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PROPOSAL FOR IMPROVEMENT OF THE ENVIRONMENTAL MANAGEMENT SYSTEM - SOLID WASTE MANAGEMENT AT THE EXTRAPORT TERMINAL, CALLAO, LIMA, 2019

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ABSTRACT

The study carried out analyzes how an Environmental Management System (EMS) generates efficient management of solid waste generated by an extra-port terminal, since the volume of solid waste is high, a situation that occurs in different places, the terminal is no stranger to this reality, then its objective is to validate the improvement of the EMS in the management of RRSS and in this way also minimize and control the risks derived from the management of this waste to protect people and the environment and achieve its reuse. For this purpose, the study of the Characterization of the RRSS was important; it was the tool that allowed the updating of the Environmental Management Plan, followed by the study of the generation, composition and quality of solid waste, from which it was possible to design and plan the most appropriate and viable proposals for its technical and sanitary treatment. The methodology used in this study was based on the simplified method proposed by Kunitoshi Sakurai, which allowed for the determination of: a) the current population projection, b) the number of samples, c) awareness and training, d) per capita generation, and e) the physical composition of solid waste. Statistical formulas for sample determination and data processing were also included. Finally, this document presents the results of the study, which validate the importance of the EMS in the management of social and environmental resources as the purpose of this research.

Keywords: Solid Waste and Environmental Management System

INTRODUCTION

Peru is a Latin American country in which most companies generate the production of solid waste, which causes a series of impacts that not only directly affect the environment but also the population in general; added to this, the deficiency of sanitary landfills in our country is evident. For this reason, new regulations, laws and alternatives have been implemented today that can contribute to the reduction of solid waste generated by industries. A World Bank report (2018) that states: *"Globally, if urgent action is not taken by 2050, global waste would grow by 70% compared to current levels"* (Banco Mundial, 2018), in this regard, Lázaro (2019), summarizes *"It is predicted that over the next 30 years, global waste generation, driven by rapid urbanization and population growth, will increase from 2010 million tons registered in 2016 to 3400 million, and although transcendent, it is not given all the importance it deserves"* (p. 33), the study addresses the situation in an Extraport Terminal of the Ferreycorp Group, located in the Constitutional province of Callao, which aimed to improve waste management in the context of ISO 140001, this has as its main activity the storage, temporary and customs storage, which generate a great diversity of waste, An EMS based on ISO14001 was implemented for the optimization of the management of non-municipal solid waste in order to reduce the environmental impacts generated by the Extraport Terminal in El Callao, considering the problem: How has the implementation of an EMS based on the ISO14001 standard influenced the optimization of the management of solid waste generated in an Extraport Terminal in El

Calla?or?, questions arose such as: What is the current situation of Solid Waste Management in an Extraport Terminal in Callao?, The planning of the environmental management system based on the ISO 14001 Standard for the optimization of Solid Waste Management in an Extraport Terminal in Callao?, How has the classification, segregation and final disposal influenced the optimization of Solid Waste Management in an Extraport Terminal in Callao? and How do the operational controls of the environmental management system based on the ISO 14001 standard, for the optimization of Solid Waste Management in an Extra-port Terminal in Callao?

The study is justified in the need for renewal of knowledge and capacities to improve the execution of an EMS for better management of solid waste in an extraport warehouse, this will increase the entire focus on the aforementioned, considering what has been visualized the constant environmental problems that threaten the planet, as Abad mentions. J. (2020), in his study carried out, *"... the management of solid waste has an influence and is linked to the constant environmental deterioration, as well as to the lack of awareness of the community in the protection of the environment ..."* (p. 14). In addition, in the analysis carried out in this work, it will identify the positive and negative aspects of the implementation of an EMS based on ISO14001, which allowed determining actions and minimization criteria with which the company Fargoline S.A. optimized its environmental management and additionally give a reuse and/or recycling value to its generated solid waste. in such a way that their actions help avoid health risks and in turn contribute to the care of the environment. (Alea et al, 2022)

