Analysıs of Occupatıonal Health and Safety Risks in Cut to Lenght Lınes in the Metal Industry

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ABSTRACT

The iron and steel industry encompasses a multitude of processes, including the lifting, transportation, cutting, and processing of substantial materials. Given the substantial size and weight of the raw materials, it is imperative to implement comprehensive and effective occupational health and safety measures. The iron and steel industry is characterized by a high risk of accidents, which can have severe and adverse consequences.

Within the iron and steel industry, cut-to-length lines are utilized to slice ready-made coils into the requisite sizes by uncoiling them according to customer specifications. The operational sequence of the cut-to-length line is as follows: initiation of the process with the placement of the roll in the feeding section of the line, establishment of a connection between the roll and the machine, initiation of the opening process of the roll, execution of the flat or skin pass processes during the opening phase in accordance with the line's characteristics, execution of the cutting process according to the order length, and finalization of the cut sheet plates through packaging. While the majority of these steps are automated, with the machine and its instructions overseeing the process, there are instances that necessitate manual intervention during the line's operation, though these occurrences are infrequent. Both these manual interventions and the length of the line during uncoiling and cutting operations, as well as the presence and effectiveness of the safety measures integrated into the line during the installation phase, are critical to prevent unwanted situations.

The prevention of unwanted accidents is contingent upon a comprehensive evaluation of the hazards and risks, the implementation of requisite health and safety measures, and the execution of protective and preventive activities in a thorough and effective manner. The objective of this research is to analyze the potential risks to occupational health and safety that may arise during the operation of cut-to-length lines in the metal sector. The study aims to make an important contribution to the healthy and safe performance of the work by revealing the necessary protective and preventive measures in the management of risks. Manufacturing roles in the metal sector entail the production of intermediate goods for other industries and the direct interaction with consumers as final products. SSI statistics demonstrate that in 2023, a total of 37,699 occupational accidents transpired in workplaces where manufacturing operations were conducted in the metal sector, and 49 employees were afflicted with occupational diseases. Notably, metal sector manufacturing jobs are ranked second in terms of occupational accidents and third in terms of occupational diseases, following building construction. These statistics underscore the significance of manufacturing roles in the metal sector, particularly in terms of their role in occupational accidents and occupational diseases. This research endeavors to contribute to the prevention of such incidents, thereby promoting safety and well-being in the workplace. The research was conducted in a steel service center, where production entails the uncoiling of coils and their subsequent cutting into the required sizes, aligning with customer specifications. A comprehensive analysis and evaluation of the hazards and risks encountered during the operation of the cut-to-length line was conducted using the Fine-Kinney Method. The risk analysis yielded proposals for corrective and preventive measures aimed at eradicating or minimizing the identified risks.

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Keywords − Metal Industry, Cut to Length Line, Occupational Health and Safety, Fine-Kinney Method, Risk Analysis

INTRODUCTION

It is evident that iron, a material with a profound historical significance to humankind since ancient times, was first utilized in various forms such as spearheads, knives, and ornaments during the Sumerian and ancient Egyptian periods dating back to approximately 4000 BC. The iron ore extracted from the ground is incorporated into the production process through a series of processes.

The leading iron ore-producing nations are Australia, Brazil, China, India, and Russia (Dinlen, 2022). The earliest documented attempts to produce iron and steel in the country took place during the Republican period, with the establishment of the first iron and steel plant in Kırıkkale in 1932 under the auspices of the General Directorate of Military Factories. This initiative was undertaken to address the steel requirements of the defense industry. The production of machinery, equipment, and construction steel in this facility marked the inception of the Turkish iron and steel industry. In 1925, following the assessments conducted by the Ministry of Economy and the legislation establishing the heavy iron industry in Turkey, the foundation stone was laid on April 3, 1937, in Karabuk, a region proximate to the coal basin. The facility continues its operations under the name Kardemir. (Dinlen, 2022)

The iron and steel sector currently holds a prominent position in the Turkish economy. On March 8, 2024, the Turkish Steel Producers' Association disseminated a press release on its website, asserting that Turkey had emerged as the foremost steel producer in Europe in January 2024. Among the world's top 10 crude steel producers, after Iran, Turkey is the country with the highest increase in production. With this performance, Turkey has surpassed Germany in world steel production and has risen to 7th place and the largest steel producer in Europe (Turkish Steel Producers Association, 2024).

In the iron and steel industry, inadequate or non-compliance with occupational health and safety measures in demanding processes, such as lifting, transportation, and processing of large and heavy materials in the production process, can lead to serious occupational accidents and occupational diseases. In the metal industry, the implementation of safety measures is paramount in the operation of complex machinery and equipment. The absence or inadequacy of protective measures and preventive actions can result in a hazardous working environment. Manufacturing roles within the metal sector yield intermediate products for subsequent sectors and final products for consumers. SSI statistics reveal that in 2023, a total of 37,699 occupational accidents occurred and 49 employees contracted occupational diseases in workplaces where manufacturing operations were conducted within the metal sector, placing it second after building construction in terms of occupational accidents and third in terms of occupational diseases (SSI, 2023).

