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WORLD MARITIME UNIVERSITY

SHANGHAI CHINA

Safe operation and accident prevention at container terminals: A case study on Asyaport Container Terminal

BY

MERT AKMAN

TURKEY

A research paper submitted to the World Maritime University in partial fulfillment of the requirements for the award of the degree of

MASTER OF SCIENCE

(INTERNATIONAL TRANSPORT AND LOGISTIC)

2016

DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views and are not necessarily endorsed by the University.

(Signature): Mert AKMAN

(Date): 19.08.2016

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And Finally, I would like to dedicate my work, to my ex-colleague Hasan Ali KUBAS, who was a seafarer, lost his life tragically during a cargo operation in a container terminal. I hope this paper contribute to creating a safer work environment.

ABSTRACT

TITLE OF DISSERTATION : Safe operation and accident prevention at container terminals: A case study on Asyaport Container Terminals

DEGREE : M.Sc.

Occupational safety always has been a challenge to overcome for all parties involved maritime business. Ports are accepted as high risk working environment, especially container terminals due to necessary man and machineryinvolvement. Since there are many factors affect on providing safe practice at a terminal, there is not a single or quick solution available. Problem consists sociological and intangible elements such as human behavior, emotions as well as technical aspect.

It is an elusive matter unless a wide approach is taken on every actor of theproblem, and make progressaltogether.

This research examines main problems and example solutions that have been taken in different cases. Also, research regards the humans are the root of solving safety problem, taking their thought and visions as a guidance in order to suggest reliable solutions, since implementations can be successful only if people embrace them.

Therefore an AHP model has been created to clarify which safety precautions are seemed more important by labors.According to the result of model, the aim of conclusion is, relying labor perspective, increase their influence on managerial and governing bodies,

Keywords: Accident prevention, Container terminals, AHP method, Safe practice.

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ABBREVIATIONS

AGV	Automated Guided Vehicle
AHP	Analytic Hierarchy Process
ESPO	European Seaports Organization
EU	European Union
GPS	Global Positioning System
HSE	Health And Safety Executive
ICHCA	International Cargo Handling Co-ordination Association
ILO	International Labor Organization
IMO	International Maritime Organization
ISM CODE	International Safety Management Code
ISPS CODE	International Ship And Port Facility Security Code
MHC	Mobile Harbour Crane
OSHA	Occupational Safety And Health Administration
PERS	Port Environmental Review System
PMA	Pacific Maritime Association
PSS	Port Skills And Safety
RTG	Rubber Tyred Gantry
RTS	Rough Terrain Crane
SOLAS	Safety Of Life At Sea
SSG	Ship To Shore Gantry Crane
STS	Ship To Shore Crane
TEU	Twenty-food Equivalent Units
TT	Terminal Tractor
TT CLUB	Through Transportation Club
TURKLIM	Port Operators Association Of Turkey
VGM	Verified Gross Mass

1. Introductıon

1.1 Background

Container terminals are very congested areas filled by labors, machines and containers. Beside its crowded nature, a terminal also has to challenge with efficiency expectations. Inevitably accidents and injuries are expected to happen in such complex working environment. Although safety actions which have been developed through years, resulted gradually decrease in serious incident occurred, terminals are still far from being arisk-freeworkspace. Container vessels are accounted for 60% of all ship and craft accidents (23 out of 38). Container ships are still the most likely vessels on which to have an accident. (PSS 2014)

Ports are trade nodes that connect inland and sea transportation modes. Since it is a stopping point inevitable, it can be seen as a bottom neck in a multi-transport model.

In a highly competitive market focusing, only performance efficiency can cause fractions with other issues which have to go developed simultaneously. While clients push for operation speed, labor unions, and regulatory organizations insist on safety precautions for both human and asset.

Operators struggle here is provide most efficient service without making a concession on safety issues. Service quality is vital for the operator. Providing shortest dwell time and vessel turnout is a performance success recognized by clients. On the other hand, managers somehow have to sustain the smooth working system in order to not clash with worker's unions and law.

Since there are an economical and social differences between countries or companies, it reflects service quality of their ports as well. Therefore every port can be an example to another for solving problems with solutions are already has been practiced.

Besides enforced obligations, there are many trends to improve the safe working environment at the port. Researchin this field is looking also for intangible improvements such as safety management systems and safety conciseness as well as technical upgrades.

The key issue is broadly speaking, the existence of accident despite current advanced technological and managerial precautions. Statistics named of the incidents commonly faced in a container terminal as, slipped, tripped, fell on the level(27%). This is followed by driving related incidents (16%), injured when handling, lifting or carrying (16%), hit by moving, flying or falling object (10%), fell from height (9%) and hit something fixed or stationary (4%) (PSS 2014)

The Health and Safety Executive (HSE) (2012) statistics show 392 accidents in 2010 caused by workers' improper use of equipment in container terminal operations. Also, the National Safety Council stated that 94% of all injuries in the workplace were associated with human errors. (PMA2012)
Of course, there are many triggering factors affects human behavior and lead serious accidents such as, job stress, lack of training, neglect behavior, etc. which will be investigating in this paper.

A container terminal is placed many cargo handling transports and stacking machines, vehicles are heavily involved. A TT Club reports that 53% of insurance claims arisen among their partners are related to yard equipment. (TT CLUB 2012) This mean equipment factor must have an important role on both causing and preventing accident. A major participant of these incident happens where the lifting trucks 22%, other trucks, and vehicles %17, and yard cranes 11%, & wharf cranes 11% involved.

It is sure that technically improves in cargo handling equipment and box technologies can improve safe working practice. Since operation dependency on machines is getting higher and higher, theimportance of equipment quality is becoming crucial.

As mentioned, human and technology factors are companions work together, cause accident and injuries together as well. Operators' task should be sustain harmony, between parties. Not only maintain high safety awareness of employees, but also achieve well managing of technical equipment theirmaintenance as well. Current advisory IMO, ILO publications and mandatory ISM, system are main contributors to thedevelopment of safety management.

While some quick implements can be cure current issue, some of them goes theroot of the problem and need to some time to evolve in order to be practicable. These thoughts are the ones who will shape future trends in safety-related upgrades.

The main idea of containerization was actually creating a standardization and get faster and safer cargo transport. To provide this many systems has been developed since 1950s related shapes, markings, fittings. Also, box technology shaped to thedirection of improvement of yard technology. We have started to see gantry cranes, slings, straddles, etc. Now we hypothetically make anassumption about what we need in the future by looking past experiences through today's results. Increasing Automation, even further, developed monitoring tracking systems, early warning systems, more reliable, durable versions of current equipment, more interactive and efficient management approach, all are these are subject to improve in the future.

Also, there are restrictions on theenforceability of suggestions. Social differences and economic gaps between ports push managers to choose different solutions in order to manage their resources mindful. Therefore an answer for a question may differ from port to port. Nowadays leaders of the market try to challenge barriers of mind by getting closer to fully automated terminals, same developing countries still using Mobil rubber tire cranes, even more, some undeveloped areas terminals can be called

only self-geared vessels. Risk potential is higher but still with the same values, on human and asset.

As we examine all contents above, Asyaport Container Terminals is going to be used as a case study.

Despite its rising economy, Turkey is still recognized by a developing country. Noting that general labor welfare, rights, ILO ratification/not-ratified clauses, incident numbers, etc., show us working environment in Turkey also still in its developing period. Although a recent improvement has been made on work safety and labor rights issues according to EU membership negotiations, serious accident severe injuries and loss of life incidents still happen at work environment proves existing agap between EU standards and Turkey. I believe regarding Turkey's vision is to be the leading logistic center which connects east and west, Asyaport will play a vital role and improving its service quality and reputation seen as a priority.

1.2: PURPOSE &METHODOLOGY

I believe this topic is worth to investigate since it is related the most precious element in the business, "human life."

Even though research shows that accident and injuries reduced significantly through the years of developments in thework environment (Sisson 2013), we can still see accident happens as statistical data was given before, causes loss of life or severe injuries, or serious damage to asset or loss. This means still there is room to improve on some safety issues.

As we breakthrough the safety issue, we see no matter human behavior always determinative factor in the whole system. Not only stevedores and foremen who work on the field also managerial approach is to act a vital role.

This research paper will try to point out main safety issues, clarify root of problems, Compare the examples that actions has been taken in order to solve them in particular examples, and a further step, come with new solution thoughts.

1.3 :OBJECTIVES

1- Sınce there is several minimum requirements about work environment subject, what is going wrong with our safety practice?
2- Is there any gap, not covered by current regulations?
3- How to overcome current problems and make create further precaution for potential threats.

We also have some objectives to achieve to come up reliable solution for our aims. This research need to compare different ports systems developed, undeveloped, High Automation, high manpower, technology leaders-cost leaders, examine differences in results regarding total accidents. I hope thedifferent system can be a proven example to others in order to mitigate risk potential.

Our pathway here is; finding realistic ideas which can be implemented in a cost-efficient way, then divide agroup of solutions for each type of port. Separation should concern investment cost, required regulatory foundations, and another available resource.

At this point Asyaport Container terminals will be used as a tool, regarding it is future prospect and fast developing characteristic. Workers legal rights, accident precautions, port equipment and development trends through years will be examined.

In order to evaluate safety risk factors, we will apply AHP model. As a quantitative method, this should give us tips about factors importance in safety behavior. Throughout questionnaire surveys and existing data, research may emerge few key points to managers to focus. Distinguishing the most important issues will help us to achieve a cost effective suggestions, in future investments.

Regarding quantitative methods' lack of ability to answer "how or why" questions, theinvestigation should also be supported by example incidents using qualitative methods. With a holistic approach, meaningful relationships may be unrevealed between problems, reasons, and results and serves our explanatory perspective.

This research's intention is to be a useful handbook rather than atheoretical workshop. Therefore writing method focuses on know-how subjects. Investigating some case studies, resources they had and theamount of usage, theimpact of implementations that decided to adapt whether successful or failed, then questioning whole system applicability to other ports which have similar problems.

Also hypothesis or assumption of today to be challenged with facts and trends of other business thoughts. In order to achieve that related technological works, expecting changes in social life and working culture, business strategies, and globalization trends will be examined. Then the paper will try to forecast which futuristic ideas can be practicable in the future and beneficial to invest.

2. LITERATURE REWIEV

A container port is a field that many parties' interest conflict. Workers, clients, and operators are represent 3 legs of a very dynamic system. All party try to influence theway of work in favor of them. Their attempts sometimes lead a useful improvement but sometimes caused damage to other participants. Researchers with different approaches are necessary in order to reveal interactions between subjects and evolve these 3 legs simultaneously.

While Safety conciseness has advanced through years, there are many types of research have been carried out on safety related topics. Regarding thevast content of the subject, each paper merely focuses one component of the broad safety topic. We may distinguish problems by their causing factors and divide related literature into 2 main topics.

1- Human-related factors & Managerial related factors

2-Technical factors.