Studies such as those of Burga (2022), on environmental management and solid waste treatment in which an improvement in environmental management in the Chota market has not been properly strengthened, or Saldarriaga (2021) in his study of the implementation of the ISO 14001:2015 Standard in the Environmental Management System of a bottling company, for the implementation of an EMS based on the ISO 14001 standard, in a bottling company in which substantial improvements are achieved thanks to the application, Saucedo (2020), who has a study of environmental management and solid waste treatment in a municipality (Toledo, 2013), whose objective was to establish the relationship between environmental management and solid waste treatment and it was shown that this situation exists, also demonstrating that there is a close relationship between solid waste management and solid waste treatment, with the reciprocal incidence being, Kiatkulthorn, K. and Sundstedt, F. (2016) his work on the implementation of ISO 14001:2015 for the performance of companies, developed in Sweden, showed that the company achieved a better methodology, cost reduction, greater efficiency and waste reduction. Additionally, there was evidence of a change in the behavior and environmental awareness of employees and the process of developing new products (Miranda, 2013), Medina et al (2022), in their academic article on the implementation of the ISO 14001 EMS in a pharmaceutical company that had the purpose of implementing the EMS and observed the treatment of the solid waste generated and the hydrological and energy resources consumed. favored by an appropriate segregation by colors from the source, which indicates the implementation of operational controls for the mitigation of their impacts on the environment, Cano (2019) in his study that proposed the design of an environmental management system in an educational area of Mexico, whose purpose was to propose the design of an environmental management system for the educational zone of a Mexican region, based on the ISO 14001:2015 standard, recognizing, among other things, the importance of registering all processes and having the necessary documentation to be able to define deviations or non-compliances and take preventive actions in a timely and relevant manner, this model can be replicated in other realities, carrying out responsible habits with the environment, all of which has been socialized with senior management, making them express great interest in the subject, Yataco et al (2022), in their article on the management of ISO 14001 and environmental quality in a Peruvian locality, with the purpose of verifying the effectiveness of promoting environmental quality in a coastal locality, identifying the problem and reaching suggestions that, if not addressed, would affect the environmental quality of the area, leading to environmental degradation that would especially affect the health of the inhabitants of the area and Chamba (2022), in its thesis of design of an environmental management system applied to a public entity, its purpose is to structure and implement an EMS and thus protect the health of workers and the preservation of the environment, making moderate use of natural resources such as the generation of solid waste, saving economic resources and complying with environmental legal requirements.

Environmental management is defined as a permanent and continuous process, aimed at managing the interests and resources related to the objectives of the National Environmental Policy in order to achieve, thus, a better quality of life for the population, the development of economic activities (Ortiz (2025), page 3), therefore environmental management is not necessarily as simple as it seems and varies depending on the point of view. For example, from an economic point of view, it is considered as the set of activities

aimed at ensuring an order of the environment and contributing to the establishment of sustainable development. In Peru, environmental management comprises a set of actions and provisions necessary to achieve the maintenance of environmental capital, so that people's quality of life is as high as possible.

The ISO 14001:2015 standard that includes the 14000 family developed by the ISO organization, the International Organization for Standardization. are those designed to help companies of different industries and sizes implement EMS, the implementation of an Environmental Management System according to the ISO 14001 standard offers the possibility of systematizing, in a simple way, the environmental aspects that are generated in each of the activities that are carried out in the organization, in addition to promoting environmental protection and pollution prevention from a point of view of balance with socioeconomic aspects.

Solid waste is substances, products or by-products in a solid or semi-solid state, discarded by a generator (OEFA, 2020). A generator is a person or institution that produces solid waste due to its activities. They are usually considered to have no economic value, and are colloquially known as "garbage", but they are really usable to a certain extent, solid waste is that which is produced by the activities of man or animals. In the domestic environment, solid waste includes paper, plastics, food scraps, ashes, etc. Also included are "liquid waste" such as paints, old medicines, used oils, etc. In commerce, packaging, wooden and plastic containers make up the largest part. Liquid sediments Solids from industry and wastewater plants.

RESEARCH METHODOLOGY

This research has a qualitative approach. This approach refers to using data, without numerical measurement, with which the phenomena of an investigation can be described, understood and interpreted. (Hernández, Fernández and Baptista 2014), the research is applied and explanatory and with a quasi-experimental design, evaluating the before and after.

The study had two aspects as a population:

- Solid waste generated by the company Terminal Extra Portuario FARGOLINE S.A.
- 198 workers of the company Terminal Extra Portuario FARGOLINE S.A.

The sample was composed of 114 workers of the company and solid waste is non-probabilistic, since the volume of solid waste produced is not regular.

Applying the observation and recording of values to collect all the information, using records, control systems, monitoring actions and surveys to obtain the information that has been developed from the data collected and the analysis of the information in a statistical way to determine the relationship between the variables analyzed.