Cut-to-length lines, which play a critical role in the iron and steel industry, facilitate the production process by ensuring the unrolling and cutting of ready-made rolls to the specified dimensions, in accordance with customer demands. In this study, we will delve into the hazards and risks associated with the utilization of cut-to-length lines. Our investigation will meticulously examine the underlying sources of these hazards and explore the protective and preventive measures that can be employed to eliminate and/or minimize these risks to an acceptable level.

MATERIALS AND METHODS

The Concept of Occupational Health and Safety; Although the concept of occupational health and safety is examined in two parts, health and safety, these two concepts are considered as a whole that complement each other and are inseparable from each other. According to the World Health Organization (1998), health is defined as "a state of complete physical, mental, and social well-being." This definition underscores that, in order for an individual to be considered healthy, bodily integrity alone is insufficient; mental and social well-being must also be considered. This conceptual framework is further reinforced by legal provisions, as evidenced by the inclusion of definitions for occupational accidents and occupational diseases within our nation's legal framework. Specifically, Law No. 6331 on Occupational Health and Safety stipulates that an

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occupational accident is defined as "an event that occurs in the workplace or due to the execution of the work, causing death or disabling the body, integrity, mentally or physically. According to Law No. 5510 on Social Security and General Health Insurance, an occupational disease is defined as "temporary or permanent illness, physical or mental disability due to a repeated reason due to the nature of the insured's work or the nature of the work or the conditions of the work. The implementation of prevention activities in the workplace is of paramount importance to ensure the occupational health and safety of employees. These activities not only serve to protect the employee under the law, but also contribute to the maintenance of production and operational safety.

Occupational health and safety can be defined as the assurance of the continuity of the employee, work, and workplace in a healthy and safe manner. This is achieved by conducting the necessary scientific studies to eliminate or minimize possible health problems and occupational risks that may be exposed due to physical, chemical, biological, etc. conditions during the performance of the work.

Research Type and Model

This research conducted a risk analysis using the Fine-Kinney method in a steel service center where production is performed by uncoiling coils and cutting them into desired sizes according to customer requirements.

In this study, a risk analysis was employed to evaluate potential hazards to occupational safety and health across all processes, beginning at the placement of the coil on the line and culminating in its cutting and packaging into the desired dimensions. This analysis yielded recommendations for risk management.

A work flow chart of the production process in the cut-to-length line was created. According to the work flow chart, the risks that can occur in all processes were evaluated.

Rısk Assessment Methodologıes

Risk assessment, a critical component of OHS practices, has emerged as a pivotal stage in identifying risk sources and determining control measures (Gül, 2018). The fundamental objective of risk assessment is to address the following questions: "Are the identified risks acceptable?" and "What measures should be implemented for risks that are deemed unacceptable?" (Çakmak, 2014). A range of methodologies is employed to identify potential hazards in the context of occupational health and safety, assess the risks posed by each hazard, and establish a prioritized list of actions. Risk assessment techniques are classified into three categories: quantitative, qualitative and mixed (Marhavilas et al., 2011).

- Quantitative Risk Assessment Methods: In these methods, risk is quantified through numerical expressions such as "10," "100," "500," and so forth.
- Qualitative Risk Assessment Methods: These methods employ descriptive terms such as "low," "high," and "very high" to convey the extent of risk.
- Quantitative & Qualitative Risk Assessment Methods: This category of methods integrates both qualitative and quantitative approaches to evaluate risk.

Fine Kinney Method

The Fine-Kinney Method was first proposed by Fine in 1971 and subsequently revised by Kinney and Wiruth in 1976 to develop a more detailed risk analysis method. Despite its age, it remains a valid and frequently referenced approach in contemporary risk analysis (Birgören, 2017). This method is quantitative in nature, necessitating the utilization of numerical data for calculation. The calculation of risk score involves three critical parameters. These are probability (P), frequency (F) and severity (S) (Acar Filizci & Erdebilli, 2022).

Probability: It is defined as the probability of an undesired event occurring. In probability scoring, the scoring process is carried out in the light of the guidance given in the table below, taking into account the presence of

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technical safety devices, personal protective equipment, relevant procedures, trainings, and past accident experiences

Frequency: Frequency is defined as the number of occurrences of an undesired event or the number of times an employee is exposed to a hazard. Frequency scoring is conducted in accordance with the guidelines outlined in the subsequent table: Frequency Scoring.

Severity: It is defined as the possible consequences that people will face if the undesired event occurs. Severity scoring is based on the table below.

Table 1. The Fine-Kinney Risk Assessment Method Parameters (Kinney & Wiruth, 1976)

Probability (P)		**Frequency (F)**		**Severity (S)**	
10	Predictable- Might well be expected	10	Constantly (multiple times a day)	100	Several fatalities-Catastrophe
6	Possible - Quite possible	6	Frequently (daily)	40	One fatalities-disaster
3	Unusual, but possible	3	Occasionally (weekly)	15	Permanent damage-very serious
1	Improbable, but possible at boundary conditions - Only remotely possible	2	Sometimes (approx.. 1x a year)	7	Important damage-serious
0,5	Plausible, but unlikely - Conceivable but very unlikely	1	Rarely (approx. 1x a year)	3	Injury with loss of work capacity -important
0,2	Practically impossible	0,5	Very rarely (less than 1x a year)	1	Injury without work capacity loss –noticeable
0,1	Virtually impossible				

The Fine-Kinney risk assessment Method utilizes the following formula:

Risk Priority Value = Probability X Frequency X Severity

The PRV is determined by multiplying the numerical values assigned to the three parameters, frequency, probability and severity. The risk class is determined using the risk score resulting from this process. Subsequently, the step of determining protective-preventive measures is carried out. The determination of the risk class is then based on the table below.

