Z-21	Regulation of Solid Wastes Control Section 2	Z-34	Regulation of Solid Wastes Control Section 2
Z-9	Regulation of Noise Control	Z-22	Regulation of Air Quality Protection Section 2	Z-35	Regulation of Air Quality Protection Section 2
Z-10	Regulation of Noise Control	Z-23	Regulation of Air Quality Protection Section 2	Z-36	Regulation of Hazardous Wastes Control Appendix 6
Z-11	Regulation of Air Quality Protection Section 2	Z-24	Regulation of Air Quality Protection Section 2	Z-37	Regulation of Air Quality Protection Section 2
Z-12	Regulation of Hazardous Wastes Control Appendix 6	Z-25	Regulation of Hazardous Chemicals Section 5	Z-38	Regulation of Hazardous Wastes Control Appendix 6
Z-13	Regulation of Hazardous Wastes Control Appendix 6	Z-26	Regulation of Hazardous Chemicals Section 5	Z-39	European Union Policies

APPENDIX C

Appendix C.1 Mainly Used Chemicals and Amounts Per Year

OILS AND CHEMICALS						
NAME		QUA.	YEAR			
		KG/PC/LT	2000	2001	2002	2003
1	SEDIMENT CLEANER	KG	6875	13	90	60
2	ACETONE	KG	5	52	89	30
3	SLICONE SPREY	PC	331	184	279	154
4	MOBILE DTE 26 LUBRICANT	KG	10980	9900	8583	924
5	MOBILE TERM 605 LUBRICANT	KG	735	572	360	180
6	LUBCO BOR LUBRICANT	KG	114	220	668	191
7	MOBILE 1405 LUBRICANT	KG	360	0	182	0
8	MOBILE 630 LUBRICANT	KG	740	0	188	0
9	MOBILE DTE 68 LUBRICANT	KG	735	735	720	700
10	MOLIKOT LUBRICANT	PC	24	30	35	7
11	EXEL 46 LUBRICANT	KG	1094	15130	9301	11855
12	FOUNTAIN MOLD WATER	KG	0	126	100	50
13	CHESTERTON	KG	0	0	0	20
14	20/50 LUBRICANT	KG	2	423	402	0
15	RUST REMOVER	KG	30	60	10	0
16	SETRAL GREASE	KG	20	2	0	0
17	SETRAL SPREY	KG	0	12	0	0
18	SHELL TELLUS 68	KG	108	404	96	96
19	MOBILE GEAR 632 LUBRICANT	KG	185	128	0	0
20	PARAFFIN LUBRICANT	KG	0	4	0	0
21	SETRAL GREASE CA/C2 180	KG	0	5	15	5
22	SETRAL GREASE L1-P02	KG	0	10	5	0
23	SHELL GEAR LUBRICANT	KG	0	29	0	64
24	MOBILE DTE 24	KG	0	0	0	181
25	GLYCERINE	KG	3000	3500	3250	1000
26	CHAIN OIL 04.95 KULUBER	KG	0	15	0	5
27	MOBILE GEAR 634	KG	2590	1665	5613	0
28	PERGAL LUBRICANT REMOVER	KG	0	92	324	96
29	MOBILE GEAR SHC-XMP/220	KG	0	90	0	0
30	MOBILEUX 3 GREASE	KG	360	320	472	56
31	MOBILEUX EP 2 GREASE	KG	272	20	0	0
32	MOBILE DTE OIL MEDIUM	KG	3410	3420	6350	1089
33	MOBILE ALMO 627	KG	3	0	0	0
34	WURT CU GREASE 800	PC	10	0	0	0
35	CHESTERTON 601	KG	0	42	156	0
36	CHESTERTON 651 DTE LUBRICANT	KG	0	0	69	0
37	CHLORINE	KG	0	0	300	0