RESULTS

Based on the Implementation of ISO 14001, the following steps have been completed:

1º. **Planning:** with which the environmental policy was defined, establishing the vision, mission and values as a course,

2º. **Identification of environmental aspects:** all aspects that can generate adverse situations were warned, including: Emissions into the atmosphere, Waste management, Discharges into water, Soil pollution, Noise, Visual impact, Annoying odors, Vibrations and Ecosystems. (Encinas, 2020)

3º. Compliance with legal and other requirements.
All current regulations are taken into account, especially in the legal terms related to the Extraport Terminal. Among them the implementation of the Environmental Management System.

4º. Definition of environmental objectives and goals and definition of the environmental management program.
Considering these facts, objectives and goals were established to be able to develop the Environmental Management Program in its entirety and thus evaluate its compliance if necessary.

Environmental Management Program:

The main responsibility is **to recognize** whether the actions that take place during the Extraport Terminal cause damage to the surrounding environment and, if so, to establish the mitigation or nullity of these effects. (Arango, 2015)

In addition, it is necessary to consider whether these actions can harm the physical integrity of the collaborators, the same is done considering mitigating or eliminating the effects that cause problems to the people who work on the site, this behavior will be permanently supervised and reviewed, the following steps were completed:

A. **Implementation:** training, awareness-raising, control and communication activities were developed by the company with talks to neighbouring citizens and staff by categories and responsibilities.

B. **Structures and responsibilities:** responsibilities were designated according to roles, responsibilities and positions,

C. **Training, awareness and professional competence:** Senior Management developed and raised awareness among its employees on national, sectoral and internal environmental policies.

D. **Communication:** Internal and external communication processes were developed that consider fluidity, transparency and objectivity, aimed at the general public, authorities and sectors of interest,

E. **Documentation of the Environmental Management System:** documents were implemented such as: Management manuals (environmental policy, definition of objectives and goals, assignment of functions), in addition to instructions that show how the company's activities are carried out, Plans (audits, training...), Programs and Regulations, the manual has specified compliance with the requirements set by the Standard, in addition to the strategies that are addressed and the technical instructions for each part of the production process,

F. **Control of documentation:** control of the facts, with this documentation that is legible, dated and preserved in an orderly manner,

G. **Operational control:** the documentation and the operations or activities related to the significant environmental aspects identified were verified, controlling the activity according to specific requirements and verifying the results. The control of the collateral aspects is carried out,

H. **Emergency plan and response capacity:** the Contingency Plan was formulated to respond to the probability that accidents may occur at work, especially related to the management of solid waste as it is an EMS and in addition to the safety of people, for this reason an action plan is established for emergencies and response capacity in any circumstance of this type.

For this reason, especially in recent years, the subject of Occupational Risk Prevention has increased and there are more and more training, regulatory and material means available to interested companies.

Control actions were carried out:

A. **Monitoring and measurement:** an important action that allows us to know the status and operation of the Management System, to monitor or measure the calibration and maintenance of inspection equipment, compliance or not with applicable legislation and regulations and the updating of relevant procedures and records.

B. **Assessment of legal compliance:** Verification of whether the environmental legislation adopted and used by the company complies with the established legislation, establishing a documented evaluation procedure, gathering the results through a register that is available at all times to any interested entity.

C. **Non-conformity, corrective action and preventive action:** Situations that were assumed in order to detect corrective actions that minimize Non-Conformity and establish Corrective and Preventive Actions to prevent the specific problem from happening again.

Consequently, it must include any modifications in the procedures

Documented.

Implementation of the ISO 14001 Standard in companies

A. **Records.** The records, as we have already explained before, must be kept legible, identifiable and updated since they are the documents that collect the results of our activity, product or service involved. In the same way, there must be some procedure that regulates these, that is, that identifies, preserves and eliminates the records according to the company's need.

The recommended records are:

- Identification and evaluation of environmental aspects.
- Legal requirements.
- Communications.
- Internal audits.
- Analysis of wastewater, atmospheric emissions, noise.

B. **Internal audit of the SGMA.** Periodic review of the functioning of the EMS. Also allowing the verification of the level of conformity with the legislation, through this process it is developed for the continuous improvement of environmental management, through an examination to check its correct operation.

C. **Performance.** The EMS has been implemented, the Management must review its operation and its evolution in the company to ensure that the objectives are being met and the System tends towards the concept of Continuous Improvement.

D. **Certification of the Environmental Management System.** The EMS certification is carried out by a certified entity, which evaluates and accredits the correct implementation of the ISO 14001 Standard, similar to the audits that the company has carried out internally.