Table 2. Risk Priority Value Table in Fine-Kinney Risk Assessment Method (Kinney & Wiruth, 1976)

RISK LEVEL	**RISK SCORE**	**PRECAUTIONS TO BE TAKEN**
UNBEARABLE RISK	(400<R)	Necessary measures must be taken immediately or the activity causing the risk must be stopped / closed down.
HIGH RISK	(200<R≤400)	Urgent correction required. Improvement should be made in the short term. (within a few months)
	(70<R≤200)	Precaution is needed. Improvement should be made in the long term. (within the year)

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SUBSTANTIAL RISK		
POSSIBLE RISK	(20<R≤70)	Attention must be paid, the process must be implemented under supervision.
INVALID RISK	(R≤20)	Precaution is not a priority.

Production Process in Cut to Length Lines

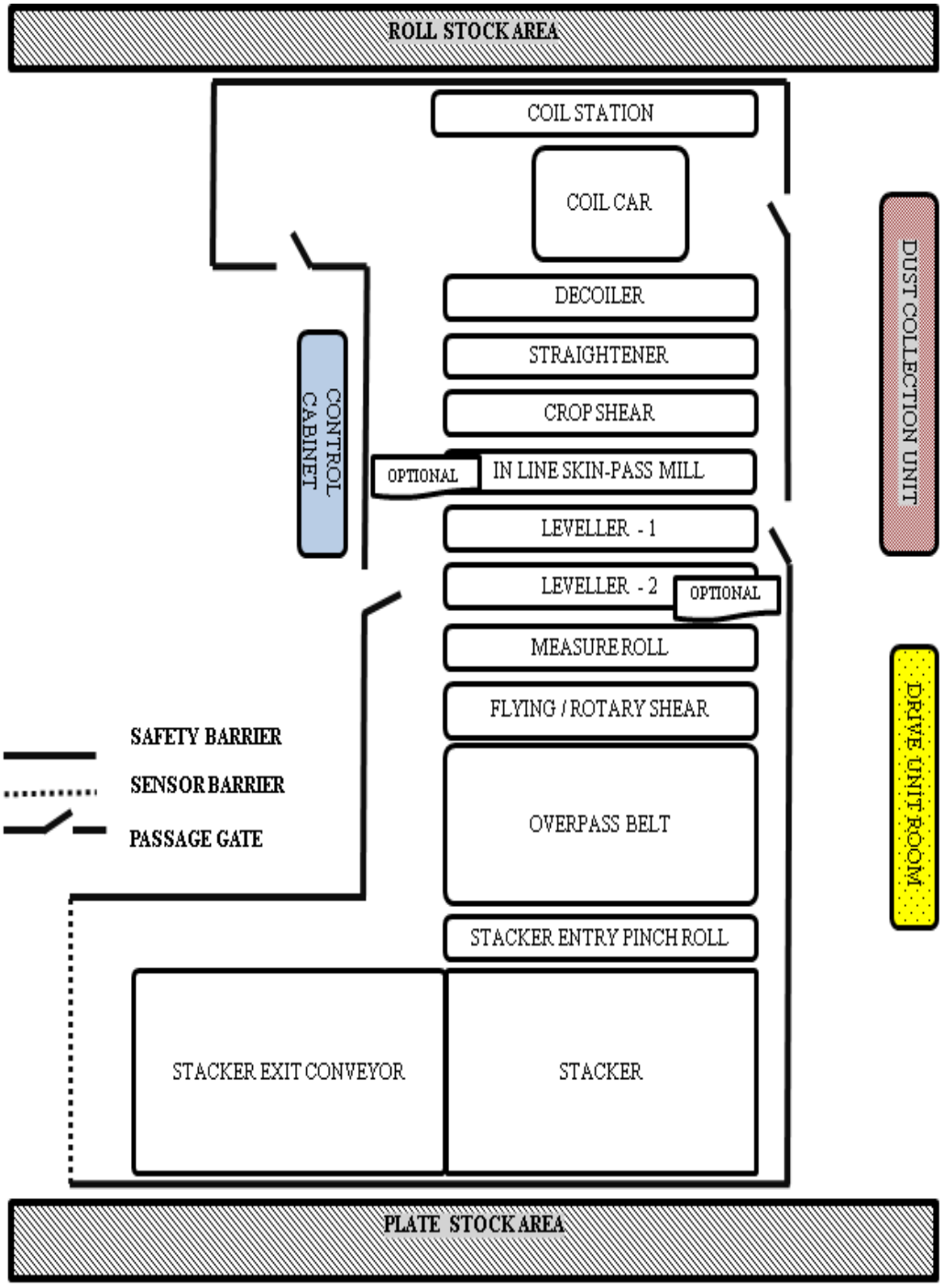

Figure 1. Cut-to-Length Line Flowchart Sample Drawing

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The general workflow in Cut-to-Length Lines is outlined as follows, as illustrated in Figure 1:

- The rolls intended for cutting are initially positioned in designated waiting stations along the production line. The rolls situated in the stock areas are subsequently transferred to the designated waiting station on the cut-to-length line through the utilization of specialized equipment and attachments, such as roll tongs affixed to the bridge crane, in alignment with the prevailing cutting process.