2.1 HUMAN & MANAGERIAL FACTORS ON SAFETY ISSUES

As statically proven and also underlined previously chapter most of the accidents caused by worker's improper use of equipment during terminal operations.

Regarding Human factor, various sub-topics examine different component with different approaches.

A research paper goes detail in individuals and research the effect of job stress in container terminal operations Chin-Shan and Szu-Yu (2016), confirms that increase in job stress level results increase in accident risk.

Writers hypothesis were, job stress's negative contribution on safety participations and compliances, also emotional intelligence's positive influence. Results were supporting thehypothesis, and illustrate how job stress & emotional intelligent affects employee safety behavior. While job stress has lead negligent acts, workers with high emotional intelligent behaviors are not so vulnerable, and they manage to maintain standard expectation on safety concerns.

Fabiano, et al (2010), theresearch examined human factor and occupational accidents, by focusing on Genoa port, analyzed data for 26 years from 1980-2006. During analyses changes in variables also considered by paper, such as downsizing a necessary number of workers, or increasing total TEU handled at Genoa. their empirical study at Genoa port shows increasing number of inexperienced , low age workers at container yard, also cause an increase accident frequency. One of the claims of researchers is point out the improper use of new technology also cause anincrease in accident frequency rate. Moreover, even containerization brought a standardization to thesector, new technological advances failed to theprevention of accidents. Conclusion tries to recognize managerial and organizational factors superiority over hardware improvements.

Another research by Chin-Shan Lu and Chung-Shan Yang(2010) has the similar view on the subject and handle subject on focusing leadership and safety behavior affects theworking environment in container terminal operations.

Data has been collected via questionnaires from Taiwanese container yards. Showing the importance of managerial behavior and influence at safety culture in a workplace. Also, results are referred also another paper claims. At the end research point out theimportance of understanding managerial dimensions in creating best safety management and reduce human related accidents.

Cooper (1998) offering a guideline to managers about how to achieve your safety related duty, by clarifying the manager responsibility to sustain safe working system

by setting up 2 tasks. Caring and Controlling. Caring attitude refers that a manager should also pay attention welfare of workers, controlling duty is a being sure with the maintaining safe practice by setting up goals and clarifying expectations and evaluating performance.

H.P. Berg (2013) notes that a major deficiency of safety management is a healthy monitoring and inadequacy in documentation. Recommend that since the beginning of standardizations companies always give most of their attention and energy on technical safety issues, now it is time to focus on the other side of the subject; safety culture, training , competency assessment programs.

Existing research has avarious approach on valid managerial issues. Summary of all research indicate theimportance of establishing a safety management and clarifies its features very well. Although acure has been given by papers still there is aquestion on how to implement and other parties' reaction to it. This dissertation may try to find acceptance of new management implications, and spread one to another by the success of work. Doing that we also reach our objective; how to adapt a successful precaution in another business environment.

2.1 TECHNICAL FACTORS ON SAFETY ISSUES:

Chia-Hsun, Jingjing and Dong-Ping (2014) carried an empirical analysis to underline most important risk factors arisen in the container terminal operations. Researchers took Taiwan container yards as acase study and apply questionnaires. Then using simulation analyses came up with list 35 of factors ordered by their importance. This list may guide port operators to invest which areas or focus which issues with their limited budget and manpower. Results suggest that highest risk is inaccurate cargo

information by owner, followed by dangerous good transportation. It is for an investor to decide best cost-performance factor in order to efficiently use their resources.

However the paper reaches theresult by information comes from real terminal managers, it doesn't question theroot of this factor or suggests to improvements on this issues. Also, thescope of theinvestigation is not limited by safety issues of yard operations but also economical and performance factors of themarket such as congestions, delays, oil prices, strikes etc…

In this dissertation, operational safety issues can be handled in a deeper approach and in order to relate managerial concerns links time and cargo loss incidents can be shown as examples.

Hamidou,et al. (2012) , draw attention to another issue , positioning of dangerous cargo in the terminal area. Papers advise methods of efficient positioning of such container in order to establish a fast, efficient operation but also fully comply with IMDG (international maritime dangerous goods) code of IMO (2014)

International organizations such as IMO and ILO interest in current researches in order to develop mandatory regulation and advisory duties. Safety and Health in Ports (ILO 2005) is a useful guidance that sums up of experience and put in practical rules to follow to maintain safety at work.

Besides law regulatory institutions many private initiatives such as insurance companies, classification societies, and safety related equipment producers, provide advisory service to their customers by publishing papers and hand-leafs. An example of that recommended minimum safety features for yard equipment PEMA, TTCLUB, ICHCA (2012) guidance published by their joint initiative. Handbook has a technical approach on equipment that used in container terminals. Detailed suggestions have been given about gantry cranes, straddles, stackers etc. Main accident causes are listed like wind effect, overloading, fire risk, container damages, etc.

Concerning about long term plans for developments Mark Sisson (2013) questioning about how to contribute our achievements in decreasing accident and injuries at theport in the future. In his research paper, Author claims that Automation on quay has a crucial role and higher automation equal higher safety. This is the approach that actually sees the human factor is the main cause of all serious accidents and tries to take it out from the equation by using technological advancements. Introducing supporting software technologies in operation inevitably causes areduction in staff number. Zwetsloot et al, (2006) indicate process job types required human force in 1970, will be redundant about %70 by 2020. Already %70 of waterfront jobs had been cut by 1970 in Newyork docks due to starting containerization, which has been predicted only %30 by Dockers Union president Teddy Gleason. (Fabiano et al. 2010)

Other than research which digs for thereason of safety problems, we need to look up for thestatistical database to understand trends and improvements and their results through the years. HSE, (Health and Safety Executive) and PSS (Port Skills and Safety) are reliable databases, that keep submitted accident logs and publish reports once in every year. Although HSE is a UK governmental office and covers only UK ports, and PSS is work with private partners still we may obtain improved leading factors that mitigate a number of accident in UK ports and use that to make arecommendation to others.

Regulatory and advisory publications which from a legal body or a privet company is supported by a huge global feedback information pool. All recommendations are arising from a previous real life incident. Therefore they have strong reliable content with experienced events. On the other hand technical guidance contents have a low interest in giving a background of suggestions. Insufficient knowledge about theproblem may not draw attention even for a serious potential threat. Despite their high reputation brand names an employee can find it difficult to relate possible real life threats and even more maybe underestimate risk without a background, or example. As we talked about human factor somehow we have to wake up self-behavior of employee, For example, explaining about safe practice of yard cranes

there are many restrictions with working under strong wind. If we can't persuade operator mind about danger, theoperator may not realize of importance and ignore instructions.

This paper can fill this gap and link, convincing results of previous research to current regulations. Also sums up official statistic provider's data and interpreted with considering trends which effect on changes and give suggestion supported by statistics.

Most of the existing empirical research focus on one particular element in one particular terminal. Due to lack of investigation on collateral improvement has been done, results may not have high accuracy. Also, social and geographic differences may cause a different level of importance or require different approaches from port to another. Therefore this research aims to integrate quantitative and qualitative methods, and reach the most accurate results.

Talking about people's attention, even after we describe thecurrent problem and bring futuristic ideas, it is vital to support our recommends by "how to do" strategies. A solution which solves the problem but impossible to implement due to economic, social or technological reasons, is not a solution at all.

My research can be an interpreter of existing data pool, moreover establish bridges between research that published before.

Regarding technical documents and handbooks and requirements, creating links between reason and results can be a persuasive role of my paper in order to attract managers' attention.

Enlarging scope of previous examples and try to find "how to apply solutions for different port systems" can make this paper a useful tool for managers. Considering different terminal operators'' economic and social capabilities my research should include examples and suggestions for every aspect of development subject. Readers should find applicable solutions for their unique situation.

3. GENERAL OVERVIEW OF ASYAPORT:

Fig:1 Asyaport Entry (https://www.msc.com/tur/news/2015-june/first-ship-docks-at-the-asyaport-in-july)

Turkey has been a bridge between eastern and western markets for centuries. Anatolian peninsula is where the silk road ends and goods being shipped across all over the Europe. Also northern markets of Blacksea relays on safe passage through Bosphorus and Canakkale straits.

According to Turkish Merchant Marine Head Office, 88% of trade in the country is seaborne.(Deniz Ticareti Genel Müdürlügü Report on Ports 2010)

Although Turkey lies on a vital geographic area, there has no significant attempt to use this advantage as a benefit. Opportunities have been lost toexistinghub ports like, Piraeus Greece, or Alexandria Egypt.

At this point Asyaport's vision is targeting to seize the opportunity and take over the hub port leadership regarding the hinterland of Middleeast, Eastern Europe And Blacksea influenced markets. Table show categories of a total number of container handled in Turkish ports from 2004 to 2014 just before Asyaport has been opened.

YEAR	LOADING	UNLOADING	TRANSIT	TOTAL
2004	1.513.985	1.423.582	176.288	3.113.855
2005	1.596.505	1.541.282	174.421	3.312.208
2006	1.824.391	1.848.741	184.921	3.858.053
2007	2.185.359	2.251.170	145.739	4.582.268
2008	2.461.165	2.514.851	115.606	5.091.622
2009	2.202.442	2.189.458	12.542	4.404.442
2010	2.410.865	2.458.351	874.239	5.743.455
2011	2.845.227	2.921.108	757.171	6.523.506
2012	3.116.027	3.178.001	898.368	7.192.396
2013	3.440.242	3.469.876	989.815	7.899.933
2014	3.755.005	3.841.879	754.238	8.351.122

Table 1. (Kugm.gov.tr 2015)

Deniz Ticareti 2014 Yılı İstatistikleri (retrieved 27.07.2106)
http://www.kugm.gov.tr/BLSM_WIYS/DTGM/tr/Kitaplar/20151204_154724_64032_1_64480.pdf

Asyaport is one of the newest port of Turkey, an initiative of Turkish Soyuer family and GLOBAL TERMINAL LIMITED which is affiliated company of MSC GROUP. Estimated project cost is 450.000.000 $. The terminal is located on the northern

Marmara Sea, in Tekirdag city.(40’ 53’’N;27’28’’E) and has started service on 8th of July 2015.

In order to compete with other existing hub centers, Asyaport has been designated to have a potential handling capacity of 2.500.000 TEU. Yard is able to stock total 33.000 TEU and 1.400 reefer containers. Whole terminals are 320.000m2 and total berth length is 2010 meters. The 18-meter depth of port sea zone allows to theterminal to serve mega container vessels too.

Although theport is started operation, some facilities are still under construction and haven't been finished yet.All Highway and railway connections are expected to finish in by 2017 However management expectation is handling 1.000.000 TEU in 2016, and reaching thefull potential of 2.5000.000 TEU in 2017. If Port achieve what they forsaw they will hold the3rd position in ranking all over the European ports.

Regarding its hub port design, such a volume may bypass traffic in the Balkans coast of thewest black sea, such as Bulgarian and Romanian ports.