The company's possession of the certification recognized its implementation and continuous improvement:

E. **Partial results.** Once the inspections of the work areas were carried out, throughout the process, they were carried out based on the monthly work schedules of the Environmental Management area. This reference was used to verify these monthly field and documentary activities. This inspection was carried out with two fundamental objectives, and they are:

- Comply with the Environmental Management Plan, and Schedule of Monthly Activities.
- Determine the observations obtained to achieve continuous improvement.

F. **Training.** General induction activities are carried out, which is always a requirement, therefore most of the personnel have passed, in order to raise awareness on the issue of environmental care, through waste recycling, it has been appreciated that there are still personnel who require training, personnel continue to be trained.

G. **Results of Environmental Management in Solid Waste.**

It has been fulfilled and continues to be fulfilled:

1º. With the segregation of waste in the colored bins implemented by the company.
2º. With the use of spill containment trays based on geomembranes and wood, for when working with liquid chemicals and to place them under stationary machinery within the project (e.g. power generators, etc.). (Bellido, 2020)
3º. With the recycling of materials derived from the unpacking of equipment and materials that arrive at the central warehouse, giving them a safe second use.
4º. With Hommel's NFPA and diamond lettering, for chemicals.
5º. With the execution of land irrigation to control dust and suspended particles.

It is not complied with:

6º. The control of the chemical products used within the project, by whom it is used and the reason, there is a record in the warehouse.
7º. The labeling and labeling of all chemical products within the project.
8º. The MSDS file is stored with the MSDS of all the chemical products of the project and in each work area used there is the specific MSDS of the product, in addition to the respective copy in the SASS office.
9º. The certification of gas emissions of the vehicles used within the project for all vehicles and machinery of the company.

Statistical studies of the variables.

Compliance of the Management System.

The situation of the Environmental Management System has been verified before and after, considering that some aspects of the implemented EMS were already practiced

Table 1. Environmental Management System Compliance

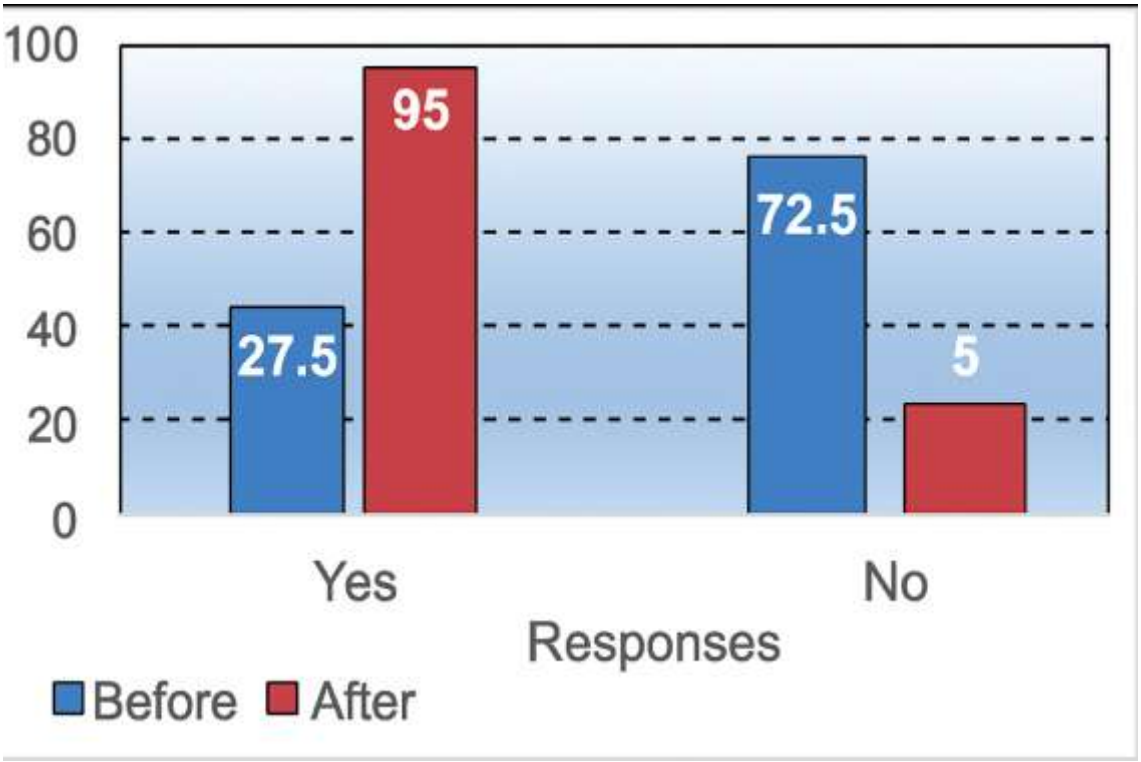
Component	Aspect	Before			After		
		Yes	No	NA	Yes	No	NA
Planning	Politics	X			X		
	Identification of Environmental Aspects		X		X		
	Legal requirements		X		X		
	Objectives		X		X		
	Goals		X		X		
	Environmental Management Program		X		X		
	Implementation of the PGA		X		X		
	Structures	X			X		
	Responsibilities	X			X		
Formation	Internal policies		X		X		
Sensitization	Talks	X			X		
Competence	Training Responsibilities		X		X		