38	MOLD PROTECTION LUBRICANT	KG	0	110	356	30
39	CHEMICAL/ ETHANOL	LT	0	2	2	0
40	BURR REMOVER AR-8407	KG	210	0	260	0
41	CHEMICAL/CARBON TETRA CLORUDE	LT	0	2	2	5
42	DYE REMOVER	KG		50	10	
43	LIME REMOVER	LT				30
44	RUST REMOVER	LT		25	155	14
45	CHEMICAL/ TOLUNE	LT	24	17	5	
46	ETHYLENE ACETATE	KG		5	9	
47	PETROLEUM ETHERINE	KG		4		
48	CHEMICAL SOLUTION	KG		15	31	10
49	PH 4 SOLUTION	LT		1		
50	PH 7 SOLUTION	LT		1		
51	SODIUM HYDROXIDE	LT		3		
52	SULFIRIC ACID	LT		2		35
53	PHOSPHORIC ACID	LT		2		
54	SULFIRIC ACID	LT		2		
55	AMMONIUM IRON SULFATE	KG		3		
56	PHENOL SOLUTION	LT		1		
57	DIPHENILE AMINE SOLUTION	LT		1		
58	CITRIC ACID	KG		5		
59	BRONSON CHEMICAL	KG		50		
60	HYDROCLORIC ACID	LT				5
61	ETHYLENE GLIKAL	KG				3
62	MOLD CLEANING CHEMICAL	KG	130	170	302	50
63	ANK HARDENER	PC	13	5	44	32
64	ANK RETARDER	PC	17	5	15	
65	ANK UNTOXIC	PC	6	3	49	20
66	WESOLVE SPREY	PC		48	5	29
67	SODIUM BROMITE	LT		2		

APPENDIX D

Appendix D.1 Air Emission Parameters in Dying Process and Limit Values, 2003

No	Unit	Dust (mg/m ³)	Limit Values (mg/m ³)
1	Dying Process	0,80	15 (TiO ₂)
2	Dying Process	4,48	15 (TiO ₂)
3	Dying Process	2,76	15 (TiO ₂)

Appendix D.2 Air Emission Parameters in Metal Injection Process and Limit Values, 2003

No	Unit	Dust (mg/m ³)	Limit Values (mg/m ³)
1	Injection Process	<0,1	5 (ZnO)
2	Injection Process	<0,1	5 (ZnO)
3	Injection Process	<0,1	5 (ZnO)
4	Injection Process	<0,1	5 (ZnO)
5	Injection Process	<0,1	5 (ZnO)
6	Injection Process	<0,1	5 (ZnO)

Appendix D.3 Air Emission Parameters in Dying Process and Limit Values, 2004

No	Unit	Dust (mg/m ³)	Limit Values (mg/m ³)
1	Dying Process	0,91	15 (TiO ₂)
2	Dying Process	4,52	15 (TiO ₂)
3	Dying Process	3,02	15 (TiO ₂)

Appendix D.4 Air Emission Parameters in Metal Injection Process and Limit Values, 2004

No	Unit	Dust (mg/m3)	Limit Values (mg/m3)
1	Injection Process	0,08	5 (ZnO)
2	Injection Process	0,12	5 (ZnO)
3	Injection Process	0,00	5 (ZnO)
4	Injection Process	0,00	5 (ZnO)
5	Injection Process	0,14	5 (ZnO)
6	Injection Process	0,04	5 (ZnO)

