

Management processes in the implementation of environmental legislation in civil engineering companies in the south of Veracruz

Procesos de gestión para implementar la legislación ambiental en empresas de ingeniería civil en el sur de Veracruz

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Abstract

The successes and errors that have arisen in the management process to implement environmental legislation in civil engineering companies were determined, and information related to the evolution of civil engineering companies in their environmental legislation certification process was presented, and finally the successes and errors that these companies have had in complying with environmental legislation were compared. As a first step, companies with ISO 14001 standards located in the region were sought. The model and instrument that served as the object of analysis of the companies was an interview by means of a survey. From the business perspective, it is stated that the companies that have as a basis to involve all their personnel, receive training, correctly establish their objectives, environmental policy, vision, mission and goals, prepare a diagnosis, a work plan and above all a change in their culture, tend to be the companies that manage to obtain ISO 14001 certification at the first attempt, as 66.67% of the organizations in the research, with 100% of the companies that prepared the environmental diagnosis and work plan, to become certified.

Management, Legislation, Environmental

Resumen

Se determinaron los aciertos y errores que han surgido en el proceso de gestión para implementar la legislación ambiental en las empresas de ingeniería civil, y se presentó información relacionada a la evolución de las empresas de ingeniería civil en su proceso de certificación en la legislación ambiental, finalmente se compararon los aciertos y errores que han tenido estas empresas en el cumplimiento de la legislación ambiental. Como primera instancia se buscaron empresas con la normativa ISO 14001 ubicadas en la región. Se realizó el modelo e instrumento que sirvió como objeto de análisis a las empresas, el cual fue una entrevista por medio de una encuesta. De la perspectiva empresarial, se enuncia que las empresas que tienen como base el involucrar a todo su personal, recibir capacitaciones, establecer de manera correcta sus objetivos, política ambiental, su visión, misión y metas, elaborar un diagnóstico, un plan de trabajo y sobre todo el cambio de su cultura, tienden a ser las empresas que logran obtener la certificación de la norma ISO 14001 al primer intento, como el 66.67% de las organizaciones de la investigación, con el 100% de empresas que elaboraron el diagnóstico ambiental y plan de trabajo, para certificarse.

Gestión, Legislación, Ambiental

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Introduction

As a first step, it is important to identify the activities carried out by companies in the production of their products and/or services, to determine the impact, they have on the environment, and thus establish environmental objectives and goals. The branch of civil engineering, which is largely focused on construction, is constantly changing the environment, negatively modifying the environment, according to Mariño (2007):

He argued that the three basic pillars of an engineering project were topography, geology, and hydrology; other environmental conditions, including social conditions, were not basic elements to be considered for project design (p. 67).

According to Mariño (2007) "it is around 1970 that this situation began to change, initially with the weak demands made at that time by the World Bank and, later, due to the progress in environmental awareness and regulations in the country" (p. 67).

Based on the above, the following question arises: What are the contributions that the implementation of environmental legislation has made to civil engineering companies and the failure it has had in the development of the same?

Knowing the successes and mistakes made by civil engineering companies allows us to identify the main shortcomings in the process of implementing environmental legislation.

Environmental management in companies is described, with the definition of environmental policies, objectives, and indicators, to achieve success in the management system. As it happens in other industries, for example in Alpina S.A., according to Acosta, Jair (2008) "Something that distinguishes Alpina in environmental issues is its wide national and international recognition in the use of good environmental practices, recognition that it has managed to sustain over time" (p. 80). Also, in the dairy industry "leads to formulate and put in writing an Environmental Policy, by virtue of which Lácteos Otero is committed to a series of general principles of environmental management. This policy complies with the requirements of the UNE-EN ISO 14001 Standard" (Fundación entorno, n.d., p. 8).

In the implementation, leadership is important, specifically mentioning visionary leadership and teamwork. In the environmental management challenges, it indicates the recommended capabilities of the person in charge of implementing the environmental management system, as well as the involvement of the personnel.

In the methodology, an instrument was elaborated to evaluate the processes of implementation of the environmental management system in the companies, which consisted of a survey, in which the results determined the line of business and size of the company, the time it took to be certified with ISO 14001, the interaction of the company's personnel in the certification, among others.

In the annexes, some tables of the results are presented; and finally, the conclusions of the research are included, with recommendations for the companies that wish to become certified, and for the companies that are already certified.

Environmental Management Systems

Environmental management in companies

The definition of environmental policies in organizations is very important, since it is part of the functions of top management, which will indicate the course to be followed with regard to the Environmental Management System, in order to achieve the objectives, set.