Component	Aspect	Before			After		
		Yes	No	NA	Yes	No	NA
	Functions		X			X	
Communication	Timely information		X		X		
	Dissemination and transparency		X		X		
Documents	Manuals	X			X		
	Standards	X			X		
	Guides	X			X		
	Protocols	X			X		
Control of the documentation	Preparation of documents	X			X		
	Procedures		X		X		
	Timely Review		X		X		
	Readability		X		X		
	Archiving	X			X		
Emergency plan	Risk Identification	X			X		
	Preventive actions		X		X		
	Contingency Plans		X		X		
	Evacuation plans		X		X		
	Drills		X		X		
	Emergency response actions		X			X	
Control actions	Tracking		X		X		
	Legal compliance		X		X		
	Corrective actions		X		X		
	Preventive actions		X		X		
Norma ISO 14001	Records		X		X		
	SGMA Audit		X		X		
	Operation		X		X		
	Certification		X		X		
	Results		X		X		
	Training		X		X		
Total		11	29	0	38	2	0
		27.5	72.5	0	95	5	0

Source: Interviews and documentary analysis of the researcher

Interpretation:

It can be seen that the percentage of conformities was 27.5% before being implemented and 72.5% of non-conformities, improved the SGA the level of conformities reached 95% and non-conformities was 5%, it is with the application of ISO 14001:2015 and the adequacy is achieved for a favorable development for the company.

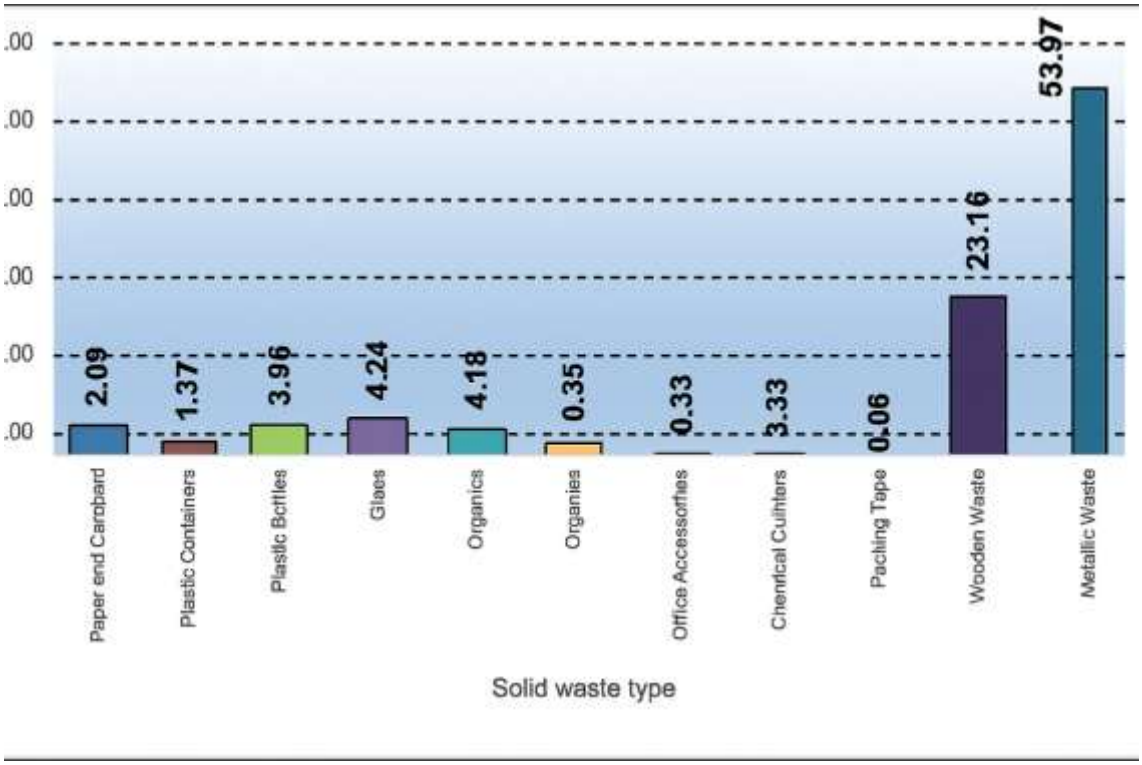


Graph N° 1: Comparison of Solid Waste Management.
Source: Table No. 1.

