DOKUZ EYLÜL UNIVERSITY
GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

IMPLEMENTATION OF OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM IN TRANSFORMER MANUFACTURING

by
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October, 2012
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IMPLEMENTATION OF OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM IN TRANSFORMER MANUFACTURING

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

by
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M.Sc THESIS EXAMINATION RESULT FORM

We have read the thesis entitled **"IMPLEMENTATION OF OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM IN TRANSFORMER MANUFACTURING"** completed by **MELİS TABAK** under supervision of **PROF. DR. DENİZ DÖLGEN** and we certify that in our opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science.

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ACKNOWLEDGEMENTS

Special appreciation is given to my supervisor Prof. Dr. Deniz DÖLGEN, the support of my family who did not spare me, I've been doing application work, to all employees and factories managers, thank you very much.

Melis TABAK

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ABSTRACT

The aim of the studies on the business health and the business security is to protect employees from industrial accidents and job illnesses, and provide them with an healthier work environment. In our country, shows significant improvements in the industrial field. Increased production and profitability of enterprises, the necessary measures are not taken as a result of holding workers' health and life-threatening increase in the number of accidents at work and occupational diseases seen.

Besides the legislation brought into force by government, international standarts such as OHSAS 18001 play an important role in improving work safety and health data in a country. OHSAS/TS 18001 Occupational Health and Safety Management Systems is a management system in which the precautions against hazards and risks are taken systematically in order to avoid possible accidents and impacts in the workplaces and provide a better working climate.

In this study, OHSAS 18001 Occupational Health and Safety Management System, work accidents, occupational diseases and the risk assessment were explained in detail. Transformer manufacturing factory was selected as a case study and all necessary information regarding to the implementation of OHSAS 18001 Occupational Health and Safety Management System was introduced.

In this context, inputs and outputs of both oil and dry type transformer production processes were investigated. Occupational Health and Safety Field Teams responsibilities were determined. Hazard identification, risk assessment and risk control methods were described by the risk assessment procedure, and risk assesment tables were prepared. According to the risk tables, the highest score was obtained for syntaxing of upper yoke, pressing processes and transformer connections. Preventive

studies were resulted app.17% reduction in accidents and 13% reduction in wasted days.

Keywords: Occupational health and safety, OHSAS 18001, risk analysis, work accident, occupational diseas, transfomer.

İŞ SAĞLIĞI VE GÜVENLİĞİ YÖNETİM SİSTEMİNİN TRANSFORMATÖR ÜRETİM SEKTÖRÜNDE UYGULANMASI

ÖZ

İş sağlığı ve güvenliği çalışmalarının amacı, iş kazaları ve meslek hastalıklarından çalışanları korumak, sağlıklı bir ortamda çalışmalarını sağlamaktır. Sanayi alanında önemli gelişmeler gösteren ülkemizde, işletmelerdeki üretim ve kârlılık artarken, işletmede gerekli önlemlerin alınmaması sonucu çalışanların sağlığını ve yaşamını tehdit eden iş kazaları ve meslek hastalıkları sayısında artışlar olduğu görülmektedir.

Bir ülkede iş sağlığı ve güvenliğine ilişkin verilerin iyileştirilmesi için devlet tarafından yürürlüğe konulan yasaların yanı sıra OHSAS 18001 gibi uluslararası standartlar da çok önemli rol oynamaktadır. OHSAS/TS 18001 İş Sağlığı ve Güvenliği Yönetim Sistemleri; işyerlerinde olabilecek kaza ve etkilerden korunmak ve daha iyi çalışma ortamı sağlamak amacıyla sistemli bir şekilde tehlike ve risklere yönelik önlemlerin alındığı bir yönetim sistemidir.

Bu çalışmada, OHSAS 18001 İş Sağlığı ve Güvenliği Yönetim Sistemi, iş kazaları, meslek hastalıkları ve risk değerlendirme konuları detaylı açıklandı. Uygulama örneği olarak, transformatör üretimi yapan bir fabrika seçildi ve OHSAS 18001 İş Sağlığı ve Güvenliği Yönetim Sistemi kurulumuyla ilgili tüm gerekli bilgiler açıklandı.

Bu kapsamda, kuru ve yağlı tip transformatör üretim süreçlerinin girdi ve çıktıları incelendi. İş Sağlığı ve Güvenliği Çalışma grupları belirlendi. Tehlike tanımları, risk değerlendirme süreciyle risk belirleme ve kontrol yöntemleri tanımlandı ve risk değerlendirme tabloları hazırlandı. Bu tablolara göre en yüksek risk değerlendirmesi, sinteks işlemi, pres ve transformatör birleşim işlemleri için belirlendi. Önleyici çalışmalarla, bir yıl içinde kazalarda yaklaşık %17 oranında azalma ve kazalar nedeniyle kaybedilen günlerde %13 oranında azalma elde edildi.

Anahtar Sözcükler: İş sağlığı ve güvenliği, OHSAS 18001, risk analizi, iş kazası, meslek hastalığı, transformatör.

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CHAPTER ONE
INTRODUCTION

The problems related to the safety of the people at workplace also increase in parallel with industrialization and technological developments. The problems which have been disregarded earlier endangers operation of businesses, and affects business efficiency, as a result, taking precautions regarding health and safety is on the agenda. The importance of this matter enhances as a result of work accidents and material and spiritual losses day by day, the corporations are forced to carry out more planned and systematic activities with regard to occupational health and safety.

The corporations focus on standards such as ISO 9001 and ISO 14001, and quality and environment management. Therefore, another standard is required to provide occupational health and safety at corporations and maintain them by continuous improvement. Developed with this understanding, the OHSAS 18001 standard is a management model which set forth systematic controlling of implementations that might affect health and security of the employees at workplace. Standard consists of OHSAS 18001: Occupational health and safety assessment series, and OHSAS 18002: Occupational health and safety management systems - OHSAS 18001 application directory.

OHSAS 18001 is handled as a part of the Occupational health and safety management system, and in this regard, it consists of (i) Policy (ii) Planning (iii) Implementation and Operation, (iv) Control and Corrective Action, and (v) Review of management activities. In this regard, it is required to determine policy, plan and objectives, give necessary training, provide documentation, and carry out control, corrective and protective activities during establishment of the OHSAS 18001. During implementation process of the OHSAS 18001 management system, the in-house investigations and review of management must be performed. During certification of the OHSAS 18001 management system, the company, which is authorized for certification must have necessary investigations. At the end of this

process, in case of success, it is inappropriate to make certification of the OHSAS 18001 occupational health and safety management system.

In this study, the necessity of the OHSAS 18001 system is investigated, the establishment of system at the business, which makes transformer production has been applied. Information has been given about the Occupational Health and Safety System, and its principles and implementation stages have been explained. At the following sections, work accident and occupational diseases, risk determination matters have been handled, and in this scope, the definition of work accident and occupational diseases, reasons, cost, risk determination and assessment methods have been introduced. The section four is the implementation part at which the implementation of the OHSAS 18001 is performed. It contains works to establish the OHSAS 18001 system which takes 1 year. An activity for establishment of system at the business, which makes production of transformer in dry and greasy type have been explained. Information has been given about premises in this regard, production process, raw material and resulting wastes have been determined, risk tables have been created, potential risky activities have been revealed, and possible precautions have been explained. The results have been discussed.

CHAPTER TWO
OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT

2.1 General

In recent years, the quality, health and safety requirements in many countries have been become more stringent. Pressures have led to the enacting of new safety legislation and safety standards. Many organizations in the America, Europe and Asia Pacific regions have adopted safety management practices to control hazards and risks better and to resolve workplace problems and accidents. An Occupational Health and Safety (OH&S) Management system is a framework that allows an organization to consistently identify and control its health and safety risks, reduce the potential for accidents, help achieve compliance with health and safety legislation and continually improve its performance. OH&S Management System is based on standards which specify a process for achieving improved OH&S performance and complying with regulations.

In this chapter, basic principles and objectives of Occupational Health and Safety are introduced and an international specification standard created to address a variety of job-site health and safety issues, i.e. The Occupational Health and Safety Assessment Series (OHSAS) 18001, is evaluated.

2.2 Definition and Principles of Occupational Health and Safety

Occupational health and safety as a concept is as follows:

Workers' health, free from the dangers arising from an employee's work environment and tool wares, or at least decrease the means (Centel, 2000).

Occupational safety hazards are addressed to the employees' work environment, elimination or reduction of the obligations imposed for the whole of which refers to the technical rules (Centel, 2000).

As the definition of the concept of occupational health and safety, ensuring a safe working environment, or definitions, such as the protection of workers will be insufficient. An appropriate definition should be more comprehensive. ILO (International Labour Organization) and WHO (World Health Organization) has been expanded in terms of this definition. According to this;

Work with the facilitator about the maximum physical and mental health, the establishment of a safe and healthy working environment, and business establishment and maintenance of physical and mental conditions to take account of employees in the organization of workers, employers and employer / employee representatives informed" occupational health and safety were evaluated as (Güvercinci, 2005).

Occupational health and safety, worker health and technical reasons, including the risks encountered during operation consists of two matter.

Occupational health and safety, workplace hazards, health hazards of the conduct of business protection and humanitarian conditions in the methodical studies to create a business environment (Seyyar, 2002).

In addition, with the concept of occupational health and safety of the employee's health and safety movement, the risks to individuals in society, while maintaining the risk of minimizing, aimed to develop a sense of safety and security measures (Özdemir, 2004). There are also some truth in the form of views.

2.3 Goals and Objectives of Occupational Health and Safety

Goals and objectives of occupational health are based on the WHO definition of health as a state of physical, mental and social well-being that provides the individual with an opportunity to conduct a socially and economically productive life. Both the WHO and the ILO Conventions on Occupational Safety and Health and on Occupational Health Services start from the principle that occupational health and safety services should be available and are the right of each individual taking part in

work, irrespective of the sector of the economy, size of the company or type of assignment. This objective covers also the self-employed, agriculture, home industries and other workplaces in the so-called informal sector, as well as workers in cooperatives and the public sector. It aims, therefore, at occupational health for all working persons everywhere. Not only the health problems directly related to work, but also the so-called work-related diseases, problems of general health and working capacity, and the potentially positive impact of occupational health on environmental health should be considered in setting objectives for occupational health.

To identify occupational health hazards, to provide appropriate advice on their control and prevention, to contribute to the development of healthy and safe workplaces and to follow up and take the necessary actions for the health of workers, a comprehensive and competent occupational health service is necessary. Such a service should be available at each workplace and accessible by each worker. Comprehensive occupational and health services are understood as front-line services, active at the workplace, containing preventive, curative and promotional elements and using, where appropriate, the primary health care approach. In their most advanced forms, comprehensive OH&S focus on workers and working populations, to the work environment and its hazardous factors, exposures and structures, and work organization. Such OH&S contain preventive, control, curative, treatment, rehabilitation and promotion activities for the improvement of working conditions, protection of health and for the maintenance and promotion of working capacity.

2.4 Occupational Health and Safety Management Systems (OHSMS)

OHSAS 18001 was created via the concerted and combined effort from a number of the world's leading national standards bodies, certification bodies, and specialist consultancy groups. It was developed to help organizations meet their health and safety obligations in an efficient and effective manner. It helps in a variety of respects; it helps minimize risks to employees, improve an existing OHS

management system, demonstrate diligence, gain assurance, etc. The benefits can be substantial.

In business, losses resulting from accidents occurring in a variety of reasons, need to protect other effects, the basic factors that the occurrence of occupational health and safety management systems.

Today, occupational health and safety, as a management system are discussed. In this context, occupational health and safety, must be part of the organization's overall management system. On this subject, in the world, OHSAS 18001 Occupational Health and Safety Assessment Series standard is one of the most common standards.

Organizations to control occupational health and safety risks, and continuously improve their performance by addressing the health and safety has been developed for the business with OHSAS 18001 occupational health and safety management systems. Occupational health and safety management system is a living process. This management system aims at continuous improvement and full participation of employees at all levels.

Occupational health and safety management systems standard, the main purpose is to be preventive. Attempting to prevent errors before they occur in this way occupational health and safety, maximum improvement is observed. OHSAS 18001 standard, organizations are helping with the management of occupational health and safety management system that effectively integrated with other requirements (Özkılıç, 2005).

The concept of occupational health and safety management system should be considered as a part. This operation is considered to workers' health, and with a factor that increases efficiency and productivity (Topçuoğlu and Özdemir, 2003).

Business thought occupational health and safety management systems brought the additional cost to them, it would help to insulate management systems. But given the

long-term issue, the total cost of occupational accidents and occupational diseases as a result of the establishment of occupational health and safety management system is well above the costs of, various studies on this subject are described.

Occupational health and safety management systems' components are the general condition, occupational health and safety policy, planning, implementation and operation, control and regulatory action, management review sections.

This standard is applicable to any organization, those who desire to make items listed below:

- Regarding the activities of the organization, employees may be exposed to occupational health and safety risks and to eliminate or minimize the risks for other parties to establish an occupational health and safety management system,
- Implement an occupational health and safety management system, maintain and continuously improve
- The fit to show to others,
- Comply with the policy that the other groups to find their own organizations,
- The organization of occupational health and safety management system certification by an external organization to provide
- Determination and the status of compliance with the requirements of this standard is to declare that you provide.

BS OHSAS 18001 is aligned with ISO 14001, which is based upon the 'Plan, Do, Check, Act' structure pioneered by the American quality expert W. Edwards Deming in the 1950's. This simple but effective structure is still used today to ensure that the hazards and risks associated with organizations activities, products and services are systematically identiied and assessed, controlled, monitored and continuously improved. PDCA cycle (Figure 2.1) can be briefly described as follows:

Plan: establishment of the objectives and processes necessary to deliver results in accordance with the organization's OH&S policy.

Do: implementation of the processes.

Check: monitor and measure processes against OH&S policy, objectives, legal and other requirements, and report the results.

Act: take actions to continually improve OH&S performance.

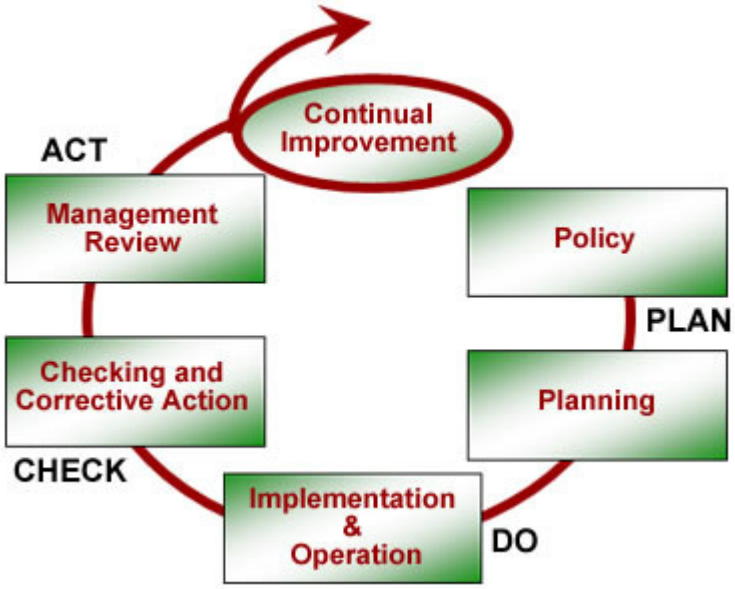


Figure 2.1 The PDCA Cycle.

2.5 Benefits and Difficulties of Occupational Health and Safety Management System

As it stated above, the purpose of occupational health and safety studies, is to protect from work accidents and occupational diseases to employees, and to provide a healthier work environment. The benefits of implementing a systematic and effective OH&S management system include the following:

- Reducing the number of personnel injuries through prevention and control of workplace hazards
- Reducing the risk of major accidents
- Ensuring a well-qualified and enthusiastic workforce by fulfillment of the increasing expectations of your employees

- Reducing the loss of materials caused by accidents and in production interruptions
- Reducing cost of insurance as well as reducing costs due to absence of employees
- Serving the possibility for an integrated management system including quality, environment and health and safety
- Ensuring that appropriate legislation is addressed and acted upon
- Meeting the increasing importance of OH&S for public image provides employers with requirements for their health and safety management systems against which a third-party registrar can assess and certify them.
- Represents the direction things are headed.
- Helps safety and health programs go global.

Difficulties of OHSAS 18000 series can also be given as follows:

- Lack of commitment of top management.
- Understanding requirements of the standard.
- Documentation control.
- Resistance of labors to apply safety regulations.

2.6 OHSAS 18001-Occupational Health and Safety Management System Content

OHSAS 18001 occupational health and safety management system as part of this framework to address and consists of the following elements:

- Occupational Health and Safety Policy
- Planning
- Implementation and Operation
- Checking and Corrective Action
- Management Review

Organization, to meet the requirements set up and maintain an occupational health and safety management system. System installation of occupational health and safety regulations applicable statutory requirements must be taken into account.

2.6.1 Occupational Health and Safety Management System Policy

Approved by senior management of the organization, the objectives of all health and safety, health and safety performance of the development which clearly demonstrate the will of the decision and must be an occupational health and safety policy.

Occupational health and safety policy;

- Occupational health and safety risks and the size of the organization structure must be suitable;
- Must include a commitment to continuous improvement;
- At least the applicable requirements of occupational health and safety legislation and implement the commitment of member organizations that include;
- A written document should be brought into, implemented and maintained;
- Employees to be aware of their individual responsibilities of occupational health and safety with the aim announced to all employees;
- Should be available to interested parties,
- Appropriate and relevant to the organization itself should be reviewed periodically to keep.

Occupational health and safety concerns with senior management responsibilities fully. Best practice, one of the top management taking full responsibility for occupational health and safety management system, and provide the applications and organization in enterprise.

2.6.2 Planning

Hazard identification, risk assessment and risk control planning for establishment, hazards identification, risk assessment and control measures required for the implementation of procedures and manuals.

These procedures should include the following:

- Routine or non-routine activities;
- Staff have the opportunity to access their places of work activities;
- Others around the facilities provided by the organization or business.

Establishment, occupational health and safety goals while the results of these evaluations and consideration of the effects of these controls should provide. Foundation hazard analysis, risk assessment and control measures, document and current body.

The organization's methodology for hazard identification and risk assessment;

- To ensure that proactive, not regulatory, scope, structure, and should be described with respect to timing,
- Targets and occupational health and safety management programs, as described in the classification and identification of measures to eliminate or control the risks that need to be provide,
- Business experience and capacities of the risk control measures should be consistent with,
- Determination of the terms of the organization, identification of training needs, provide input to develop operational controls,
- Required activities and effective, and timely implementation of the monitoring should provide for.

Purpose of risk assessment, hazard identification, risk assessment and risk control processes in the organization after using its own in the field of occupational health and safety of all the important is to have a complete knowledge about the dangers (Özkılıç, 2005).

Legal requirements: The organization itself can be applied to determine the legal and other occupational health and safety requirements, and establish and maintain a procedure to achieve them.

The organization should keep this information current. To its employees and other interested parties should communicate information about the legal and other requirements.

Objectives: The organization within each relevant function and level of occupational health and safety objectives should establish and maintain documented.

Organization and its goals for creating and reviewing the legal and other requirements, occupational health and safety hazards, risks, technological options, financial operation and operating conditions, should take into account the views of interested parties.

Commitment to continuous improvement targets, including occupational health and safety policy should be consistent.

Occupational health and safety management programs: The organization of occupational health and safety management to achieve the objectives of the program or programs and manuals.

These programs; relevant functions and levels of the organization given responsibility and authority for achievement of objectives; tools for achieving objectives and timeline.

Occupational health and safety management programs should be reviewed at regular and planned intervals. If necessary, the organization's activities in occupational health and safety management programs, products, services or re-adjusted according to changes in business conditions.

2.6.3 Implementation and Operation

Implementation and operation, performance feedback from the measurement, control and corrective action planning and control was carried out with the feeding step.