Appendix D.5 Air Emission Parameters in Hose Production and Limit Values, 2004

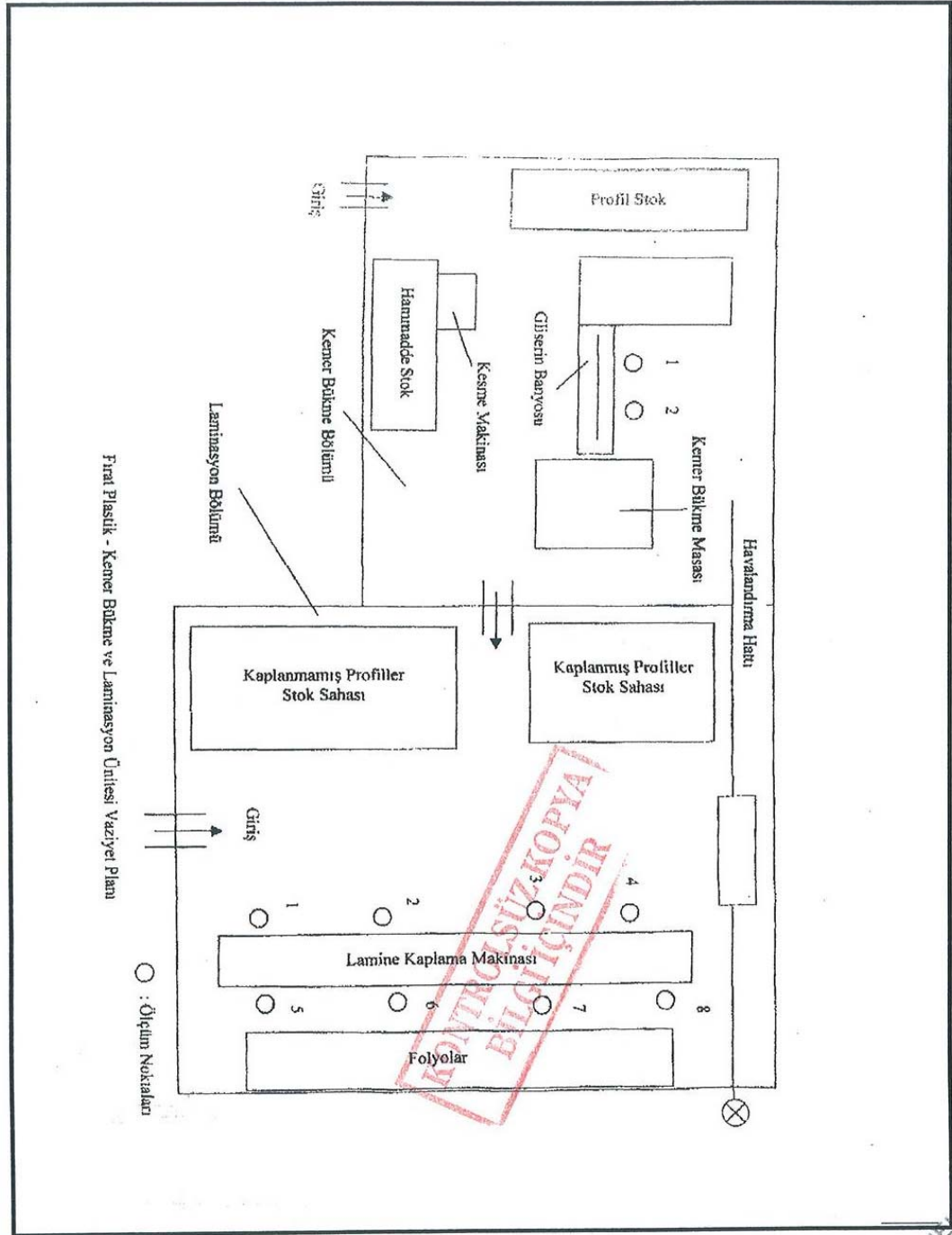
No	Unit	Dust (mg/m3)	Limit Values (mg/m3)
1	Hose Production	1,02	10
2	Hose Production	1,37	10