Table No. 2 Characterization of solid waste.
Extra Port Terminal – El Callao

Type of social media	D 1	D 2	D 3	D 4	D 5	D 6	D 7	Total	Composition
Paper & Cardboard	1.96	1.97	1.87	1.67	2.01	1.64	1.25	12.37	2.09
Plastic packaging	0.97	0.88	0.91	1.12	0.89	2.68	0.65	8.10	1.37
Plastic bottles	2.68	4.56	2.65	1.97	2.94	5.02	3.6	23.42	3.96
Styrofoam	3.65	4.58	3.69	4.25	5.26	6.26	2.97	30.66	5.19
Glass	1.79	2.05	2.9	4.12	3.97	2.18	2.16	19.17	3.24
Organic	3.65	3.67	3.76	3.98	3.46	4.01	2.16	24.69	4.18
Office Accessories	0.2	0.3	0.25	0.22	0.34	0.56	0.19	2.06	0.35
Chemical Packaging	1.1	2.1	3.5	2.9	3.4	4.1	2.6	19.70	3.33
Packing Tape	0.05	0.07	0.06	0.09	0.03	0.02	0.05	0.37	0.06
Wood Scraps	19.54	16.58	24.5	25.6	21.58	16.58	12.58	136.96	23.16
Metal Remains	45.5	56.1	61.25	65.4	57	0.91	27.65	313.81	53.07
Sum	81.09	92.86	105.34	111.32	100.88	43.96	55.86	591.31	100.00
Percentages	13.71	15.70	17.81	18.83	17.06	7.43	9.45	100.00	

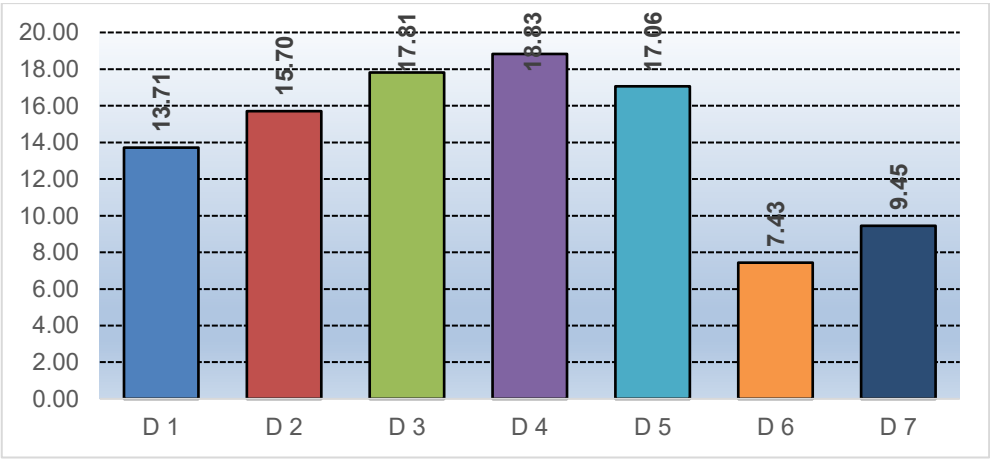
Source: Documentary record of the company.



Graph N° 2: Characterization of solid waste.
Source: Table No. 2. Characterization of solid waste

Interpretation:

It can be seen that the largest volume of solid waste is metal waste with 53.07% and wood waste with 23.16%, being the most significant waste and best used, the other waste does not mean a significant volume.



Graph N° 3: Generation of solid waste.
Source: Table No. 2. Characterization of solid waste

Interpretation:

It can be seen in graph No. 3 that waste varies between the different days and it is day 4 in which the greatest amount of solid waste generation is appreciated.