Structure and responsibilities: In order to facilitate the management of occupational health and safety organization, occupational health and safety risks affecting the operations, processes, manages, and verifies that fulfill the responsibilities and powers and duties of personnel should be defined, documented and publicized.

The ultimate responsibility for occupational health and safety, the administration is on top of. Foundation, a member from the upper management, correct application of occupational health and safety management system, and in all areas of the organization's requirements to ensure each step of the process and appoint a special responsibility.

Management, occupational health and safety management system implementation, control and provide adequate resources for the development.

Executive officer;

- Occupational health and safety management system in accordance with the requirements of this standard are established, implemented and maintained to provide;
- Occupational health and safety management system as a basis for improvement and will be presented to senior management for review of occupational health and safety management system that provides reports about the performance.

Education, information and competence: All employees, occupational health and safety policy, procedures and occupational health and safety management system should be informed about the importance of compliance with the requirements.

The organization and function of each level that allows employees to be aware of the procedures specified below must create and maintain them. Organized the training required in this time. All employees should be required knowledge and

participation in the evaluation. Training should be recorded (Binyıldırım, 1999). The organization should develop and implement required training programs.

Occupational health and safety policies and procedures, the importance of compliance with the requirements of the management system;

- Occupational health and safety policy, handbooks, procedures, instructions, forms,
- The organization's own business activities, real or potential activities on occupational health and safety outcomes and benefits of the development of personal performance;
- Preparedness for emergency situations and needs to be done in these cases, including occupational health and safety policies and procedures, and harmony are the terms of the management system of duties and responsibilities,
- The potential impact of deviation from specified operating procedures.

Training procedures should take into account the different levels of the following:

- Responsibility, talent, ability and level of knowledge,
- Risk.

Consultation and communication: The organization of occupational health and safety information available to employees and other interested parties, and transmitted them shall have procedures which helps to ensure the information is received.

Discussion of the policy and objectives, hazard identification, risk control and evaluation of participation of employees should be provided, health and safety issues should be represented.

Documentation: Establishment, written, electronic and so on. The main elements of the appropriate environment management system and create information that identifies the flow of information and ensure continuity (Özkılıç, 2005).

Document and data control: Organization, all the documents required by this standard and to control the data necessary to ensure the following procedures to establish and maintain:

- Documents to be certain places,
- Periodically reviewed and revised as necessary and must be approved by authorized personnel qualifications,
- Occupational health and safety procedures necessary to carry out effectively the functions of the system where the data and the current versions of relevant documents to be kept,
- Documents and data have become invalid immediately removed all points of the publication and use of used or unwanted avoided,
- With legal requirements, or information storage means, or stored in the archives of both documents and data in accordance with the determined purpose.

Operation control: Establishment, implementation of control measures and procedures to identify areas of activity related to the identified risks. Establishment, maintenance included, under certain conditions, with these activities, the following should do the planning necessary to ensure.

- In the absence of documented procedures, occupational health and safety policy and objectives of the occurrence of deviations from the documented procedures that are involved in situations involving the creation and maintenance,
- Connecting business criteria, procedures, provision,
- Goods purchased or used by the organization, hardware and services defined occupational health and safety risks associated with setting up procedures, maintenance, contractors, suppliers and delivered to the procedures and conditions,
- Occupational health and safety risks to eliminate or reduce sources of workplace design, process, plant, machinery parts, operating procedures and work organization and their adaptation to human capabilities, including the creation and maintenance procedures.

Emergency preparedness and needs to be done in this case: The organization of events and to predict the likelihood of emergency situations can occur in these cases to determine the to-do and the possible diseases and injuries caused by them to avoid or reduce them to establish and maintain plans and procedures.

These plans, each department determined the fire team, potential accidents and emergency situations, emergency exit locations, signage, workplace emergency unloading procedures, emergency workers and departments should be appointed. Plans and procedures should be reviewed, evaluated and updated constantly.

The organization should try to practice in areas with these procedures periodically.

2.6.4 Checking and Corrective Action

Occupational health and safety performance monitoring and measurement of a regular health and safety management system that helps business applications and business elements from the control and regulatory activities, contribute to continuous improvement in the control and management system.

Performance measurement and monitoring: The organization of occupational health and safety procedures to measure and monitor performance on a regular basis and manuals.

These procedures;

- Appropriate to the needs of the organization, should provide both qualitative and quantitative measures,
- An organization of occupational health and safety monitoring of targets,
- Performance of occupational health and safety management programs, operational criteria and applicable to the following proactive measures to ensure compliance with legal regulatory requirements,

- Accidents, illnesses, incidents (including damage events), and inadequate health and safety regulatory measures to track performance should provide evidence of other past,
- Subsequent analysis of the corrective and preventive actions to save the data to facilitate and ensure adequate monitoring and measuring results.

Performance measurement and monitoring equipment necessary for monitoring, equipment maintenance and calibration procedures for this type of organization and manuals. The results of the calibration and maintenance activities and keep records.

Accidents, incidents, non-conformances, corrective and preventive actions: Organization;

- Accidents, incidents, nonconformities, are handled and examination,
- Events, accidents and nonconformities to take measures to mitigate the impact,
- The initiation and completion of corrective and preventive actions,
- The verification of the effectiveness of corrective and preventive actions, including determining the responsibilities and authorities shall establish and maintain procedures.

These procedures, risk assessment of all proposed corrective and preventive actions should do before applying. Potential and actual non-conformities to eliminate the causes of any corrective and preventive measures taken, the problems encountered in size and should be commensurate with the risks of occupational health and safety.

The organization documented procedures, the changes resulting from corrective and preventive actions, and record applications.

Records and records management: Foundation, the results of the audit and review as well as identification of occupational health and safety records, procedures and manuals for the maintenance and regulation.

Occupational health and safety records legible, can be distinguished in terms of activity can be monitored and must be covered. Occupational health and safety records should be accessible at any time, damage, destruction or loss must be kept protected. Retention times of records should be identified and recorded.

Logs, system and in a form suitable for the organization, should be kept to demonstrate compliance with this standard.

Audit: Organization, establish procedures and the audit program for management system controls and ensure continuity.

- Planned arrangements for the management of occupational health and safety compliance,
- Applications is done correctly,
- Organization's policies and objectives are met,
- A review of previous audit results,
- Audit results should cover the activities of government reporting.

The audit program should be based on the organization's activities, risk assessment and the results of past audits. Modified controls and procedures required for reporting to the terms and scope of responsibilities, frequency, methodologies and qualifications as well as identify.

Where possible, those responsible for operating the control tests performed by an independent staff.

2.6.5 Management Review

Top management, occupational health and safety management system and continuous compliance and periodically review the terms of efficacy. The management review process, the collection of information necessary to perform such

an evaluation and review activities should be under warranty should be recorded. As a result of management review, occupational health and safety management system, policy, objectives and needs of the other elements should be mentioned that the changes can be made (Özkılıç, 2005).

2.7 Similirities and Differences of OHSAS 18001 with Other Management Systems

Until the development of the OHSAS 18001 Standard, ISO 9001 and ISO 14001 standards were used systematically in dealing with the quality and environmental problems of the companies. However, these standards do not serve to the occupational health and safety considerations. Therefore, to eliminate this deficiency and to compete with these two standards OHSAS 18001 has been developed. The general structures of ISO 9001 and OHSAS 18001 have lots of similarities. The basic difference between the standards is about their concepts; ISO 9001 deals with quality whereas OHSAS 18001 deals with health and safety.

CHAPTER THREE
WORK ACCIDENT, OCCUPATIONAL DISEASE AND RISK ASSESMENT

According to the ILO every year 1.3 million men and women die annually due to occupational accidents and occupational diseases. Again, according to the same sources, 250 million people each year, accidents at work, the 170 million people are exposed to losses resulting from occupational diseases and 6% of world gross national product is lost due to these events (Ministry of Labour and Social Security [MLSS], 2007).

According to Harb-Is Union's study, work accidents in Turkey, ranks first in Europe in the world, and in third place after South Korea and Brazil. Again, in terms of coal mining accidents, the death rate in Turkey, according to the United States 9, according to Britain 10, 14 times higher than Yugoslavia (International Labour Organization [ILO], n.d.).

Work-related accidents in Turkey is 500 million dollars of economic losses. International Labour Organization (ILO) calculates that 74 thousand job accident in 2005 in the Turkish industry is the cost of 20 million working days were lost. Workplace safety and workers' health in terms of exhibiting the worst performance in Europe, in Turkey the employer in the process of EU integration, as well as changes to the Labour Code and the Penal Code issued 33 directives on occupational safety and health of workers installing the heavy responsibilities of business owners not to take the necessary measures will face heavy financial penalties in case (MLSS, 2007).

Turkey in 2005;

- Total accidents: 73.923
- Death as a result of occupational accidents: 1.070
- Sickness permanent jobs as a result of occupational accidents: 1.374
- Working days lost due to accidents at work in the economy consists of: 1.791.292 statistics of occupational injuries is reflected in these figures.

3.1 Work Accident

One of the risks related to occupational health and safety is work accident. Cases necessary precautions are taken, accidents will inevitably occur.

3.1.1 Definition of Work Accident

Today, technological advances accelerated, leading to accidents. In line with technological developments that emerged from the source table, the necessary precautions are not taken and the measures are not complied (Demircioğlu and Centel, 2002). International Labour Organization, work accidents, damage or injury that causes a specific, unexpected, unplanned event as previously described (Sabuncuoğlu, 2000).

Article the eleventh Social Security Law No. 506, work-related accidents described as follows: The insured event, immediately or later inflicts bodily form, or malfunction are spiritually.

To be legal for an accident to the work injury, accident;

a) the insured while he was at work,

b) During the work carried out by the Employer,

c) the insured by the employer without the real work of the task due to be sent to another place with the times,

d) to give milk for the child's mother separated when the insured person,

e) the insured, provided by the employer where work is performed by a vehicle while their structures must be taken to the public (Lim et al., 2004).

3.1.2 Causes of Work Accident

Researchers, a listing of all accidents in the five main factors, one after another "accident chain" from accepted to occur.

1) The natural and social structure,

2) Personal defects,

3) The unsafe conditions and behaviors,

4) Injury,

5) Accident. (Example of Domino Stones.)

The third factor is the most important in the list of five factors, unsafe conditions and behaviors. When eliminate the effect of this factor, other factors are eliminated. Thus, the accident occurred and the damage can be prevented (Müngen, 1990).

These five factors reveals the following facts:

a) Against the weakness of human nature will not be destroyed. Absolutely impossible to get rid of accidents.

b) The behavior of each accident is a flawed human being. From now inevitable.

c) The unsafe behavior and unsafe conditions, accidents, which are important in the formation of a factor. Job security, unsafe conditions and unsafe work area to reduce or eliminate the behavior (Ezgin,1995).

In particular the prevention of work-related accidents, safety measures must be directed to the third factor. Indeed, the ring of the chain of accident, it is easier to eliminate.

The main factors that play a role in the increase of work-related accidents are as follows (Erbay, 1994):

- Lack of supervision and control of the occurrence of accidents,
- Back to using technology,
- Education (including workplace training),
- Lack of protective measures, the guards should not be strictly followed in the application, neglect, and caring,
- Conditions are not conducive to health and safety,
- The employment of inexperienced staff (cheap labor and personnel) and not do orientation training for new workers,
- Cause of accidents, how to have occurred, the causes of occurrence, recurrence of the same accident and the need to take serious measures before the accident

after the accident also responsible for the Foreman, engineers, business, construction site supervisor and employer representative by the chief of security shall not be treated carefully.

3.1.2.1 Human Factors

Approximately 80% of the causes of accidents are caused by personal factors (Sabuncuoğlu, 2000):

a) Personal reasons: Personal characteristics of being prone to take risks and unexpected behaviors such as entering into the cause of certain behavioral tendencies that are specified. This behavior can result in unsafe behavior trends. For example, as being negligent and failed to follow procedures. Such behavior increases the likelihood of an accident in the people. In addition to other personality factors increase the likelihood of an accident. For example:

- Age, gender, education, experience,
- Emotional state,
- Mind occupancy,
- Accidents on the situation: visual and hearing disturbances, anxiety, depression, sadness, inexperience, hypertension,
- Some neuropsychiatric diseases: epilepsy, behavior disorders, mental disability, phobias,
- Some addictive drugs: alcohol, drugs, medications, sedatives, tranquilizers or pain relievers,
- The possibility of an accident to be higher, (such as clumsiness),
- Talents are temporarily damaged, for example, fatigue, insomnia, alcohol, tobacco, weakening the ability to react with the use of sedative drugs, analgesics, such as prolongation of the rate of reaction,
- Permanent damage to the body due to chronic diseases capabilities, advanced degree of vision, hearing disabilities, neuromotor system lesions, such as color blindness.

b) The physiological reasons:

- Physical fatigue and muscle fatigue,
- Physiological fatigue-sleep may become disturbed,
- Physical disease and paraplegia, hemiplegia, such as blindness,
- Nonsense idiot or a half-globes of brain function disruptions (such as can not use left or right handed).

c) The Psychological Causes:

- Sensory equilibrium,
- Reaction time,
- Intelligence level,
- Special talents,
- Psychological fatigue,
- Perception speed,
- Perception, attention, memory disorders, such as his inability to decide, other causes of a man,
- Job dissatisfaction,
- Mental fatigue,
- Insecurity,
- Incompatibility,
- Monotomi,
- Not being an expert at the job,
- Psychomotor co-ordination,
- Broken-judicial prejudice,
- Excessive joy, grief, tension, feelings of being in distress.

3.1.2.2 Environmental Factors

These factors generate 20% of the causes of the accident.

- Using personal protective devices,
- Incorrect placement of production devices,
- Physical factors (noise, heat light, radiation, etc.),
- Biological factors (micro-organisms, etc.),
- Chemical factors (irritant and asphyxiant gases, anesthetic, and narcotic substances, systemic poisoning),
- Employer and employee relations, compensation systems,
- Shift systems,
- Working hours,

Other factors are as follows:

- Excessive workload,
- Lack of education,
- Machines to be neglected,
- Improper storage,
- Non-ergonomic conditions,
- Unsafe loading and unloading,
- Electrical leakage.

3.1.3 Costs of Work Accidents

Work-related accidents, occupational diseases, the direct costs and indirect costs, as the road started in two main categories (Kaynak et al., 2000):

a) Direct (Direct) Costs:

- Costs of health care organizations,
- Compensation paid to the worker,
- Insurance premiums.

b) Indirect (Indirect) Costs:

- During the interruption of production in an accident (loss of production),
- Machines damaged
- Separation of raw materials and scrap,
- The other adversely affected by the accident of workers (low yield),
- Government agencies and audit costs of investigation.

3.1.4 Classification of Work Accidents

Social Insurance Institution, evaluates work-related accidents in three groups (Fıratlı, 2004):

- While it may fail to occur or significant damage accidents (accidents do not cause a loss of more than a day job),
- Accidents causing temporary incapacity,
- Accidents which result in permanent incapacity.

Injury or illness and / or property, the environment or harm to third parties resulting in the arrival of events.

a) Near misses: Any injury or material loss or damage, accidents do not cause a slight margin.
b) Occupational accidents causing property losses:

1. Financial losses: not part of any injury, but the company property, vehicles, Malinda or devices (before any insurance payments) 10,000 USD or accidents that cause more damage.

2. Small financial losses: 10,000 USD in damage or loss of product occurred accidents.
c) Occupational accidents resulting in injury: During the performance of a task at work, which is defined in a single event or within a short period of time from more than one incident of injury or become ill (or sick) state.

d) First-aid accidents.

e) Temporary total disability.

f) Permanent partial disability.

g) Permanent total disability.

f) Fatal accidents at work: Work-related accidents resulting in death. There may be more than one person's death. The time between injury and death are ignored. These types of accidents, property damage may also occur (Binyıldırım, 1999).

3.1.5 Measures for Work Accidents

The most effective action to be taken against an accident, an accident previously able to locate and eliminate the cause. These measures are not always possible to determine in advance. But at the same time, how to act against many known causes of the accident. Is the most important thing in the workplaces, identify and eliminate the causes of the accident. One of the most important tasks in the workplace occupational health and safety committees should be to find the causes of importance to those tasks that are not workplaces. Other measures may be taken in the workplace is a "near miss accident alert" system use. Near miss accident notification system, cheap near-miss, a harbinger of possible accidents in the accident reported very few remaining events system.

Weaknesses in the management system of rings, a preventive system that allows to determine the problematic parts. Learning based on real cost of an accident, near miss accident is almost zero. Change in behavior, responsibility-sharing, awareness and come together with the approach of reward and develop the concepts of near miss accidents.

Providing training on the prevention of work-related accidents, according to the machines technical measures, a number of environmental measures for the safety of the workplace (workplace lighting, cleaning, etc..) is required. The most important is the human factor in the occurrence of accidents. Characteristics of each employee, information, structures are different. According to this difference needs to use

personal protective of each person according to his work. Personal protective equipment must be used strictly according to the state of work. For example, by determining the lower limit of the damaging noise in a noisy environment, use ear plugs if necessary. Security devices in the area where, less common than workplace accidents. But the careless act of workers relying on protective devices also drawbacks.

Elimination of unsafe work conditions the first stage, threatening the health and safety risks arising from work is to identify environments. Then planned and carried out measures to eliminate these risks. Basic methods of prevention of risks are as follows:

- No danger to the source,
- Can not be cleared from danger dangerous thing to change what is less dangerous,
- Danger of hazardous substances can not be cleared, the machine, equipment or process to isolate,
- Engineering controls to make
- Personal protective use (MESS, 2006).

All security measures must be taken to prevent loss of manpower required. In addition, a stable business environment should be provided in a relaxed dialogue. In short, workers must trust the work environment. As an example, a fire in a workshop fire extinguisher available will have difficulty found in the workers' trust in the workplace. A fire-fighting tool in the periodic times be controlled, or whether the workers in various protections (gloves, helmets, safety belts, etc..) Worker training is not about to use it or will not lead to the continuous accident. Workers to lead, at least as important as taking action.

3.2 Occupational Disease

As can be seen at the root of the word of occupational disease is a disease caused by the employee of his work. Definition, causes and measures to be taken are as follows.

3.2.1 Definition of Occupational Disease

Repetitive nature of the work executed by the insured for any reason or due to conditions of execution of work suffered temporary or permanent illness, disability or mental cases of the failure (Social Security Law).

The Social Insurance Law (No. 506) defines occupational diseases as follows: Occupational diseases disturb the health of the worker and the claim could produce, such as accidents at work are defined by law.

Social Security and Health Procedures Regulation, set the necessary conditions for the adoption of a disease as an occupational disease and occupational diseases has gathered into five groups (Fıratlı, 2004):

- Occupational diseases of chemical substances and compounds (lead poisoning, chromium compounds, mercury, etc.),
- Carcinogenic and non-skin disease (allergic skin diseases, etc.),
- Pneumoconiosis and other occupational diseases of the respiratory system (waste gases, etc.),
- Occupational infectious diseases (especially in the agricultural and livestock sector),
- Physical factors of the occupational diseases (radiation, noise, pressure, heavy load carrying, etc.).

Labor Organization in the United States, the most common classification of occupational diseases was as follows (Byars et al., 1997):

- Skin injuries and damage,

- Lung diseases caused by dust,
- Dependence on the formation of toxic substances,
- Poisoning due to toxic substances,
- Diseases caused by physical agents other than toxic substances,
- Trauma-related disorders, other occupational diseases.

3.2.2 Causes of Occupational Disease

Factors that may cause occupational disease listed as the following (Kaynak et al., 2000):

- Metal objects composed,
- Composed of organic bodies,
- Comprising in physical and mechanical effects,
- Composed of dust,
- Composed of bacteria,
- Psychosocial environment of the organization.