Appendix D.6 Air Emission Parameters in Krah Unit and Limit Values, 2004

No	Unit	TVOC (mg/m3)	Limit Values (mg/m3)
1	Krah Unit	19	1800

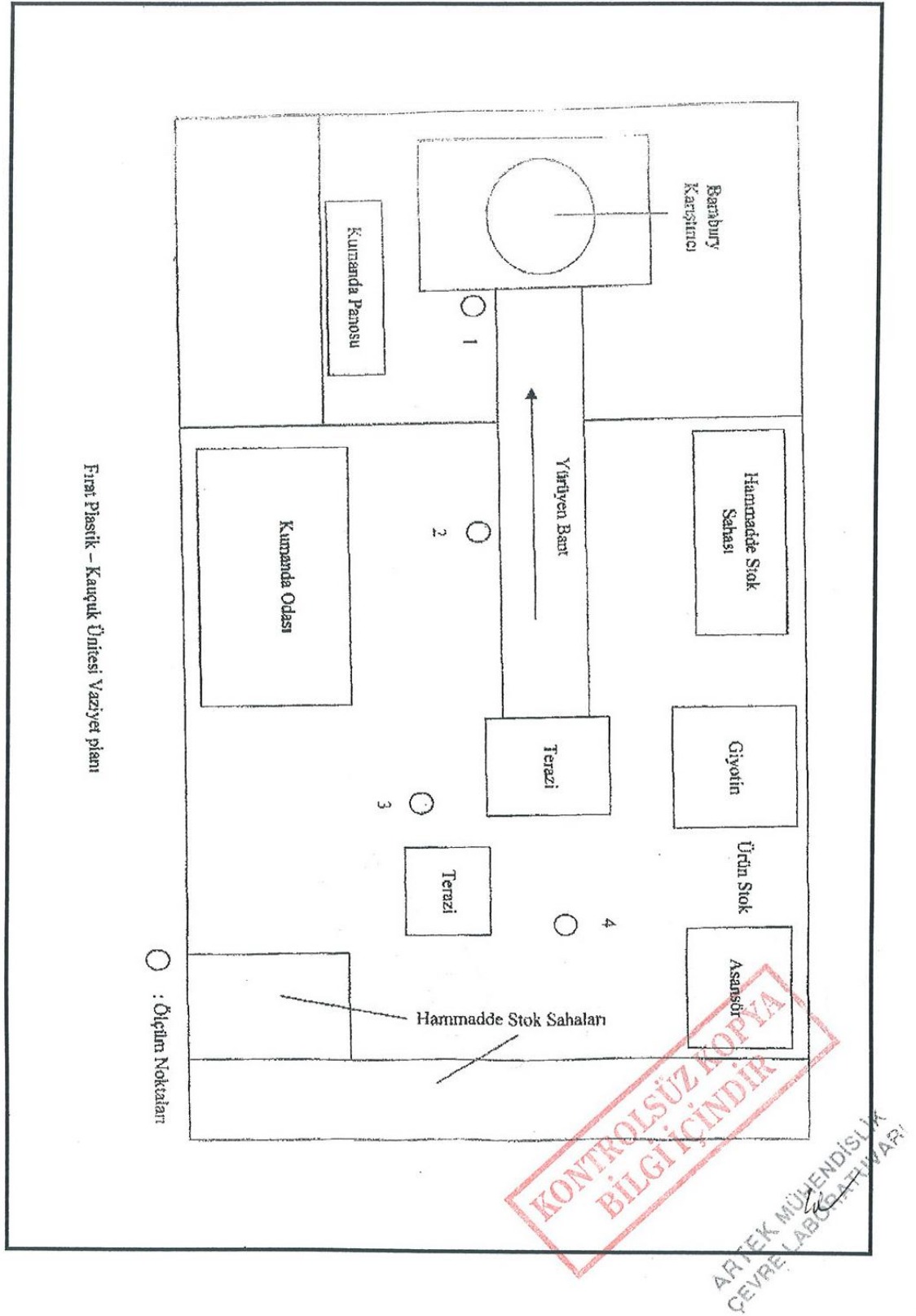
APPENDIX E

Appendix.E.1 Plot Plan of Bending And Lamination Units

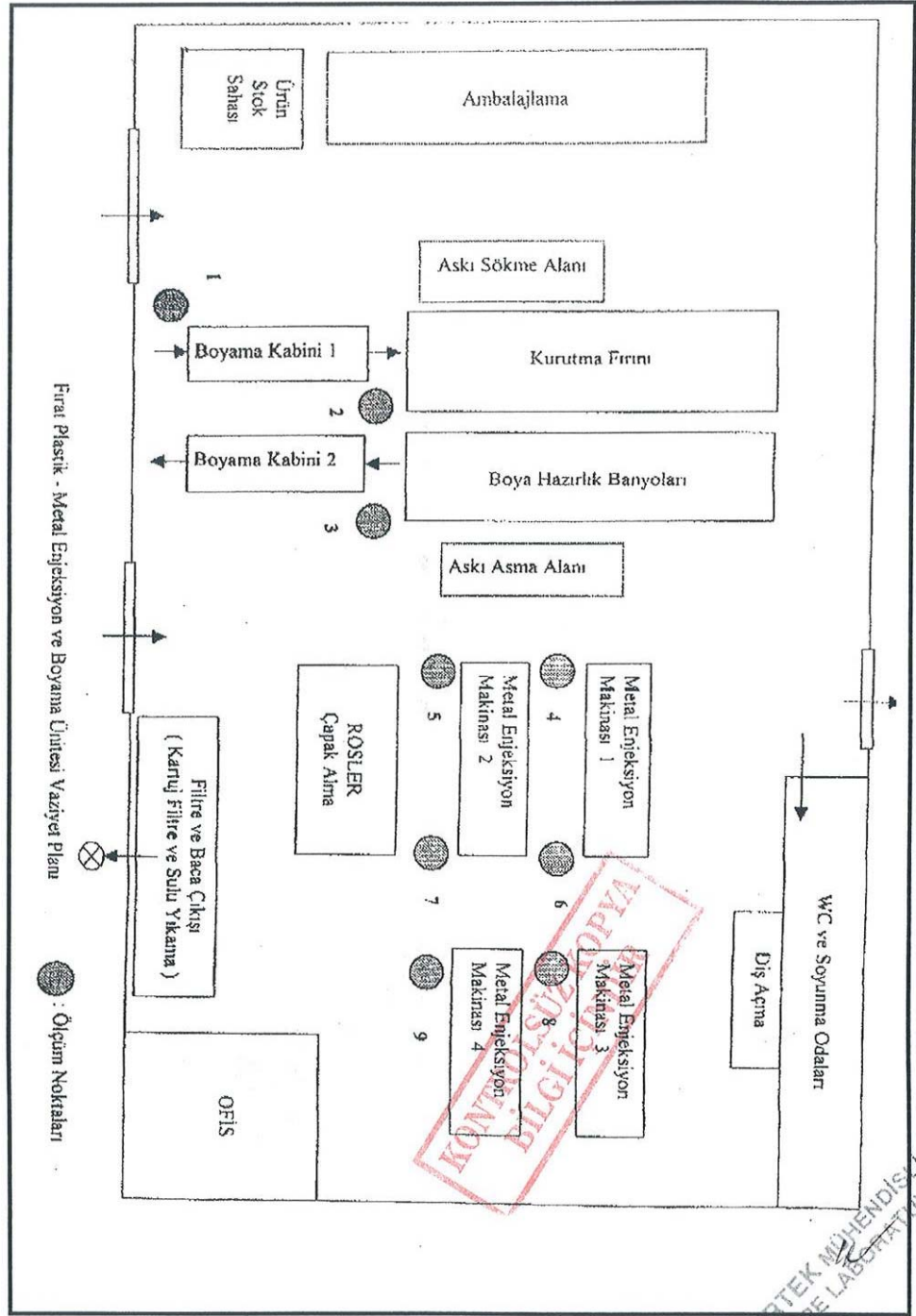


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ÇEVRE LABORATUVARI

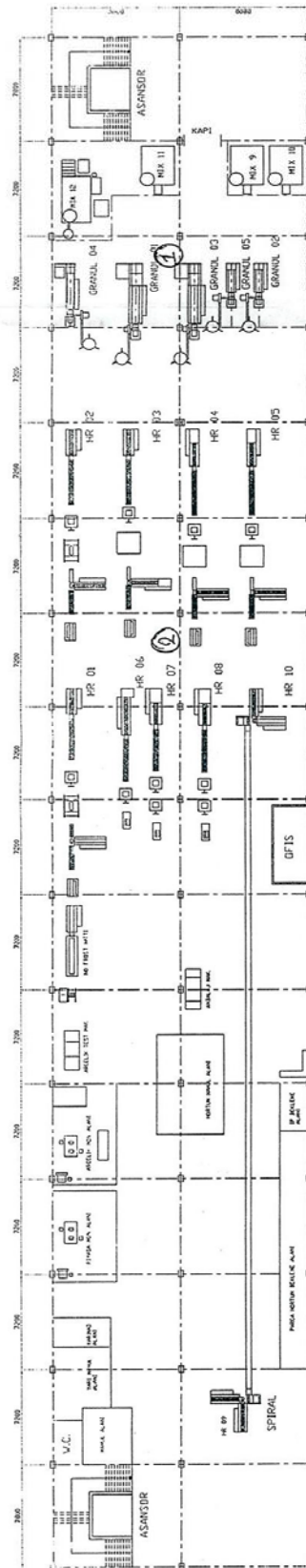
Appendix.E.2 Plot Plan of Rubber Plant



Appendix.E.3 Plot Plan of Metal Injection and Dying Units



HORTUM BOLUMU YERLESİMLERİ

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CEVRE LABORATUVARI

APPENDIX F

Appendix.F.1 Results of Measurements for 1st Common Bag Filter Chimney in Mixer

Source Name:		1st Common Bag Filter Chimney in Mixer				
Chimney No	Characterization of Source	Diameter of Chimney		Height from Ground		Height from Roof
1	Process Chimney	40 x 40 cm		4 m		-
Limit Value		-		-		-
Parameter		Measurements			Average	Limit Value
		1	2	3		
Temp. Of Flue gas (C)		13,70	13,60	13,90	13,73	