Fig.2 Asyaport Model

(http://www.asyaport.com/index.asp?p=1)

4. GENERAL OVERVIEWOF LABOUR SAFETY SITUATION IN TURKISH PORTS

Turkey is a huge peninsula, surrounded by black sea, medıterranean, and Aegean sea with a coast line 8483 km.

According to TURKLIM statistics Total 23.200 personnel work in Turkish ports, 8300 of them registered as yard personnel, and another 8300 is work for a subcontractor. And left 6.300 are carrying office related jobs,in 2015 8.146.398 TEU have been handled ın Turkish container terminals (TURKLIM 2015)

Although Turkey has ratified ILO ‘’Occupational Safety and Health (Dock Work) Convention’’, (1979)
comparing EU states Turkey fails on providing Labour rights and work environment safety.

There has been no reported accident in Asyoport yet, howeverin Turkey ‘’Labour Health and Safe Work Assembly’’ (aka: iscisagligi ve iş güvenligi meclisi) announced in 2015 at least 1730 labor lost their life in accidents during work. 25 of them taken place at ports and shipyards.

Table 1 shows a comparison between EU states And Turkey regarding labor death due to theaccidents. (in 100.000 workers)

Ülke	2002	2011
Türkiye	16.8	15.4
AB-15	2.5	1.8
Belçika	2.6	1.6
Danimarka	2	1.5
Almanya	2.5	1.2
İrlanda	2.6	2.6
İspanya	4.3	2.5
Fransa	2.6	2.1
İtalya	2.1	3
Hollanda	1.9	0.9
Avusturya	5.1	3
Portekiz	7.6	4.3
Finlandiya	2	1.3
İsveç	1.2	1.2
İngiltere	1.4	0.6
Norveç	3.1	1.9

(table 2: death rate in EU ports , safety practice at ports A. DANACI, H. KİŞİ)
http://www.imo.org.tr/resimler/ekutuphane/pdf/17246_25_39.pdf

Essential actor on amplifying labor rights and their demand and put pressure on employers is unions.

Limaniş is the union for Turkish dock labors which has 3.845 members, that equals only %16.5 of total labor work at ports. (csgb.gov 2016)

There have been several claims and accusation to employers about their actions in order to prevent laborto be a member of a union. Since being a union member is not enforced as a compulsory act by thegovernment, labor will always be threatened by their membership desire.

Turkey's ILO relations ships started in 1927. Back then Turkey was notan active member of theorganization, remained only as an observer until 1932, when thecountry became a member state of League of Nation. In 1945 by establishing Turkish Labour Ministry, increased collaboration with international organizations. During EU membership negotiations, existing regulations seem not adequate and, in 2012 Turkey government enforced work health and safety regulations law no:6331 which fully complies wit EU regulations. According to that after 1st January 2014 ports has been declared 'dangerousworkplace' category.

Sınce now 59 ILO conventions ratified by theTurkish government, but 46 of them still not adopted, includes MLC 2006. (ILO.org)

Another issue about Turkish economic status. Although governing party increased by a shocking %30 at the beginning of 2016, still Turkish minimum wage is about 1300 TL (419 $) which is lower than in most of the EU member state.As we will examine later, economic struggles, political and social disturbance affect safety behavior of people and puts safety concern of labors back in the line of priority

5. FACTORS THAT AFFECTS SAFE OPERATION IN CONTAINER TERMINALS

5.1 Human Factors and Labor on Safety

The Labor Statistics Bureau has recorded 88 deaths that happened in the container terminals from 2005 to 2012 in the United States. However, some of the accidents impose life threatening injuries to the victims. An accident is likely to happen in a terminal because of is the heavy machinery that load and offload cargo. Additionally, the machinery moves freight that increases the chances of accidents to occur. Despite the harsh weather condition, the movement of freight and cargo is still fast. The movements occur at any time and expose the workers to accidents. The Bureau shows that traffics in the terminal resulted in 52 deaths. Despite the implementation of safety programs for the pedestrians and the vehicles in a terminal, injuries happen. The safety programs include traffic controls, use of safe equipment and employees' skills to operate the machinery. Therefore, more research should be carried out to find new ways to reduce deaths and injuries that occur in a terminal. The companies should focus on the labor and human factors to reduce death and injuries. Because of the impacts of human attributes in the cause of accidents, it is important for an organization to educate employees about safety. The human traits such as stress, motivation, and relations affect the probability of a worker's involvement in an accident. The traits lead to psychotic disruptions, which expose them to accidents. Therefore, concentration is an important aspect that determines if an accident happens. When organizations manage stress and motivation they help lower the number of accidents and injuries in a container terminal. Besides, the workers prone to injuries and death include the mechanics, the repair personnel, the port authority officers, the crew of ships, and the vehicle operators.

The positive hypothesis states that proper management of labor and the human factors improve safety in the container terminal. Therefore, labor and human factors help achieve a positive impact on the safety of workers in the terminal.

The null hypothesis states that the proper management of labor and the human factors do not improve safety. The accidentdoes not occur because of under qualification or mismanagement of the labor and human factors.

5.1.1 Research Design

The internet provides information on the accidents, and how they occur. However, the information about the relationship of the stress, motivation, and concentration is not available. Because the variables are not controllable in a laboratory, the non-experimental research format was applicable. The information depends on the interpretation of data and literature. Moreover, the interaction of the workers is important for the research. The interview data collection method was used. The secondary data was used to compare results. Researchers studied the relationship between the number of working hours and the accidents. The information helped to validate the accidents that happen because of the number working hours, human behavior as well as labor.

The research questions were structured to obtain data of factors that cause stress in labor. The factors include fatigue, family problems, drug abuse, and interactions. Moreover, the questions captured information about the motivation of workers in relation to job satisfaction. The job satisfaction includes incentives, the relations of employees with their superiors, and workload. The simple sampling method was used to get a sample. All the workers in the terminal had an equal chance to participate. The selection was random among terminal workers in all over the country because the probability of accidents does not accrue to a specific group of workers. All workers are vulnerable to accidents The sample size was restricted to only 50 employees and the answers were rigid.

Interview Question	**Number of Employee Responses**	
	Yes	**No**
Have you ever worked while tired or drowsy?	42	8
Do you experience family problems regularly?	12	38
Do you have friends in the work premises?	46	4
Do u have job satisfaction?	27	23
Are you happy with the wages/ salaries?	17	33
Do you relate with your superiors easily?	24	26
Should the workload reduce?	37	13

Table 3. Questionnaire

5.1.2 Description of Results

The results show that 84% of respondents agree to work when tired or sleepy. 24% of them experience family issues that occur frequently. Besides, 92% of the workers have friends in the terminal. The job satisfaction is for 54% of the

employees. 66% of the respondents are not happy with the remuneration. 48% of the employees said that they interact with their superiors in a friendly way. 74% of the respondents agreed on the reduction of the workload.

5.1.3 FACTORS THAT AFFECT HUMAN BEHAVIOR ON SAFETY

5.1.3.1 Stress and Safety

Stress is a human factor that affects work. It is a reaction of the body to respond to pressures or demand. The body releases stress hormones if there is imminent danger. Moreover,O'Keefe, Brown, & Christian (2014) state that stress is a caution to the body and the nervous system prepares for a crisis action. Ronen (2012) argues that stress is helpful at normal events. Stress ensures that a person is alert, energetic, and healthy. Furthermore, a person maintains focus in an activity. Stress assists in overcoming emergency scenarios by the provision of extra power to conquer. When people experience healthy stress, they solve challenges easily. However,according to Ibrahim & Sayed (2011), stress destroys the mind and physic. Additionally, the concentration of a person reduces if stressed. Sometimes a person does not differentiate stress and pressure. In other words, there is no limit for healthy stress. Tucker & Turner (2011) indicate the benefits of knowing the signs and symptoms of the stress. If a person is able to notice the symptoms of stress, he can easily get treatment. The regular treatment leads to a healthy life.

The research question relied on factors such as fatigue, family problems, drug abuse, and interactions to describe the levels of stress. Most of the results show stress. In this context, the indexes show high levels of fatigue and family problems lead to stress. Tesone (2012) indicates that fatigue is a major cause of stress. Furthermore, it reduces productivity and diminishes the logic apprehension of workers. Workers are unable to handle challenges efficiently. More than half of the total accidents relate to fatigue in the container terminal. The incidents of traffic accidents involve the human failures. Fatigue is a result of heavy the workload. Molenberghs (2012) concludes that pay should be equivalent to work done. Nonetheless, it is the right of a worker to

have enough rest. However, the organization in the container terminal does not provide workers with psychologists and psychiatrists to advise stress management. Therefore, the workers do not know the risks of stress and the danger fatigue possess. The workers complain about family problems that occur frequently. An efficient worker is healthy physically and psychologically. The family problems distract the psychological health. The challenges emerge from the nature of the job. The job descriptions in the container terminal involve long hours. The lengthy work period reduces the time that a worker spends with the family. The workers become alien to their families and misunderstandings are bound to occur. Moreover, workers who travel to spend long time frames on the sea. The time can extend up to six months or more on rare occasions. Therefore, the employees have less time allocation for the family. However, the level of pay may influence the persistence of problems in the family. Almost all employees require salary and wage increments. A high number of the employees opt for a salary increase. If the level of income improves, employees in low and average pay jobs believe that the family problems can reduce. There is a significant relationship between stress and family problems. Family problems increase the stress intensity. However, Ko, Hur, & Smith-Walter (2013) show that the pressure from family is essential for growth of an employee. The pressure provides necessary pressure. The employee ambition includes the happiness of his or her family. Therefore, an employee reduces productivity as a result of comfort in the family. Nevertheless, the family problems are dependent on the immediate social and cultural factors. For example, the family friends of a worker influence the domestic pressure. A family strives to be the best among the fraternity of friends. The community influences the cultural factors that affect the pressure in family units. The workers in the container terminal compete with families from other occupations from the same area. A high variability in remuneration creates cultural pressure. The pressure affects the family units and directly affect the stress levels of workers. A good economy ensures that a family can upkeep his or her needs. Constructive stress emanates from affordable family pressure. When a worker does extra work, stress acts a motivation factor. Conversely, the family pressure is expensive for a worker

andleads to destructive stress. A person feels helpless if he cannot afford to pay for his bills and basic needs. However, Molenberghs (2012), indicate that a worker learns to live with the pressure that is unbearable. The pressure is harmless if there is a way that the worker relieves the pressure gradually. The pressure is a time bomb if there is no incentive to relieve pressure. The pressure accumulates and becomes destructive to a person. A person who suffers intolerable pressure experiences involuntary reflexes that are a danger to the patient.

Drug abuse causes stress because it disrupts the normal functions of the body and the mind. There is a strong interrelationship between stress and drug abuse. People use substances to hide from the imminent pressure and stress. The level of stress can directly determine the indulgence in substance abuse. The results show half of the workers are comfortable to report to work while under the influence. The workers abuse cigarettes and alcohol. Despite the caution of workers being sober during work, half of the workers cannot afford to skip work in case they are under the influence. Some workers believe that they are more productive when under drugs than when they are sober. However, the nature of work in a container terminal is dangerous to a drug abuser. Nonetheless, a person who abuses a drug is a danger to other workers and the assets of the employer. Drug abuse is a danger to safety.