3.2.3 Measures for Occupational Disease

Working conditions in the workplace leads to progression of certain diseases. For example, a heart patient, in the face of hot, oven-furnaces work, heavy duty work that requires high energy expenditure, leads to disease progression. These types of diseases, "work-related diseases" is called. Because the business, accelerate their development. These measures to be taken as the natural rate of progression can be slowed, or completely eliminated. In addition to coming into work, whether it is appropriate assessment and the health of people in this business it is necessary to act on.

Occupational disease prevention measures can be examined as follows:

- Medical Protection Measures in the workplace should be taken by the occupational physician medical measures to be taken. New workers will be hired as

the first available is determined whether there is sufficient physical and mental aspects. Hired workers should be examined at regular intervals during operation. Because the various articles of occupational health and safety regulations related to the periodic examinations stipulated matters. Physician workplace conditions as well as hazardous to health in the workplace by identifying, employers and workers in adverse health effects of these conditions and gives training in methods of protection.

- Protection measures in the workplace by the employer, workplace hazardous substances harmless or less harmful substances used in the modification, which is harmful to health made a number of transactions closed areas or separate areas, continuously cleaning and maintenance in the workplace positively affect workers' health.

- Protection measures for workers in the workplace, workers falling for the prevention of work-related accidents are a number of tasks. Helmets, hair and ear protectors and guardians of workers required to use certain tools to work. Workers employed in hazardous jobs has to wear glasses for the eyes. Workers should use gloves to protect hands at the same time (Karataş, 2006).

3.3 Risk Assesment

3.3.1 Risk Assessment Definition and Objectives

Probability of occurrence and severity of risks as they emerge in the account which is used to bring processing "Risk Assessment" is called. In other words, the work environment is always the possibility of the dangers which can be defined as a system for measuring the severity and likelihood of occurrence. Risk is defined as a combination of the probability and harmful events' results. The hazard is defined as injury and illness of people, cause damage to goods and at the workplace, or they can occur with the potential situation (OHSAS 18001, 2006).

Risk assessment methods are applied systematically in the world since 1950. In the development of methods to show that according to the requirements of

development. The main purpose of risk assessment and health risk in the workplace is to reduce any danger caused by working conditions. These risks can be all kinds of work related accidents and occupational diseases may be other health risks. As a result of risk assessment, all the hazards in the workplace what is decided, the possibility of accidents with the size and magnitude of potential accidents will have knowledge about. At the same time, risk assessment, who is an accident should be given to employees on what to do. All employees work reduced to minimum levels of risk for the risk assessment work needs to be done for all companies, especially manufacturing.

For this purpose, where the workplace is extremely important in risk assessment. In the workplace because of work or other tasks associated with a risk of a hazard risk assessment is required in any environment. The main objective of the risk assessment is to prevent accidents. Deeper and more systematic analysis, by developing an understanding of the risks it will support the reduction of hazards. Therefore, risk assessment of hazards identification, risk analysis taking into account the likelihood of these hazards will cause harm to be done and determined implementation of the measures to be taken accordingly, to check the adequacy of the measures described as. In other words, the basic principles of occupational health and safety can also be defined as a systematic way to implement the assessment.

Risk assessment in the workplace a safer environment for the formation of a study and an investment. Such a study, and the investment of health, as the return of security, business and labor required to reduce power losses. Risk assessment is a decision for the management of workplace representatives of the employer or the employer should be included at every stage. However, if the execution of the event, particularly occupational health and safety risk assessment experts or specialists, including occupational physicians, conducted by a team of technical staff and employees (Anık, 2007).

3.3.2 Process of Risk Assessment

Risk assessment of occupational health and safety management system contained in a section, although very important, provide the backbone for the management system. Risk assessment is built on the three magic words, to observe, assess and take control.

Risk assessment in the workplace a safer environment for the formation of a study and an investment. Risk assessment process steps can be listed as follows:

- Tasks and the identification of hazards
- Assessment of the risks
- Decision-making control measures to reduce risks
- Risks to the implementation of the measures identified in
- Monitoring and reviewing risks.

3.3.3 Risk Assessment in Company

Importance of reduced losses in enterprises, to increase employees' qualifications and expectations of the enrichment, social and ethical responsibility to prepare the ground to avoid problems such as increasingly more complicated, the concept of human development in enterprises earned more and more important, this concept has become more valuable. Developing countries, such as lawfully required to look beyond the load level, while now theoretical, such as the burden of responding to needs arising from beyond the laws now are setting targets.

Affairs of businesses, operations, raw materials, semi finished goods and materials, machinery and hardware, their cleaning, maintenance and repair of health effects resulting from the activities of identification, assessment, and the harmful effects of preventive, protective, and in a manner to minimize the monitoring of these activities within the concept of a configuration management system increasingly becoming a necessity. The risk will be evaluated in terms of occupational health and safety issues, work related accidents and occupational diseases, the business

activities caused by factors that cause health problems. Buildings, building equipment, machinery, equipment, materials and operations can lead to accidents and diseases.

Evaluation and ranking of harmful factors, prevention and control activities, which features how to supervise and extraction of that which is required for allocation of resources. Tolerable level of risk to those urgently needed to eliminate or reduce risks to tolerable levels, a risk assessment, there is a need to extract from each other.

3.3.3.1 Risk Assessor

Risk assessment studies be conducted in the workplace is an important issue of who or by whom. There are different opinions on this subject being introduced by experts. Some of them always as a team conducting the risk assessment studies and others supporting the idea of risk assessment will be performed, taking into account the individual's or entity's property should be conducted by the team suggest (Koray, 1996).

Both are correct vision, and can be applied more flexibly displayed a second opinion.

The diversity of businesses and jobs is an important issue that should not be ignored. Obligation to carry out risk assessment within the scope of the Labour Law covers all workplaces. This coverage, the industry is considered or not considered, the number of workers from more than three and up to tens of thousands of mines and metallurgy from the office, the office up until the fall of many businesses. For this reason, people worked three jobs to be established within the team. Occupational Safety Specialist, and the people related to the regulation may be defined as follows:

Occupational Safety Specialist: certified by the Ministry, in charge of work safety engineers or technical staff,

Engineer: Universities chemicals, machinery, mining, geology, metallurgy, industrial, electrical, electronic, construction, physics, geophysics, computer, textile, petroleum, aircraft, ships, environmental, food engineering and architecture faculties of agriculture and those who graduated in agricultural machinery,

Technical Staff: Universities, occupational health and safety departments, science of chemistry, physics, geophysics, and geology departments refers to those who graduated from the Technical Education Faculties.

The assessment made by the individual or team leaves practitioners with a more flexible range of motion. Status of the work by examining the business and risk assessment studies to be performed by an individual or a team will be evaluated. Some small business people with the level of risk taking into consideration the adequacy of risk assessment will be possible to carry out the work. Workplace occupational health and safety risks to be small and low in the cases of individuals with an acceptable alternative approach has some benefits. Risk assessment studies done by the individual, the result is thought to deliver on a short time. During studies of individuals to act as an independent, stand-alone and quickly take decisions and be able to apply quickly. For this reason, conclusion will be reached as soon as possible.

In addition, during the execution of work as a team working on the issue of risk assessment expert, or people who are in the top positions in a hierarchy or other team members, roles and responsibilities as a team. Get rid of the negative effects of the individual studies, regardless of the referral will be provided in execution. Risk assessment studies done individualist and result in a short time, depending on the reception of the value of the cost will be lower. There are also some negative aspects of the evaluation is carried out by the individual. One of these individuals is that the one-dimensional approach. Individual applications only their education, experience, knowledge and know-how to undertake. This in turn can bring a failure. In practice, multi-dimensional risk assessment studies are need the support of a team that is always visible.

Risk assessment studies to ensure the full participation of employees' ideas need to be taken. Otherwise, the employees were not thinking of their value, against the organization and not feel an affiliation to the work done and the results will not participate, and even be able to develop an attitude and as a result of risk assessment activities will think that there is the danger in their own section.

Creating the risk assessment team should be aware of the following:

- Team members should be determined according to ability.
- Team members of the professions subject to the risk assessment should be appropriate for.
- Team members should choose a leader from among themselves.
- The team leader needs to know the best businesses and risk assessment techniques.
- An appropriate risk assessment method must be selected.
- Each stage of the assessment should be recorded.
- Business knowledge and expertise when working with different departments should be made taking into account the elections.
- All the techniques used to ensure the involvement of employees.
- Interactions inside and outside the team, and interventions should be considered.
- Risk assessment studies are conducted in accordance with section of workers should be sought. Significant resource management with the use should be made.

The number of workers and the job-workplace characteristics taking into account, the risk assessment team must be created at least the following members:

- Employers or their representatives,
- Occupational Health and Safety Specialist,
- Workplace doctor,
- Employees or representatives
- Competent technical staff of the department of risk assessment studies are conducted,
- In the case of outsourcing, experts from the person or organization.

3.3.3.2 Risk Map

Risk analysis, risk group, and the size of the workplace by using appropriate methods of analysis, manufacturing facilities, machine tools, machinery and equipment used in the business to cover all the areas is removed by performing workplace risk map. One innovation in the workplace that make up the basis of the new occupational safety risk assessment done to remove the corporate risk map. Number of employees up to tens of thousands of all businesses and activities required to identify sources of danger to the company's planned withdrawal from the risks acceptable limits, the legal requirement.

Risk Map, also known as Hazard Map. A place of business, community or other area of interest on the dangers of drawing as a visual (adhesives, symbols or words) by checking the common method of data collection and presentation of a preliminary study and risk assessment studies to be done starting. Parsing algorithm should be the preparation of risk maps. According to a dangerous degree of separation of parts is required because of danger. These steps are a risk assessment to anyone who will save both time and prevent financial loss.

3.3.3.3 Emergency Action Plan

Workplace is a fire, explosion, sabotage, earthquake, flood, state of war, the occurrence of occupational accidents and disasters, according to the likelihood that harm the environment, "Emergency Action Plan" in the plan preparation and emergency exit gates, roads, fire hoses, fire extinguishers and emergency places to gather in a quiet area outside the building a case to be determined. In case of emergency to take charge of each section, "Emergency Teams" is created.

Emergency Action Teams consist of the following groups:

- Fire Team
- First Aid Team
- Security Team

- Maintenance Team
- Leakage Control Team
- Accompanying the team charged with.

3.3.3.4 Knowledge Base

This is primarily to form the banks to do it, people have experienced in this field should work as well as intense. Data banks to be created:

- Building material knowledge base,
- Equipment featured knowledge base,
- Material featured knowledge base,
- Process unit featured knowledge base,
- Bank of information on accident scenarios.

3.3.3.5 Workplace Analysis

Workplace analysis, the first step in risk assessment studies. First, the number of workers working the fields, the number of shifts, the heads of departments, foremen, operators are determined. Staff working in the field should be aware of all the equipment and conditions. For a list, so it's removed. Levels are determined with the job that controls the operation of their commanding officers and supervisors are responsible for information section of each piece of equipment must be able to list.

Convenient access to the records and the records to be kept regularly and properly, accident records and health information must be accessible at any time. Business risk analysis and detailed depiction of jobs done at his workplace, in every job and task analysis in terms of health and safety factors are taken urgently. Finally, the business / factory visited is noted, and all hazards that may arise in the workplace hazards that may arise are noted.

3.3.3.6 Bookmarks

Pending the establishment of risk map which sections, which identified the mark be made, where necessary in accordance with the Regulation on Health and Safety Signs and markings should be marked with the markings of risk map (Özkılıç, 2005).

Red: Prohibited sign. Refers to the act or dangerous behavior.

Figure 3.1 Prohibition symbols.

Yellow: Warning sign. Be careful, taking precautions, check means.

Figure 3.2 Warning symbols.

Green: Emergency escape, first aid sign and gates, the output shows the locations and routes.

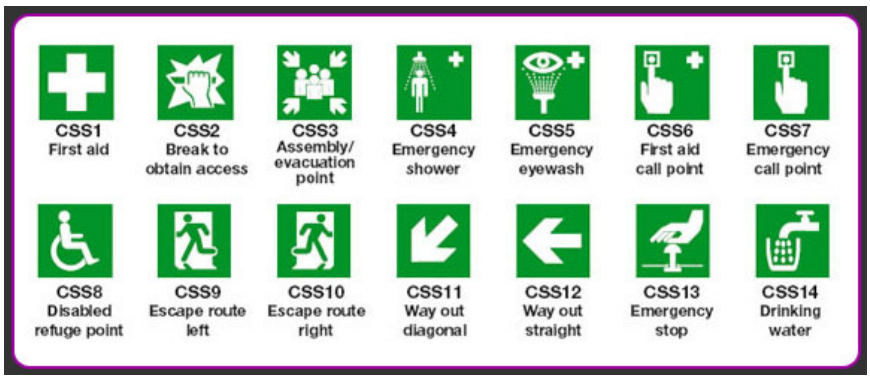


Figure 3.3 Safe condition symbols.

Blue: Just as the color of safety when used in a circular shape is considered.

Figure 3.4 Mandatory symbols.

Fire Fighting Signs: In the event of fire signs that should be followed.

Figure 3.5 Fire fighting symbols.

General Signs: General signs should be in every enterprise.

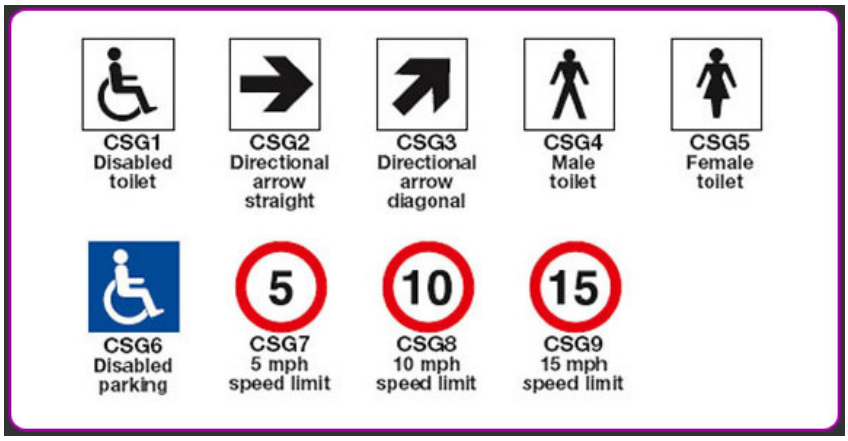


Figure 3.6 General symbols.

3.3.4 The Benefits of Risk Assessment

Risk is a combination of hazard occurrence likelihood and the resulting damage. There are always risks and can not be eliminated completely. However, the realization of the risk is manageable and preventable. The first step in evaluating the risks of managing risks. The participation of management and employees an effective risk management is essential in ensuring a safe and healthy workplace. The target is not reset all the possible risks. The main goal, all employees aware of the risks is that the control is to ensure the risks. In the event of risks in the workplace and the people around the injury, sickness, temporary or permanent physical or mental disability, in cases, such as death, there are many undesirable situation facing the stay. Property damage and production losses that may occur in the workplace, and everything is encountered after the end of the legal penalties, lawsuits, claims, customer loss, the loss of public esteem, low morale of the workforce, and therefore can lead to yield losses up to shut down the business. All this has happened from the beginning to avoid the risk of being in a state of vigilant and act to minimize the risk assessment process should be the first step to start businesses (Andaç, 2002).

The following benefits are obtained with a business risk assessment:

- Available in the workplace awareness and awareness of hazards and associated risks is provided.

- Who are at risk and often unknown number of persons determined to be at risk.
- Adequacy of measures is reviewed multiple times.
- Some risks may not increase the bass side of risks can be eliminated.
- The first is the most important risks can be taken under control.

In summary for all staff to continue their work without risk, will have the appropriate methods. At work because of work or other tasks in relation to the risk of a hazard risk assessment is required in any environment.

CHAPTER FOUR
OHSAS 18001 OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM APPLICATION IN TRANSFORMERS MANUFACTURING

4.1 Company Presentation

This company was established in 1981. Company being a family company was established by 100% Turkish capital and locates at four different locations in total 17.500 m^2 in Ataturk Organized Industry Zone being the most developed Organized Industry Zone of Izmir.

Nowadays, companies conceived that total quality management is the most important factor for competitive advantage at international markets. For a better company performance, the company received ISO 9001 Quality Management System Certificate in 1996.

The company accomplishes its all responsibilities in order to keep this world clean, which we will bequeath to our children.

In the frame of regulation on the control of waste oils, regulation for control of hazardous waste and regulation on the control of packaging and packaging waste, hazardous and packaging wastes of our company are stored harmless to the environment, transported and avoided by licensed companies. Recyclable wastes are separated at source. Therefore, the company received ISO 14001 Environmental Management System Certificate in 2004.

The aim is, to present a complete, accurate, unbiased and repeatable test process to our customers. Company's Test Laboratories are approved by TÜRKAK. By this accreditation; our test laboratories achieved the status to give test service to other companies as an independent laboratory. The company received TS EN ISO/IEC 17025 Laboratory Accreditation Certificate in 2010.

The company endeavors for presenting the opportunity of living in a working area which is safe or has minimum danger, to our customers, employees, business partners, suppliers and other people who are in sphere of influence. Company works to be a good example for other companies, by managing Quality and Environmental Management Systems integrated with these actions;

- Complying with related legislation about OHS,
- Establishing OHS culture on the base of safe behavior,
- Evaluating accident risks and taking corrective-preventive precautions,
- Education of all employees,
- Reviewing OHS results as performance criteria,
- Applying continuous improvement.

The top management has to begin these studies because of number of work accidents (42) and number of wasted days (407) in 2010 and especially exports of firms searching for OHSAS 18001 certificate criteria.

The requirements of OHSAS 18001 Occupational Health and Safety Management System standard was introduced in begining of the 2011. The system installation has been completed throughout 2011 and OHSAS 18001 Occupational Health and Safety Management System has been certified at the end of the 2012.

The company has not been faced great difficulties during the Occupational Health and Safety Management System installation through to Quality Management System implemented since 1996 and Environmental Management System implemented since 2004.

Senior management and all employees as well as the long-standing culture of management systems has facilitated the installation of the Occupational Health and Safety Management System.

In this section, the implementation of Occupational Health and Safety Management System are explained and in the fifth section the results obtained with the installation are summarized.

This company has been operating in the manufacture of transformers. Transformers are produced in 2 different types in this company:

- Oil type transformers: Oil type transformers are produced in two different types:

Oil type distribution transformers are used to reduce medium voltage from (3.3-36kV) to low voltage (<= 1000 V). This company produces oil type distribution transformers from 25 KVA to 4000 kVA.

Oil type power transformers are the transformers equal or higher than 4MVA. This company produces power transformers between 4000kVA -40000 kVA and both low and high voltage side of which are 3.3 kV-66kV.

- Dry-type transformers: This company cast-resin dry type transformers are produced up to 20000 kVA with maximum voltage level 36 kV and 250 kV impulse level.

Flow charts of both oil and dry type transformers are given in Figure 4.1 and Figure 4.2, respectively.