- The roll is then retrieved from the waiting station by the operator, who utilizes the roll trolley to do so.

- The roll is then connected to the line for cutting. Following its removal from the waiting station by the operator with the transfer trolley, the roll to be cut is attached to the section referred to as chuck, situated at the commencement of the line.

- The operator then enters the width-width information of the roll to be cut, aligning with the customer's request and the number of pieces to be included in the package. This information is then entered into the panel. Subsequent to this step, the cutting process is initiated.

- Following this, either automatic or manual wedge and strapping techniques are utilized in the packaging section to secure the materials.

- Finally, arriving materials at the exit conveyor are transferred to the stock area via specialized equipment such as bridge cranes, among others, for subsequent handling.

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Application

Risk Number	Activity	Hazard	Risk	Exposed	Source of Risk / Hazard	Current ontrol Measures	PRE-ACTION RISK ASSESMENT					ACTION PLAN Corrective - Preventive Actions	Responsible	Deadline	AFTER THE ACTION RISK ASSESMENT				
							PROBABILITY	FREQUENCY	SEVERITY	SCORE	LEVEL				PROBABILITY	FREQUENCY	SEVERITY	SCORE	LEVEL
1	Machine Setup	Insufficient work area	Injury to personnel as a result of collision etc.	Operator, Employees	The machine is set up in a way that there is insufficient working space for the operator during installation.	---	6	10	7	420	UNBEARABLE RISK	During the line installation, the installation will be done in a way that there is enough movement and working space for the employees.	Employer or Employer Representative, Department Manager	Throughout the installation	0,2	0,5	7	14	INVALID RISK
2		Operators or other employees entering the line's working area or physical intervention by personnel while the line is operating.	Injury resulting from unauthorized or unauthorized intervention, such as loss of limbs etc.		Line boundaries are not determined and access to the line area is not physically restricted.	---	6	6	40	1440	UNBEARABLE RISK	The area around the line must be physically limited to prevent unauthorized persons from entering and intervening in the line area.(sample fencing system) Physical boundaries must be designed in a way that does not allow people to pass through, under or over them.		End of line installation	0,5	0,5	40	10	INVALID RISK

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3		Situations requiring personnel intervention due to the design or installation of the machine	Injury etc. situation		The machine does not comply with the legislative standards or the machine that complies with the legislative standards is not installed accordingly, the safety equipment is missing.	---	6	6	40	1440	UNBEARABLE RISK	In line with legal legislation, machines must comply with the Machinery Safety Directive and the EN ISO norms within its scope, and the installation must be carried out in accordance with the provisions of this legislation and the machine acceptance must be carried out.		Throughout the installation	0,5	0,5	40	10	INVALID RISK
4	General	Personnel not being fit for health	Injury etc. situation	Operator, Employees	The health of the personnel is not suitable in terms of the work to be done, the machine to be used (cutting line or overhead crane) and the working order (such as shift work).	---	3	6	40	720	UNBEARABLE RISK	The workplace doctor should perform pre-employment and periodic health checks and necessary examinations and follow up.	Employer or Employer Representative, Department Manager, Relevant Department Employees		0,2	0,5	40	4	INVALID RISK
5	General	Use of accessories and inappropriate work clothes	Injury due to tripping, pinching, etc.	Operator, Employees	- Wearing accessories such as watches, rings, necklaces, earrings, etc. - Wearing loose, baggy and torn	---	3	6	7	126	SUBSTANTIAL RISK	Accessories can be attached anywhere and can also create arc welding. Therefore, employees should be given information training on not wearing accessories such as watches,			0,5	0,5	7	1,75	INVALID RISK

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					work clothes - Use of accessories such as ties, scarves, etc. - Wearing work shoes by stepping on the back or using them without tying the laces							rings, necklaces, earrings, etc. in the field, keeping their hair tied up while working on rotating parts, not wearing things like flounces and ties, not wearing loose, baggy or torn work clothes, not putting on work shoes without stepping on the back of them, and tying their laces and tucking them in.Application control must be carried out fully and effectively by foremen and department managers.							
6	General	Exhibiting dangerous behavior	Injury etc. as a result of dangerous behavior	Operator, Employees	-Casual gestures and pranks -Fighting, throwing things at each other -Carrying sharp-tipped objects such as screwdrivers in the pocket or behind the ear	---	3	6	7	126	SUBSTANTIAL RISK	-Employees should be trained to not behave casually towards each other, not play practical jokes, not fight, and not throw things at each other. -Employees should be informed not to carry sharp objects such as screwdrivers and pens in their pockets or behind their ears, and to use tool kits. -Field inspections must be carried out fully and effectively by foremen and department managers.			0,5	0,5	7	1,75	INVALID RISK