The interactions among employees in the work environment is essential for safety. Friendly employees offer emotional and economic assistance. The employee interactions create a company's culture that is an identity of the individual employees. Employees experience similar problems because of the similarity in incomes, social class, and the job context. The prevalence of interactions reduces the individual stress and the absence of employee relations results in stress escalations. The results indicate that the employees in the terminal are friendly. The friendliness is an explanation of the reduction in the number of accidents. Conversely, loneliness is a symptom of stress. Because the lonely behavior is unusual in a terminal, cases of psychotic support are less. The few cases of advances in stress caused by intrinsic lonely behavior possess more danger to the safety of other workers. It only takes an individual to cause an accident that causes multiple fatalities. Therefore,

unfriendliness in the work premises is unacceptable except for new recruits who are yet to make friends.

5.1.3.2 Motivation and Safety

Motivation is another human factor that affects the labor force. Motivation is the internal drive to achieve goals in an occupation. It is the drive that regulates employees discipline in the absence of the authority. Motivation is dependent on self-drive. Self-drive is the mental convictions that a person has an ability to accomplish particular objectives. Self-determination relates to job satisfaction and the relationships between the leaders and the junior workers.

The results of the study show that most of the employees do not enjoy job satisfaction in the terminal. The level of satisfaction depends on remuneration, rest hours, and social class in an occupation. The employees do not have good wages and they lack enough rest hours. The frequent problems in the family relations indicate that the job does not provide adequate positions in the social class in the society (Ko, Hur, & Smith-Walter, 2013). Therefore, employees lack motivation from job satisfaction. The employees are helpless because the job contracts are exact in the number of hours and the wages. The contracts provide an annual review of payments that occur once. Therefore, it is difficult to follow the reviews because of the busy work schedule in the terminal. Employees do not work hard because any future hope of incentives. Therefore, employees are ready to combine occupations to supplement their incomes. According to Ronen (2012), employees allocate more time on the occupations that are profitable. A worker is ready to shift or combine occupations to ensure that he achieves his needs in the shortest time period. The fast pace of the activities in a terminal is an explanation of the importance of time. However, speed increases the possibility of injury, especially in places that involve high traffic or heavy machine use (Bartošek & Marek, 2013). Consequently, job satisfaction contributes to the safety of employees. Pawellek and Axel argue that job satisfaction can lead to underperformance because workers are not content lack ambitions. The management is responsible for the motivation of employees.

The employee- employer relationship is a major factor that affects motivation. Employers are able to manipulate the actions of juniors if they can relate to the problems, needs, and ambitions. Researchers show that almost half of the employees have direct relations with the superiors. The Maslow Hierarchy of needs provides a concise conceptualization of employees' satisfaction of needs. However, workers are different and their needs are unique. An employer success relates to the worker comfort and the consideration of employees. The Hawthorne Studies show that people react differently to observations. A person acts differently if he or she knows that there is surveillance. Because of the shifts in employee behavior in the presence of superiors, their relationship is absent. Consequently, the employer faces difficulty in the observation of real traits of workers and cannot predict the danger that stress causes.

5.1.3.3 Training Programs on Safety

The employers in a terminal must train employees on the dangers of fatigue when controlling traffic. The employee knows the sign and symptoms of fatigue. Training programs should include the substance abuse education ("OSHA TRAFFIC SAFETY IN MARINE TERMINALS", 2016). The employer designs and the workers assist in implementing measures of safety. The measures promote an alcohol and drug-free environment. The program includes the worker education, a drug-free company policy, supervisor education, and drug tests. The assistance to workers is a feature for the drug users. Ibrahim and Sayed (2011) argue that the human resource is the most significant factor of production. Therefore, the investment of training programs to the labor force results in an increase in productivity.

5.1.3.4 Safety Awareness Programs

The employer provides the necessary information about the dangers of accidents in the terminal to pedestrians. The information states the instructions and directives for the protection against injuries. Information includes the provision of visibility vests, available pave ways, the blind spots, and the swing radius of trucks and the forklifts (Bartošek & Marek, 2013).

5.1.3.5 Employee Psychology Benefits

The employer must invest in the psychotic health of the employees. The funds prevent property damage and the absent days as a result of the injury. (Kelloway, 2015) argues that the prevention of a catastrophe is better than the solution because there is a possibility that of the lack of a cure. The employee who attends mandatory psychiatrist sessions shows significant improvements in performance. A healthy human resource ensures a comfortable environment for work and innovation.

In conclusion, the positive hypothesis is true in that the good management of the labor force results in improvement in the safety. The number of accidents in a container terminal is reliant on the human factors and the psychotic wellbeing of the worker population. The human factors influence the human behavior and the safety of employees. The stress, motivation, and concentration affect the safety of workers. The non-experimental data is useful because the factors are intangible and qualitative. The employees in a container terminal experience stress that is destructive and endangers the safety of the human population. The pressure from families, the workload, the rest hours, the interactions of employees contribute to stress. Most respondents' express negativity because of the nature of the jobs in a terminal. However, stress is necessary to achieve performance. The absence of stress implies that the employees are content and there is no variable to cause effort. Yet, stress is a threat because there is no exact difference between constructive and destructive stress. Motivation reduces stress and contributes to concentration and safety in the work premises. The employer is responsible for the motivation incentives. The employer-employee relationship provides a platform to assess the motivation of employees. The motivations of employees emanate from the self-determination to accomplish good remuneration and a good social image in the society. The lack of determination leads to the job combination by the employees to realize their ambitions. The work of speed increases and the employees reduce in job concentration. The case poses a danger for the human population in the terminal. The introduction of training and awareness of the probable dangers in a terminal improves safety. The education features employers, employees, and the supervisors.

Furthermore, the aspects of the education include management, safety issues, and the identification of intrinsic problems. Moreover, investment in psychiatrist sessions for employees prevents destructive stress and helps improve employer-worker relations.

5.2 Management factor of safety operation and accident prevention in container terminals

The past few years have witnessed a lot being said concerning the importance of managing well the safety within the industries. One of the major areas that have had to depend on maximum prevention and analysis to ensure thesafety of the workers is the container terminals. Loading of the containers and their respective discharge are very significant in the network of transportation at the sea. The very operations within the container terminals have always proved dangerous and hence the necessity of exercising the highest precaution of managing the safety of the workers whenever they are at their places of work (Lu & Yang, 2010).

5.2.1 Managerial Factors in ensuring safety at the container terminals

The management is the primary body that is tasked with ensuring that its employees stay as safe as possible. This should be in relation to the creation and the subsequent maintenance of the safety and the health standards of the place of work. The employer has a duty of (Bartošek & Marek, 2013):

- Ensuring that all of the work activities around the container terminals are managed and conducted in the best way possible. This will help in ensuring the worker's safety and their subsequent welfare
- The container terminals' employers should be able to design, to provide and to maintain the terminal with:

a. A safe access and a good egress
b. The employer should be able to ensure that the container terminal is very safe for use by the employees and that none of them is faced with any health risks when working at the terminal

- The employer should be able to prevent the employees from being exposed to risks by limiting their access to dangerous or machines in heavy lifting at the terminal.
- The management should be able to provide the employees with welfare facilities.
- The management should be in a position of ensuring that the employees are provided with the necessary information about the risks that have relation to the activities being carried out at the place of work.
- The employers at the container terminals should be able to provide the employees with the opportunity for the accidents that can be reported and the hazardous situations within the workplace are forwarded to the Authority in Charge of the workplace health and safety.

If the above procedures are properly followed at the place of work, then there will be a tremendous reduction in the rates of accidents within the container terminals. It will also be fundamental to ensuring the utmost observation and respect for the safety and the health of the workers.

The process of ensuring that the working place is safe is not just the role of the employers alone, the employees also have a huge role to play in the process of ensuring a secure and safe environment for carrying out loading and discharge of the containers. The employees can help with ensuring that the workplace remains safe and free from preventable accidents by:

- Complying with the available legislation regarding safety and workplace health.
- The container terminal employees have a role in ensuring a maximum co-operative with their respective employers and the other individuals that are in charge of running the operations of the terminal
- The employees should ensure that they don’t get access to theworkplace in the case they drink or under the influence of any strong substances.

- The employees should also be keen to replicate the training they obtained regarding the safety of the workplace and put them to use.

How to improve safety at the container terminals

There are several factors that can be put into practice to ensure that the workplace at the container terminals remains as safe as possible. The first of the procedures and the steps that should be utilized are stated below:

- Making use of the Fail-safe design and ensure that it is not compromised in any way whatsoever.

This can be argued for a fact that if there is excessive reliance on the equipment provided safety then this will limit the reliance that will be held in the decisions on the humans and their judgment. The mostly used improvement measuresare the improvement in the safety protection buy the equipment. However, in the case of malfunctioning of the protection offered by any of the machines, then there is a recommendation for more advanced systems to be used. The design of using thedevice of fail-safe to help with ensuring that the workplace remains as safe as possible. This is done by using the instrument.

5.2.2 How to create a safe working environment at the container terminals

There can be several difficulties associated with working at the ports and the container terminals while they typically remain operation for 24 hours of a day, in numerous conditions and with a variety of employees and the contractors working on their respective activities. This therefore calls for all of the stakeholders that are concerned to ensure that there is a safe working environment created within the container terminals. This is an obligation to the employer in ensuring that the working environment of his/her employee remains as safe as possible by ensuring implementation of the safety systems at the workplace. Below are some of the potential strategies that the respective container terminals can, make use of in the case they have a goal of making the working environment as safe as possible.

a. Traffic Management

The management of traffic should have a direct aim at reducing the transport hazards that the workplace exposes the employees to hence provide a site which is relatively safe. For instance, there are cases where the transport control has little or no power over them. If this occurs then there should be control measure put in place to ensure that there is proper management of transport within the given areas. This includes the provision of the speed limits, proper lighting, and the use of roads signs, walkways, just to mention a few.

b. Installation of mirrors to aid in vision

Making use of the mirrors is always a very fundamental tool for assisting in vision. This therefore for thenecessity of fitting mirrors in the vehicles being used in the container terminals to ensure that the drivers of the trucks have a clear vision of that which is going on around them at any given time.

c. Employee training

In order to prevent security breaches and unnecessary exposure to theaccidental situation, the employees should be taken through thorough training in the best way of handling oneself when at the workplace. Furthermore, they should also be provided with the instructions in the necessary steps and procedures to follow in the case of an accident within the premises of the terminals.

d. Safety Regulations

The employees should be provided with appropriate safety regulations that govern their area of jurisdictions. These are the limits that the individuals that are working at the terminal should not go beyond in the case of any danger within the terminal. Furthermore, it should provide necessary steps that should be clearly followed in the case of an accident at the container terminals.