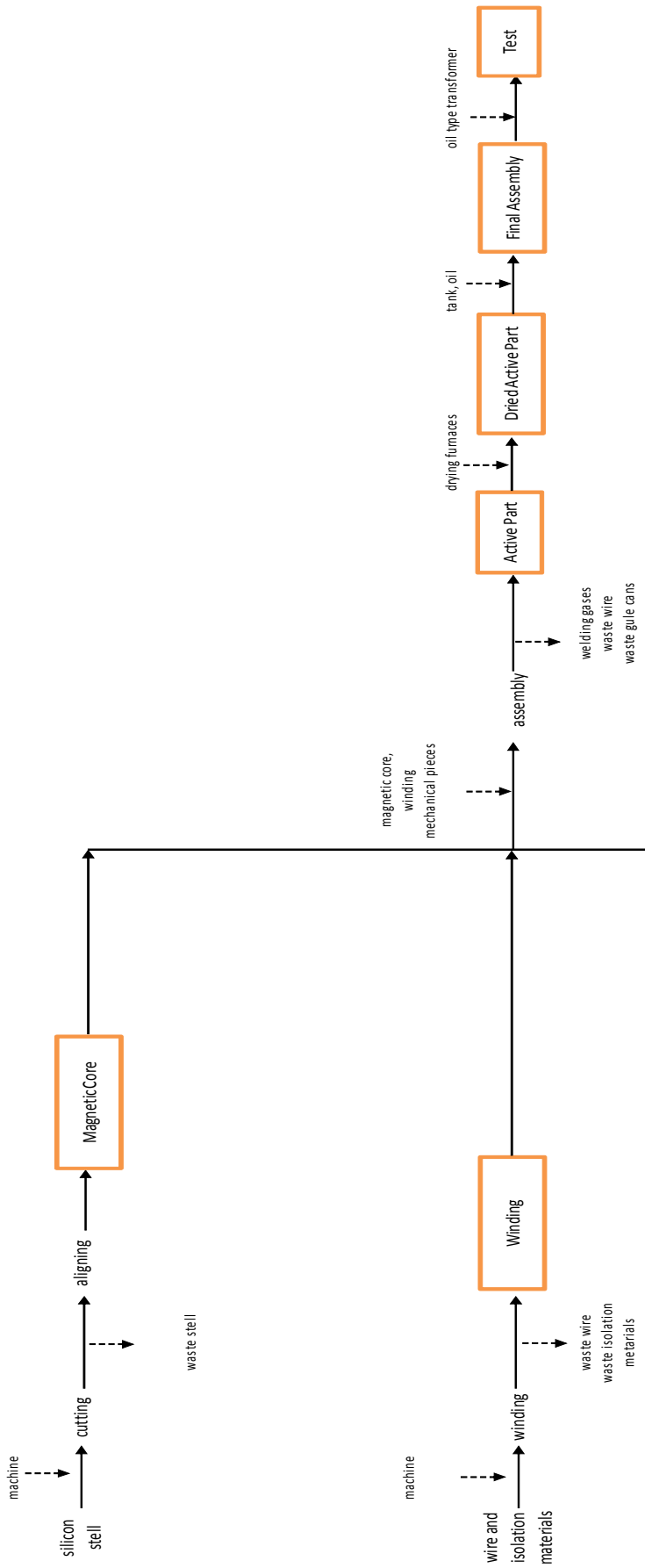


Figure 4.1 Flow chart of oil type tranformer production.

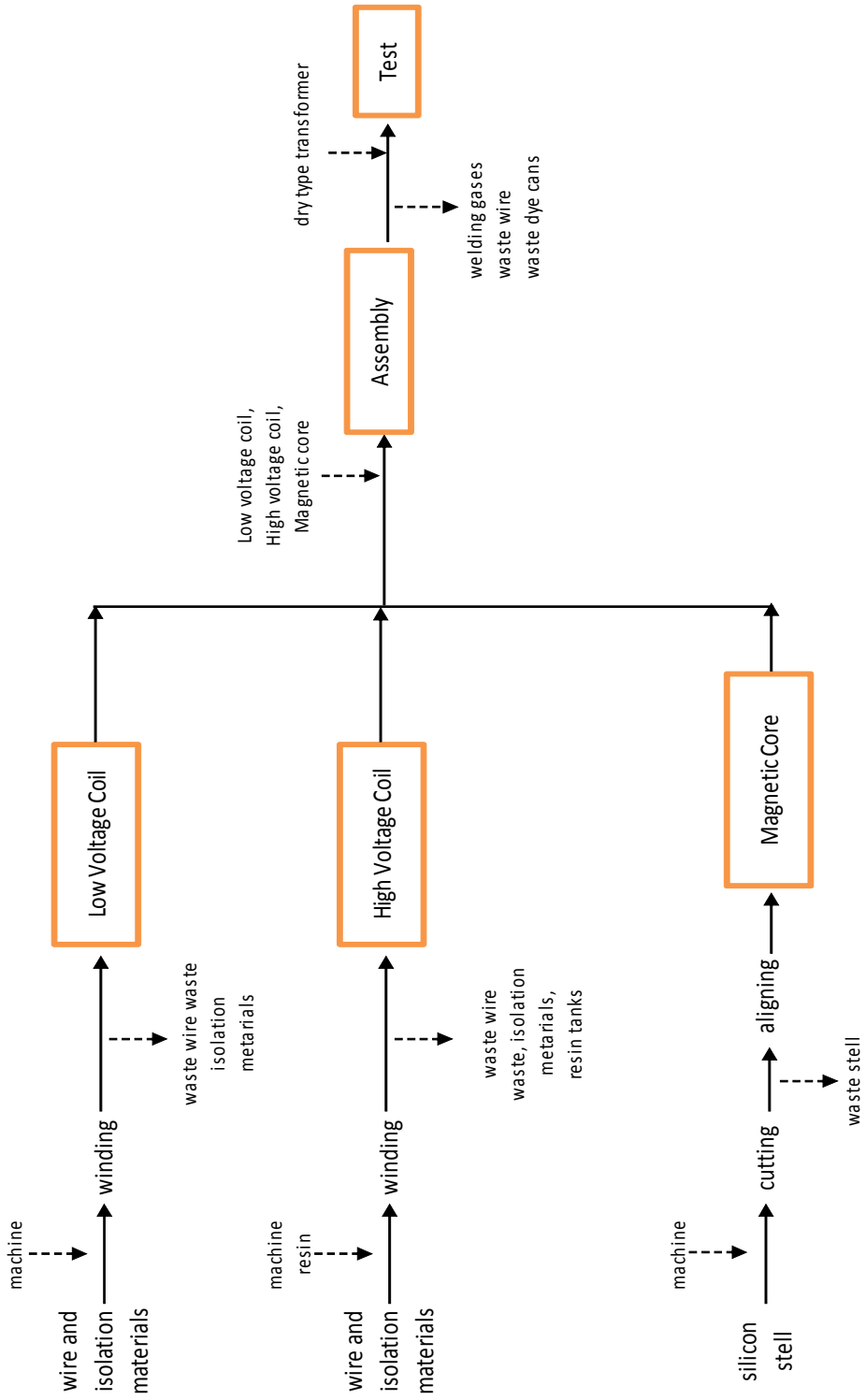


Figure 4.2 Flow chart of dry type tranformer production.

4.1.1 Process of Oil Type Transformers Manufacture

Oil type transformer production prosesses in general are shown in the Figure 4.3:

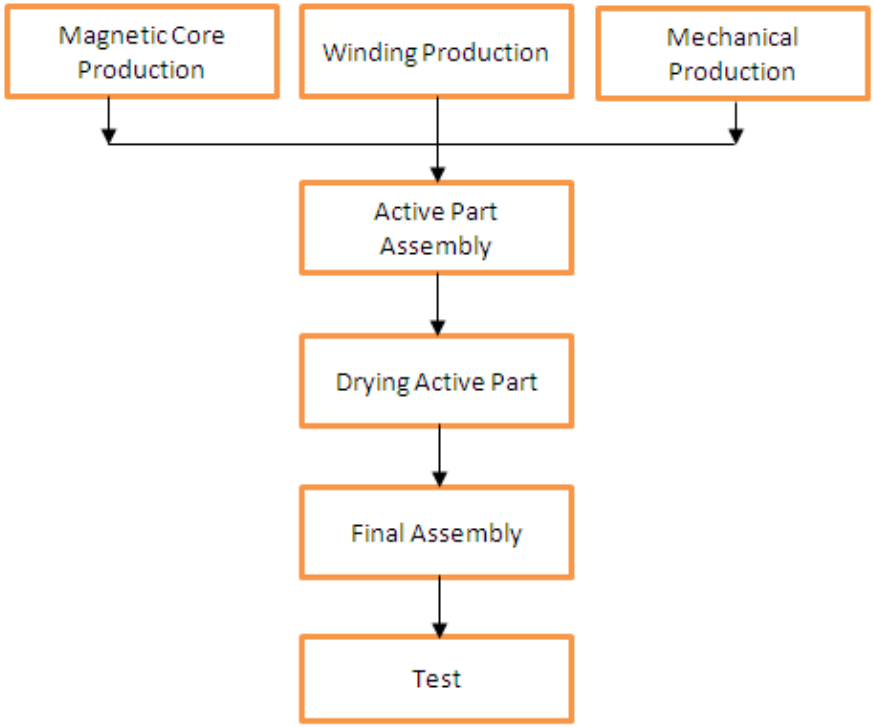


Figure 4.3 Flow chart of oil type tranformer production.

4.1.1.1 Magnetic Core Production

The silicone steel core material having high conductivity and low losses has been used in magnetic core production. Core material is slitted and cut into small parts. Slitting and cutting operations in company are done by machines that have to be maintained periodically for quality control of product.

All the laminations sheets, which could be length up to 4 to 4.5 meters, are stacked manually. In facility, high level of accuracy in stacking of the core and reliability of tension forces are applied to hold the core laminations in place. It should be done with special care since loss and noise levels of the core are crucial parameters and fully dependent on these applications.

Last procedure of the core building is the lifting operation doing with special equipment and techniques in order to eliminate undesirable mechanical forces at the core.

4.1.1.2 Winding Production

The cleanness of the winding workshop are one of the most important factor in transformer production. The winding workshop has been operating by pressurized building technology. Pressurized building technology results with high level reliability in winding production. The windings are built on CNC controlled horizontal and vertical machines. In order to achieve maximum reliability, the machines are equipped with braking and pressing mechanisms. All blue color employees of the company are either graduated from Industrial High Schools or Industrial Institutes and are experienced in the field of electromechanical production.

Conductors used in power transformersare mainly flat and transposed around the copper conductors. Depending on the power rating, voltage levels, and customer specification, various winding techniques are utilized. High quality and high level insulation material have been used in the windings.

Following the winding operation, windings are exposed to drying operation under pressesing in order to avoid changes in the winding lengths. In this regard, all windings are dried with modern vapour phase technology under dynamic pressing.

4.1.1.3 Mechanical Production

The company has been producing mechanical equipment for distribution and power transformers in the Mechanical Production Unit. The basic elements of the production are:

- Core Fixing Steel
- Conservators
- Covers

- Tanks
- Piping
- Cable Boxes

Raw materials, i.e. steel have been prepared in Pre-Processing Department with state of art CNC controlled machines. Raw materials used in the production have to acquire certain standards that are given in below:

- Steels in accordance with DIN EN 10025-91 and TS 2162
- Steels in accordance with EN 10130 St-12
- Stainless Steels in accordance with DIN 17441 1.4301
- Steel Piping in accordance with DIN 2448

In pre-processing department, company is conducting;

- Oxygen and Plasma cutting
- Shearing
- Punching under press
- Bending
- Cylindrical folding
- Punching
- Lathe operations
- Milling operations
- Planing
- Threading
- Marking
- Blasting before welding

All metal parts produced in Pre-Processing Department are welded as per specification in “Assembly Department”. Their welding procedures are in accordance with ISO 4063 –135. They are also capable to apply procedures in accordance with ISO 4063 –111. All pins are welded with Pin Welding machines.

All welding are tested with penetration method in accordance with EN 571-1. They are also capable to make testing with ultrasonic and radiographic methods. The records of the company show that leakages are at ignorable levels.

All welding personnel have competency certificate in accordance with EN 287-1. Competency tests and examinations have been repeated in every two years. In addition, each welding personnel has been trained regularly within the organization and external training programs have also applied to increase their competency.

Dangerous gases are emitted with plymovent central emission system operating at eye level to eliminate any risk to the employees. In order to reduce the impacts of those gases on to environment, they are filtered by exhausting system. In this regard, records of the company show that the level of gases exported to the environment are less than the standards (limits).

This company is also capable to get hot dip galvanizing which has done in request for all distribution and power transformer up to certain dimensions.

Following welding process, “Surface Processing Department” utilizes lead to complete the process for surface preparation and painting. In this process, all mechanical part having more than 4 mm in thickness is blasted in accordance with EN ISO 1294. Lower thickness are blasted with flap disk and if required with chemical cleaning process to minimize the risk of damage to the surface.

Following blasting and cleaning process, all material parts are phosphated and painted. To proceed with painting, company applies three main standard applications unless otherwise stated in the specifications:

(N) Type : Standard atmospheric conditions

(T) Type : Tropical climate, heavy industrial conditions

(S) Type : Tropical climate, sea level salty conditions and heavy industrial conditions

In facility, all the processes are monitored, conducted and followed through ERP system. Quality check points are clearly defined and followed by experienced quality engineers and technicians.

4.1.1.4 Active Part Assembly

Another critical factor in transformer production is to have a synchronized operation between core production and winding operation. Because, once the core is in vertical position, the windings should be ready to start assembly on the core. The importance of this operation is to minimize the level of moisture to be absorbed by the windings from the environment before assembly. This criteria is fully respected in our operations which eliminates negative outcomes during upper yoke stacking. Following upper yoke stacking, tap changer is assembled and other connections are done between tap changer and tapping winding and between windings.

The transformers produced in factories are periodically checked by Quality Department with pre-defined procedures at check points given in our standards also approved by the customers on project basis. Similarly, once the active part is fully assembled, a team consists of Production, Quality, Design and Test engineers are inspecting the active part before oven process.

4.1.1.5 Drying Active Part

During the manufacturing process, insulation paper on copper conductors, insulation material between windings and insulation parts in supporting structures are exposed to humidity. This moisture, further to its affects on dielectric withstand of the transformer, also impacts the forces active part can withstand. In this regard, drying of the complete active part is a must in transformer production. Therefore, all active parts in our facilities are dried in vapour phase ovens equipped with state of art technology. The period of drying is based and defined on the voltage levels and insulation quantities.

4.1.1.6 Final Assembly

Following drying process, active part is prepared for pressing operation in order to increase short circuit withstand capability of the transformer. This operation, which is a critical factor for a high quality product, enables us to increase stability of the windings and the active part. The active part is once more controlled by the specialized team in order to ensure the quality before tanking. Following this inspection, active part is inserted into tank and fixed. Consequently, the cover is closed, the tank is taken into vacuuming operation and the oil is filled. Following oil filling, the transformer is left for resting before factory tests and the period of resting depends on the capacity of the transformer.

4.1.1.7 Oil Type Transformers Test Laboratory

Oil Test Laboratory is an accredited laboratory in accordance with TS EN 17025 standard. Following tests defined in IEC 60076 - 11 standard are applicable to cast-resin dry type transformers.

4.1.1.7.1 Routine Tests. Routine test is an important process and is conducted for all transformers. Following to tests, routine test report is prepared, regularly. Routine tests are done according to the IEC 60076-11 standard.

- Measurement of coil resistance
- Measurement of conversion rate and connection group
- Measurement of on-load loss
- Measurement of off-load loss
- Measurement of partial discharge
- Test of voltage applied
- Test of voltage inducted

4.1.1.7.2 Type tests. Type tests defined in IEC 60076-11 standard; (optionally) are presented below:

- Lightning impulse test
- Temperature rise test

Specific tests given in IEC 60076-11 standard could also be done;

- Measurement of noise level
- Mechanic short-circuit resistance test (performance tests at various powers were executed at international independent laboratories.)
- Environment test
- Thermal shock test
- Fire action test (Eltaş, 2011)

4.1.2 Process of Cast-Resin Dry Type Transformers Manufacture

Cast-resin dry type transformers are used in certain areas such as; indoor and outdoor transformer stations, industry and oil refineries, undergrounds, oil rigs, mines, power plants, schools, hospitals, airports, shopping center (sc), wind mill turbines, passenger and cargo ships, marinas, etc.

Some of the areas that cast-resin dry type transformers are used:

- Indoor and outdoor transformer stations
- Industry and oil refineries
- Undergrounds
- Oil rigs
- Mines
- Power plants
- Schools
- Hospitals
- Airports
- Shopping center (SC)

- Wind Mill Turbines
- Passenger and cargo ships
- Marinas

4.1.2.1 Advantages of Cast-Resin Dry Type Transformers

- Instalation close to people
- Low noise level
- Non-flammable and self extinguishing
- Less space than the oil transformers with the same rating
- Maintenance free
- Moisture resistant coils
- In case of long-term deactivation, no need to drying when re-operation
- On-site replacement of coils for any reasons
- Minimization of cable investment and belts when placed at load centers directly
- 50% increase of nominal power by use of cooling fan
- Environmentally friendly due to being free of toxic chemical substances
- High impulse stress resistance
- High resistance to short circuit

Dry type transformer production prosesses in general are shown in the Figure 4.4:

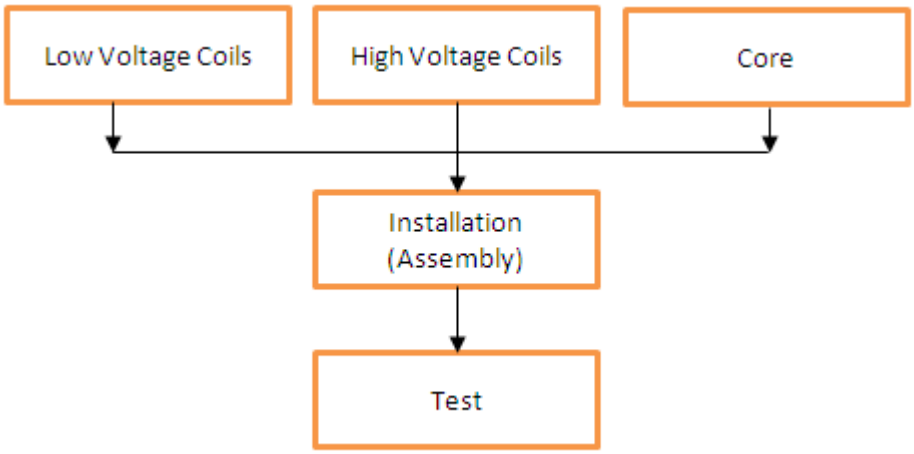


Figure 4.4 Flow chart of dry type tranformer production.

4.1.2.2 Low Voltage Coils

In low voltage coils, foil coil technology is used due to the technical advantages. Copper or aluminium material are used for coils by request. By means of foil coil technology, axial short circuit forces are reduced; prepreg insulation material class F (optionally class H) is used between back beams to control the radial short circuit forces. Coils are subject to tempering process following the winding and resistance to the hardest industrial atmospheric conditions and perfect dielectric characteristics. Low voltage coils can be also manufactured by casting technology under vacuum depending on request.

4.1.2.3 High Voltage Coils

High voltage coils are manufactured by using copper and aluminium flat or round conductors as class F or H insulated as request. High voltage coils are tempered slowly at different temperature for casting with resin and in order to obtain void-free structure, crack-free coil is vacuumed completely. For this reason, life time of cast-resin transformers is very long due to lower partial discharge value. More effective

cooling and advantage for high voltage impulses are achieved by many cooling channels having the technique of high voltage winding used for cast-resin transformers.

4.1.2.4 Core

Core sheets are the cold-rolled grain oriented silicon steel having low loss. Core is cut by step-lap cutting method abd designed with low magnetic induction to obtain lower no-load losses. Cores are coated with epoxy resin for protection against vibration and dyed with special anti-corrosion paint. Core is grounded by the requested standards.

4.1.2.5 Installation

Clamping bars are used at the bottom and at the top for fixing coils of cast-resin dry transformers. These are used to hold the core and coils. Coils are installed with glass wool reinforced support against short-circuit forces and vibrations. Wheels are designed to allow the transformer move front and back, right and left. All steel components used for installation of transformer are dyed with anti-corrosion epoxy dye. Method of dyeing is chosen for the atmospheric conditions of the transformer.