Table No. 3: Situation of solid waste

N°	Aspect	Danger	Risk
1	Cranes	Crane failures Poorly determined weight Deterioration of the clamps	Falls, collapse, collapse of containers.
2	Sewers	Accumulation, Logjam.	Flood. Water and soil pollution.
3	Transfer	Wood in poor condition, Floor failure, Hand tools in poor condition	Falls, collapse, collapse. Soil contamination.
4	Stored	Iron in poor condition, Wood in poor condition, Hand tools in poor condition	Slippery, falls, crumbling. Soil contamination.
5	Stacking.	Deteriorated floors. Cranes in poor condition. Clutter and Cleanliness, Poor lighting,	Entrapment, Falls, Blows, Loss of material. Soil contamination.

Source: Observation and Summary made by the researcher.

- The observation determines 6 Environmental Aspects and various Hazards and Risks with respect to solid waste in the activities carried out so far.
- During the development of the project, no other environmental aspect was found to be affected.

The implementation is favorable for the environmental management system of the extraport terminal since with the results obtained it is a key example that will be for the good of the environment.

The terminal's overall environmental management system provides the basis for measuring and evaluating overall performance, for a better applicable environmental rule.

VERIFICATION OF RESULTS.

A. The evaluation of the current process of the solid waste environmental management system will influence the optimization of solid waste. In a logistics company in Callao, as can be seen in Graph No. 1

It can be seen in this graph that the Non-Conforming condition is equal to 29 before the implementation of the GHS, which represent 72%, and then the Conformity is equal to 36, which represents 95%, this improvement can be seen in the summary of the surveys on the conditions of solid waste treatment.

Table No. 4: Summary of the Solid Waste Treatment Survey

Item	Criterion	Moment	And	B	To	R	M	NS /NO
1.	Consideration of social media management	Before	9	6	14	15	58	12
		After	24	31	44	5	8	2
2.	Collecting from social media	Before	4	5	11	19	63	12
		After	27	35	31	11	8	2
3.	Social Media Management Plan	Before	0	0	0	22	80	12
		After	24	18	61	5	4	2
4.	Participation in the PMRS	Before	4	7	7	11	73	12
		After	34	37	17	15	9	2
5.	Equipment for the management of social networks	Before	4	7	9	17	65	12
		After	24	27	45	3	9	2
6.	Cleanliness Status of Environments	Before	6	9	14	17	56	12
		After	26	39	24	17	4	4
7.	Location of Social Media Containers	Before	4	5	9	19	65	12
		After	35	47	19	4	6	3

8.	EMS Planning	Before	4	5	9	28	56	12
		After	36	27	29	15	3	4
9.	Social media segregation	Before	3	6	7	17	69	12
		After	23	46	29	9	4	3
10.	Social media layout	Before	4	5	16	11	66	12
		After	24	33	29	19	6	3

Source: Applied survey

Comment:
Given the results, it was noted that the improvement of the WMS has influenced the Treatment of Solid Waste, since there is a difference between the before and after in all cases, appreciating a notable improvement.
The planning of the environmental management system based on the ISO 14001 standard has contributed to the optimization of solid waste management.

Analysis:
Table 4 shows that all the components of the Environmental Management System have been complied with based on each fact, Table 4 on Planning indicates that it was not acceptable or favorable to the opinion of the respondents, it can be seen that there is a favorable response in Table 14 that evaluates the opinion of the Solid Waste Management Plan.

By concluding that the Solid Waste Management Plan is acceptable after the implementation of the System, it is deduced that it is favorable for all events related to planning. The classification, segregation and final disposal will have a direct impact on the optimization of Solid Waste Management in an Extraport Terminal in Callao.

The characterization has made it possible to identify the solid waste, from Table No. 4 and item 9 that are the before and after to specify the segregation of solid waste and it can be seen that everyone sees it as something favorable for the company after the improvement of the EMS, Table No. 4 specifies that item No. 10 agrees on the adequate disposal of solid waste after the improvement.

With the implementation of the EMS, solid waste management has been significantly optimized, in which the classification, segregation and disposal of solid waste is also significantly complied with. The operational controls of the environmental management system based on ISO 14001 will directly influence the optimization of Solid Waste Management in an Extraport Terminal in Callao.

In Table 1, a component is ISO 14001 included in the Environmental Management System, which explains that it was not implemented until the improvement of the System in general occurs, in fact, it is its implementation that improves the system and improves solid waste treatment actions.

Therefore, the implementation of the ISO 14001:2015 Standard in the Environmental Management System has been favorable.

The proposal to improve an Environmental Management system based on the ISO 14001 International Standard has influenced the optimization of Solid Waste Management in an Extraport Terminal in Callao.