For Van Hoof (2008) cited by Marquez (2010) "A part of the whole management system that includes an organizational structure, planning activities, responsibilities, practices, procedures, processes and resources to develop, implement, achieve, and maintain an environmental policy" (p. 69).

Achieving and maintaining the environmental policy will make organizations competitive, giving added value to their products or services.

With the results obtained in the indicator, it can be determined whether the goal was met or not (achieved or not). Therefore, when the proposed goals are met, success in the environmental management system can be predicted.

According to the Practical Guide to Environmental Indicators in the Wood and Furniture Sector (2004) "environmental indicators are an effective tool to inform the company itself on the degree of compliance with the agreed objectives and targets" (p. 5).

Also, the Practical guide of environmental indicators in the wood and furniture sector (2004) says that "If historical situations are compared, environmental indicators can reveal potential for environmental improvement, which are economically viable" (p.5). With the results obtained, it will be possible to propose adjustments to obtain better results (continuous improvement), and it is in this way that the results are linked to improvement processes.

The implementation of an environmental management system

Leadership is a fundamental part to implement the EMS (Environmental Management System), it depends on a leadership convinced of the need for the implementation of the system in the organization, a visionary leader to know where he wants to go, according to Perez (2006) "In a participatory manner creates a Vision, Mission and Objectives that can be achieved by sharing efforts and work in common" (p. 81).

In addition, it is suggested that you know how to work as a team to make a diagnosis of the current situation of the company, with knowledge of the processes and environmental impacts by the same, in order to develop a work plan, where you can, if you consider it, seek advice from a company specializing in the implementation of EMS.

Choosing the norm that will be taken as reference for its EMS, as for example ISO 14001, elaborating the environmental policy according to the organization, establishing goals and indicators that will serve to measure the achievement of objectives, for the Practical guide of environmental indicators in the wood and furniture sector (2004) "the environmental indicators are an effective tool to inform to the same company between the degree of fulfillment of the objectives and agreed goals" (p. 5).

And depending on these results to apply the continuous improvement in the EMS, also the Practical guide of environmental indicators in the wood and furniture sector (2004) indicates that "If historical situations are compared, environmental indicators can reveal potentials for environmental improvement, which are economically viable" (p.5).

Challenges of Environmental Management

Based on the consultation material, for Sisto, Tsoukas and Chia (2002) cited by Ahumada (2004) "Market liberalization, the growing number of mergers and acquisitions, the emergence of free trade blocs, technological changes, labor flexibilization, among others, are frequently cited as destabilizing factors in the organizational environment" (p. 54). Due to this, several capabilities are required to face the pressure exerted by the markets, the personal capabilities that the person in charge of carrying out the environmental diagnosis in an organization must present, among others, are:

- Leadership.
- Knowledge (skilled).
- Interest in caring for the environment.
- Ability to adapt to change.
- Ability to adopt an environmental management system such as ISO 14001.
- Continuous improvement.

According to the Colombian Ministry of Environment (2000) cited by Muriel (2006):

One of the most important problems in Public Management (including environmental) is that planning decisions are made independently from execution and control decisions. And the functions and components of self-evaluation, improvement, adaptation, and adaptation are not included (p. 2).

Sometimes the boss invests a lot of time in planning, including the development of control indicators, but does not carry out the control, thus losing all sense of planning, much less improving, adapting and adapting.

The involvement of all stakeholders in environmental management, as indicated by Ernest Guhl (2000) cited by Muriel (2006): The participatory management of the environmental situations of a region by the various actors, through the use and application of legal, planning, technological, economic, financial, and administrative instruments, to achieve the adequate functioning of ecosystems and the improvement of the quality of life of the population within a framework of sustainability (p. 2).

Methodology

As a first step, we looked for companies related to civil engineering, which were certified with ISO 14001 standards, located in the region of Coatzacoalcos, Minatitlan, etc. (southern Veracruz), to develop research in a specific area. (South of Veracruz), to develop the research in a specific area.

The model and instrument that would serve as an object of analysis to the companies was made, which consisted of conducting an interview by means of a survey with questions formulated so that they could be solved. Considering the following points:

Informative use: the main purpose of the survey is to obtain relevant information that serves as a basis and foundation to be able to discern in the process of implementing environmental legislation in a company. To be able to establish a process to be followed before achieving the expected result.