4.1.2.6 Dry Type Transformers Test Laboratory

Dry Test Laboratory is an accredited laboratory in accordance with TS EN 17025 standard. Routine, type and specific tests are performed in accordance with TS 267 EN 60076-1 for dry type distribution and power transformers. Moreover tests are performed at our laboratories in accordance with ANSI/NEMA/CSA standards.

4.1.2.6.1 Routine Tests. Routine test is an important process of the production and is conducted for all transformers, and routine test report is prepared regularly.

- Measurement of coil resistance
- Measurement of voltage conversion rate

- Control of phase shift
- Measurement of short circuit impedance and on-load loss
- Measurement of idle loss and current
- Dielectric routine tests
- Test of voltage applied
- Tests of on-load tap changer (if any)

4.1.2.6.2 Type tests. Type tests defined in TS 267 EN 60076-1 standard are presented below; ;

- Temperature rise test
- Impulse voltage test

Specific tests:

- Dielectric specific tests
- Determination of capacity between coils and earth and coils
- Determination of transition characteristics of temporary regime voltage
- Measurement of zero component impedance of three-phase transformers
- Mechanic short-circuit resistance test (conducted at international independent laboratories and test report is available.
- Measurements of harmonics of idle current
- Measurements of power drawn by ventilator and oil pump engines
- Measurements of insulation resistance of coils to the earth and/or measurements of loss factor of capacities of insulation system.

All test values are compiled in a test report and submitted to the customer. These values constitute statistical test database of test laboratory (Eltaş, 2011).

4.2 Transformer Production Inputs and Outputs in terms of Occupational Health and Safety

4.2.1 Oil Type Transformer Production Inputs and Outputs

In this section, the oil type and dry type transformer production processes of inputs and outputs are investigated.

4.2.1.1 Inputs and Outputs of Magnetic Core Production

Metal rolls are used in magnetic core production. Metal coils are cut and arranged to fit the project at slitting machine. Thus, the transformer core is formed.

Figure 4.5 Core production.

Noise level is very high during the process due to the slicing machine, and consists of small amount of waste metal. In order to reduce the impacts of noise on workersi headphones should be used. In addition, exposures have to be measured by ear audiogram test for workers in every year. The waste metal parts may cause injury due to sharp edges. For this reason, the metal parts of the waste out of the machine goes directly to the waste box. Waste box, lifted by forklift from the leftover site to waste room. Thus, the metal wastes are disposed without contact with workers.

Core process inputs and outputs are summarized in the following figure:

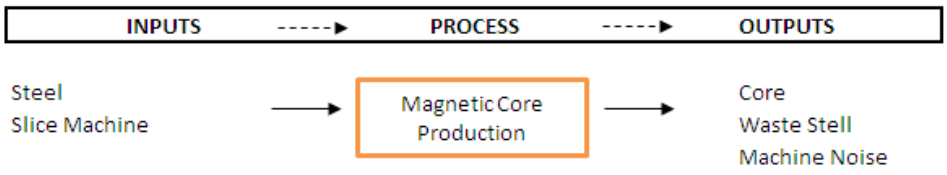


Figure 4.6 Core process inputs and outputs.

4.2.1.2 Inputs and Outputs of Winding Production

In coil winding process, insulation materials, aluminum and copper wires are wound together by coil winding machines.

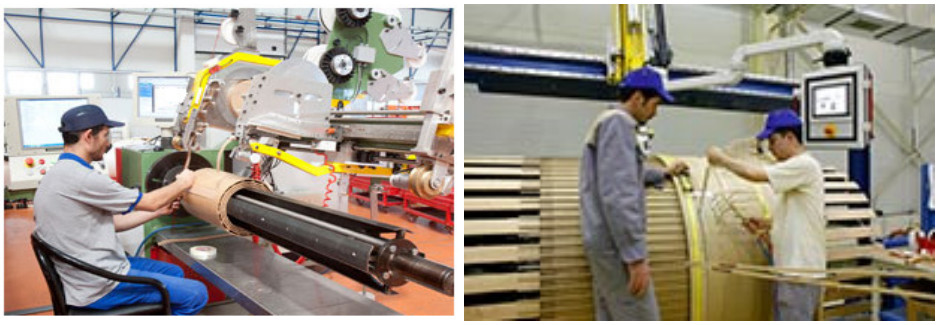


Figure 4.7 Winding production.

With the occurrence of the coil at the same time to consisted of waste wires and waste insulating materials. Waste wires and insulation materials are separated according to the types of waste collected in rooms. Coil winding wire is used during the merger with another wire may be required. Welding process is performed using a combination of such cases. In the meantime, to consisted of welding gases in the working environment, reduce the quality of work of breathing. Operating environment, breathe the oxygen level that can be taken to ensure the ventilation system is run continuously, and the workers are required to using the mask.

Winding process inputs and outputs are summarized in the following figure:

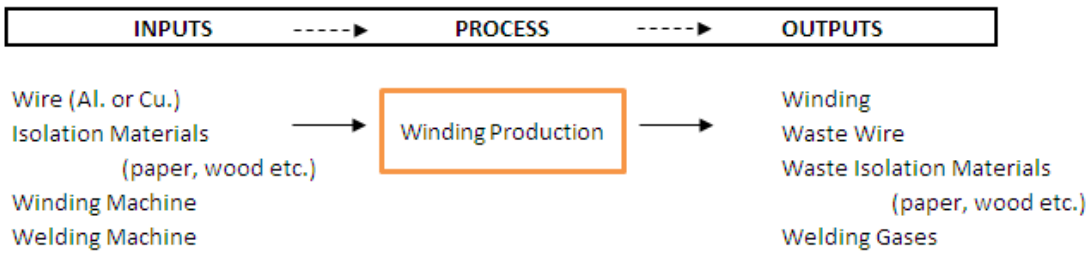


Figure 4.8 Winding process inputs and outputs.

4.2.1.3 Inputs and Outputs of Mechanical Production

Projects in accordance with CNC or the guillotine machines are cut metal sheets. The cut pieces are brought together, and the final version of the semi-finished goods (housing, cover, tank, cable box, etc.) are painted.

Figure 4.9 Mechanical production.

Guillotine cutting machines having high level of noise are utilized to reduce the risks of injuries when hand cut is applied. To reduce the influence of noise, staffs are required to wear a headset. To avoid the risk of injury situations, a variety of machines with safety guards are mounted buttons.

Bringing of the cutting components are used in welding machines. During the process, gases and hazardous substances can be released to the working area. In this situation, to minimize the harmful effects of welding gas to workers, the air-conditioning system is run continuously and workers are are required to use a mask.

Painting process produces certain gases at disturbing level and waste paint cans. Waste paint cans are transfered to disposalarea by responsible workers. To eliminated the odor from dying process, the ventilation system is operated. Paint contamination in the working area is eliminated by using thinner. Cans that are painted and polluted with thinner are left to waste room by the instructor. Maintenance and repair of mechanical equipment may be required. In that case, waste barrels and lubricating oil are emptied carefully and disposed of in waste area by using forklift.

Mechanical producion process inputs and outputs are summarized in the following figure:

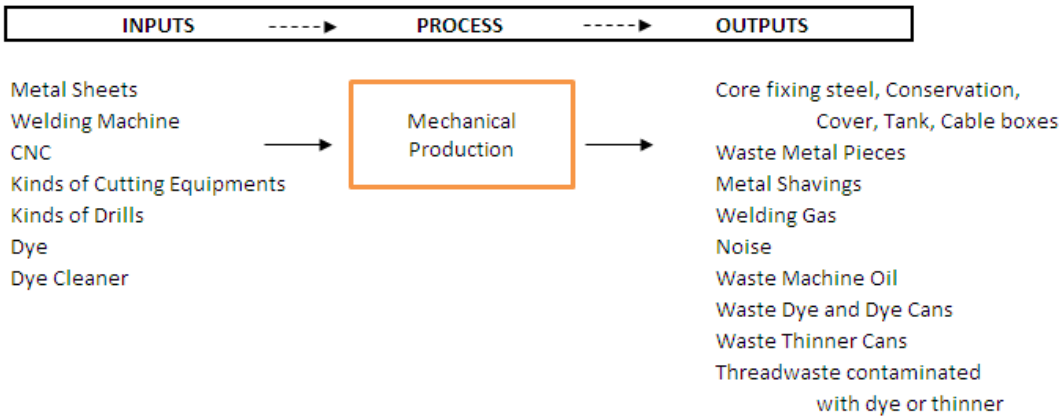


Figure 4.10 Mechanical production process inputs and outputs.

4.2.1.4 Inputs and Outputs of Active Part Assembly

The first three in the process, to created for the installation of the active part of this workshop are all semi-finished goods. This workshop-in-process assembly wires, hand equipment, welding machines and chemicals adhesives are used. Assembly at the end of the active portion of the transformer (electrical section) is completed.

Figure 4.11 Active part assembly.

After this process, waste mounting wires, chemical boxes and the welding gases are consisted. Waste assembly wires are collected in their box in the working area. When the box is filled, waste assembly wires are brought to metal waste room. Transmitted during the assembly of chemicals used in cleaning of waste bins and chemical thinner rags, other wastes are separated and collected in the waste room. In

order to prevent the welding gases, air-conditioning system is run continuously, and the workers are required to use a mask.

Active part assembly process inputs and outputs are summarized in the following figure:

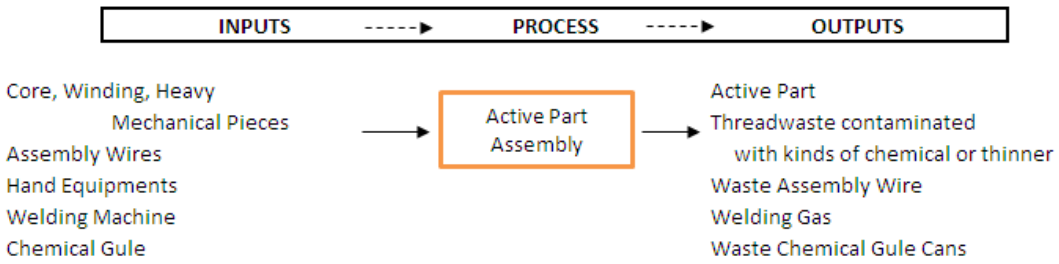


Figure 4.12 Active Part Assembly process inputs and outputs.

4.2.1.5 Inputs and Outputs of Drying Active Part

In drying process, the assembly of the active part is dried in the oven at predetermined temperature and time. Small amount of water vapor is produced from active part assemblying process. Water vapor is released to the atmosphere by chimney. Oven is operated at high temperatures, workers, working environment is completely isolated, and therefore should be regularly monitored. Thus, the workers are prevented by high temperature effect.

Figure 4.13 Drying active part.

Drying active part process inputs and outputs are summarized in the following figure:

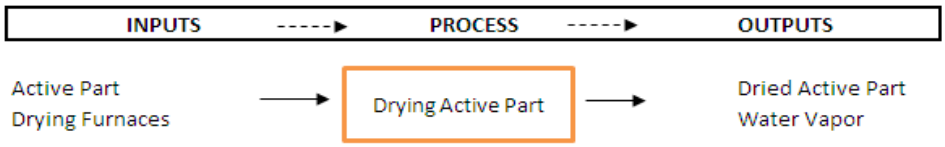


Figure 4.14 Drying Active Part process inputs and outputs.

4.2.1.6 Inputs and Outputs of Final Assembly

In this process, dried active part and the case are assembled. Assembly is carried out by hand equipment. Semi-finished form of transformer is taken into the oven again to oil fill under vacuum. Transformer oil filling is performed inside the furnace. When the transformer oil filling is completed, it should be transfered to the test area to be tested.

Figure 4.15 Final assembly.

Transformer oil is purchased in large quantities and kept in a warehouse. Transformer oil filling tank is carried out with the links. Therefore, there is not waste oil per barrel in factory. Workers have not contact with transformer oil.

Final assembly process inputs and outputs are summarized in the following figure:

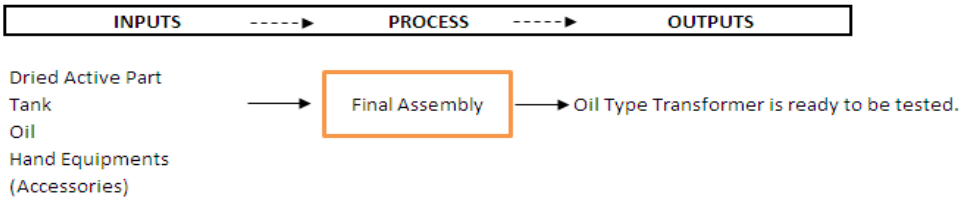


Figure 4.16 Final Assembly process inputs and outputs.

4.2.1.7 Inputs and Outputs of Test

In this process, the oil filled transformers are tested routinely. High-voltage electrical energy is used during the test. Workers are impressed for high voltage in this field, and testing area is completely separated from the production area. Accidents may occur during the testing process, thus all necessary measures have been taken to prevent the test area. Electricity is automatically cut to input field during the test. This is carried out through sensors placed on the entire area. Test results are sent directly to the software and set up the necessary accounts is done through the computer. When the transformer is shipped to the test area, a negative test result is sent back to the transformer. This process does not produce any waste.

Figure 4.17 Test.

Test process inputs and outputs are summarized in the following figure:

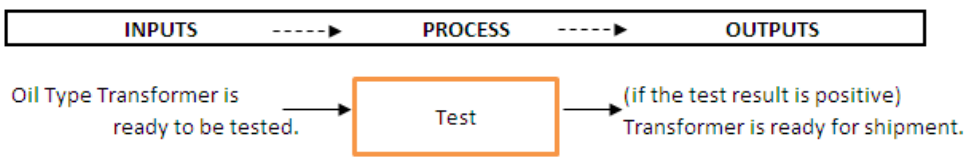


Figure 4.18 Test process inputs and outputs.

4.2.2 Cast-Resin Dry Type Transformer Production Inputs and Outputs

4.2.2.1 Inputs and Outputs of Low Voltage Coils Production

Aluminum or copper windings used in low voltage windings band. Band winding technology are minimized the amount of waste. Prepreg insulation material is used without waste. Therefore, waste is not generated during the process.

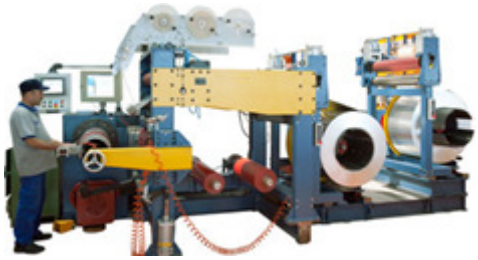


Figure 4.19 Low voltage coils.

Welding process produces certain gases that ultimately affect negatively the working area. Therefore, ventilation system is run continuously, and the workers are required to wear masks.

Low voltage coil production process inputs and outputs are summarized in the following figure:

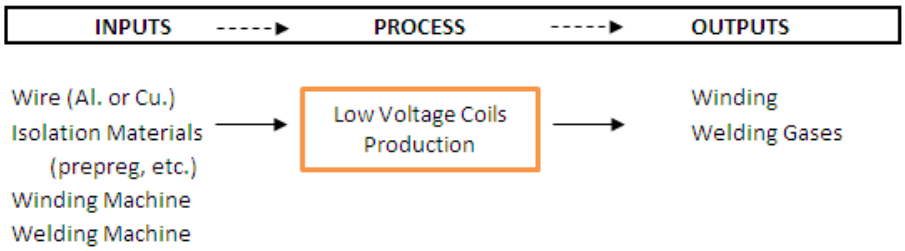


Figure 4.20 Low voltage coil production process inputs and outputs.

4.2.2.2 Inputs and Outputs of High Voltage Coils Production

Glass-fiber material is used as an insulation material. Adhesive properties of this material contains large pieces of powders. In order to avoid the dust probles of fiber glass material operators are requested to wear disposable special work clothes, masks, and gloves to wear a bathing cap.

Figure 4.21 High voltage coils.

Winding area of glass fiber material is isolated from the production area is carried out in a special section. Resin casting is done under vacuum at the end of the coil winding. Vacated the resin tank, the waste room is left with a forklift. The operator is required to use special gloves and a mask.

High voltage coil production process inputs and outputs are summarized in the following figure:

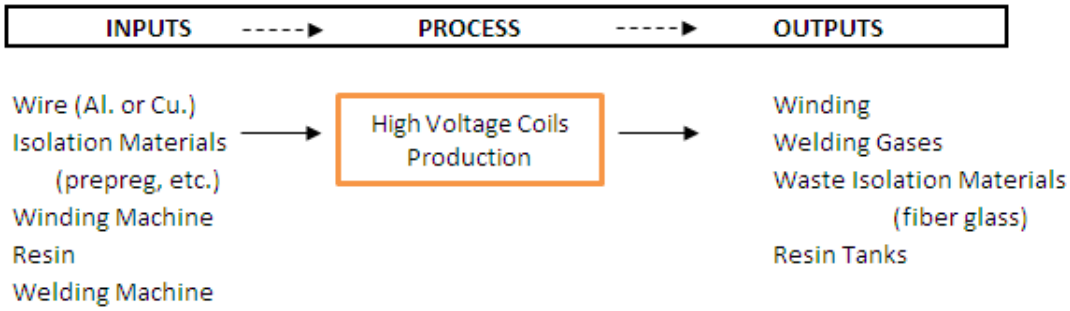


Figure 4.22 High voltage coil production process inputs and outputs.

4.2.2.3 Inputs and Outputs of Core Production

This process is the same for both the oil-type transformers and dry type transformers. The main difference is the form of cutting the metal rolls. In this process, the metal rolls are used. Metal coils are cut and arranged to fit the project at slitting machine. Thus, the transformer core is created.

Figure 4.23 Core.

Noise level is very high during the process of slicing machine, and consists of a small amount of waste metal. To reduce the impact of noise, workers are requested to use headphones. In addition, ear audiogram test have to be done in every year, to measure the exposure. The waste metal parts may cause injury due to sharp edges. For this reason, the metal parts of the waste out of the machine goes directly to the waste box. Waste box, lifted by forklift from the waste left to waste room. Thus, metallic wastes are disposed without contact with workers.

Core production process inputs and outputs are summarized in the following figure:

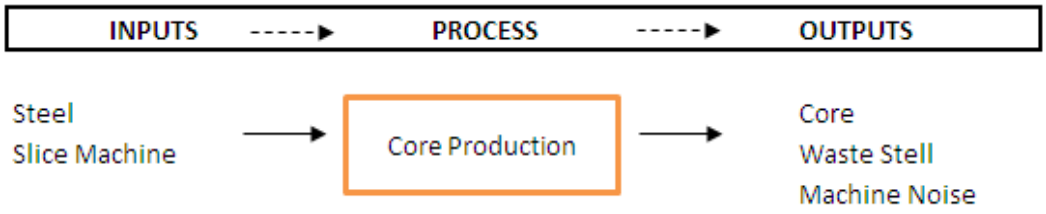


Figure 4.24 Core production process inputs and outputs.

4.2.2.4 Inputs and Outputs of Installation (Assembly) Production

The first three in the process semi-finished products are brouhgt mounting workshop. In this workshop, semi-finished products, installation wires, hand equipment, welding machine and the paint are used. The end of the transformer assembly is ready to be tested.

Figure 4.25 Installation.

After this process, waste assembly wires, paint cans and the welding gas are occurred. Wastes are collected in their boxes in the work area. When waste bin is fulled, waste bin is taken to waste room with forklift by waste responsible. Thinner contaminated cloths, paint cans and other waste contaminants produced during assembly process are separated and collected in the waste room. Ventilation system is used to eliminate the odor from dying process. Welding gases and affection in order to avoid the smell of paint is run as a continuous ventilation system and the workers are required to use a mask.