Velocity of Gas (m/sec)		3,10	3,20	3,20	3,17	-
Cross-sectional Area of Chimney (m2)		0,16	0,16	0,16	0,16	
Flow Rate of C.Gas (m3/h)		1.785,60	1.843,20	1.843,20	1.824,00	
Flow Rate of dry C.Gas(m3/h)		1.700,27	1.755,73	1.753,90	1.736,60	
Dust (mg/m3)		2,90	3,10	3,20	3,07	491
Dust Emission (kg/st)		0,0049	0,0054	0,0056	0,0053	15

Appendix.F.2 Results of Measurements for 2nd Common Bag Filter Chimney in Mixer

Source Name:		2nd Common Bag Filter Chimney in Mixer				
Chimney No	Characterization of Source	Diameter of Chimney		Height from Ground	Height from Roof	
2	Process Chimney	40 x 40 cm		4 m	-	
Limit Value		-		-	-	
Parameter		Measurements			Average	Limit Value
		1	2	3		
Temp. Of Flue gas (C)		13,90	13,90	13,80	13,87	
Velocity of Gas (m/sec)		3,60	3,50	3,60	3,57	-
Cross-sectional Area of Chimney (m2)		0,16	0,16	0,16	0,16	
Flow Rate of C.Gas (m3/h)		2.073,60	2.016,00	2.073,60	2.054,40	
Flow Rate of dry C.Gas(m3/h)		1.973,14	1.918,33	1.973,82	1.955,10	
Dust (mg/m3)		2,10	2,20	2,00	2,10	491
Dust Emission (kg/st)		0,0041	0,0042	0,0039	0,0041	15

