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Environmental management system implementation: experience and perspectives of a corporation

Jaime Bartholomeu Filho[a], Alexandre de Oliveira e Aguiar[b]

[a] Chemical Engineer from Escola de Engenharia Mauá, Masters student at Universidade Nove de Julho - UNINOVE. Operations manager at Pragma Consultoria e Assessoria Ltda., São Paulo, SP - Brazil, e-mail: jaimebartholomeu@terra.com.br

[b] PhD in Public Health from Universidade de São Paulo (USP). Professor at Universidade Nove de Julho -UNINOVE, São Paulo, SP - Brazil, e-mail: aaguiar@uninove.br

Abstract

The present report on management practices is the result of the study of the implementation of an Environmental Management System and its outcomes, according to ISO 14001 (International Organization for Standardization). The implementation of models of environmental management has been the subject of relevant discussions both in academic circles and organizations, mainly regarding the results and benefits, both measurable and unmeasurable ones, when compared to the resources that were available and invested. Some studies present good arguments and results while others simply do not see such benefits. The present paper addresses the case of an industry that produces materials for tire retreading, discusses the implementation of environmental management in similar industrial operations where different methodologies for the implementation were used and presented different results. The present study was carried out by direct observation, once one of the authors worked for the company under study, and also by studying the available documents, as well as by revising the bibliography related to this matter. The results show that the methodology applied in Brazil, different from the ones used in other units worldwide, resulted in a better environmental performance in comparison to the other units where the implementation was based on the classical paradigm of having only one individual responsible for the environmental sector. Another important point is that the corporation had established long-term goals in order to achieve a consistent performance improvement.

Keywords: Environmental management system. Organizational structure. Organizational change. Environmental performance.

Introduction

Inside an organization, environmental issues are becoming more important by the day. Among the main drives concerning the relevance of the environmental management, the following aspects should be mentioned: the need to comply with the law which is ever more restraining as to environmental impacts; the market forces that require that products and services be the result of sustainable operations; strategic reasons of organizations that need to consider environmental issues as a competitive differential and need to see the environmental management as one of the critical factors for success.

On the other hand, one can observe that environmental issues are being incorporated into political decisions in many countries. Therefore, those issues will imply in important changes in the way that the organizations conduct their businesses, incorporating some concerns that so far were not taken into account: environmental management; green supply chain; life cycle of products; sustainability of operations; social environmental actions, to name but a few.

In this scenario, it is possible to observe a growing number of companies placing environmental issues at the center of their business as an item belonging to their business strategies. Therefore, those companies initiate their inner formal processes to implement environmental management, and one of the possible results is to be granted the ISO 14001 Certification, which is a norm published by ISO (International Organization for Standardization).

There is an intense discussion about the results of implementing such management systems, whether they are effective or not. There are examples for and against it in the scientific literature, which have considered the factors determining the success and the best results from this implementation.

Once ISO provides the companies the flexibility to define how they will internally organize to comply with it, the means and style of the implementation can definitely influence its practical results. Such means can vary, for instance, if the responsibilities of the process will be centralized or widely shared.

As stressed by Moreira et al (2010), in a continent-sized country such as Brazil where most of the cargo is transported by road, it is very important to make this mode of transportation environmentally sound and economically feasible. Therefore, tire retreading may play an important role in achieving this.

In the present paper, the activities of a global company that manufactures rubber goods for the automotive market are explained. The company's core business is to extend the lifespan of tires, and hence to help minimize the environmental impacts by reducing the consumption of natural resources along its supply chain, from primary suppliers to final users, also helping to reduce other environmental impacts caused by the disposal of used tires. This paper aims to discuss the results from the environmental management system implemented in the corporation, by comparing the results obtained in the Brazilian unit to other units, as well as the organization model that was chosen to implement it, considering the distribution of the responsibilities in the working areas and the structure of the teams.

Theoretical framework

The theoretical framework of the present paper has the following main dimensions: the environmental management systems; the introduction of environmental management into companies and the organizational structure they have adopted; and the role of the environmental manager.