Installation (Assembly) production process inputs and outputs are summarized in the following figure:

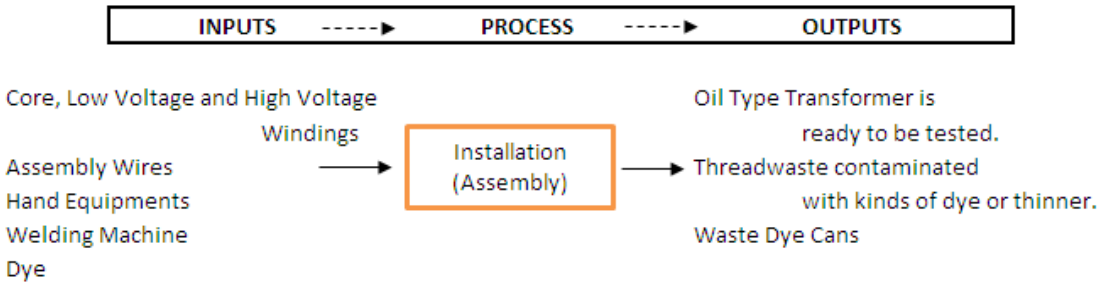


Figure 4.26 Installation production process inputs and outputs.

4.2.2.5 Inputs and Outputs of Test

In this process, the oil filled transformers are tested regularly. If the customer has requested additional tests can be done.

Figure 4.27 Test.

High-voltage electrical energy is used during the test. Workers are impressed for high voltage in this field, and testing area is completely separated from the production area. Accidents that may occur during the testing process, all necessary measures have been taken to prevent the test area. Electricity is automatically cut to input field during the test. This is carried out through sensors placed on the entire area. Test results are sent directly to the software and set up the necessary accounts is done through the computer. When the transformer is shipped to the test area, a negative test result is sent back to the transformer, the process is the problem. This process does not produce any waste.

Test process inputs and outputs are summarized in the following figure:

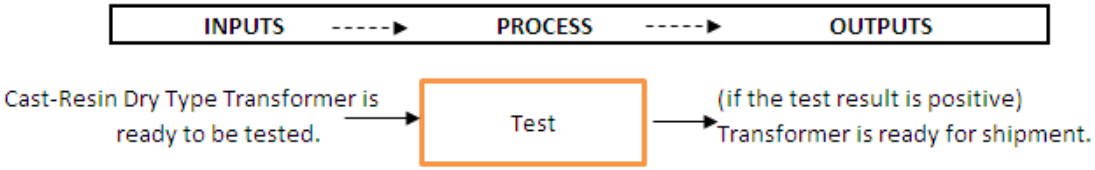


Figure 4.28 Test process inputs and outputs.

4.3 Occupational Health and Safety Management System Installation

The company has TSE EN ISO 14001 certification and has not been received the OHSAS 18001 certification yet. Graduate thesis is intended to establish to the OHSAS 18001 system and is prepeared in coordination with the existing ISO 14001

(environmental management system) and ISO 9001 (quality management system) systems.

One year period is prescribed for the establishment of the system. During this time, each week, department supervisors, safety representatives and safety professionals attended management meetings, the issues are related to each other for the overall assessment of the situation, and joint decisions were made.

The required procedures, instructions and application forms were published and combined with the production department heads who was give the necessary information, and intended to apply quickly.

Epidemiological studies, an enterprise management system for the establishment of an effective occupational safety studies should have been given the following issues:

- General Requirements
- Organizational Structure
- Establishment of Occupational Health and Safety Policy
- Planning
- Hazard Identification, Risk Assessment and Risk Control
- Compliance with Legal Requirements
- Targets
- Implementation and Operation
- Structure and Responsibility
- Training Awareness and Competence
- Documentation
- Document and Data Control
- Process Control
- Accident Investigation and Analysis
- Emergency Preparedness and In These Cases Necessary
- Control of Chemical Substances
- Medical Operations

- Promotion of Work Safety to Employee
- Management Support
- Checking and Corrective Action
- Accidents, Events, Incompatibilities, Corrective and Preventive Action
- Performance Measurement and Monitoring
- Management Review

4.3.1 General Requirements

4.3.1.1 Organizational Structure

The main issues related to occupational health and safety management system was set, and the system was commissioned within the identified persons. At this stage,

- Occupational Safety Management Representative
- Occupational Safety Specialist
- Section Instructors

Occupational Health and Safety Field Teams responsibilities were determined. According to these responsibilities, job descriptions were given in Table 4.1:

Table 4.1 Responsibilities and Task Descriptions in Occupational Safety Management System

Responsibilities	Task Definitions
Occupational Safety Management Representative	Responsible for fulfilling the requirements of Safety Management System. Job security of employees in the bridge between top management.
Occupational Safety Specialist	Safety Management System requirements of the task is defined procedures.
Section Instructors	The main issues identified in the Safety Management System for the establishment of a system that meets all the requirements by evaluating the offer.

Occupational safety management representative was provided the link with senior management and the fulfillment of certain conditions, an important position for a

certain level of authority was required. Quality and environmental systems management representative was appointed to this position in the factory.

Work safety experts who know the business, an experienced person was selected.

Section Instructors expended time to these issues, i.e. giving responsibility for large number of people who are willing to work different topics.

Occupational Health and Safety Field Teams that of 4-5 people, and businesses in designated areas were determined considering the size and organizational structure to ensure propagation. Afterward, teams of engineers, maintenance workers and people working in the selection of employees were presented.

4.3.2 Establishment of Occupational Health and Safety Policy

Entity approved by senior management, all health and safety objectives and the performance of which clearly demonstrate its commitment to developing an Occupational Health and Safety Policy was established. Occupational Health and Safety Policy was prepared considering other Management Systems (Quality / Environment).

For this reason, following topics was included in Occupational Health and Safety Policy:

- Reduce risks and prevention,
- Reduction of accidents and occupational diseases,
- Work environment safety,
- Hazard, risk analysis and prevention,
- Training of employees,
- Performance review,
- Continuous improvement,
- Compliance with laws and regulations,
- Employee health, safety and the provision of social rights.

Company was taken into account the above issues, such as Occupational Health and Safety Policy has prepared the following:

- Our aim is to improve competition ability and product range; in order to achieve sustainable production increase, ensuring continuous job security and continuous improvement.
- Supplying all our products and services in a customer oriented, process-weighted, environment conscious, safe and secure manner means to us Quality, which is the necessary prerequisite to achieve our company target.
- Implementation of Quality Management System and adoption of quality awareness will be realized with the participation, satisfaction and endeavor of all of our employees, by doing our works with quality at first time and using our sources effectively in the frame of occupational safety.

In this frame, the basic objectives and duties were;

- To comply with all regulations of Environmental-Occupational Health and Safety Management System;
- To run Environmental-Occupational Health and Safety Management System effectively;
- To achieve perfection by continuous improvements in Environmental-Occupational Health and Safety Management System;
- To minimize waste production, the usage of energy & natural resources, while improving new methods for recycle of wastes;
- To determine materials and activities that can create risk, in order to eliminate accidents by planning & implementing precautions;
- To inform all of our employees, sub-contractors and suppliers about our application on Environmental-Occupational Health and Safety Management;
- To achieve awareness among our employees for our Environmental-Occupational Health and Safety Management System also by keeping our system open for public inspection.

In order to achieve these targets and to make them permanent, we as XYZ Company declare hereby our commitment, by also ensuring our employess participation and commitment.

4.3.3 Planning

Operation, hazard identification, risk assessment and risk control methods to determine the method of selection were described by the risk assessment procedure. The size of the data collected in accordance with the prescribed forms of risk assessment and control of risk management when making the application was based on assessed requirement.

XYZ Company, hazards identification, risk assessment and control measures needed to be hazard-risk-measure table, the risk assessment procedure and forms were created.

4.3.3.1 Hazard Identification, Risk Assessment and Risk Control

Operation hazards identification, risk assessment and risk assessment procedure has been created to make the necessary control measures, routine or non-routine activities, all facilities were included in the enterprise.

ISO 31000 Risk Management System, to provide reasonable assurance as to carry out the objectives of the institutions, systematic evaluation of the potential risks and the direction of reducing the impact of potential losses, based on the data management system standard that enables decision. So, this management system was utilized during the risk assessment process.

Risk assessment and review procedure with the business plans the following activities:

- Identification of hazards,
- Current control measures and assess the risks,

- Needed to be additional risk control measures,
- Risk control measures are adequate to minimize the risk of assessing whether to accept,
- Risk-control processes are documented.

To the procedure, risks may arise from multiple sources of danger that would allow comparison of the predicted probability of impact and digitized, the rating was done. Digitization of degrees of probability and impact ratings of the sources of danger, as the relative risk reduction of hazards that is a priority in determining the practical utility was provided.

Risk is a function of probability and the impact was considered to be the "Risk= Probability x Impact " was digitized by the formula.

Risk is expressed as a numerical size of the digitizing. Thus, the risk was compared, and the priority was determined according to size.

Risk assessment forms in line with the collected data was processed in the evaluation of hazard-risk-measure table and probability/impact using tables, determined by the degree of risk.

The frequency of occurrence of each hazard risk assessment in the statement of "probability" table, caused by damage or losses caused by the "impact" was set the table. In exchange for each parameter was specified in the figure, a "risk assessment" of the statement that danger "probability" and "risk" were placed in their homes.

Table 4.2 Rating for impact

Degree	Definition
1	First Aid with minor injury does not cause loss of near-miss business day light exposure (headache, eye redness, scratches).
2	That can be outpatient treatment of minor injuries (1-2 stitched, small, superficial cuts, tissue injuries, eye burr to escape).
3	Requiring rest, creating a temporary incapacity for work injury, moderate impairment (fractures, dislocations, back pain).
4	Great injury (limb loss), may be a result of severe impairment (hearing loss), permanent disability creating events.
5	Fatal event, a fatal disease or injury (fall from height, brain trauma, cancer).

Tablo 4.3 Rating for probability

Degree	Definition
5	Very high probability (can occur on a daily basis).
4	High probability (at least once each month may be encountered).
3	Medium probability (three months or less may be encountered).
2	Low probability (less than six months or more may be encountered).
1	Very low probability (less than once a year or more may be encountered).

Probability and the definitions in the corresponding figures for impact, a "risk matrix" intersection at the point number was determined.

Table 4.4 Risk Matrix

Impact / Probability	1	2	3	4	5
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25

The severity of the risk matrix, which enters the number was obtained the Risk Rating Table Severity.

Table 4.5 The importance of the degree of risk

Important Status	Not Important Risk	Middle Risk	High Risk	Very Important Risk
Quantitative Status	1 - 3	4 - 6	8 - 12	15 - 25

In order to reduce the risks identified as significant impacts, hazard-risk-measure table, the significant risks identified by means of numerical values were ranked in descending order.

If risks are considered to be insignificant, when they came on the agenda with changes in legislation or in case of the disappearance of the factors identified as important were reviewed in order of priority and were assessed.

Hazard-risk-measure table and high efficiency to ensure continuity in the application was awared of the following:

- Eliminate the risk,
- Extension of the risk,
- Applications to an insignificant risk of bringing the situation, to investigate the efficacy and the likelihood of new hazards,
- Changes in the functioning of the existing conditions and / or repeated assessments and risk control plan to be updated when new circumstances,
- Reduce or completely eliminate the risk for the necessary technical facilities,
- Supply of trained personnel for positions that require skilled workers,
- Risky environment, appropriate training of the staff working conditions,
- Necessary measures to protect persons,
- Planned maintenance, the necessary personal protectors,
- Responsible for occupational safety and empowered to be control applications. The company's risk assessment tables are given in Table 4.6:

Table 4.6 Risk Assessment Tables

XYZ COMPANY - RISK ASSESSMENT TABLE

Unit : Core Workshop (1. Operation)

Work	Potential Dangers	Potential Reasons	Potetial Results	Precautions	P	I	Risk degree	Result
Moving the sheet to rolls from the store to slicing machine	- To drop a plate, overthrow, - Hand injury, noise	-Unbalanced load, -Packing Problem, -Inappropriate and fast use of the forklift -Improper handling by forklift, -Tipping with forklift and the opening of the roll sheet -Process guillotine shears -Sharp sheet metal surface -Mechanical work -Coil binding apparatus disconnection -Roll the use of transfer machines	-Injury -Time-loss injury -Damage to the plate -Soil damage -Hearing problems	- Providing training about job security - Licensed forklift drivers - Appropriate packaging of sheet metal, - Tilting apparatus supplies - Use of Personal Protective Equipment - Planned maintenance of crane - Periodic maintenance of machinery - The limitation of the machine area - Control apparatus and ropes - Transfer car limit physical movement	2	3	6	Middle

P: Probability, I: Impact

Table 4.6 Risk Assessment Tables, continue.

XYZ COMPANY - RISK ASSESSMENT TABLE

Unit : Core Workshop (2. Operation)

Work	Potential Dangers	Potential Reasons	Potetial Results	Precautions	P	I	Risk Degree	Result
Processing of sheet metal with cutting machine	- Material falling - Hand injury - Projection of a plate - Noise	- Rope break - Apparatus problem - Connecting unbalanced - Sharp hair surface - Compression machine, - Mechanical problems - Projection of the end Portion of sheet metal - Disposal of scrap sheet Metal machine - Mechanical work	- Damage to a plate - Material losses - Hand cut - Injury - Hearing problems	- Planned maintenance of crane - Control apparatus and ropes - The use of personal protective equipment - Establishment of Mechanical protection cage - Car physical limitation of working area - Transition limitation will be increased - Sheet feed haspeline be protected - Scrap the renewal of enclosures - Scrap the launch field, limiting - Automatic shut-off system made	3	3	9	High
Processed sheet handling and stacking	- The overthrow of a plate - The collapse of the steel sheets	- Unbalanced load - Forklift and transport with the appropriate apparatus Transportation of the cut sheet metal in syntax workshop	- Injury - Material losses - Job loss	- Maintenance of Forklift and apparatus -Put the protective to sheet metal corners -Limitation of the study area	3	3	9	High

P: Probability , I: Impact

Table 4.6 Risk Assessment Tables, continue.

XYZ COMPANY - RISK ASSESSMENT TABLE

Unit : Core Syntax Workshop (3. Operation)

Work	Potential Dangers	Potential Reasons	Potetial Results	Precautions	P	I	Risk degree	Result
Core syntax	- Material falling - Hand cut - Tripping, stumbling - The overthrow of a plate	- Crane rope break - Expulsion of the nucleus of materials needed Sharp hair surface - Sheet stacking apparatus, or the collapse of the overthrow	- Injury - Environmental impact - Eye and skin irritation - Effect on the respiratory system - Hand injury	-Planned maintenance of crane -Control apparatus and ropes -The use of absorbent material -The use of personal protective equipment -The use of special sheet stacking apparatus	3	5	15	Very important
Bandaging	- Broken of bandage - Injury	- The use of mobile cranes and lifting apparatus - Sharp sheet metal surface	-Injury	-Maintenance of mobile crane	2	3	6	Middle
Lift of core	- The overthrow of the core - Fall from height	-Crane rope break - Problems of lifting apparatus	-Death -Injury	-Electronic Weighing compression -Seat belt -Special lifting apparatus -Planned maintenance of crane -Apparatus safety pins	4	4	16	Very important

P: Probability , I: Impact

Table 4.6 Risk Assessment Tables, continue.

XYZ COMPANY - RISK ASSESSMENT TABLE

Unit : Winding Workshop (4. Operation)

Work	Potential Dangers	Potential Reasons	Potetial Results	Precautions	P	I	Risk degree	Result
Wire transport rollers	-Fall or overthrow of the rollers	-Unbalanced load the truck with -Lack of capacity of forklift	Material losses Forklift damage Injury	-Forklift licenses -Proper use of forklift	2	3	6	High
Installation of wire trolley wire rollers	-Decrease in Distance -Hand, arm jam	-Crane rope break	-Death -Injury -Material losses	-Periodic crane controls -crane training	4	4	16	Very important
The template is passed into the pipe	-Fall or overthrow of the material	-Crane rope break -Strain and stress of the material	-Death -Injury -Material losses	-Periodic crane controls - Transportation for the temporary fixing of the legs better	4	4	16	Very important
The template optimization of the vertical pipe and horizontal situation	- Fall or overthrow of the material - Crush, jam	-Crane rope break -Problems of apparatus	-Death -Injury -Damage of pipe, coil, and the pattern	-Periodic crane controls -Appliance controls	4	4	16	Very important
Connecting the pipe and the pattern winding machine	-Fall or overthrow of the material -Crush, jam -Ergonomic problems	-Crane rope break -Material routing and binding machine -Manual operation	-Death -Injury -Damage of pipe, coil, and the pattern	-Periodic crane control -Use of personal protective equipment	4	4	16	Very important

P: Probability, I: Impact

Table 4.6 Risk Assessment Tables, continue.

XYZ COMPANY - RISK ASSESSMENT TABLE

Unit : Mounting Area (5. Operation)

Work	Potential Dangers	Potential Reasons	Potetial Results	Precautions	P	I	Risk degree	Result
Combining the core and coil	-Disintegration of the nucleus, overthrow, fall combustion	-Lack of winding bandages -Crane rope break -Coil lifting apparatus and disconnection	-Death -Injury -Material losses -Hand, body burns	-Periodic crane controls -Rope and periodic control apparatus -The use of personal protective equipment	4	4	16	Very important
Syntax of the upper yoke	-The overthrow of the hair -Sharp hair surface fall from height	-Plate is arranged in an unbalanced -Hair is arranged in sloping -Working at Height	-Damaged -Injury -Hand cut	-Working platform -Sheet reference knives -Belts -Feed pads	4	5	20	Very important
Pressing process	-Thrown presses the shock, hitting	- Press shift, rocketing	-Injury	- The use of personal protective equipment	4	5	20	Very important
Connection of transformer	-Source gases -Source temperature -Sharp steel and copper surfaces	-Oxyacetylene welding	-Hand, arm withdrawal -Hand, arm burns -Eye irritation	- The use of personal protective equipment	4	5	20	Very important
Entering into the boiler for repairs	-Fall, slip -Oil equipment to contact -Lack of oxygen -Flammable gases	-Oil boiler landing -Closed and airless environment boiler	-Suffocation, poisoning -Injury -Skin irritation	-Oxygen and flammable gas measuring devices -The use of personal protective equipment -Work instructions and norms	4	3	12	High

P: Probability , I: Impact

Table 4.6 Risk Assessment Tables, continue.

XYZ COMPANY - RISK ASSESSMENT TABLE

Unit : Last Mounting Area (6. Operation)

Work	Potential Dangers	Potential Reasons	Potetial Results	Precautions	P	I	Risk degree	Result
Active parts in the implementation and installation of boiler	-Reduction of the active moiety -Fall from height -Contact with oil	-Crane rope break -Removing unbalanced -Working at Height -Oily surfaces	-Death -Injury -Damage to the active moiety -Accident damage - Eye and skin irritation toxic effects	-Periodic crane controls -Ensuring Platform -The use of personal protective equipment -Seat belt -Ensure the ventilation system	4	3	12	High
Accessory assembly and final assembly work	-Fall from height -Material falling	-Working at Height -Crane rope break	-Death -Injury -Material damage	-Ensuring Platform -Periodic crane controls -Seat belt -The use of personal protective equipment	4	3	12	High
Touch-up paint process	-Solvent vapor -Fire -Eye contact and body -Spilling, scattering	-Use of solvent -Use of paint	-Toxic effects -Skin, eye irritation -Respiratory problems -Environmental impact	-The use of personal protective equipment -Fire detection and extinguishing system -Prohibition of Smoking and flame source	4	3	12	High

P: Probability , I: Impact

Table 4.6 Risk Assessment Tables, continue.

XYZ COMPANY - RISK ASSESSMENT TABLE

Unit : Test Laboratuary

Work	Potential Dangers	Potential Reasons	Potetial Results	Precautions	P	I	Risk degree	Result
Transformer Test Procedure	-Shock	-Transformer oil catches -Fire -High voltage -Spark, arc heat source, such as the formation	-Death -Material losses -Fire	-Fully enclosed and isolated test rooms -Fire detection and extinguishing system	3	3	9	High

P: Probability , I: Impact

Table 4.6 Risk Assessment Tables, continue.