Appendix.F.3 Results of Measurements for 3rd Common Bag Filter Chimney in Mixer

Source Name:	3rd Common Bag Filter Chimney in Mixer					
Chimney No	Characterization of Source	Diameter of Chimney		Height from Ground	Height from Roof	
3	Process Chimney	40 x 40 cm		4 m	-	
Limit Value		-		-	-	
Parameter		Measurements			Average	Limit Value
		1	2	3		
Temp. Of Flue gas (C)		13,70	13,90	13,80	13,80	
Velocity of Gas (m/sec)		2,90	2,80	2,80	2,83	-
Cross-sectional Area of Chimney (m2)		0,16	0,16	0,16	0,16	
Flow Rate of C.Gas (m3/h)		1.670,40	1.612,80	1.612,80	1.632,00	
Flow Rate of dry C.Gas(m3/h)		1.590,58	1.534,66	1.535,20	1.553,48	
Dust (mg/m3)		3,20	3,10	3,30	3,20	492
Dust Emission (kg/st)		0,0051	0,0048	0,0051	0,0050	15

Appendix.F.4 Results of Measurements for 4th Common Bag Filter Chimney in Mixer

Source Name:		4th Common Bag Filter Chimney in Mixer			
Chimney No	Characterization of Source	Diameter of Chimney		Height from Ground	
4	Process Chimney	40 x 40 cm		4 m	-
Limit Value		-		-	-
Parameter		Measurements			Average
			2	3	
Temp. Of Flue gas (C)		13,90	14,10	14,00	14,00
Velocity of Gas (m/sec)		3,80	3,90	3,90	3,87
Cross-sectional Area of Chimney (m2)		0,16	0,16	0,16	0,16
Flow Rate of C.Gas (m3/h)		2.188,88	2.246,40	2.246,40	2.227,20
Flow Rate of dry C.Gas(m3/h)		2.082,75	2.136,08	2.136,82	2.118,55
Dust (mg/m3)		3,90	4,00	4,00	3,97
Dust Emission (kg/st)		0,0081	0,0085	0,0085	0,0084

Appendix.F.5 Results of Measurements for Common Chimney in Hose Production
(suction lines of mixer machines)

Source Name:		Common Chimney in Hose Production (suction lines of mixer machines)			
Chimney No	Characterization of Source	Diameter of Chimney		Height from Ground	Height from Roof
5	Process Chimney	40 x 70 cm		8 m	-
Limit Value		-		-	-
Parameter		Measurements			Limit Value
		1	2	3	
Temp. Of Flue gas (C)		31,90	31,80	31,90	31,87
Velocity of Gas (m/sec)		6,80	6,70	6,90	6,80
Cross-sectional Area of Chimney (m2)		0,28	0,28	0,28	0,28
Flow Rate of C.Gas (m3/h)		6.854,40	6.753,60	6.955,20	6.854,40
Flow Rate of dry C.Gas(m3/h)		6.137,26	6.048,99	6.227,52	6.137,92
Dust (mg/m3)		4,90	4,80	4,90	4,87
Dust Emission (kg/st)		0.0301	0.0290	0.0305	0.0299
					469
					15

Appendix.F.6 Results of Measurements for Ventilation chimney in extrusion machines
in rubber plant

Source Name:		Ventilation chimney in extrusion machines in rubber plant				
	Characterization of Source	Diameter of Chimney		Height from Ground	Height from Roof	
Chimney No						
6	Process Chimney	50cm		14m	2m	
Limit Value		-		-	-	
Parameter		Measurements			Average	Limit Value
		1	2	3		
Temp. Of Flue gas (C)		28,50	28,40	28,40	28,40	
Velocity of Gas (m/sec)		16,20	16,10	16,20	16,20	-
Cross-sectional Area of Chimney (m2)		0,20	0,20	0,20	0,20	
Flow Rate of C.Gas (m3/h)		11.445,30	11.374,70	11.445,30	11.421,80	
Flow Rate of dry C.Gas(m3/h)		10.363,40	10.302,90	10.366,80	10.344,40	
TVOC (mg/m3)		210,00	209,00	209,70	300,00	469
TVOC(kg/st)		2,1763	2,1533	2,1770	2,1689	6
Mass Flow Rate (kg/st)		1,6322	1,6150	1,6328	1,6267	10