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7	General	Distraction	Injury etc. due to distraction	Operator, Employees	-While the staff is working, they are also talking on the phone and busy with their surroundings. - Making jokes and distracting employees while they are at work - Staff listening to music or messaging on their smartphones or spending time in gaming or social networking areas while working	---	3	6	7	126	SUBSTANTIAL RISK	-Employees should be given training to inform them not to talk on the phone, not to be busy with the surroundings, not to joke with each other, not to listen to music or play games on their smart phones or to engage in activities on social media while using machines or vehicles or doing any other work. -Foremen and department managers should check whether the rules are followed during work area inspections and if not, the personnel should be warned.	Employer or Employer Representative, Department Manager, Relevant Department Employees		0,5	0,5	7	1,75	INVALID RISK
8	General	Falling or contact of the foot with sharp points	Head and/or foot injury	Operator, Employees	Working in production and work areas without helmets and work shoes	---	6	2	15	180	SUBSTANTIAL RISK	-Helmets and steel toe + steel midsole work shoes that comply with CE EN standards should be provided to employees. -Necessary training should be provided on the use, maintenance and cleaning of personal protective equipment, and their full and effective use in production and work areas should be ensured. Application control should			0,5	1	15	7,5	INVALID RISK

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												be carried out by foremen and department managers.						
9	General	Tripping, slipping, falling	Head and/or foot injury	Operator, Employees	The work area is wet and slippery, there are obstacles in movement areas.	---	6	2	15	180	SUBSTANTIAL RISK	-Work areas must be clean and tidy, and movement routes must be free of random blocks, etc. -Information training on cleanliness and order should be provided, and full and effective application control should be carried out by foremen and department managers on cleanliness and order in work areas.			0,5	1	7	7,5	INVALID RISK
10	General	Lack of visibility due to employee not being noticed	Injury due to impact etc.	Operator, Employees	- Walking around in civilian clothes in work and production areas - There are no reflectors in current work clothes or the reflectors have been removed.	---	3	2	15	90	SUBSTANTIAL RISK	-Appropriate reflective work clothes should be provided to employees on a warrantee basis and they should be able to use them fully and effectively. -Employees should be given information training on not making changes to the structure of their work clothes, such as removing reflectors, etc. -Application effectiveness should be ensured through field checks by foremen and department managers.	Employer or Employer Representative, Department Manager, Relevant Department		0,5	1	15	7,5	INVALID RISK

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11	Loading, Unloading and Storage Works with Overhead Crane	Unauthorized and unqualified personnel using cranes	Injury due to impact etc.	Operator, Employees	Lack of knowledge and/or professional competence of the person who will use the relevant equipment or attachment.	---	6	6	100	3600	UNBEARABLE RISK	Personnel who will use the crane and attachments must have knowledge and experience in lifting and carrying. If the personnel do not have knowledge and experience, they should be trained beforehand. Personnel must have theoretical and practical knowledge and a valid Bridge Crane Operator professional qualification certificate.			0,5	0,5	100	25	POSSIBLE RISK
12		Material hitting the operator or personnel in the area while lifting or carrying material	Injury due to impact etc.	Operator, Employees	- Wrong key pressed by the operator (e.g. reverse instead of forward, forward instead of reverse, etc.) - The material is lifted by the operator without fixing it in a vertical axis and the material oscillates during this time.	---	6	6	100	3600	UNBEARABLE RISK	-The meanings of the buttons on the crane control must be known by the employees and the necessary signs must be present on the buttons. Control buttons should be regularly reviewed by operators and deleted signs should be renewed. Before giving the crane a movement command, the operator must look at the directional keys and their meanings and give the crane a movement command in line with the meanings of these keys. -Employees should be trained on the importance of			0,5	0,5	100	25	POSSIBLE RISK

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												lifting materials vertically and application checks should be carried out.						
12	Loading, Unloading and Storage Works with Overhead Crane	Material hitting the operator or personnel in the area while lifting or carrying material	Injury due to impact etc.	Operator, Employees	- Personnel stay close to the material - Personnel standing between the material to be lifted and another stack or wall - If the material is being lifted by another operator, the operator must lift the material with a crane while there is another worker between the material to be lifted and another stack or wall.	---	6	6	100	3600	UNBEARABLE RISK	-During the material lifting and carrying process, employees should be informed about not standing in front of or behind the material, right or left of the material, standing at the corner point, i.e. diagonally or away from it according to the lifting height of the material, and also that there should be no obstacles behind the personnel, and application checks should be carried out. -Cranes should be used with remote controls instead of wired controls that cause the crane to be close to the material during use, and the necessary automation connections should be made on the crane for this purpose. -If any personnel is in the danger zone, they must be informed that work must not be done at all and that work must be stopped in such dangerous situations.	Employer or Employer Representative, Department Manager, Relevant Department Employees		0,5	0,5	100	25	POSSIBLE RISK