Introducing Environmental Management into Companies

Our civilization's prevailing production and consumption model lead humankind to a situation in which it consumes more natural resources than the planet can replace (MEADOWS et al, 2014). These authors project future scenarios in which the production and the well-being indicators will reach a peak sometime in the twenty-first century, and from the peak will rapidly decrease to levels close to those of the 1950s. Regarding transport and vehicles, UNEP (2011) points out that business-as-usual will significantly increase the fleet of vehicles and the costs society incurs. Among the identified strategies, there are the need to seek alternative transport means and the need to advance vehicle technologies to lower-carbon ones. Tonelli et al (2013) studied industrial sustainability and pointed out that the industrial sector is responsible for about 36% of global CO2 emissions. They also remarked that activities to promote economies of scale in reuse, remanufacturing and recycling may play an important role in improving environmental performance of products.

Companies are progressively being brought to participate in the changes that will lead society to a more sustainable development, and the involvement of companies with sustainability has been discussed from various points of view.

Elkington (1999) sought to translate the ethical concept of sustainable development dimensions that could indicate strategies and business management practices, starting from the "triple bottom line" in which environmental, economic and social dimensions form a balanced structure.

More recently, other authors have been seeking to strengthen the strategic aspects of sustainability for corporations. As an example, Amini and Bienstock (2014), when studying the scientific literature on the topic, propose some elements: application and sustainability reporting at the business level; focus on sustainability driven innovation with the involvement of multiple stakeholders; triple bottom line approach; and a stance that includes leadership in regulatory affairs.

Nilsson (1998) presents the following definition for environmental management: "Environmental management comprises planning, organization and it guides the company to reach specific goals compared, for example, to what happens with the quality management. One relevant aspect of the environmental management is that its introduction requires decisions to be taken in the upper levels of the administration and, therefore, it conveys a clear message to the organization that it is a corporate commitment." (p. 134)

Faucheux et al (1997) identified two basic strategies to introduce environmental management into companies: defensive and proactive. In the defensive strategy, environmental management is seen as a factor that restrains company's processes and it is

considered a consumer of human and financial resources. The integration of environmental management in the company's processes and, therefore, the role of the manager, is limited to comply with the law in force at their location. In the proactive strategy, the role of the manager is seen as very important in the business environment. The "natural environment" is regarded as a field for new opportunities and an important factor of competitiveness and success, mainly as to the aspects related to the prevention of negative impacts caused by some business activities and by the characteristics of the products that are made available to the public.

Environmental management process is very wide and comprises organizations as a whole and not only their industrial activities. Nascimento et al (2008) present the role supposed to be taken by each area in a company, such as Production, Human Resources, Purchase, Finance, Marketing, and Upper Administration, so that strategic social environmental management can succeed. Such a strategy includes an environmental management system.

Corazza (2003) presented three fundamental aspects of the organization of a company, regarding the environmental management, as follows: a) the integration of the matrix is essential for the company to reach the results of the process of learning new requirements; b) the identification of organizational mechanisms that can change the structure of the companies and can promote adequate environmental performance; c) the need of all stakeholders to get involved, which means neighboring communities, employees, suppliers, clients, consumers, organized society, etc.

Sambavisan and Fei (2008) studied the implementation of the ISO 14001 management systems in companies from the electronic sector in Malaysia and concluded that the main factors to be successful are the following in order of importance: the managerial approach, the management of changes, the technical aspects and the external social aspects. The authors also stressed that for the implementation of the ISO 14001 management system to succeed, it requires the commitment of all employees, and the responsibilities must be clearly defined and communicated. That could mean some changes in the structure and in the channels of communication.

Oliveira et al (2010) studied the difficulties that were reported by the companies that were granted the ISO 14001 Certification, in Brazil. The main ones are the increase in costs related to environmental management, and constant changes in the Brazilian Environmental Laws.

Jabbour (2011) classified the companies, which were certified according to ISSO 14001, in two groups of environmental management development stage: one group was in the stage of synergy towards eco-efficiency, and the other group was in the stage of complying with environmental laws. According to the above mentioned author, evolution occurs in a nonlinear way.