In a period of 7 months there was an improvement of the Environmental Management System, which includes ISO 14001:2015 and on top of it an improvement in the treatment of solid waste.

DISCUSSION OF RESULTS.

Various studies such as that of Burga (2002), indicates that with respect to the GHS of the Chota market and shows that the lack of the EMS affects the treatment of solid waste, that is, environmental management and solid waste treatment has a high positive correlation, then Saldarriaga (2021) with respect to compliance with the ISO 14001:2015 standard that compliance has been favorable in implementation with 72.9% and planning in 90% and inspections of 96.95% and 100% of the identification and in the end 100% compliance, Saucedo (2020) in his study of environmental management and solid waste treatment, which concluded the planning of 76% considering it low, an allocation of resources to 56%, control and monitoring to 62% and a perspective of improvement to 78% and with respect to treatment the consideration of the hierarchy is at

58%, integration to 56%, 48% responsibility, 76% in reduction, 66% in recycling and 62% in reuse, demonstrating that there is a close relationship between solid waste management and treatment, Kiatkulthorn, and Sundstedt, (2016) on the implementation of ISO 14001:2015 for the performance of companies, the study is synthesized that shows that the company presented an improvement in the use of resources and raw materials, due to the implementation of ISO and a change in the behavior and environmental awareness of employees and the process of developing new products, Medina et al (2022), in their academic article on the implementation of the ISO 14001 EMS in a pharmaceutical company, achieved the results such as the treatment of solid waste generated and the hydrological and energy resources consumed, implementing advice for its segregation, the recovery of usable waste: plastic, paper and cardboard, was implemented under an integrated waste management plan (PGIR) (Gutiérrez, 2013), showing appropriate management indicating the implementation of operational controls for the mitigation of its impacts on the environment, Cano (2019) in a study that proposes the design of an environmental management system in an educational area of Mexico, thus, the EMS made it possible to integrate the variables of the educational and institutional process to favor sustainable development with its environmental performance, in addition to an integrated management of urban solid waste (Romero, 2012), Yataco et al (2022), in their article on ISO 14001 management and environmental quality in a Peruvian locality, the study shows that environmental management would help mitigate negative environmental impacts on the environmental quality of life of the population of the district and there is a significant relationship between the management of ISO 14001 and environmental factors and Champa (2022), in his thesis on the design of an environmental management system applied to a public entity, the initial review allowed the identification of the environmental practices carried out, this identification allowed to appreciate that low and moderate impacts are produced which must be prevented or mitigated with the implementation of environmental management plans and the EMS which allows economic savings and compliance with the established standards.

Comment:

In the present study from which this study arises, it has been possible to appreciate that by implementing the EMS and improving its performance, it can be seen that the management and treatment of the RRSS is improved, favorable results are achieved in all aspects of the treatment of solid waste, in the study carried out it is later verified that the EMS is vital for the improvement in the management of the RRSS, With respect to the characterization, it can be seen that due to the nature of the study, a lot of wood and metals are generated as the main waste, with the implementation of the study carried out, in which it has been possible to appreciate the improvement in the 7 months that the improvement has been implemented in all its aspects. The survey determined satisfaction in all its scopes on solid waste management.

CONCLUSIONS

- The current situation of the environmental management system for the optimization of Solid Waste Management in an Extraport Terminal in Callao is favorable with the existence of the Environmental Management Plan.
- The contribution of the planning of the environmental management system based on the ISO 14001 standard for the optimization of Solid Waste Management in an Extraport Terminal in Callao is influential or favorable.
- The impact of carrying out the classification, segregation and final disposal for the optimization of Solid Waste Management in an Extraport Terminal in Callao helped to understand the problem of solid waste in the Terminal.
- The effect of the operational controls based on ISO 14001 in the environmental management system for the optimization of Solid Waste Management in an Extraport Terminal in Callao is favorable for environmental management.
- The influence of the Environmental Management system based on the ISO 14001 International Standard has allowed the optimization of Solid Waste Management in an Extraport Terminal in Callao.

SUGGESTIONS

- Every company must add in its Environmental Management Plan, it must consider an environmental education program, as well as a system of community participation, to control the

habits and customs of the inhabitants, assuming a responsible position in the face of this problem. It is necessary to have a permanent solid waste management program inside and outside the company, so that the effective situation in solid waste management can be considered in each of the stages.

- The tables presented in the classification of solid waste, organic matter has a percentage of 44% of production in the business environment. Woods and metals should be used to be able to reuse these materials, a segregation program must be made at the source.

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