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13	Loading, Unloading and Storage Works with Overhead Crane	Failure to make a warning or stop the crane in case of danger	Injury due to impact etc.	Operator, Employees	-There is no audible warning on the crane or it does not work or the audible warning is not noticed because its sound is the same as other warning sounds. -There is no horn or emergency stop button on the crane control unit to be used in emergency situations or it does not work.	---	6	6	100	3600	UNBEARABLE RISK	-There must be an audible warning on the crane and its sound must be different from other warning sounds so as to give a warning during the operation of the crane. -There should be a horn and emergency stop button on the remote control for use in emergencies, and the operator should actively check the operation before starting work			0,5	0,5	100	25	POSSIBLE RISK
14	Loading, Unloading and Storage Works with Overhead Crane	Material falling during transportation	Serious undesirable situations such as material damage, injury, loss of limbs, etc.	Operator, Employees	-The equipment or attachment is not suitable for lifting and carrying roll / sheet material. - Equipment or attachment capacity is smaller than material tonnage. - Breakage / rupture of equipment or attachment during operation	---	6	6	100	3600	UNBEARABLE RISK	-The equipment or attachment to be used should be a suitable apparatus for the material to be lifted and carried, such as roll or sheet. Roll tongs should be used for rolls, and package tongs or special apparatus should be used for sheet and plate materials. -The safe working capacity of the equipment or attachment must be higher than the material tonnage. -There must be a valid periodic inspection report indicating that the	Employer or Employer Representative, Department Manager, Relevant Department		0,5	0,5	100	25	POSSIBLE RISK

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					-Placing the roll or plate material by placing the weight on one side. -Using the tong without a safe grip -Opening/ejecting of equipment or attachment during transport							equipment or attachment is suitable for use. A control form should be prepared and checked by the user before each use. In case of non-conformity, it should be forwarded to the superior officer and should not be used until it is deemed appropriate for use. -When placing the material, the weight should not be placed on one side, operators should be trained and application control should be carried out. / -Warning lights indicating full grip must be present and active during the lifting and carrying process, and the employee must perform the lifting and carrying process according to the full grip warning lights. Employees must be trained and application control must be carried out. -If a tong is used, it must have a safety system that will not open it even if the opening command is accidentally pressed during transportation. Warning lights indicating that full grip is being performed during the lifting and							

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												carrying process must be present and active. The lifting and carrying process must be carried out according to the working full grip warning lights. Employees should be trained on all these issues and their implementation should be checked.							
15	Machine Use	Personnel authorized to use the machine are not defined.	Injuries etc. due to unauthorized and incompetent persons using the machine.	Operator, Employees	Authorized and competent personnel who can use the machine are not defined and unknown.	---	10	10	40	1440	UNBEARABLE RISK	The operators who can use the machine must be specific and defined, and authorized user information must be included on the machine or on appropriate information boards. Necessary warning signs should be hung to prevent unauthorized persons from using the machinery, and employees should be provided with informational training.	Employer or Employer Representative, Department Manager, Relevant Department Employees		0,5	0,5	40	10	INVALID RISK
16		Use of the machine by personnel	Injury etc. due to lack of informati	Operator, Employee	Use of the machine by unauthorized and unqualified	---	10	10	40	1440	UNBEARABLE	Personnel who can use the machine must have vocational training / professional qualification.			0,5	0,5	40	10	INVALID RISK

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		who do not know how to use it	on		persons							Otherwise, personnel should not be allowed to use machines. If necessary, training / examination services should be taken to ensure that employees are qualified.						
17		Working of personnel without basic OHS training	Injury etc. due to lack of informati on	Operator, Employees	Employing new employees without providing Basic OHS Training Failure to provide renewal training in appropriate periods for the hazard class	---	10	10	40	1440	UNBEARABLE RISK	Basic OHS Training should be given to existing and new personnel for periods appropriate to the workplace hazard class, and recorded through measurement and evaluation activities.		0,5	0,5	40	10	INVALID RISK
18		Yetkinliği olmasına rağmen teorik ve pratik bilgisi olmayan personelin makineyi kullanması	Injury etc. due to lack of informati on	Operator, Employees	Lack of theoretical and practical knowledge of personnel on operating the machine.	---	10	10	40	1440	UNBEARABLE RISK	Safe Work Instructions for the machine should be prepared and communicated to the relevant employees through training. Safe Work Instructions should be conveyed to the newly hired personnel by the responsible engineer and/or supervisor through on-the-job training.		0,5	0,5	40	10	INVALID RISK
19	Machine Use	Unauthori zed personnel	Injury due to impact	Opera tor	-The fences around the line are dismantled or	---	6	3	40	720	UNB EAR	-There should be a fence system around the line. The fence system around the line	Employ er		0,5	0,5	40	10	INVALI D RISK

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		entering the machine work area while the machine is operating.	etc.		missing. -Sensor - switch devices in line transition areas and doors are disabled or not working.						should not be dismantled on its own initiative. If there is a deficiency in the fence system, it should be completed immediately. Employees should be informed about not dismantling the fence systems and they should be checked. -Sensor and switch systems should be cancelled and the line should not be used. Employees should be informed and checked about not removing or cancelling sensor and switch systems.							
20		Personnel contact with the moving point on the machine	Injury due to impact etc.	Operator, Employees	Personnel being present at the pinch point during cutting or the line being operated or continuing to operate while personnel are present at the pinch point.	---	6	6	100	3600	UNBEARABLE RISK	Warning signs must be hung stating that entering the area while the machine is operating is dangerous and prohibited. Information training should be provided and recorded. Employees should be informed and recorded about not working by removing physical barriers or canceling the sensor-switch system. Barrier, sensor and switch devices should not be removed or disabled while working, or these should not be allowed and regular			0,5	0,5	100	25	POSSIBLE RISK