5.2.3 Imposed regulations at port by port authority to ensure safety at the container terminals

Port authorities always have a wide range of lawful duties that are related to the safety and the very health of their employees and the other individuals that are

using the water in the area of their jurisdiction and the facilities within the ports that they control. The duties are always expected to be applicable to taking into consideration of the port's size or the nature of the business that is being carried out.

In the case of the multiple-operator ports, where there are several terminals that are present at the ports, there is always a call for them to forge their operations and carry out their duties in togetherness. However, this should always be done in collaboration with the respective port authority. This is expected to aid with the effectiveness of the management at the ports. For the sake of the facilities of the shared ports and the ones for the common users, they too have an obligation to having Maximum Corporation with the one another to make sure that the place of work remains as safe as possible. There should be properly laid down protocols, Procedures and rule that regard the safety of having the facilities and areas managed appropriately.

Ports authority ensures that the ports remain as safe as possible. It does this by ensuring that it remains directly responsible for the movements regarding shipment to and from the ports facilities. It also imposes control on the cargo that it regards as being dangerous. It does by ensuring that it remains solemnly responsible for the issues regarding the maritime operations.

To ensure that the safety of the employees is respected, the port authority has also ensured that there is a provision that governs the contracts with the employers. This is very helpful full as leads to the satisfaction of the employees hence making them –give their best when at the places of work (Yousefi, 2013). The port authority also provides a regulation on the procedures that can be used within the port hence ensuring that unnecessary clashes are avoided by providing a systematic way of handling the clearances and forwarding of the cargo at the ports.

The Safety, Health and Welfare at Work Act 2005 has set up a framework through which the safety at the place of work is properly managed. This regards the employers, the employees, the contractors and even the other employment personalities within the employment sector. At the container terminals, there is

theimportance of having in place proper ways of identifying and assessing the hazards that the workers and the employers are faced with on a daily basis. The act has provided a clear way of handling the safety of the workplace by setting out the guidelines to be followed in the following cases (Monie, et al. 1998):

- Ensuring that there is proper control of the safety and the concerned individual's health
- Proper management, organization and the requirements relating to the system of work at hand.
- The responsibilities and the roles that the employees and the employees have.
- The necessary procedures for ensuring that there is adequate enforcement of the rules and toe regulations of the safety process within any given container terminal.

There are several other legislations that are also aimed at ensuring that the shipping and the container terminals remain as safe as possible. One of them is the national maritime legislation which contains several Merchants Shipping Acts. This is legislation that contains a variety of the legislation regarding the implementation and the safety standards at the international level (Zhao, Mi & Bao, 2012). This is management with regard to the security and the safety of the ships, the cargos that they carry and the very individuals that either has a direct or an indirect role with how the ships and the safety of the environment of their operations.

5.3 Asyaport's Management Polıcıes and Interactıons With Labors

Right after Asyaport opensits gate for thevessel, an integrated governance system policy has been declared by port management. According to their

declarationmanagement assures that port will be responsible for any education in order to increase it's personnel's technical and behavioral capabilities.Candidates who apply a vacancy in the port have to complete a test which reveals person abilities and interests. Only then Human resources departments assign workers for a position fits them most. All operators are systematically being trained for their responsible equipment.Also how to react in an emergency situation, such as accident, fire, earthquake, and security related subjects according to ISPS. Training not only focuses their health on theworkplace, as well as environmental protection.

Asyaport is the first port in Turkey which established a training facility with simulation equipment. STS an RTS crane operators have an obligatory 6 weeks education here before they start using their equipment.

Also Port policy encourage to teamwork between management and field workers. In order to get high efficiency. Port also sees worker's collaboration in decision-making progress as a vital element. (Asyaport policies 2015)

Human resources center are responsible for interacting daily needs of employees. Port has created a network system for their labors to create a friendly work environment and make thebond between workers. To do that Social activity, cultural briefings, welfare programs are carried regularly. In order to demonstrate equality among workers port management established a mosque, a church and a synagog in the port facility Also port community has proven their unity as their reaction to unlawful attacks on ademocratic foundation of thecountry on 15thJuly 2016, by organizing marches and protest under the Port banner.

Port Management also has rigid prohibitions and restrictions due to sustain order in theport area.

List of rules placed all over the port also given as leaflet to workers. According to thelist, Work without asafety helmet, safety shoes, fluorescent safety vest are strongly forbidden.

As we mentioned before vehicles movement in port should be regulated and monitored closely by management. Getting off from thevehicle, outside the established safe zones are forbidden. Also drivers must drive under speed limit inside the port, and not use their mobile phone while driving. Container's doors must be closed during the transport.

Whoever breaches one of these rules may face a 3 days suspension for the first breach and up to permanent suspension from work if act repeated.

Port policy has no tolerance towards illegal drug usage and works under alcohol affection. Employee who found under influence of a substance , shall immediatelyremove from position (Seaport work health and safety rules Asyaport 2015)

5.4 Technology Use in Ensuring Safety at the Container Terminals

Since containers were introduced during the 1960s, there has been tremendous efforts made in ensuring the safety of workers and the workplace in general. Due to the complexity of the supply chain within the ports, increasing the efficiency of the ports technologically is the best way of ensuring the safety operations and the prevention of accidents at the ports. To enhance the safety of the ports and that there is theadequate prevention of the accidents, there are several factors that should be taken into consideration. They include:

- Proper management of transportation within the airports. This includes the optimization of the way the carriers are chosen with a basis of the service that is required and the freight rates
- There should proper management of logistics. This should include tracking of the containers as they are moved from port to port by providing the most

appropriate routes for use, how the containers are stored and distributed in the best and appropriate way as possible (Sudalaimuthu & Raj, 2009).

- Documentation concerning trade and the transportation of the containers. This should be done electronically, customs clearance and other staffs that are requirements that are needed to regulate the ports.

Below are some of the recommendations that can be technologically followed in ensuring that the ports remain as safe as possible. They provide features that can be followed in ensuring that the ports remain as safe as possible.

The port authority or the individuals and companies concerned should ensure that there is an adequate use of travel anti-collision in reducing the risks of the cranes colliding with the nearby objects (*Porttechnology.org*). In ensuring that this is done, the concerned persons should be in a position of putting down two zones of detection within the ports. They include the warning or simply the zone for slowing down. The authority should also institute a zone for stopping of the vessels to ensure that they are safely parked and that they don't pose any harm to the users and the employees at the port. Furthermore, this type of range of detection is to ensure that there is adequate time to enable the cranes to have a normal stop (Bartošek & Marek, 2013). The detection zones should be designed for the sake of the pathways and the respective cross-travel anti-collision. As a result of the cases of wear, tear and the reality of aging, there should be a test done annually to determine the time taken before due the functioning of the brakes.

The concerned persons at the ports can also ensure that they have machines and equipment in place to help with the detection of wind and alarm to give the drivers a chance of stopping any of the operations that he or she might be indulging in, park and then be able to shut down the equipment in safe way (Bartošek & Marek, 2013). This will ensure that there is a reduction of the damages and the respective injuries that the operating RTGs can cause if they are operated in the cases of high winds. This can be done by having an anemometer installed at the top of the audible and indication that can be visually seen by the driver. This will enable the drivers to determine whether the limit that is safe for the operation of the crane has been

reached or not. There should also be the installation of audible alarms to give an indication to the individuals who are using the berth that the given limit has been attained (Peng, 2009). There should also be [proper rating of the anemometer in the cases of awindstorm. This will be with regard to the speed of the wind and the direction of thewind. This will be subsequently recorded. Just to caution the users and the drivers of the cranes. They should be fitted with the equipment that shuts themselves down automatically. This should be an exclusive case even in the instance of continuous sound by the alarm. If this is done, then the equipment should be able to the respective positions of parking.

There is another highly valuable aspect of safety that should be followed precisely by the users of the ports. This should be by making sure that the braking of the equipment is resistant to being improperly utilized and free from manipulation as well as the influences and aspect of the environment. This will help in preventing movements that can't be controlled and that which come from the winds that suddenly moves (Peng, 2009). The braking system of the equipment should be able to withstand a certain amount of wind. The most recommended one is always 40m/s. This is a scenario that should be taken care of during designing of the equipment. In this case the distribution of weight that is uneven should be keenly monitored and corrected.

To ensure that the ports remain as safe as possible, the ports should have the temperature and smoke detectors in the sensitive areas like the electrical rooms and the machine rooms (Peng, 2009). This will be fundamental to ensure that there is reduction or prevention of the cases related to fires in the electrical rooms and the machine rooms. To ensure that this is put in place, the port should have adequate alarm systems installed inside of the rooms for electrical control. The alarm systems should be able to provide both of visual and audible alarms in the cabin of the driver, inside of the electrical, rooms and also in the ports of the given gantry structure (Yousefi, 2013). In the instance there is the detection of temperature or smoke, there should be anadequate transfer of information to the office in charge of maintenance for the response action to be taken appropriately.

The port authorities across the globe should also put into practice the ideology of protecting the ports against the risks of being caught up in fire by using detection and suppression machines that are reliable. This will ensure that there is theadequate prevention of fire related to the equipment as a result of the hydraulics and the fuels used. For the sake of the hydraulic systems, there should be the use of the head sensor present in the hydraulic system to help with stopping the activities after the oil being used in the hydraulics has reached a temperature of 90 degrees Celsius (Lu & Yang, 2010). This will help with the risks that are associated with fire at the port.

For the sake of the fuel systems, there should be the use of the pressure after the fuel has been pumped. This will be reliable in giving out warning the one in charge of operating the equipment of cases of leakages of the fuels and hence making the engines stop immediately. When the fire detection systems and the suppression system have been properly used in the compartments of the engines then this will lead to a reduction in the cases relating to fire within the ports and of the equipment being used (Lu & Yang, 2010).

Another way of ensuring safety and security of the dock is to have a device to be used in fixing the trolley to the given bridge. This will be very useful in ensuring that the trolley is not carried away hence putting an end to the storm pins for the given trolley in the position of parking at the bridge of the crane (Zhao, Mi & Bao, 2012).

One of the technological advancement that has been used for quite a while now is the case of using the system of auto steering. This has helped with ensuring that the possibility of being a collision with any of the containers at the track or other structures that are strategically fixed during the process of long traveling are minimized (Lu & Yang, 2010). It can be done by making use of the distance measurement that is optically reliable. This ensures that there is proper maintenance of the RTG on the track. This can therefore be deployed by any other port across the world who has any ambitions of reducing cases of collision within the premises of the port.

The ports can also deploy the use of the anti-truck lifting to help with the safety of the ports. This will be fundamental in assisting the truck or the given trailers when the container is being hoisted as a result of twist locks that are not being able to be unlocked (Won & Kim, 2009). This can be done by ensuring that there are optical sensor systems of measurement in place. The optical sensors should be placed at specific zones of detection to help with monitoring the wheels of the given trucks or the trailer or even the axles of the wheels. The sensor should also be mounted on the inner parts of the sill beam of the truck lane to help with stopping the activity related to hoisting the truck in the case of an identification of the lifting of the truck or the trailer. In the instances when the weighing system of the container has been utilized for the sake of lifting the equipment then the weight of the measured container can be put in comparison with the weight that was previously determined (Won & Kim, 2009). This can help with stopping the movements due to lifting just in the case of the increased weight.