XYZ COMPANY - RISK ASSESSMENT TABLE

Unit : Shipping Area

Work	Potential Dangers	Potential Reasons	Potetial Results	Precautions	P	I	Risk degree	Result
Shipping	-Fall or overthrow of the transformer -Compressed air	-Crane rope break -Unbalanced load lifting -An air bag or hose problem -Forklift shock	-Death -Injury -Material losses	-Periodic crane controls -Crane training in the use -Control and maintenance of an air bag and compressed air hoses	4	4	16	Very important

P: Probability , I: Impact

4.3.3.2 Compliance with Legal Requirements

All businesses are obliged to fulfill the legal requirements in terms of job security. "Occupational Health and Safety Legislation" in terms of work security firms operating in Turkey indicates that their profession.

"Occupational Health and Safety Legislation" is examined, legislation, and working conditions in the field of activity as required by the laws and regulations, which come into view. A business, all of these laws and regulations, which do not care. For this reason, the legislation is examined in detail is determined and business-related ones.

In this business, legal and other requirements are specified in the legal regulations applicable to the list, table, and document control procedure, legal liability are established.

Business constantly updating this information conveys information to employees and related parties. Operation of Occupational Health and Safety Manual as part of the statutory and other requirements specified in laws, rules and regulations are kept.

4.3.3.3 Targets

At the company, its relevant functions and levels within each documented occupational health and safety objectives, the legal "CE" other terms and conditions, occupational health and safety hazards, technological options, financial run, operating conditions and taking into account the views of interested parties formed.

Includes commitment to continuous improvement targets and supports the Occupational Health and Safety policy. Occupational Health and Safety objectives were determined the regular meetings with the participation of the board of directors.

4.3.4 Implementation and Operation

4.3.4.1 Structure and Responsibility

In order to facilitate the establishment of Occupational Health and Safety management, occupational health and safety risks that affect the activities, processes, manages, and verifies that fulfill the roles of staff with responsibilities and powers were defined and documented, the organizational chart of occupational health and safety management system, occupational health and safety management system handbook, job descriptions and work procedures were created.

4.3.4.2 Training, Awareness and Competence

In company, education, awareness and competence training procedures for work performed was specified. The training will be held with the annual training plan is announced. Training will be carried out by expert trainers.

4.3.4.3 Documentation

In company, occupational health and safety management system in order to ensure effective and efficient implementation of all necessary health and safety procedures, instructions and forms were prepared and kept current. Documentation for the effectiveness and efficiency of the documents were kept to a minimum.

4.3.4.4 Document and Data Control

All documents and data, required by the standard operation to control the preparation of related documents, before the publication of review, approval, distribution and updating, where relevant, were present, and repealed, provided with a systematic procedure for control created documents.

4.3.4.5 Process Control

Operation is carried out under the control of all activities that may cause danger and risk. Occupational health and safety measures, process control procedures, plans and instructions and are fully documented. About the legal limits and procedures specified.

Business activities within the areas of application, production areas, administrative office activities, storage activities, visits and temporary work, contract staff activities, dining hall and dormitory activities.

Process control, process control criteria are defined periodic monitoring and follow-up applications are being developed with the ongoing and continuous improvement activities. Examples of some of the controls applied to business process is as follows:

- Processing instructions (Instructions for safe operation with electric arc welding, manual handling, processing instructions, instructions for installing scaffolding at height, safe working instructions, etc.)
- Signs and warning signs
- Equipment is safe to make
- The use of personal protective (fins, gloves, goggles, masks, ear)
- Periodic maintenance activities
- Education and awareness
- Emergency response equipment
- Health and safety inspections

4.3.4.6 Accident Investigation and Analysis

Proactive approach to Safety Management System are based on. However, work-related accidents that occurred in the recording, keeping and historical reports are made from the data analysis is necessary for the functioning of the system.

4.3.4.6.1 Annual Occupational Health and Safety Report: Annual occupational health and safety report (01.01.2011 - 31.12.2011) is given as follows:

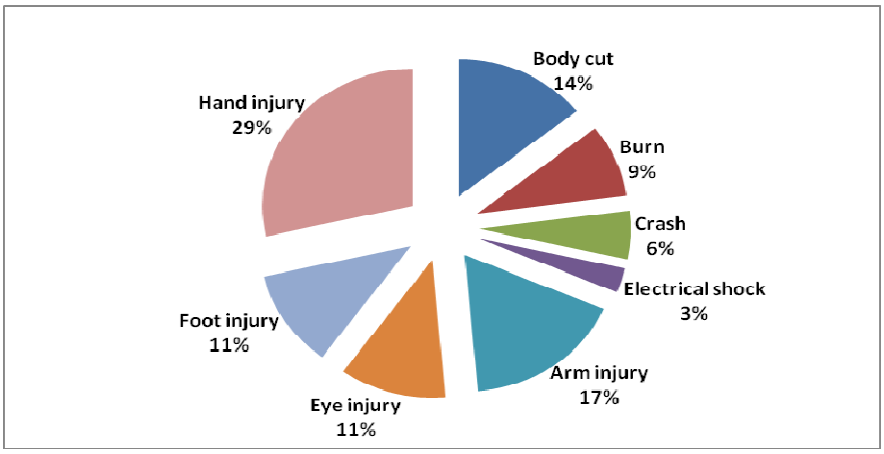


Figure 4.29 Occupational Accident According to Injury Types in Our Company.

Most accidents were hand injuries, arm injuries and body cuts. Special scissors to cut resin hoses are purchased in order to reduce the food-eye injuries and burns. Nevertheless, our employees sometimes forget using curved scissors and cut with knife and therefore cause some accidents. Also, some injuries happened as a result of the crash and friction because of the note using hand gloves in different works.

Eye injuries were caused by unwearing goggles or unproper wearing goggles. In work health and safety training, workers were given necessary training about wearing personal goggles accurately and necessary warnings were made in factory controls. Foot injuries and slide downs were caused by stressful working and workplace disorganization.

Hand cuts during the install of the particles were very probable. Therefore, wearing protective gloves against hand and finger cuts were extremely important. Responsible people should always be warned about this danger.

4.3.4.6.2 Analyzing and Result. The following table shows the number of occupational accidents and wasted days according to year 2010 and 2011.

Table 4.7 Occupational accidents and wasted days according to year 2010 and 2011.

	YEAR 2010	YEAR 2011
Number of the Occupational Accidents	42	35
Wasted Days	407	356

In occupational accidents, 16,6 % decrease was obtained, and 12.5 % reduction was ochieved in wasted days. After we started OHSAS 18001 studies, we see that significant reduction at work accidents at 2011 annual reports.

These studies both bring prestige to the organizations and enable us to see the improvements mathematically. In addition, workers' motivation increases and accordingly work efficiency and quality increase. Workplaces become more peaceful and efficient, and working hours are used more efficiently.

As a result, in order to prevent occupational accidents, improve mechanical and technological conditions, and eliminate any serious accident factors, we meet on the basis of departments, make situation assessment, and perform the necessary improvements.

4.3.4.6.3 Other Potential Hazards in The Company. Other potential hazards are described as follows:

Visualy Impaired

Visually impaired production section of the assembly during operation and during the welding process when you spot the eye of the damage of UV rays from the office section on the computer screen while working as a hazard encountered. Appropriate use of masks and gloves to the danger the production area, conveniently close to the office section and the appropriate display modes have been working as a precaution.

The hazard control methods with the existing measures more, to secure the welding process of instruction and periodic training ranked as.

Unsafe Connection of The Track To Crane Strap

Operation in the realization of the production area of serious injury and death which is the most serious risk of impact is one of the dangers. Cranes, crane operators are only available during the activity by moving jobs (eyebolts, sling, hook), the most effective use of the existing measure. Hazard crane usage guidelines, and periodic training is aimed to be under control.

Dangers of Injury That May Occur During The Use of Stone Share

Grinding stone motor activities that may occur during use, the greatest danger to the hand, arm injuries with a risk of failure and adverse events. Although the use of personal protective equipment in danger, action was taken as the theoretical and practical training.

Machining Machine Tools

There are several dangers in the activities in the production machining looms. Approaching the moving parts, with the introduction of hand and finger hazards, working with high-speed machines, loose clothing that may occur as a result of hazards, in accordance with the workpiece chuck on the connection of the part as a result of the danger of jumping, cutting machine apparatus (circular saw, milling cutter, pen turning, etc.) Touching the hazards that may occur as a result of the teams and the hazards that may occur with machines that leap of sawdust.

All of these hazards may occur in the body burns, damage to the eyes, hand and finger cuts grab anything from loss of limb or even result in death has a large risk group. Against hazards, stalls not use anyone other than operators, always full and proper use of personal protective equipment, use of shields, all employees of the unit is training as a precaution. Control methods are applied to the dangers of the looms are working safe instructions, training and periodic replication of the warning signs.

Exposure to Temperature

Danger of exposure to temperatures of operation during the cutting process, the process of cracking after welding burrs, burrs splashed with the theme, and a variety of manufacturing processes applied to materials as a result of the antenna consists of bare hand. Measures taken in the face of danger, masks, gloves, work shoes and work clothes such as proper use of personal protective equipment in full. Hazard related to the use of personal protective equipment required by staff by periodic training are informed about the subject.

Fall from Height

The most important hazard is the fall from height from like crane, roof, etc. studies conducted in unsafe areas. Danger of accident if it results in injury, disability and death can occur as adverse events. Measures taken in danger of falling from height in the enterprise, personal protective equipment, parachute-type safety the courts, the appropriate scaffold, ladder and use of equipment, the audit applies. Detection of unsafe areas, periodic training and working at heights and tries to prevent the danger and risk are controlled by the instructions.

Electrical Shock

The point is one of the many dangers that we face in the business. In this context, the isolation of electrical hand tools and plug-use of the damaged cable, electrical panels kept closed, the key is not on the electrical panels, rubber mat implementation in front of them, attention is paid to the use of personal protective equipment. Fire extinguishers and warning signs, periodic training and maintenance plans are the method of control.

Ergonomics

Manual handling of parts of the figure as a result of improper rotation of the waist, cuts, defective and unsafe working conditions, but the severity of the enterprise is unlikely to constitute a high risk. Periodic training of staff are informed about

ergonomics. The action taken against the business risk, the use of personal protective equipment and safe working rules apply.

Noise

The machines work in the field of production, manufacturing, installation and maintenance activities that may occur during the ambient sound level of 85 dB is exceeded there is danger of hearing impairment. As a precaution necessary in areas of production area, and a headset to use personal protective equipment is compulsory. All personnel within the legal requirements, and periodic training sessions are held audiometric tests are considered dangerous.

Slippery Floor

Machinery used in oil field machinery and equipment leaks, and leaks due to various reasons, work environments, creating a slippery slope with the danger of slipping and injury, there is a risk of injury. At the same time, similar to the hazard, office areas, powder and liquid materials spilled on the ground but it comes with. As a precaution in case of leakage, the floor is cleaned. Employees with personal protective equipment, rubber-soled work shoes slip measure. In addition, cleaning süresincede "Wet Floor Alert" is underway.

Exposure to Chemicals

Priming activities of the enterprise risk of exposure to chemical substances and chemical materials warehouse emerges. Informed the staff that perform activities on the subject, masks, helmets, gloves, work clothes appropriate use, storage instructions complied with and to drink buttermilk after the priming process. Control methods are applied to reduce and eliminate the danger is as follows: existing measures will continue and the work to be instructed, chemical materials, storage instructions, periodic training, the emergency plan.

4.3.4.7 Emergency Preparedness and In These Cases Necessary

In company, industrial accidents, explosions and natural disasters (fire, earthquake, flood) emergency work to do in an emergency procedure as specified. Emergency intervention plan describes the most likely to do in an emergency. Preparation of contingency plan, risk assessment studies are carried out with.

The scope of the emergency plan is generated as follows:

- Identification of potential emergency situations.
- In case of emergency personnel to take part in the definition.
- The details of the activities carried out by staff in case of emergency.
- In case of emergency powers and duties of the personnel function. (fire team, the first aid team, rescue team, protection team)
- Evacuation procedures and definitions related to the placement of hazardous materials emergency activities to be performed.
- Communication with external emergency services and government agencies.
- Loss and the protection of vital equipment.
- The availability of the necessary information in case of emergency.

Emergency situations that could interfere with the establishment of a minimum of ten people, first aid, fire, rescue and protection teams are established.

Emergency plan every six months with teams created a fire-fighting, evacuation, rescue and first aid scenario exercises are tested once a year, and records are kept under review.

Legitimate business needs that must be defined and a sufficient number of emergency equipment available at intervals are determined by the continuity of the workings are tested and records are kept.

4.3.4.8 Control of Chemical Substances

Control of chemical substances in order to ensure that existing problems have been identified as the first and reached the following problems:

- Unlabeled chemical substances or non-Turkish entry into the factory and the use of labels.
- Material Safety and Data Sheets of chemicals is incomplete and inadequate.
- Material Safety and Data Sheets are not points of use for the workers lack of knowledge about the effects of chemical substances.

The first step in solving the problems of chemical substances purchased by contacting the manufacturer with companies have been asking substances Material Safety Data Sheets, chemicals the right-Turkish-complete with labels. After this work for the factory, warehouse, based on labeling of those problems have been tagging before going to the point of use.

In order to educate employees about the chemicals, the Material Safety Data Sheets were hung panels work areas. In addition, chemicals used and stored points "Material Safety Data Sheet" cards were hung by the handle.

4.3.4.9 Medical Operations

All businesses, the business structure of the "Occupational Health and Safety Legislation" stated in the health service, in other words, can perform the activities of health personnel, and these elements must have a physical space. Health and first aid service, including preventative medicine, there are 2 different task. The aim of the work in preventative medicine, periodic examinations and participation in the improvement efforts is to prevent occupational accidents and occupational diseases. To achieve this, the following points are observed:

- Health service is a very good record management system. Each person's private medical file is existed and that no one outside the reach of health personnel files are stored in a safe place.

- In addition, fire and other emergency situations in the files are taken to avoid damage.
- Health staff is participated actively in risk assessment studies. Apart from this field of study visits are made periodically.
- Periodic examinations about accordance with this plan, a plan is prepared and carried out inspections.
- A procedure that describes the functioning of the health service is prepared and announced to the entire factory.
- Health service records are analyzed and the results of this analysis announced to the plant.
- Starting a new business or engaged in business change elements are pre-examination.

4.3.4.10 Promotion of Work Safety to Employee

The installed system, started a successful practice will be adopted by employees. For this reason, employees must be made aware of job security. Awareness-way passes through the training. The goal here is to provide awareness outlined in a matter of short time working.

In terms of continuity of the system by employees in the overall evaluation will be useful to know. For this purpose, different parts of the plant safety presentation boards are prepared and provided the following information:

- Work Accident Statistics
- Important Procedures
- Posters
- Newspaper News
- Articles Written by Management
- Audit Results
- General Safety Rules

Another important issue is related to job security and good practice award for improvements made. Thus, the motivation level of employees will be subject.

4.3.4.11 Management Support

Occupational Health and Safety Management System is one of the most important issues in the upper and middle tier managers and give support to the importance of the subject is required.

First, administrators should set the example for all staff. For example, circulating in the areas of work in the past managers and team leaders did not see the need to use personal protective equipment. However, when viewed from employees, managers and team leaders are valid for the dangers they faced. In such a case, it is very difficult to convince employees to use personal protective equipment. If the managers of these materials they are using a sample of employees to all employees in the response to this issue will be minimized.

There are many parameters, the performance evaluation of employees. Productivity rates, scrap rates, these performances are followed by indicators such as quality scores and evaluation is carried out according to the results. Many of these indicators are based on the old understanding of the product and production-oriented. However, to make a full evaluation of the performance evaluation system is necessary to include the human-oriented goals. Absenteeism rates, rates of occupational accidents, employee satisfaction such as the most widely used indicators.

Management support is another way of going to the specific time periods and areas of study was to perform the audit and safety speeches.

As a result, the support to the management of Occupational Health and Safety Management System can be summarized as follows:

- Administrators are setted the example for all staff.

- Upper and mid-level managers are added to the indicators of job security objectives.

- Managers are done their own work areas periodically audit.

4.3.5 Checking and Corrective Action

4.3.5.1 Accidents, Events, Incompatibilities, Corrective and Preventive Action

Operation of accidents, investigation of the causes of events, the reasons for removal, and possible prevention of duplication of the possible causes of potential nonconformities be eliminated, preventing the formation of non-compliance activities, corrective and preventive action procedure is applied as indicated.

Operation near miss accidents, incidents and non-conformities related to any corrective and preventive actions are recorded. Directly affect the health and safety performance data to be analyzed and forwarded to senior management and the management review meeting evaluated.

4.3.5.2 Performance Measurement and Monitoring

The accuracy of the products manufactured and services provided to business performance measurement and monitoring activities, monitoring and measurement procedure is applied as indicated.

Performance criteria, application frequencies and control techniques are specified in procedure. Precautions are taken in cases of deviation from the goals and made the necessary improvements. Suitability of products and services produced by the department responsible for the establishment of a continuously monitored and measured way. Products related to any non-compliance is encountered, the elimination of non-compliance is provided by establishing contact with the entity involved.

Performance measurement and improvement with the relevant forms (form of audit reports, audit results report, the form of non-compliance) are filed. Management review meeting evaluated the performance evaluation results.

4.3.6 Management Review

Occupational health and safety management system in operation in order to see the effectiveness of management review meetings are held at least once a year. The results achieved by the internal controls across the enterprise prior to the meeting, review activities, continuous improvement activities and the requirements of OHSAS 18001 occupational health and safety management system had not been fulfilled and monitored.

CHAPTER FIVE
CONCLUSION

There are no major changes at the stage of establishment of the OHSAS 18001 Occupational Health and Safety Management System because presence of the ISO 9001 Quality Management System and ISO 14001 Environmental Management System, and system culture has been established in the factory. When standards are examined, the presence of some common items is clearly seen. These common items are investigated and in accordance with the OHSAS 18001 Standard.

At the premises we made application, firstly, transfer of task and authority has been carried out in order to determine task, authority and responsibilities, we have announced and given information to all employees. Safe walking and emergency exit routes have been determined with applications made within scope of the OHSAS 18001 activities; safety and health marks have been completed, procedures and forms have been created, records have been kept, follow-up process and monitoring have started, power task and responsibilities have been distributed, training plan has been started, training has been given in line with plan, contract has been made with occupational physician, the occupational physician has started to work on certain days of week, action plan has been created, an emergency situation and prevention plans have been created, and emergency situation teams have been created. Training of the teams have been completed and noise, temperature, dust and particle measurements have been made at internal and external fields, hazard risk assessment table has been created and action plans have been made, possible hazards have been followed up, and continuous improvement activities have been realized.

Continuance increasing improvement has been seen at business in terms of data of near misses and accidents at work. As a result of the OHSAS 18001 activities, there is continuous reduction in near misses and accidents at work and in parallel, reduction of monetary losses have been observed. While number of accident in 2010 is 42, this amount reduces to 35 in 2011. In parallel this, the number of loss day is 407 in 2010, and this number has reduced to 356 in 2011. This decline provides

reduction of material and spiritual losses for both business and employee. For periodic controls, a team has been established and an investigation, risk assessment and improvement mechanism has been created. The increase of use of personal protective equipment of employees creates clear indicator of improvement of occupational health and safety culture. Integrity has been created by taking desire and opinion of employees at meetings held in certain times, and the choice of personal protective equipment is employee's choice. A permanent system has been established in workplace for ongoing activities, necessary arrangements have been realized with supervision, assessment and continuous improvement activities.