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												checks should be carried out by supervisors. An automation system should be made in such a way that when personnel enter through the fence doors or sensors, the line automatically stops and cannot continue working without a reset process, and this automation system should work actively.							
21		Failure to stop the machine in an emergency	Injury due to impact etc.	Operator, Employees	In case of emergency, the emergency stop button is not active or the emergency stop buttons are covered or there is no emergency stop button to stop the machine.		6	3	40	720	UNBEARABLE RISK	To stop the machine in emergency situations, emergency stop buttons must be placed visibly on the machine and must be in an active working condition, and the buttons must never be covered. Operators should be informed and application control should be carried out.			0,5	0,5	40	10	INVALID RISK
22	Machine Use	Intervention in rotating assembly	Injury due to compression etc.	Operator, Employees	- Personnel intervening in the rotating parts during operation of the machine - Lack of storage in rotating evenings - Failure to replace the	---	6	6	15	540	UNBEARABLE RISK	-Information trainings/instructions should be organized and recorded on the subjects of not intervening in the rotating parts without stopping the line and not climbing on the conveyor. -Rotating parts must be protected and installed against possible snagging,	Employer or Employer Representative Department		0,5	1	15	7,5	INVALID RISK

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					removed guards during maintenance etc.							jamming, etc. -The guards that are removed during maintenance etc. operations should be replaced after the operation is completed. Maintenance personnel should be given information training and application control should be carried out after maintenance operations.							
23	Machine Use	Noisy	Hearing loss	Operator, Employees	In noise measurements, noise is above the exposure limit values.	---	10	6	15	900	UNBEARABLE RISK	Engineering measures should be taken to eliminate or minimize noise sources. In cases where engineering measures are not sufficient, appropriate ear protectors must be provided to employees on a warrant. Employees should be trained on the use, cleaning and maintenance of ear defenders. Department managers should observe the use of ear protectors during field inspections and take the necessary corrective and preventive actions in case of deficiency.			0,5	1	15	7,5	INVALID RISK
24	Machine Use	Exposure to dust	Health problems such as	Operator	The work area is dusty	---	10	6	15	900	UNBEAR	- Continuity of full and effective operation of dust collection units in the line			0,5	1	15	7,5	INVALID RISK

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			respiratory tract etc.									must be ensured. - Dust measurement should be carried out. If the exposure limit values are exceeded as a result of the measurement, the effectiveness of existing measures to prevent dust from coming into contact with the employee should be checked and the deficiencies should be eliminated and / or additional appropriate collective protection measures should be taken.							
25	Manual hoop throwing or hoop cutting	Unrolling the roll	Injury etc. as a result of the opening roll end hitting the personnel	Operator, Employees	The roll end is thrown backwards during the cutting of the circle.	---	6	6	40	1440	UNBEARABLE RISK	The rolls should be placed on the stand with the roll end facing down, or the circles on the roll should be cut after the rolls are turned on the stand with the roll end facing down. The relevant employees should be informed about the issue and the application should be checked.	Employer or Employer Representative, Department Manager, Relevant Department Employees		0,2	0,5	40	4	INVALID RISK
26	Manual hoop throwing or hoop cutting	Contact or impact	Incision occurring	Operator, Employees	-The circle is thrown and the personnel is within the area of effect at that time. -Inadequate use of hand tools for	---	3	6	15	270	HIGH RISK	-In case of possible hoop throwing and cutting operations, the employee should adjust his/her stance so that he/she is not in the impact area and work at the correct angle. Employees			0,5	0,5	15	3,75	INVALID RISK

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					circle cutting - Not using hand and arm protection - Not using eye and face protection							should be informed and the application should be checked. -For cutting the circles on the roll, suitable scissors should be obtained and used, the handles of the scissors should be long enough not to pose a risk (short-handled scissors should not be used). -Cut-resistant work gloves and cut-resistant sleeves should be provided to ensure that employees use them fully and effectively, and employees should be informed and their application should be checked. - Protective safety glasses and visors should be provided to employees and they should be used fully and effectively. Employees should be informed and application control should be carried out.							
27	Intervention in the Electrical	Electric	Injury due to electric shock etc.	Operator, Employees	-Unauthorized persons intervening in electrical panels - Electrical panel covers are open	---	6	3	40	720	UNBEARABLE RISK	- All employees should be informed that unauthorized persons should not interfere with electrical panels, and warning and information signs should be hung on the	Employer or Employer		0,5	0,5	40	10	INVALID RISK

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					- Electrical panel covers are locked but the key is on or near it - No insulating mat in front of the electrical panel							subject. - Electrical panel covers must always be kept locked. The key must be kept by authorized electrical maintenance personnel or a responsible person who will not allow unauthorized and unauthorized persons to intervene in the panel. - Information/training should be provided and recorded regarding not leaving keys on or near the panel. - There should be an insulating mat of appropriate size and standard in front of the electrical panel.							
28	Maintenance and Repair Works	Operation of the machine during maintenance	Crushing /compression injury	Operator, Employees	Not shutting down the machine before maintenance and repair operations Operating the machine during maintenance and repair operations	---	6	3	40	720	UNBEARABLE RISK	The machine must be shut down before starting maintenance and repair work. Maintenance and repair should not be performed while the machine is running. Lockout–tagout (LOTO) System should be implemented. The necessary equipment must be supplied by the	Employer or Employer Representative, Department Manager, Relevant		0,5	0,5	40	10	INVALID RISK