There should also the use of the safe location of the driver. If this is done in the best way possible then, the cases or the risks related to acollision with the driver of the truck at the given road of the port's stack can be minimized greatly (Monie, et al. 1998). Sensor technology for detection or the mats that are sensitive to pressure or just the use of the confirmation buttons can be very useful in helping the safety of the truck driver in the case of handling of handling of the container. This will greatly help with improving the safety of the most fundamental member of the port, the driver.

To ensure further safety for the drivers, there should be the use of the filtration for the operator cabin air. There have always been increased cases of the drivers of the equipment suffering from effects caused by emissions or the other related pollutants found at the waterside. This can be reduced by having the cabin provided with apositive filtration system that has been proved. This should be one that has very high rate of efficiency particulate and the absorbers of the gas or related qualifications to help with the protection of the driver of the trucks from being

exposed to the harmful emissions that come from the air pollutants of the ship (*The economist*, 1843).

There are several other cases and procedures that can still be taken to ensure that safety of the drivers. One of them to ensure that the driver remains as protected as possible and with the utmost visibility from his seat. This will minimize or eliminate the case reacted to the collisions of the instruments within the yard. This can be done by having the trucks fitted with air bags to help with the preventions of very serious injuries in the case of an occurrence of thetoppling of the straddle. The drivers should also have their trucks fitted with reflective stripes that are of high visibility on the side and on the front of the legs. The truck should also have the LED brake lights at the same level with that of the eye.

The next procedure that should be taken to ensure that the dock remains as safe as possible is by having an indication of the load and the positioning to help with the prevention of entering some specific zones or even the zones that have been prohibited (Office, 2005). This will be very fundamental in ensuring the damages that are related to the equipment getting into the areas that have been prohibited is done with the help of the restrictions of the axle loads. This can be done by having a routine of having one sound the alarm and then stopping before making their entry in the zones that have been prohibited by the load restrictions of theaxle. This can be done by making use of the indicators of load that has a link to the DGPS or other systems that are used for localization (Lu & Yang, 2010).

Finally, there should a properly installed system for safe speed control. This will be fundamental in ensuring that there is theprevention of the AGV that is running are speeds that are not controlled (Lu & Yang, 2010). It can be done through the help of the encoder sensor for detecting speed so as to help with the prevention of the high speed that is not controlled.

It can therefore be concluded that safety at the ports is something that is fundamental. However, the dangers and the rates of the accidents at the port can be reduced and prevented respectively. It is also good to note that it can only be prevented if there are systematic procedures that are followed.

Fig3. Asyaport SSG cranes (www.asyaport.com/Assets/Gallery/Zoom/f204f83a-e77c-46ed-a8cb-1d1a2fed195f.jpg)

5.4.1 Technological Advancement of Asyaport

As Asyaport one of the newest port of Turkey and has a great potential to be aregional leader, port governance ensures the most reliable technologies in used during operations.

There is 11 SSG (Ship to shore gantry crane) with a max. lifting weight 65tons and able reach up to 24-row containers on board. Also to provide operation mobility 2 MHC (mobile harbor crane) accompany handling operations with a lifting capacity 40 tons, 17 row reaching capacity on board.

Regarding ports' hub mission, a well-ordered stocking and very efficient stacking procedure is necessary. There are 33 RTG (rubber tier gantry) in use at stocking area,

work with 49 TT (terminal Tractor). Beside them also 2 RTS (Reach truck stacker 45 lifting capacity, and 8 ECH (empty container handling machine) 7 tons lifting capacity are extent container storage ability.

A collision prevention system and anti-truck lifting technology are being used in all crane in the terminal. Trough mounted sensors on crane body, and spreader, themachine may reduce thespeed of movement or even stop operation itself in order to prevent a dangerous clash.

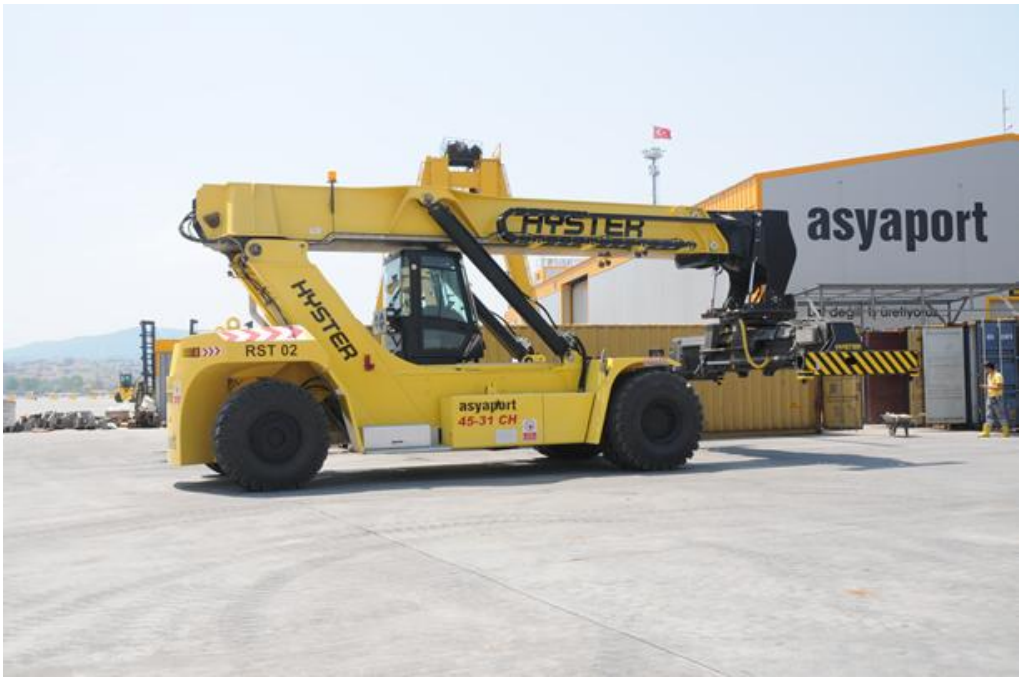

Fig.4 Asyaport Stacker (www.porttechnology.org/images/uploads/news/gottwald_hamburg_AGV_battery_powered.jpg)

Also advance IT system has been established to support in all operation in the port. In this matter Port Authority chooses to use VCE Vblock systems to cope its complex logistic system. As IT company claims, VCE Block system designated to

mitigate to therisk of downtime, saves Port against time lost, potential pollution, and severe penalties.

Also VCE system helps to performance optimization and data handling. Port now able to track and handle up to 5 millions of container per annum. Software works integrated with all yard equipment and monitored by IT center in Port Headquarter.(vce.com)

Another distinguished feature of Asyaport is being the first ECO PORT PERS awarded terminal.

PERS(Port EnvironmentalReview System) is an award given by ESPO (European Sea Ports Organization) and Lloyd's Register to ports that achieve high environmental standards. Sınce now there are only 27 ports awarded in Europe.

Port generated 186.053 kWh electric power in second half of 2015 Moreover Asyaport is the first port in Europe which uses LNG fuels instead of diesel, in port transportation equipment

According to Port Authority Asyaport's environment-friendly technologies will reduce greenhouse gas emission by 1630 tons annually. (asyaport.com/news).

6. CURRENT LAWS AND REGULATIONS

Operations on daily business at the seaports have potentially been dangerous business since early times to the present shipping industry. The shipping industry is a venture where time is very important, its money and in most cases, it has been observed that the managements of the ports breach the prescribed safety protocols in order to improve the speed of operations that results in the increase of profitability (plc, 2016). The outcome of such ambitions is that the workers at the dock are

increased risks of respiratory problems and life-threatening injuries, and in other unfortunate cases, death results. Presently, the operations at the port rely on complicated container stowage movements accompanied by the use of large cargo handling machines. Although the safety of the dockworkers has always been the key foundations of the domestic as well as the international platforms, the management of ports, agents of the government and other organizations that bring together nations have gradually developed a number of guidelines on the safety programs as a response to the numerous maritime related tragedies in the recent past (Kuehne & Nagel, 2016).

In the past, the management of the ports perceived the port safety programs as unnecessary barriers that affected the sought after performance levels and were thought to infringe the expected profit margins that the companies so desire. It has however been realized that very high premiums for high insurance cost of compensating injured workers, court fines resulting from lawsuits are more expensive compared to the designing and the control of safety plans (Kuehne & Nagel, 2016).

The physical and health safety is a concern in the modern global economy. With the heights of globalization being achieved, it is expected that the level of imports and exports amongst countries is expected to reach the highest levels. Sea transport is the most popular cargo freight ever embraced in the movement of goods overseas (Kuehne & Nagel, 2016). More entry of cargo into the port facilities has made it possible to have in place more cargo handling equipment and the movements of cargo to deliver them to the next level in the handling process and thereby increasing the risks of work-related accidents. Some of the safety procedures that have been put in place over the recent past include the programs on safety training, initiatives on environmentally friendly operations as well as the introduction of automated machines that are probably powered by electricity to handle cargo, automated vehicles and the use of character recognition devices.

6.1 The safety issues associated with cargo handling

There are a number of dangers that have existed within the ships as well as outside, the hold men, people working on the cargo inside the cargo vessels to the center of the hold from the wings, communicated with the machines operators using signals. The gesture of the hold man directed to the operators where they expected the cargo to be moved. This means that any misunderstood signal would always lead to a disastrous to the workers carrying out their activities under the containers. These people in most cases have had very small spaces, and time to escape the falling cargo containers.

Dust inhalation is another danger that the workers at the port face. Notably, that dealing with cement products; and since there is poor ventilation and it becomes very difficult to avoid suffocation, and this leads to severe breathing problems. Other dangerous elements include acid, fertilizer, and asbestos. It has been noted that these issues are usually reported to the port management, but no action is usually taken. In July of 2016, the safety of life at sea convention of the international maritime organization or IMO came up with regulations that require the shippers to verify the mass of the containers on transit when tendering it to the sea carriers as well as the terminals. There are however very many frustrations regarding the lack of proper information from the significant service providers. It is important also to note that different countries have different rules and procedures of handling procedures that have made it very difficult to implement in order to comply with some of the rules (Port Equipment Manufacturers Association, TT Club and ICHCA International 2 3 Recommended Minimum Safety Features for Container Yard Equipment INTRODUCTION, 2012).

The United States, Department of Labor report came up with how severe the injury rates of the workers are at disturbing levels. It was in fact described at one point as one of the most dangerous forms of labor that one could engage in (Kuehne & Nagel, 2016).