Appendix.F.7 Results of Measurements for Ventilation chimney of bambury machine

Source Name:		Ventilation chimney of bambury machine			
Chimney No	Characterization of Source	Diameter of Chimney		Height from Ground	Height from Roof
7	Process Chimney	60 cm		7m	-
Limit Value		-		-	-
Parameter		Measurements			Limit Value
		1	2	Average	
Temp. Of Flue gas (C)		27,50	27,40	27,40	
Velocity of Gas (m/sec)		2,90	2,80	2,90	-
Cross-sectional Area of Chimney (m2)		0,28	0,28	0,28	
Flow Rate of C.Gas (m3/h)		2.950,30	2.848,60	2.950,30	2.916,40
Flow Rate of dry C.Gas(m3/h)		2.680,30	2.588,80	2.681,20	2.650,10
Dust (mg/m3)		3,00	2,80	3,10	487
Dust Emission (kg/st)		0,0080	0,0072	0,0083	15
TVOC (mg/m3)		37,00	37,00	36,00	300
TVOC(kg/st)		0,0992	0,0958	0,0965	6
Mass Flow Rate (kg/st)		0.0744	0.0718	0.0724	10

Appendix.F.8 Results of Measurements for Dust collecting bag filter chimney of bambury machine

Source Name:		Dust collecting bag filter chimney of bambury machine			
Chimney No	Characterization of Source	Diameter of Chimney		Height from Ground	Height from Roof
8	Process Chimney	50 x 50 cm		6 m	-
Limit Value		-		-	-
Parameter		Measurements			Limit Value
		1	2	3	
Temp. Of Flue gas (C)		31,10	31,30	31,20	31,20
Velocity of Gas (m/sec)		6,80	6,70	6,80	6,77
Cross-sectional Area of Chimney (m2)		0,25	0,25	0,25	0,25
Flow Rate of C.Gas (m3/h)		6.120,00	6.030,00	2.246,40	2.227,20
Flow Rate of dry C.Gas(m3/h)		5.494,11	5.409,76	5.492,31	5.464,39
Dust (mg/m3)		12,00	12,00	13,00	12,33
Dust Emission (kg/st)		0,0659	0,0649	0,0714	0,0674

APPENDIX G

APPENDIX H

Appendix.H.1 EMS-Project Monitoring Forms For Environmental Target No.22

 PLASTIK, KAUCUK SAN. ve TIC. A.Ş. <u>EMS - PROJECT MONITORING FORM</u>																																															
<u>Obj./Target No:</u> Env.22 <u>Existing Situation:</u> Combustion process of dyed layer on hanger surface in open air <u>Obj./Target:</u> Combustion will be made directly in the oven																																															
<u>Projects</u> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <th rowspan="2" style="width: 30%;"><u>Phases of Project</u></th><th colspan="9"><u>Deadline</u></th></tr> <tr> <th><u>10</u></th><th><u>12</u></th><th><u>14</u></th><th><u>16</u></th><th><u>18</u></th><th><u>20</u></th><th><u>22</u></th><th><u>24</u></th><th><u>26</u></th></tr> <tr> <td rowspan="2">An oven will be bought</td><td><u>x</u></td><td><u>x</u></td><td><u>x</u></td><td><u>x</u></td><td><u>x</u></td><td><u>x</u></td><td><u>x</u></td><td><u>x</u></td><td><u>x</u></td></tr> <tr> <td><u>x</u></td><td><u>x</u></td><td><u>x</u></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>										<u>Phases of Project</u>	<u>Deadline</u>									<u>10</u>	<u>12</u>	<u>14</u>	<u>16</u>	<u>18</u>	<u>20</u>	<u>22</u>	<u>24</u>	<u>26</u>	An oven will be bought	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>						
<u>Phases of Project</u>	<u>Deadline</u>																																														
	<u>10</u>	<u>12</u>	<u>14</u>	<u>16</u>	<u>18</u>	<u>20</u>	<u>22</u>	<u>24</u>	<u>26</u>																																						
An oven will be bought	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>	<u>x</u>																																						
	<u>x</u>	<u>x</u>	<u>x</u>																																												
<u>State of Project</u> ☒ Project continues ☐ Project lasted																																															
<u>Description</u> Actions started in order to buy oven. Offers invited for the oven are analyzed, decided to make an investment in June																																															
<u>Revisions For Project</u> No revision requirement																																															
<u>Monitoring Table</u>																																															
<table style="width: 100%;"> <tr> <td style="width: 50%;"><u>Responsible</u></td> <td style="width: 50%;"><u>Date</u></td> </tr> <tr> <td>I.H. -</td> <td>07.04.2003</td> </tr> </table>										<u>Responsible</u>	<u>Date</u>	I.H. -	07.04.2003																																		
<u>Responsible</u>	<u>Date</u>																																														
I.H. -	07.04.2003																																														



PLASTIK, KAUCUK SAN. ve TIC. A.Ş.