Statistical use: from the information obtained previously, graphs are established to compare the processes of implementation of environmental legislation that the organizations have gone through, to find similarities and differences that they have had during the development of the certification. At the same time, to be able to analyze which are the key points of their success and/or failure.

Ease of response: for greater convenience and speed in the resolution, it was decided to create the study instrument in the Google database. In order not to interfere with activities or scheduled commitments of the company or person to answer the survey, it is done "online", so it can be answered at the time you want.

Confidentiality: This instrument was only used for the first two points above. In other words, the names of people who directly or indirectly influence the operation of the company are not requested, in order not to expose their integrity. Similarly, no statement is made of the company or companies that have participated in the development of the research, the reason is to safeguard the prestige obtained from each company throughout their working career.

Of the different types of existing surveys, it was decided to develop one of a mixed nature, that is to say, it is composed of a part of closed questions, in which the respondent can choose one or several options, and open questions so that he/she can freely write his/her answer. Since specific answers were required from the companies, closed questions were chosen, but it is also important to know the experience of each one of them during the process of implementing the Environmental Management System, in order to know the successes and errors they had, that is why open questions were also included. In the same way, answers in the form of a scale were used, including numerical scale, nominal scale, and Likert scale.

The advantages of closed-ended questions are that they are easy to process, and the results can be more easily compared quantitatively. And the advantages of open-ended questions are that they provide the opportunity to obtain answers without any type of restrictions from the organizations. Being a mixed survey, both types of results are obtained, but their processing can be more complicated, as it requires graphs and tables, for example.

We proceed to establish contact with the companies. This contact is made in two ways, one by e-mail and the other in person at the facilities.

A total of 9 companies related to civil engineering, from different sectors, participated, and some of them gave talks and toured the facilities. From all of this, we acquired knowledge of the approaches of the evaluators, and of the one we have as a company, in each ISO (ISO 9000, ISO 14000 and ISO 45000).

To achieve the objectives, set out at the beginning of this research, the information was simultaneously compared and formed into graphs in the Google database for better analysis and interpretation. In addition, graphs were made in the Excel program for a better understanding of the results.

The results are presented in order, starting with the company's line of business and then the process that each company underwent in its ISO 14000 certification. Special emphasis is placed on the variables that have significantly influenced the successes or errors of the companies, suggesting possible reasons that may have led to these results. For reasons of privacy and confidentiality of the companies, names were assigned according to the notification of the answers that were received, for a better understanding the companies will be presented as:

- Company 1 (Industry, medium).
- Company 2 (Industry, medium).
- Company 3 (Industry, medium).
- Company 4 (Industry, small).
- Company 5 (Industry, trade, medium).
- Company 6 (Industry, large).
- Company 7 (Industry, large).
- Company 8 (Industry, service, large).
- Company 9 (Industry, medium).

Results

The results obtained from the application of the instrument to the study sample are presented below.

Most of the companies in the region are construction companies and the others are engaged in specific activities in the civil works sector, including construction, as in the case of company 5 and company 8. Similarly, 55.6% of the organizations surveyed are medium-sized companies, 33.3% are large companies, and only 11.1% are small companies. Therefore, 66.7% of the companies belong to SMEs.

On the other hand, regarding the certification acquired by the corporations, it is observed that large companies are the ones that take the least years to achieve certification, i.e., it takes them in fashion 7 years, while SMEs take an average of 15.67 years.

A large percentage of the companies (88.89%) hired the services of a specialized organization to implement their environmental management system, since, of the 9 participating companies, 8 hired the services of a specialized organization and only 1 did not hire such services. It has been mentioned that every company for its optimal operation must have all its personnel trained and updated, in order to offer a better service and have a better performance, and indeed this is proven by noting that all the companies in this research took training on environmental legislation. Likewise, before performing a certification on environmental legislation, an environmental diagnosis of the company should be made, in addition to developing a program of improvements, to make the implementation process easier and more satisfactory in obtaining results. All the companies in this study carried out both activities.

The success of a company comes from the management (owner(s) and/or directors of the company), since they are mainly those who indicate the direction of the company, how it should go and how far it has to go, however, also those in charge or lower hierarchy personnel must participate in the implementation of the environmental management system (vision, mission, objectives, policies, goals and indicators). The ISO 14001 standard specifically mentions that in order for this environmental legislation implementation process to be better used and its objectives and requirements to be achieved, the participation of most of the positions, areas and departments is required, so that it becomes a work team with the same purpose in culture and ideology. In the study, company 7, company 8 and company 9 are the companies in which between 1 and 3 positions, areas or departments were involved in the environmental legislation process, and these were the 3 companies in which there was the least participation. On the other hand, the remaining 6 companies occupied between 3 and 6 positions, areas or departments during the certification process.