6.2 The enforced legal regulations

The enforced legal regulations on safety procedures that have been put in place over the recent past include the programs on safety training, initiatives on environmentally friendly operations as well as the introduction of automated machines that are probably powered by electricity to handle cargo, automated vehicles and the use of character recognition devices (Kuehne & Nagel, 2016). On July 1st of 2016 nevertheless, the regulations became international law under IMO but a law in 162 countries that are signatories to the SOLAS convention. According to the regulations, it will be the responsibility of the shipper to provide the verified gross mass (VGM) that have been signed on paper or electronically. According to the regulations,carriers are not expected to load any cargo containers in any part of the world without being accompanied by the verified gross mass (VGM) because that would mean they are not in compliance with the insurance rules and the flag state. The list of country by country guidelines by the world shipping council showed that only approximately two dozen countries of the world had adopted the guidance in June. A number of the challenges faced in the adoption of the rules stem from the desire by all the stakeholders to avoid any increases in the cost of operations which could compromise their objective of earning their desired level of profitability ("Regulations on Subdivision and stability of passenger ships as an equivalent to part B of chapter II of the international convention for the safety of life at sea, 1960 ..," 1974).

The lack of training amongst the dockworkers is said to be the highest contributors to the high rates of accidents. The 2006 maritime labor convention was adopted by the international labor convention of the international labor organization (ILO). The convention was under the ILO Constitution in article 19 in a maritime convention in the year 2006. The main aim of the article prepared in the convention is to carry out an analysis of the MLC regulations concerning the inspections in the sea ports (Dacanay & Walters, 2011). This required that those countries that are

members to the ILO that have ratified the MLC enforce the contents of the article through the port state control procedures. The MLC regulations as constituted do not directly apply to the ship owners but actually relies on the implementation by the countries through their national domestic laws or other regulations. This, therefore, means that those countries that have signed the convention are required to align their law as to the MLC which will then be implemented by the ship owners and other stakeholders.

More recently in 2010, the occupational safety and Administration (OSHA) came up with a revised regulation that provided the guidance to be enforced for the maritime cargo handling sector. According to the OSHA guidelines, the emphasis has been placed on the need for the port managers to provide the dockworkers with personal protective requirements and the vertical tandem lifts that were aimed at reducing the number of injuries involving the workers. In 2010 alone, the United States labor statistics showed that seven people died while another 2,900 were injured while carrying out their duties at the cargo handling centers (Dacanay & Walters, 2011). The directive by OSHA required that a clarification is made on the personal protective equipment so that the employers would be required to provide their employees with the protective equipment at no cost when the employers must pay for the replacement of the equipment and cases where employers don't pay for the protective equipment.

The international labor standards on occupational safety and health have set a principle that states that all the dock workers are protected from ill health, disease and injuries that arise from work related issues (Maistralis, Wang, & Bonsall, 2003). It is unfortunate however that for millions of dockworkers, the reality is very different. The code of conduct has set out a number of guidelines for port managers and their employers they are intended to supplement the national laws on dock workers safety rather than to replace them for purposes of mitigating the effects of accidents on the workers.

As a result of the numerous stakeholder interventions to improve the safety of the dock workers, some modern day cargo handling mechanisms have been created thus significantly reducing the number of work-related injuries and fatalities. First came the automatic guided vehicles in the 1990s. Most European firms introduced the automated guided vehicles and the automated lifting vehicle. The AGV, s was programmed and manage med by a global positioning system (GPS), where the cargo container would be moved from the ship and placed on the designated yard address. The advantage of the system is the reduction of the workforce and most importantly the reduction in the risk exposure by some of the people handling the machines (Maistralis, Wang, & Bonsall, 2003).

fig.5 AGVs At Hamburg Port (porttechnology.org/images/uploads/news/gottwald_hamburg_AGV_battery_powered.jpg)

The other safety measure is the introduction of the twist locks. The automated twist locks were meant to further improve the safety of the employees who worked on the unloading of the containers. The twist locks were designed to secure the containers that have been placed on top of each other. OSHA estimates that the use

of these automatic devices greatly reduced the need for a dockworker to mount the containers and thereby reducing the risks of them falling or being accidentally crashed. The health and safety authority (HAS) also come up with safety and healthy procedures that were meant to ensure that workers working at the port are safe from fatal accidents (Maistralis, Wang, & Bonsall, 2003). The authority recommended for instance that where it is possible, there was the need for people avoiding to climb on top of containers and vehicle. It further states that where people cannot effectively carry out their activities from the ground, then the most appropriate step would be to provide a very safe access for purposes of sheeting.

Fatigue has been recognized as one of the main causes of accidents in the maritime operations. The healthy and safety authority, therefore, came up with ways of preventing fatigue-related accidents. Fatigue is an element that develops gradually as the working hour's increase and will eventually lead to an increase in the chances of individual causing or being involved in accidents (Dacanay & Walters, 2011). The health and safety authority have recommended measures that will ensure that resting periods are put at the appropriate time. The report states that the workers working during the day and those working during the night have to be properly trained on the dangers of too much work, lack of sleeping hours and the health risks associated with fatigue (Dacanay & Walters, 2011). The port managers have also been required to shift their workers in a manner that each one of them will have adequate rest before resuming for duty. When planning the work schedule for the day, consideration has to be placed on the working time act of 1997 (Maistralis, Wang, & Bonsall, 2003).

Regarding the handling of machines and equipment, it is recommended that properly trained machine operators should be the only people allowed to run the machines. This is to ensure that accidents do not occur due to improper machine handling techniques caused by unqualified operators (Dacanay & Walters, 2011).

7. AHP Analysis

AHP (analytic hierarchy process) is a decision-making technique based on themulti-criteria model. Using pairwise comparisons between retrieveddata. These data can be objective numerical facts or subjective judgments by people.According to structure of our model, calculations give the best way to combine elements in order to reach our goal or a ranking list to prioritize our concerns.

As previous research show pure quantitativemethodology may fail in safety precautions subject due to involving intangible factors such as emotional behavior,motivation, discipline, social interactions etc. , therefore this paper adopt a qualitative based approach and transform it a quantitative data.

A questionnaire survey has been carried out through 50 people chosen from all, dock workers, yard equipment operators, terminal managers, operation supervisors, container vessel seafarers. In order to get a common perspective responders are chosen all across from Turkey, contacted via mail, social media (Linkedin, facebook etc.) or in theface to face question/answer meeting.

A total of 15 question have been asked in 3 main categories that affect safety situation at theterminal; and also responders have been asked to compare importance on their point of view between this 3 head subject.Effects of human, managerial and technical factors.

7.1 Questions Regarding Human Factors

The process of ensuring that the workplace at the container terminals is safe is not just the role of the employers alone. The employees also have a huge role to play in the process of ensuring a secure and safe environment for carrying out loading and discharge of the containers. Responders have been asked to choose any number to show if you either agree, disagree, strongly disagree or strongly agree with each of them.

I. Do you think that the employees should comply with the available legislation regarding safety and workplace health?

II. Do you think that the employees should assume the leadership and become the managers at the ports?

III. Do you think that the employees should ensure a maximum co-operation with their respective employers and the other individuals that are in charge of running the operations of the terminal?

IV. Do you think that the employees should ensure that they don't get access to theworkplace in the case they drink or under the influence of any strong substances?

V. Do you think that the employees should be keen to replicate the training they obtained regarding the safety of the workplace and put them to use?

7.2 Questions Regarding Technological Factors

Due to the complexity of the supply chain within the ports, increasing the efficiency of the ports technologically is the best way of ensuring the safety operations and the prevention of accidents at the ports. To enhance the safety of the ports and that there is theadequate prevention of the accidents, there are several factors that should be taken into consideration. Responders have been asked to choose any number to show if you either agree, disagree, strongly disagree or strongly agree with each of them.

I. Do you believe it is necessary to increase the efficiency of the ports technologically so as to ensure the safety operations and the prevention of accidents at the ports?

II. Do you believe it is necessary for the port authority or the individuals and companies concerned to have the braking of the equipment resistant to being improperly utilized and free from manipulation as well as the influences and aspect of the environment?

III. Do you believe it is necessary for the port authority or the individuals and companies concerned the ports to deploy the anti-truck lifting an anti-collision system?

IV. Do you believe it is necessary for the port authority or the individuals and companies concerned to the temperature and smoke detectors in the sensitive areas like the electrical rooms and the machine rooms?

V. Do you believe it is necessary for the port authority or the individuals and companies concerned to have the auto steering used at the ports?

7.3 Questions Regarding Managerial Factors

The management is the primary body that is tasked with ensuring that its employees stay as safe as possible. This should be in relation to the creation and the subsequent maintenance of the safety and the health standards of the place of work. Responders have been asked to choose any number to show if you either agree, disagree, strongly disagree or strongly agree with each of them.

I. Do you think the management plays a key role in ensuring that all of the work activities around the container terminals are managed and conducted in the best way possible?

II. Do you think that the management plays a key role in ensuring that the terminal is properly designed?

III. Do you think that the management plays a key role in ensuring that the employees are prevented from being exposed to risks by limiting their access to dangerous machines in heavy lifting at the terminal?

IV. Do you think that the management plays a key role in ensuring that it provides the employees with welfare facilities?

V. Do you think that the management plays a key role in ensuring that the employees are provided with the necessary information about the risks that have relation to the activities being carried out at the place of work?

7.4 Application of AHP Model

First of all, main subjects have been compared between themselves in order to measure their weight that affect theoverall comparison between all questions.

	1	2	3	Total
Human Factors	1	0,80	1,30	3,1
Tech Factors	1,25	1	1,63	3,9
Mng Factors	0,77	0,62	1	2,4
Total	3,0	2,4	3,93	9,4

Then a weight is divided among them according to result.

	1	2	3	Total	CUMULATIVE NORMALIZED SCORE OR ROW SUM	NORMALIZED PERCENTAGE OR PERCENT RATIO SCALE OF PRIORITY	Rank
Human Fac.	0,33	0,33	0,33	0,33	1,32	33,12	2
Tech. Fac	0,41	0,41	0,41	0,41	1,66	41,40	1
Mng Fac.	0,25	0,25	0,25	0,25	1,02	25,48	3
Total	1,0	1,0	1,0	1,0	4,0	100,0	

As aresult of thecomparison, Technology seemslike the most important factor by far from people view.

Human factors are accepted as 2nd most important and managerial factors take 3rd place.

Also confirm with consistency check:

Consistency Check	**Linked to the matrix above Row 9 to 11**			**Weights from above column I 16 to I18**
	1,00	**0,80**	**1,30**	**0,33**
	1,25	**1,00**	**1,63**	**0,41**
	0,77	**0,61**	**1,00**	**0,25**
(1) Calculate the weighted rating for each row in matrix 1				
	0,99 Formula			
	1,24 Formula			
	0,76 Formula			

(1) Calculate the weighted rating for each row in matrix 1

	0,99	Formula
	1,24	Formula
	0,76	Formula

(2) Approximation of Lambda(max)

	3,00	Formula
	3,00	Formula
	3,00	Formula
Average	**3,00**	Formula

(3) Calculate consistency index (CI)

CI = (Lambda(max) - n)/ (n-1), where n is the number of elements that we compared in matrix 1.