A permanent system has been established at the end of activities taking 12 months with implementations at the factory. The presence of this system facilitates adoption stage to the changing legal arrangements, the things required to do by business is all the time to control the system according to the legal requirements, and to make necessary arrangements in system when there is suspended aspects, and provide continuity all the time.

After the date starting the implementation, it has been found that there is obvious reduction at work accidents at workplace when compared to periods prior to implementation, and continues reduction to the certain point. The loss of prestige, loss of motivation, fire, explosion, mechanical failures and risks of inactivity increased by work accidents are reduced parallelly.

REFERENCES

Andaç, M. (2002). *Risk Analiz ve Yönetimi*, ISG Yayınları, 39.

Anık, F. (2007). *Risk Değerlendirmeye Neden İhtiyaç Duyulmuştur?* http://www.cevremuhendisleri.com/makaleler.asp?procid=34&sayfa=1

Binyıldırım, T. (1999). *İş Kazalarının Oluşumu ve İş Kazalarının Sınıflandırılması*, İş Sağlığı ve Güvenliği Konferansı Bildiriler Kitabı, İstanbul. 124.

Byars, L. L. and Rue, L. W. (1997). *Human Resource Management*, 5th Edition, 498.

Centel, T. (2000). *İş Sağlığı ve Güvenliği Mevzuatı*, Mess Yayınları, İstanbul. 3.

Çalışma ve Sosyal Güvenlik Bakanlığı (2006). 5 Adımda Risk Değerlendirmesi, Ankara

Çalışma ve Sosyal Güvenlik Bakanlığı (2010). *İş Kazaları ve Meslek Hastalıkları İstatistikleri,* http://isggm.calisma.gov.tr/haberler/sskistatistik2005.asp.

Demircioğlu, A. Murat and Centel, T. (2002). *İş Hukuku*, İstanbul. Beta Basım Yayım, 139.

Eltaş (2011). *Transformatör Üretim Prosesleri,* http://www.eltas.com.tr/eng/bilesenler/pages/index.php?pid=19.

Erbay, N.Ö. (1994). *İnşaat Sektöründe İş Güvenliği*, Türkiye Mühendislik Haberleri 374, 56.

Ezgin, R. (1995). *İş Sağlığı Ve Güvenliği Kavramının İrdelenmesi İle Otomotiv Sanayinde İşçi Sağlığı Ve İş Güvenliği Uygulamaları Üzerine Bir Araştırma,* Yayınlanmamış Yüksek Lisans Tezi, Marmara Üniversitesi SBE, İstanbul, 41.

Fıratlı, İ. (2004). *İş Sağlığı Ve Güvenliği Esasları Eğitim Notları,* İstanbul, Eğitim Danışmanlık, 14-16.

Güvercinci, M. (2005). İş Sağlığı Ve Güvenliği Konusunda Yeni Dönem, *İşveren Dergisi*, Sayı 9, 28-33.

Karataş, İ. (2006). İş *Kazası ve Meslek Hastalıkları İhtilafları ve Çözüm Yolları,* Yaklaşım Yayıncılık San. Ve Tic. A.Ş., Ankara. 38.

Kaynak, T., Örücü, E. And Köseoğlu, M.A., (2000). *İnsan Kaynakları Yönetimi*, 2. Baskı, Dönence Basım ve Yayın Hizmetleri, İstanbul. 410-418.

Koray, M. (1996). *Endustri İlişkileri*, Doğruluk Matbaası, İzmir. 58.

Lim, T.E. Tracy, L.Y. and Öncü, (2004). S.. *İş Sağlığı Ve Güvenliği Yönetim Sistemleri OHSAS 18001:1999 Değerlendirme Ve Kurma El Kitabı,* 3.Baskı, İstanbul. 110.

Mess, (2006). *Zorunlu İş Sağlığı ve Guvenliği Eğitimleri: Genel İş Sağlığı ve Güvenliği*, MESSYayınları, Hanlar Matbaacılık, İstanbul. 14.

Müngen, M. U. (1990). Türkiye'de İnşaat İş Kazalarının Analizleri Ve İş Güvenliği Sorunu, *Yapı Endüstrisi Merkezi İş Güvenliği Ve İşçi Sağlığı Sempozyumu*, İstanbul. 6.

Occupational Health and Safety Management Systems - Guidelines for the implementation of OHSAS 18001, BSI, 2.

Özkılıç, Ö. (2005). *İş Sağlığı ve Güvenliği Yönetim Sistemi ve Risk Değerlendirme Metodolojileri*, TİSK Yayınları, İstanbul. *20,* 107-115.

Seyyar, A. (2002). *Sosyal Siyaset Terimleri*, Beta Yayınları, İstanbul. 265.

Sabuncuoğlu, Z. (2000). *İnsan Kaynakları Yönetimi,* Ezgi Kitabevi Yayınları, Bursa. 265.

Topçuoğlu, H. ve Özdemir, Ş.(2003). *OHSAS 18001* İş Sağlığı ve Güvenli Yönetim Sistemi, *Mühendis ve Makine Dergisi*, Sayı 520.

TSE (2007). *OHSAS 18001 İş Sağlığı Ve Güvenliği Yönetim Sistemi* http://www.tse.org.tr/Turkish/KaliteYonetimi/18001bilgi.asp

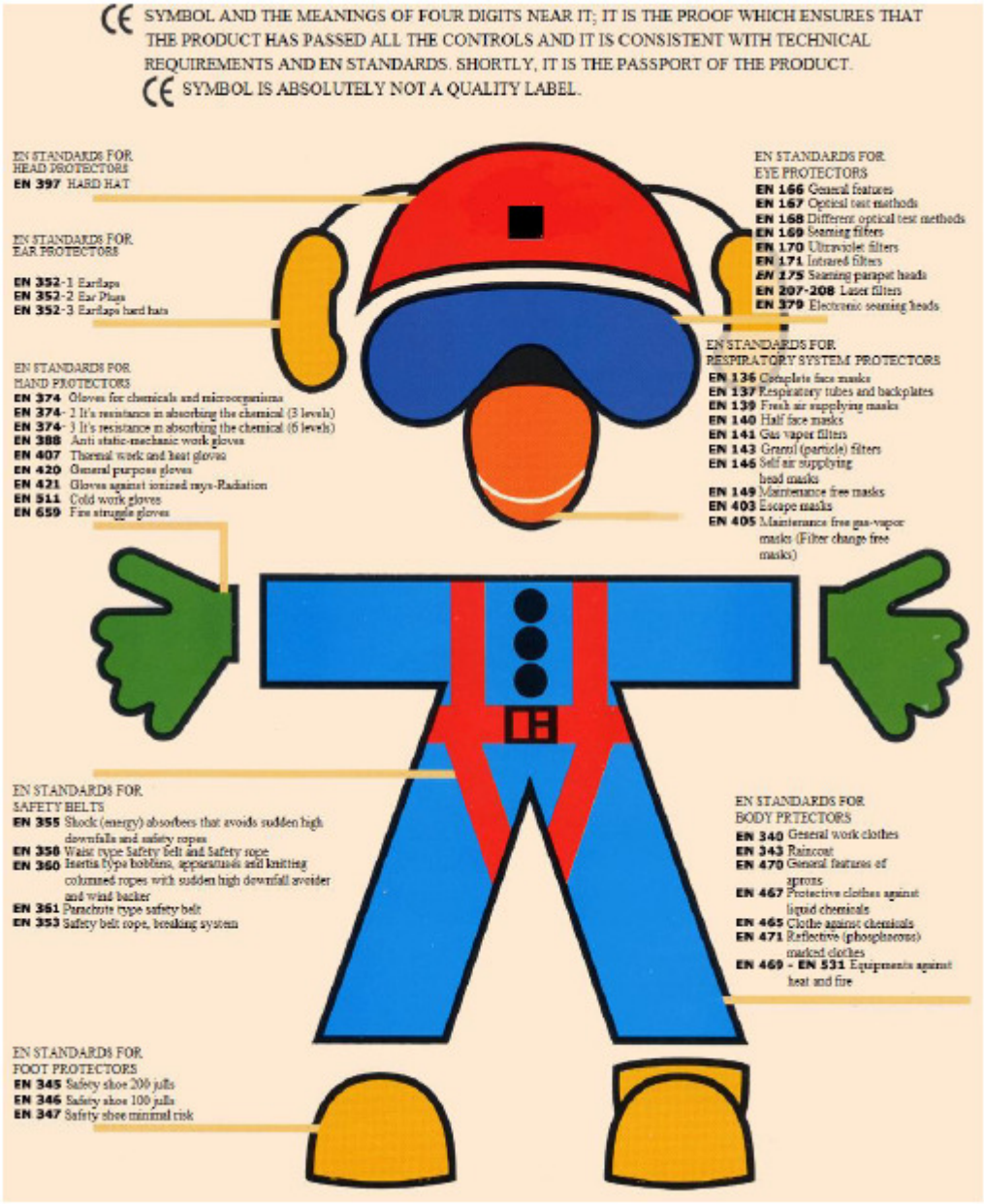
TS (2004). *OHSAS 18001 İş Sağlığı Ve Güvenliği Yönetim Sistemleri – Şartlar*, Türk Standartlar Enstitüsü, Ankara, Türkiye.

TS-18002 (2004). *İş Sağlığı Ve Güvenliği Yönetim Sistemleri – TS 18001 Uygulama Kılavuzu*, Türk Standartlar Enstitüsü, Ankara, Türkiye.

World Health Organization (1999). *Regional Guidelines for the Development of Healthy Workplaces*.

APPENDIXES

Appendix 1: Personel Protection Equipments



Appendix 2: Danger symbols and signs.

Symbol	Abbreviation	Hazard	Description of hazard
(Physicochemical)			
	E	explosive	Chemicals that explode.
	O	oxidising	Chemicals that react exothermically with other chemicals.
	F+	extremely flammable	Chemicals that have an extremely low flash point and boiling point, and gases that catch fire in contact with air.
	F	highly flammable	Chemicals that may catch fire in contact with air, only need brief contact with an ignition source, have a very low flash point or evolve highly flammable gases in contact with water.
(Health)			
	T+	very toxic	Chemicals that at very low levels cause damage to health.
	T	toxic	Chemicals that at low levels cause damage to health.
	Carc Cat 1	category 1 carcinogens	Chemicals that may cause cancer or increase its incidence.
	Carc Cat 2	category 2 carcinogens	
	Carc Cat 3	category 3 carcinogens	
	Muta Cat 1	category 1 mutagens	Chemicals that induce heritable genetic defects or increase their incidence.
	Muta Cat 2	category 2 mutagens	
	Muta Cat 3	category 3 mutagens	
	Repr Cat 1	category 1 reproductive toxins	Chemicals that produce or increase the incidence of non-heritable effects in progeny and/or an impairment in reproductive functions or capacity.
	Repr Cat 2	category 2 reproductive toxins	
	Repr Cat 3	category 3 reproductive toxins	
	Xn	harmful	Chemicals that may cause damage to health.
	C	corrosive	Chemicals that may destroy living tissue on contact.
	Xi	irritant	Chemicals that may cause inflammation to the skin or other mucous membranes.
(Environmental)			
	N	dangerous for the environment	Chemicals that may present an immediate or delayed danger to one or more components of the environment

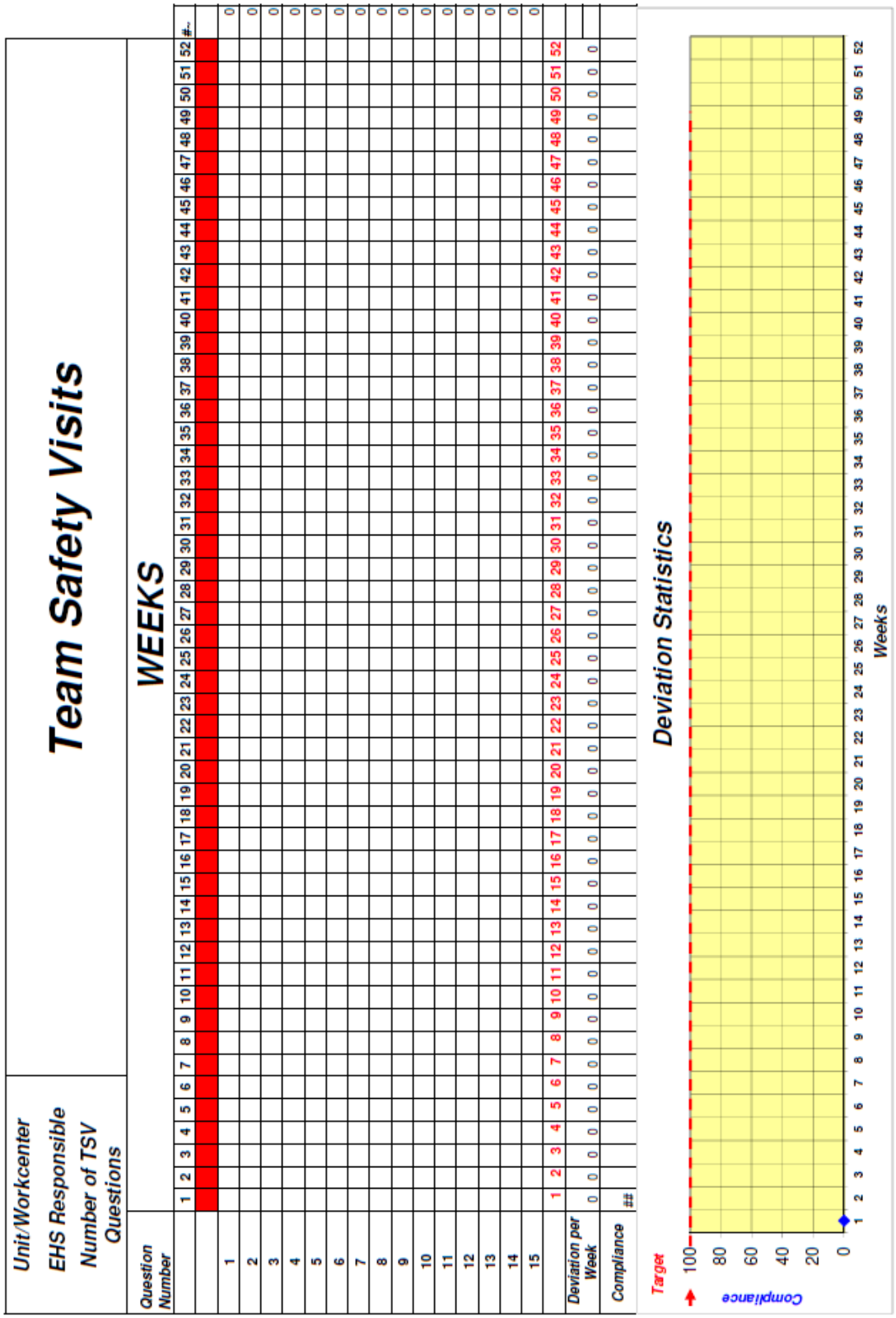
Appendix 3: Risk Analysis Table.

Description	Explanation	Measures to be taken and equipment to be used
Falling	To fall down during erection, maintenance or repair	Parachute type safety belt will be used while working at a place which a person could be injured by falling from it, regardless of whether it's above, at or below ground level and it will be connected to a strong location. Scaffold rolloers will be fixed, metal ladder will be used instead of wooden ladder and it will be fixed by fixing hooks on the top.
Tripping / Slipping	Presence of parts that can cause tripping ;oil, chemicals or water can cause slipping in work places	Parts on the ground that can hit the foot will be removed, if removal is not possible warning labels will be used, oil absorbant material , nylon pan and piece of cloth will be used for waste oil. Piece of cloth and broom will be used to remove accumulated water.
Flying particles	Presence of flying particles in work places;	Safety glass, helmet and suitable mask will be used.
Fire / Explosive Atmosphere	To perform work with heat (welding, grinding)	Welding gloves and eyeglasses will be used, flammable objects will be cleaned from the working area. Fire blanket and sufficient fire extinguisher will be ready ,screening will be done
Electric shock	In any environment having electric danger, in an enclosure or distribution board, during site tests etc	De-energization and earthing must be done, maintenance supervisor will keep the control panel lock key until the work is over. Warning label will be used which indicates that the work is going on. Local earthing if necessary will be done in the working area safety measures will be taken against unvoluntary touch. Safe distance between the device and operator must be maintained during testing , warning band must be put. During opening and closing actions under HV (>1 kV); safety shoes insulated glove insulated band and earthing rod must be used.
Moving machinery / parts	Presence of crane and/or moving machinery	The strength of crane rope and sling shots will be checked. Helmet and safety shoes will be used. Entrance to work area will not be done before the safety of moving machinery and parts are completed.
Moving vehicles	Presence of forklift or vehicle traffic	Pedestrain walkway will be used, working area will be marked and isolated from the surrounding. The maintenance and control of the forklift will be verified. Entrance to the work place will be allowed only after the safety measures are verified.
Noise	Presence of noise level higher than 85 desibel	Suitable earplug will be used.
Substances,chemicals, fumes, dust	Probable contact with SF6 gas, oil or other chemicals	Following protective material will be used in maintenance of SF6 circuit breakers: 1-Clothes like dust free , washable or used once for covering all the body, except the face, 2- Liquid free, plastic washable or used once gloves, 3- Dust and liquid free boots, 4- Full face and air supplied gas mask (with B2-P2 filter), 5- Electrical broom will be used to remove the particles around or on the ground. If explosion occures ,immediately after the explosion ventilation will be done and no entrance to the work area before normal oxygen level is achieved , will be done. Necessary glasses, mask and safety suits will be provided by the customer.
Protruding objects ,parts	Presence of sharp, protruding machinery material or product	Working area will be isolated by safety band , safety shoes and helmet will be used.Sharp points will be marked with warning labels.
Manual handling	While lifting or loading parts during erection or maintenance	Helmet, gloves and safety shoes will be used. Safe lifting/handling conditions will be considered.
Respiration problem	Presence of gas, dust or particles in the environment	Suitable mask will be used.Necessary glasses, mask and safety suits will be provided by the customer.
Struck by falling objects	While lifting or loading parts or working under platform during erection or maintenance	Safety shoes, glove and helmet will be used. No work must be started if there is already another work going on in the work area.
Contamination	Oil leakage	Nylon will be used in probable leaking areas (under the oil circulation rubber cell and oil barrels) nylon or pan will be put under pipe and valve connections.Entrance to the work area will be limited if some contamination occurs, waste will be removed by absorbant material in a suitable manner, it will not be put into the trash pot.

Appendix 4: Accident Monitoring Form

XYZ COMPANY													
ACCIDENT MONITORING FORM													
Page :1/1	Date	Time of Accident	Starting Time	Day of Week	Name	Company Experience (Year)	Unit that Accident Occurred in	Accident Type	Type of Injury	Part of Body	Type of Personnel	Cause of Accident	Lost Work Days	Brief Explanation of Accident	Corrective Action

Appendix 5: Team Safety Visits Table.



Appendix 6: Risk Management Formt at Project Applications

RISK MANAGEMENT FORM AT PROJECT APPLICATIONS

SUBJECT:

Possible risks, What can go wrong?

Categorize and list the risks.(Budget, Delivery,Manufacture Faults)

Possible Results of the risk.

Effect of Risk. (Scale 1-5)	Probability of Risk . (Scale 1-5).	Total Risk Score.(Scale 0-25).

Necessary Actions that should be taken to minimize the effects of risk to acceptable levels.

Risk Following Indicators?

Suggestions:

EFFECT						
	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
		POSSIBILITY				

RED
YELLOW
BLUE

SCALE

Posibility	Effect of Risk	Total Score
1 Very Low	1 Negligible	1 - 6 Low
2 Low	2 Low	8 - 12 Medium
3 Medium	3 Medium	14 - 20 High
4 High	4 Serious	>20 Very High
5 Very High	5 Very Serious	

NAME&SURNAME DATE SIGNATURE

Appendix 7: Emergency Meeting Plan