Since the elaboration of the indicators, company 3, company 5, company 6 and company 8, are the organizations with the highest number of labor personnel occupied for the certification of the standard, on the other hand, the rest of the companies had a very low participation of labor personnel, occupying between 2 and 5 people for the process. For the implementation of the standard, the majority or if possible the totality of the participation of its personnel is required, being company 5 the one that occupies the majority of its personnel in this process with a total of 50 people. Company 3, company 4, company 6 and company 8, are the ones that show a medium participation of their personnel, having between 10 and 16 people involved, company 1, company 2, company 7 and company 9, are the ones that have a low interaction with their personnel, since only between 3 and 4 people participate.

Although it had been mentioned that the success of this process depended on the participation and interaction of its personnel, company 1 and company 2 are the ones that needed 3 or more attempts to be certified, being the companies with the least participation of people in the process. It was also determined that 6 companies, equivalent to 66.7%, only needed one attempt to achieve ISO 14001 certification, while company 3 only needed 2 attempts to obtain the accreditation of this standard, being a company with a medium participation of people in the process. It is worth noting that large companies are the ones that obtain their certification at the first attempt.

This is followed by a fundamental analysis of the companies, their successes and failures.

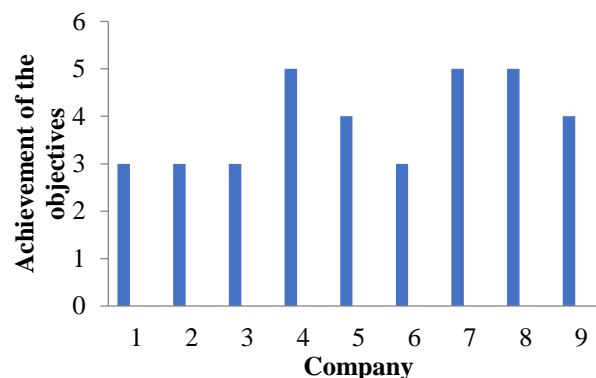
Previously it was established the different approaches that the company has, the organization that evaluates and the approach that the standard has, based on this, the companies with their different lines of business have different requirements to evaluate. For example company 1, company 2, company 3, company 7 and company 9, where it can be noted that their successes are very different, but this is essentially what ISO 14001 mentions, it says that the companies may not coincide in any favorable aspect, because the direction is different as well as its vision, mission, goal, policy and objectives.

What is interesting and verifiable are the bases of the standard, for example on the change of the corporate culture, this means that not only a change is made in the management of the activities in environmental matters, but that it must become a culture to take care of the environment, the company proves it being one of them its success. The specific norm that there must be control measures oriented to the workers and the degrees of danger for its correct handling and disposal, mentions that there must be safety and hygiene measures throughout the company, in order to protect the health of the personnel and their physical integrity, with the above the company should change its ideology regarding environmental management in order to create environmental awareness and responsibility, then, the damages caused to the environment should be repaired immediately before being an irreversible damage, these points are established in the answers of company 1, company 2 and company 3. In the answers of the survey it was also obtained that, company 4 verifies and shows that it is fundamental the objectives and the environmental policy to obtain this certification, because of these two points depends a lot the development of the environmental management system and mentions an objective of the norm for its correct operation, that is to say, the internal audits, these help to self-evaluate as company and to see the lacks that they have or are presented through the time in order to correct them and the implemented system continues in correct execution. Company 5 and company 6 confirm that staff training is very important in the development of the certification process, because the more you interact with the staff, the more understanding and a better work team, company 8 has this similarity by including all its workers, also companies 5 and 6 mention the commitment of senior management, and making it clear that participated in the whole process, from the implementation to the development of indicators and execution of the same. It is established that in order for a company to be successful in the development of the environmental legislation implementation process, it must have defined and established its scopes, as these come from its objectives, since it is what they want to do and what they expect as results, its correct application is synonymous with the achievement that is sought, this point is demonstrated by company 7.