5,25662E-07

Step 4: Calculation of consistency ratio (CR)

9,06314E-07

Sınce (CR)<10% amount of consistency is accepted.

After this step responders answered give their opinion on the scale of 1 to 5 for each question.

Their responses give weight to every single question and resulted in a priority list.

AHP Analysis regarding answers to human related factors;

Human Factors	1	2	3	4	5	Total
1	1	1/5	2,00	4,00	1/5	7,4
2	5,00	1	2,00	1/3	1/5	8,5
3	0,50	0,50	1	1/4	2,00	4,3
4	0,25	3,00	4,00	1	1,00	9,3
5	5,00	5,00	0,50	1,00	1	12,5
Total	11,8	9,7	9,50	6,58	4,40	41,9

Human Factors	**1**	**2**	**3**	**4**	**5**	**Total**	**CUMULATIVE NORMALIZED SCORE OR ROW SUM**	**NORMALIZED PERCENTAGE OR PERCENT RATIO SCALE OF PRIORITY**	**Rank**
1	**0,09**	**0,02**	**0,21**	**0,61**	**0,05**	**0,18**	**1,15**	**19,10**	**3**
2	**0,43**	**0,10**	**0,21**	**0,05**	**0,05**	**0,20**	**1,04**	**17,31**	**4**
3	**0,04**	**0,05**	**0,11**	**0,04**	**0,45**	**0,10**	**0,79**	**13,22**	**5**
4	**0,02**	**0,31**	**0,42**	**0,15**	**0,23**	**0,22**	**1,35**	**22,52**	**2**
5	**0,43**	**0,52**	**0,05**	**0,15**	**0,23**	**0,30**	**1,67**	**27,85**	**1**
Total	**1,0**	**1,0**	**1,0**	**1,0**	**1,0**	**1,0**	**6,0**	**100,0**	

Consistency Check

1,00	0,20	2,00	4,00	0,20	0,19
5,00	1,00	2,00	0,33	0,20	0,17
0,50	0,50	1,00	0,25	2,00	0,13
0,25	3,00	4,00	1,00	1,00	0,23
5,00	5,00	0,50	1,00	1,00	0,28

(1) Calculate the weighted rating for each row in matrix 1

1,45
1,52
0,93
1,60
2,39

(2) Approximation of Lambda(max)

7,58
8,80
7,02
7,10
8,58
7,81

(3) Calculate consistency index (CI)

2,4074401

Step 4: Calculation of consistency ratio (CR)

2,1495001

Sınce (CR)<10% amount of consistency is accepted.

AHP Analysis regarding answers to technology related factors;

Tech Factors	1	2	3	4	5	Total
1	1	2,00	0,20	4,00	0,60	7,8
2	0,50	1	1/2	4,00	1/2	6,5
3	5,00	2,00	1	1/4	2,00	10,3
4	0,25	0,25	4,00	1	1/2	6,0
5	1,67	2,00	0,50	2,00	1	7,2
Total	8,4	7,3	6,20	11,25	4,60	37,7

Tech Factors	1	2	3	4	5	Total	CUMULATIVE NORMALIZED SCORE OR ROW SUM	NORMALIZED PERCENTAGE OR PERCENT RATIO SCALE OF PRIORITY	Rank
1	0,12	0,28	0,03	0,36	0,13	0,21	1,12	18,66	3
2	0,06	0,14	0,08	0,36	0,11	0,17	0,91	15,24	5
3	0,59	0,28	0,16	0,02	0,43	0,27	1,76	29,33	1
4	0,03	0,03	0,65	0,09	0,11	0,16	1,07	17,77	4
5	0,20	0,28	0,08	0,18	0,22	0,19	1,14	19,00	2
Total	1,0	1,0	1,0	1,0	1,0	1,0	6,0	100,0	

Consistency Check:

Consistency Check

1,00	2,00	0,20	4,00	0,60	0,19
0,50	1,00	0,50	4,00	0,50	0,15
5,00	2,00	1,00	0,25	2,00	0,29
0,25	0,25	4,00	1,00	0,50	0,18
1,67	2,00	0,50	2,00	1,00	0,19

(1) Calculate the weighted rating for each row in matrix 1

1,37
1,20
1,96
1,53
1,31

(2) Approximation of Lambda(max)

7,37
7,86
6,67
8,62
6,89
7,48

(3) Calculate consistency index (CI)

2,2394243

Step 4: Calculation of consistency ratio (CR)

1,999486

Sınce (CR)<10% amount of consistency is accepted.

AHP Analysis regarding answers to management related factors;

Managerial Fac.	1	2	3	4	5	Total
1	1	1/5	2,00	4,00	0,60	7,8
2	5,00	1	1/2	1/3	1/2	7,3
3	0,50	2,00	1	1/4	2,00	5,8
4	0,25	3,00	4,00	1	1,00	9,3
5	1,67	2,00	0,50	1,00	1	6,2
Total	8,4	8,2	8,00	6,58	5,10	36,3

Managerial Factors	1	2	3	4	5	Total	CUMULATIVE NORMALIZED SCORE OR ROW SUM	NORMALIZED PERCENTAGE OR PERCENT RATIO SCALE OF PRIORITY	Rank
1	0,12	0,02	0,25	0,61	0,12	0,21	1,33	22,22	2
2	0,59	0,12	0,06	0,05	0,10	0,20	1,13	18,82	3
3	0,06	0,24	0,13	0,04	0,39	0,16	1,02	16,95	5
4	0,03	0,37	0,50	0,15	0,20	0,25	1,50	24,97	1
5	0,20	0,24	0,06	0,15	0,20	0,17	1,02	17,04	4
Total	1,0	1,0	1,0	1,0	1,0	1,0	6,0	100,0	

Consistency Check:

Consistency Check

1,00	0,20	2,00	4,00	0,60	0,22
5,00	1,00	0,50	0,33	0,50	0,18
0,50	2,00	1,00	0,25	2,00	0,19
0,25	3,00	4,00	1,00	1,00	0,23
1,67	2,00	0,50	1,00	1,00	0,17

(1) Calculate the weighted rating for each row in matrix 1

1,67
1,55
1,07
1,77
1,24

(2) Approximation of Lambda(max)

7,58
8,44
5,69
7,55
7,12
7,27

(3) Calculate consistency index (CI)

2,137399

Step 4: Calculation of consistency ratio (CR)

1,908392

After we calculate all weight we combined them with their parent subject's and resulted in our final priority list.

	Necessity for Safety at the Container Terminals															
	1. Human Factors That Can Be Useful In Ensuring That The Container Terminals					2. Technological Factors That Can Be Useful In Ensuring That The Container Terminals Are					3. Managerial Factors That Can Be Used To Ensure That The Container Terminals Are					
Weight %	33,12	33,12	33,12	33,12	33,12	41,40	41,40	41,40	41,40	41,40	25,48	25,48	25,48	25,48	25,48	
Question #	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	
Weight %	19,1	17,3	13,2	22,5	27,8	18,7	15,2	29,3	17,8	19,0	22,2	18,8	16,9	25,0	17,0	
Overall Weigh	6,3%	5,7%	4,4%	7,5%	9,2%	7,7%	6,3%	12,1%	7,4%	7,9%	5,7%	4,8%	4,3%	6,4%	4,3%	
Rank	8	10	13	5	2	4	9	1	6	3	11	12	15	7	14	

The result shows; Responder think, the most important elements is the having anti-collision and anti-truck lifting technologies, then replicating training they obtained at theport.3rd element in our priority list to concern is having auto steering equipment in port operations.

8. Suggestion to Asyaport According to the Result of AHP Analysis

All subjects with related questions have been examined previously chapter. To underline theimportance and urge the Asyaports attention on these matters, suggestions have been given in the last part of paper.

People in theportenvironment have been witnessed a great technological advancement through years. Therefore they are aware how technical improvements make their work easier and safer.

According to theresult of AH Analysis, workers think prevention sensors systems such as anti-collision and anti-truck lifting technologies are the most important development in order to prevent accidents. These computer-based restriction systems are designed to mitigate human fault. Asyaport investments for this concern can be seen parallel to labor view. Port has already had these systems in all of their crane equipment. Since start operation June 2015,except some minor cases only ended up container damage, there has been no injury or fatal accident in Asyaport. As a suggestion, the Port may think extent their system range by adopting stockingequipment as well. Asya port as a hub port is a huge logistic center. While providing the best for loading/unloading equipment other yard participants can't be ignored.

Second come up from the survey is demonstrates the importance of training. Training must be taken seriously and accept as a procedure to follow in an emergency

situation , not only some legal enforcement to fulfill. Asyaport has introduced a wide range of training programs not only for emergencies also safe work practice and technical briefings. As we mentioned before preparation programs for labor pre-work period are essential to maintaining safety conciseness from the first day of work. Asyaports health and safety experts challenge here is get rid of mainstream effect in training activities. To achieve that should be more random training take place without any pre-announcement or schedule. Otherwise mentally prepared labor react to an ordinary training activity may never able to measure theemergency readiness of participants.

A 3rd element in the list is having anauto steering/guided equipments in ports. As we underlined global trend is replacing people with machines in technological factors subject, people also agree with having fewer people on the field will decrease serious accidents at theyard. Asyaport is one of the newest port, serving a vast hinterland, there hasn't been any investment made related automation technology regarding cargo handling and transportation equipment. Management preferred to create a strict monitoring system to maintain order, and be sure about every labor follow rules and regulations announced by port governance. Unfortunately it may get more and more difficult when terminal reach it's potential and congestion shows up as a potential threat. Sınce railway infrastructure and highway connections haven't been completed yet; the yard is already full of trucks and drivers. Efficiency is also affected by such crowded work environment, as a4th suggestion of our result supports that hypothesis ; it is necessary to increase the efficiency of the ports technologically so as to ensure the safety operations and the prevention of accidents at the ports.

Labor themselves accept, under theinfluence a substance or alcohol may cause serious incident during work. All strict regulations have been in force both in Asyaport and generally in all ports in Turkey. But port management must be sure that everybody obeys rules and regulations. Port management may think to introduce regularly check procedures against drug abuse and alcohol consumption.

In overall managerial factors seem less important than the other in the eyes of labors. The reason of that may arise from an insufficient communication between management and labors. In our survey people want to see management involvement mostly in their welfare concerns. As paper examined human emotion and mood directly affect his safety behavior, in previous chapters. Asyaport provides a welfare service to their labors. But service mission must be extended. A creating friendly community between workers is not only assignment of the personnel department. Also, a professional social, and psychological support must be provided to help individuals.

AHP analysis gives almost same weight ‘’concern about having the braking of the equipment resistant to being improperly utilized’’ and ‘’employees should comply with the available legislation’’ questions as both of them point out to follow regulations and standards. Employees should not intervene to systems that are approved by experts, and port governance must be sure that everything goes according to book.

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