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												employer. Procedures and instructions for LOTO should be created and employees should be trained. The isolation of harmful energy should be done in accordance with the relevant procedures, instructions and training. The One Person - One Lock - One Key Principle should be applied. The effectiveness of the harmful energy insulation should be tested before starting work. If it is insufficient, it should be repeated until it is sufficient. If there is any hesitation, the work should be stopped and the immediate superior and OHS should be informed. After the work is completed, any removed guards etc. should be installed and all deactivated safety equipment should be activated. After the work is done, each staff member must unlock it							

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												with his/her own key. A check should be made before starting the machine, and after the check, the machine should be started only after making sure that everyone is in the safe area.							

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CONCLUSION

It is seen that the possibility of Occupational Health and Safety has a systematic structure that is better understood by every section of today with the legal legislation regulations. For a sustainable corporate culture, protecting employees, which is also the basis of occupational health and safety, and providing production and business opportunities are separate requirements. One of the most important building blocks of occupational health and safety practices is the process of managing risks. Although there are various methods at this point, the Fine-Kinney Method is a valid method that is still widely used today. Three parameters; probability, severity and frequency, are used in the risk score calculation.

Cutting to length lines are used in the industry to cut roll sheets into sheets in desired sizes and to produce them in series, taking into account different areas of use in line with customer demands. The structure and length of the cut-to-length lines distinguish it from many simple machine designs such as the guillotine. In this study, the dangers and risks that may be encountered during the use of the cut-to-length line are discussed in detail, the sources of danger are explained, and the protective and preventive measures that can be applied to eliminate the risks and/or reduce them to an acceptable level are included. Routine and non-routine activities such as machine installation, operators' competence and proficiency levels, line use, maintenance and repair work were taken into account within the scope of the analysis. In the risk assessment study, a total of 28 risks were analyzed, including 21 Unbearabel Risks, 1 High Risk and 6 Substantial Risks. Following structural and preventive actions, 6 of these risks were reduced to Possible Risks and 23 to Invalid Risks.

Risk assessment tests Updating the Unbearable Risk is one of the sources of danger / risk, the machine not complying with the legislative regulations and / or the installation and separation is not done properly, or the machine suitable for separation is not installed in this direction and the defects in the safety equipment. This determination reveals the importance of starting the risk assessment process at the design stage, as stated in the Occupational Health and Safety Risk Assessment Regulation. In order to prevent risk at its source, safe design should be at the forefront, and the installation of machines in accordance with standards and the sustainability of this compliance, and the integration of automated safety systems in line with technological developments should be among the basic prevention activities.

Other issues included among the corrective-preventive activities suggested within the scope of the risk assessment process are as follows;

- Continuing the standard compliance provided in the installation completely and effectively throughout all works,
- Monitoring the health of employees through pre-employment and periodic examinations to determine whether they are fit for work,
- Regularly updating the necessary training and awareness settings regarding occupational health and wages of new and existing employees
- The personnel must have the necessary technical knowledge and skills in using the relevant machinery and their qualifications must be sufficient,
- Physical determination of the surroundings of the cut-off lines since they are too long to allow uncontrolled entry and exit through observation.
- In order not to leave the safety measures in occupational health and safety to the initiative of the employees, technical measures such as closing the danger zones, placing switched doors in the passages, placing safety barriers on the moving parts are taken, automation systems are designed in such a way that the machine stops when any personnel enters from all these security points, and technological developments are followed and implemented such as not continuing to work without resetting after the necessary checks and corrections.
- Implementation of technical and engineering solutions such as machine guards-sensors
- In cases where collective protection measures are not sufficient, personal protective equipment of appropriate standards should be provided and their full and effective use should be ensured,
- Increasing awareness with warning and information signs
- Preventing unwanted situations by performing periodic maintenance and controls effectively,

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- Performing application checks of protective and preventive measures and identifying and eliminating any deficiencies.

In the concept of Occupational Health and Safety, of course, it is not enough to follow technological developments alone and adapt them to the workflow. These practices, which have become part of the production process, must be adopted by employees, their activity must be checked, and a safety culture that is kept active and functional must be created and its continuity must be ensured. Dursun's (2013) study found that there is an interaction between the organization's occupational safety culture and the behavior of employees, and that a good occupational safety culture positively contributes to employees' safe behavior. In the study conducted by Gökçe (2020), the priority in eliminating negative situations in workplaces is to create a positive safety culture with the participation of management and employees and to ensure the continuity of the safety culture. These studies reveal that increasing the training and awareness levels of employees is not only a legal obligation but also has an important place in the development of occupational safety culture. Having a positive and sustainable occupational safety culture is of critical importance in preventing work accidents and occupational diseases.

All findings in the study show that; considering technical, managerial and cultural measures as a whole is very effective in the process of identifying and managing risks in terms of occupational health and safety in enterprises. The solution suggestions presented in the study are applicable and improvable both theoretically and practically.

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