Regarding the errors that the companies had, an important point to provide the service in the best way is to have the necessary resources and of good quality, however company 1 and company 7 have problems with their resources, the first in the low quality and depletion of the same, while the second in their general resources. The norm indicates that the legal part is indispensable, since this legal part is the one that demands the implementation of environmental legislation in the organizations, in the study company 2, company 3 and company 4 have a lack in these legal requirements, and one of them has affectations in the communities due to lack of legal knowledge. Company 5 and company 6, mention the mistake of not involving all their personnel or most of their departments for the implementation of this environmental management system, which is why there are non-conformities on the part of the organization that evaluates the requirements requested by the regulations. The objectives are considered essential in the implementation of the environmental management system, since the direction and operation of the company and the company's personnel depend on them, however, company 8 has marked as an error the fact of not having planned its objectives correctly.

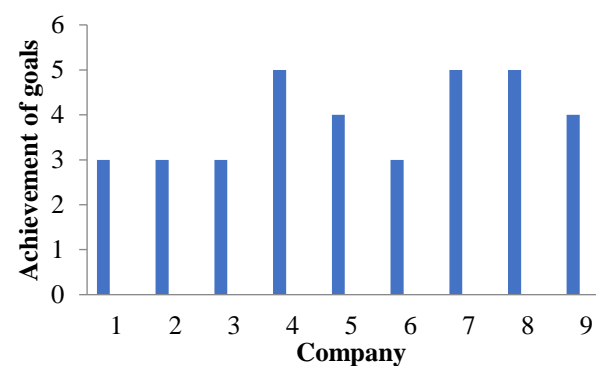
Among the requirements requested by the ISO 14001 standard, it states that the information acquired in the company and all its personnel must be clear and accurate, so that the activities to be performed are effective and professional, in turn indicates that the company must have parameters and measurements of these to assess their progress or deficiency, the company shows lack of information on the extent of compliance in their processes, and therefore must start from scratch.

Graphics 1 and 2 show the level of compliance with the objectives and goals of the companies, which indicates that the companies' responses are reliable, because if the goals are met, then the objectives are met. Company 4, company 7 and company 8 have an efficient compliance in the development of both points. On the other hand, company 1, company 2, company 3 and company 6 have a medium fulfillment of their objectives and goals. Companies 5 and 9 have an almost efficient execution in the previous points.



Graphic 1 Level of achievement of the objectives, scale used Poor 1 – 5 Efficient

Source: Own Elaboration, (2021)



Graphic 2 Level of achievement of goals, scale used Poor 1 – 5 Efficient

Source: Own Elaboration, (2021)

The processes developed by the companies go hand in hand with their environmental policies, they depend directly on each other, since the operation of the labor personnel is involved in the processes and this personnel depends on the environmental policy of the company, company 7, 8 and company 9 have a very good compliance, being the three companies that are achieving the results in all levels of compliance, while the remaining companies show a good and regular compliance depending on the case. In other words, 55.6% of the processes perform well, 33.3% perform very well, and only a minority (11.1%) perform regularly. In the case of environmental policies there are no regular behaviors, only good and very good levels, being 66.7% and 33.3% respectively.

Table 8 shows the proposals for improvement that the companies presented based on the errors they had in the process of implementing environmental legislation, also making a schedule of improvements.

Finally, in Table 9 the level of compliance with the proposals for improvements made previously, the only companies that fully complied with these proposals are company 4, company 5, company 7 and company 8, while company 2, company 6 and company 9, their level of compliance was almost efficient, as well as the responses of the remaining companies in their execution of their proposals were regular.

Annexes

Company	Industry	Commerce	Service
1	✓		
2	✓		
3	✓		
4	✓		
5	✓	✓	
6	✓		
7	✓		
8	✓		✓
9	✓		

Table 1 Business line

Source: Own elaboration, (2021)

Company	Small	Median	Big
1		✓	
2		✓	
3		✓	
4	✓		
5		✓	
6			✓
7			✓
8			✓
9		✓	

Table 2 Company size

Source: Own elaboration, (2021)

Company	Company creation	Standard implementation	Years
1	19/01/1987	03/01/2013	17
2	28/07/1988	08/10/2012	16
3	15/09/2005	05/05/2011	6
4	12/06/2006	14/05/2018	12
5	07/01/1991	20/01/2017	21
6	26/03/2013	26/07/2014	1
7	27/04/2006	29/10/2013	7
8	12/05/1997	08/03/2004	7
9	26/11/1984	07/04/2018	22

Table 3 Years elapsed to be certified, considering that the ISO 14000 Standard was published in 1996

Source: Own elaboration, (2021)

Company	Elaboration of environmental diagnosis	Elaboration of work plan
1	✓	✓
2	✓	✓
3	✓	✓
4	✓	✓
5	✓	✓
6	✓	✓
7	✓	✓
8	✓	✓
9	✓	✓