EMS - PROJECT MONITORING FORM

Obj./Target No: Env.22

Existing Situation: Combustion process of dyed layer on hanger surface in open air

Obj./Target: Combustion will be made directly in the oven

Projects

<u>Phases of Project</u>	<u>Deadline</u>								
	<u>15</u>	<u>20</u>	<u>25</u>	<u>30</u>	<u>35</u>	<u>40</u>	<u>45</u>	<u>50</u>	<u>-</u>
An oven will be bought	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>-</u>
	<u>X</u>	<u>X</u>	<u>X</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>

State of Project

☒ Project continues

☐ Project lasted

Description

New offers receipt.
Discussions continuous.

Revisions For Project

The deadline to buy the oven changed as the end of the year.

Monitoring Table

Responsible

I.H.

Date

11.07.2003



PLASTIK, KAUCUK SAN. ve TIC. A.Ş.

EMS - PROJECT MONITORING FORM

Obj./Target No: Env.22

Existing Situation: Combustion process of dyed layer on hanger surface in open air

Obj./Target: Combustion will be made directly in the oven

Projects

<u>Phases of Project</u>	<u>Deadline</u>								
	<u>15</u>	<u>20</u>	<u>25</u>	<u>30</u>	<u>35</u>	<u>40</u>	<u>45</u>	<u>50</u>	
An oven will be bought	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	.
	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	.	.	.

State of Project

☒ Project continues

☐ Project lasted

Description

Discussions of offers ended.

Process started.

Revisions For Project

No revision requirement

Monitoring Table

Responsible

I.H.

Date

09.10.2003



PLASTIK, KAUCUK SAN. ve TIC. A.Ş.

EMS - PROJECT MONITORING FORM

Obj./Target No: Env.22

Existing Situation: Combustion process of dyed layer on hanger surface in open air

Obj./Target: Combustion will be made directly in the oven

Projects

<u>Phases of Project</u>	<u>Deadline</u>								
	<u>15</u>	<u>20</u>	<u>25</u>	<u>30</u>	<u>35</u>	<u>40</u>	<u>45</u>	<u>50</u>	<u>5</u>
An oven will be bought	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>-</u>
	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>-</u>

State of Project

☒ Project continues

☐ Project lasted

Description

The oven is bought.
Infrastructure operations started (new storage area)
Planned to go in operation on March,2004

Revisions For Project

Deadline changed as Week 15.

Monitoring Table

Responsible

I.H.

Date

08.01.2004



PLASTIK, KAUCUK SAN. ve TIC. A.Ş.

EMS - PROJECT MONITORING FORM

Obj./Target No: Env.22

Existing Situation: Combustion process of dyed layer on hanger surface in open air

Obj./Target: Combustion will be made directly in the oven

Projects

<u>Phases of Project</u>	<u>Deadline</u>									
	<u>20</u>	<u>25</u>	<u>30</u>	<u>35</u>	<u>40</u>	<u>45</u>	<u>50</u>	<u>5</u>	<u>15</u>	
An oven will be bought	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	
	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	

State of Project

☐ Project continues

☒ Project lasted

Description

The oven started to operate by March, 2004

Revisions For Project

No revisions about completed project.

Monitoring Table

Responsible

I.H.

Date

05.04.2004

CURRICULUM VITAE

Education

- 2001-** : Marmara University Faculty of Engineering
Environmental Engineering Department – Master Degree
1997- 2001 : Yıldız Technical University Faculty of Civil Engineering
Environmental Engineering Department
1990 – 1997 : Edirne Anatolian High School

Experiences, Apprenticeship

- 2005,03 –** : GlaxoSmithKline
Sales Assistant
2003,09 –2004,11 : MAK Demir Çelik Sanayii ve Temsilcilik Ltd. Şti.
Sales Engineer
2002 Summer Training : Pfizer
Environmental Health & Safety Department
2002 Winter Training : Pfizer
Environmental Health & Safety Department
2000 Summer Training : Artima Treatment Systems
Construction
1999 Summer Training : Municipality of Edirne, Water Treatment Plant
Laboratory

Languages spoken

English (Advanced)
German (Beginning)

Personal Information

- Date, Place of Birth** : 04.11.1979, Edirne
Nationality : Turkish Citizen
Marital status : Single
Driving license : Available, Class B