Table 4 Companies that prepared an environmental diagnosis, and a work plan to implement the standard

Source: Own elaboration, (2021)

Company	Number of attempts the company needs to get certified
1	3 or more
2	3 or more
3	2
4	1
5	1
6	1
7	1
8	1
9	1

Table 5 Number of attempts the company needs to get certified

Source: Own elaboration, (2021)

Company	Main successes
1	Control measures oriented to workers and degrees of danger.
2	The correct implementation of safety and hygiene measures in accordance with ISO standards.
3	Create awareness and responsibilities in the company for the management of waste handled in construction.
4	Environmental objectives, environmental policy and internal audits.
5	Training of personnel involved in the management system, commitment of top management.
6	That the commitment was not only from the management, but also from the company's operating personnel.
7	The scopes.
8	The good compliance of all its employees and not being tolerant of any event.
9	Emphasize and prioritize change in corporate culture.

Table 6 Successes that companies had in the process of implementing the standard

Source: Own elaboration, (2021)

Company	Main mistakes
1	Buying materials with low quality and depletion of natural resources.
2	The delivery of the required documentation.
3	Lack of knowledge of the legal aspects used in the communities.
4	There were only observations on the legal requirements.
5	Assume that the management system depends on a department that manages, however, each process must be aware of the participation and consultation of personnel as a fundamental part of the system.
6	That those involved were not considered when generating the procedures.
7	Resources.
8	Failure to plan target points well.
9	Not having enough information to show the extent to which your procedures are being followed and having to start from scratch.

Table 7 Errors that companies had in the process of implementing the standard

Source: Own elaboration, (2021)

Company	Improvement proposals
1	Warehouse improvement, noise measurement and maintenance programs.
2	The use of special bins to separate hazardous waste in the work area.
3	Identification of environmental aspects found in offices and construction projects.
4	Expand legal requirements.
5	Improve the way system performance is measured.
6	Reuse products instead of generating disposal.
7	Document control.
8	Training of your personnel before carrying out any established activity.
9	Reducing waste, discharges and emissions and optimizing processes.

Table 8 Proposals for improvement raised by the companies

Source: Own elaboration, (2021)

Company	Level of compliance with the improvement proposals (poor 1 – 5 efficient)
1	3
2	4
3	3
4	5
5	5
6	4
7	5
8	5
9	4

Table 9 Level of compliance with the improvement proposals

Source: Own elaboration, (2021)

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Conclusions

At the end of the research, with the application of the instrument to obtain relevant information from the companies, the analysis, distribution and interpretation of the results, it can be concluded that the ISO 14001 standard gives a greater enhancement to the company and commercial competitiveness, especially its contribution to society and the environment, referring to the fact that it takes care of people's health and environmental integrity.

With regard to the business perspective, it is stated that companies that have as a basis to involve all their staff, receive training, correctly establish their objectives, environmental policy, vision, mission and goals, develop a diagnosis, a work plan and especially the change of their culture, tend that companies can obtain the ISO 14001 certification at the first attempt, this makes it clear that if the requirements set out in the standard are followed correctly, the implementation process is a success. It can also be concluded that the successes acquired and obtained by these companies are the result of good planning and the intervention of management from start to finish, thus dispelling any doubt that the interaction of management and all departments is something negative; on the contrary, much depends on the success of the implementation of environmental legislation.

With the information obtained, the hypothesis of the research can be proved, by knowing the successes and mistakes that civil engineering companies have had, it allows to identify the main deficiencies in the process of implementing environmental legislation.

Based on the above, the following can be recommended to companies that take the initiative to acquire environmental legislation certification:

- Be correctly informed of the requirements of the ISO 14001 standard.

- To carry out a diagnosis of the company to be able to see the deficiencies that they present.
- Train all the company's personnel.
- Establish and define your environmental objectives and policies.
- Involve all your staff in the process of implementing the standard.
- Interaction of the board and all its departments.
- Change its corporate culture.

It is recommended that small and medium-sized enterprises (SMEs) follow the same process as large companies, since it takes fewer years to acquire certification and at the first attempt.

As for companies already certified, it is recommended:

- Be subject to internal audits for a better operation and efficiency in the development of the same.
- Efficiently implement the improvement plans proposed.
- Develop a work plan in accordance with the improvement proposals.
- Continue to involve the board of directors and all the personnel of the different areas and departments of the company.
- Maintain or improve the level of compliance with the standard.
- Maintain or improve its corporate culture.
- Create environmental awareness and responsibility.

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