Environmental Management Systems

According to Aguiar (2004), " ... Following the international movements and the development of the laws regulating environmental controls, during the decades of 60s and 70s, industries started to enhance the use of technology to deal with the emission of pollutants. Such technologies were consolidated at that time and nowadays are re-

ferred to as end-of-pipe technologies because they were concerned with the elimination of the pollutants after they had been generated by the processes."[1] (p.53).

In the 80s, several accidents and unwanted events happened that taught us a lesson that technology, by itself, could not solve environmental issues, particularly the ones related to pollution and environmental impacts derived from the operations of companies. In order to provide advancements to the environmental management in companies, and to grant more credibility to their compromises, some worldwide accepted models of management were created, among them being the ISO 14001on environmental management systems. This norm proposes a model of management that intends to be environmentally responsible, law abiding, committed to continuous improvement, and to the prevention of pollution. It is based on the PDCA Cycle (Plan-Do-Check-Act) and is adequate for a third party certification.

It is worth noting that a growing number of companies are placing environmental aspects in the center of their business as an element of their strategic plans. Therefore, those companies initiate their formal processes to implement the environmental management into their businesses and as a result can be granted the ISO 14001 Certification.

Figure 1 shows the evolution of the number of companies that were granted ISO 14001 worldwide, from 1999 to 2012.

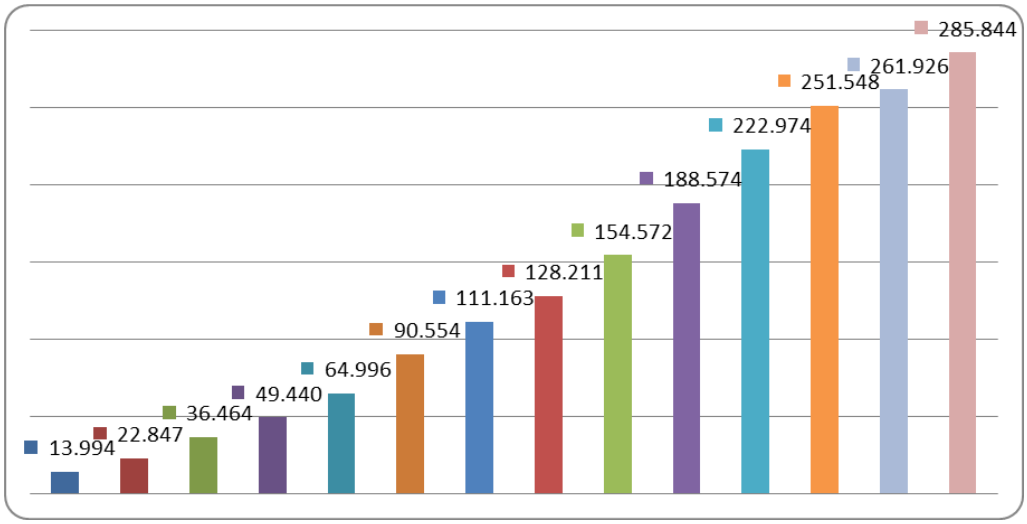

Figure 1 – Evolution of the ISO 14001 Certifications Worldwide
Source: Elaborated by the authors, using data from ISO (2013).

When it was created, ISO 14001 aimed several potential benefits to be achieved by the organizations that would implement environmental management systems in accordance with its requirements. As the years passed by, the said benefits are being both confirmed and questioned by some authors.

Darnall et al (2008) concluded that the results are positively influenced by the motivation to implement a more comprehensive system and its internal aspects, such

[1] Translation from the original by Rosely Rodrigues

as the commitment of the employees and their engagement in research and development activities. Potoski and Prakash (2005) concluded that the companies certificated by ISO 14001 had a better performance when complying with law requirements. They also concluded (2005b) that the certificated companies reduced their pollutant emissions at a higher rate than the companies with no certification. Babakri et al (2004) concluded that certificated companies had a better performance in waste recycling than the companies with no certification. Link and Naveh (2006) concluded that when environmental activities are included into the day-to-day routine of the companies, the environmental performance is improved, but they did not find any evidence of a better global performance of the business.

Boiral (2011) calls the attention to the fact that for the implementation of an environmental management system to succeed, it depends much less on the norm itself and much more on the attitude to face such implementation. Yet according to this author, it is more important to know how the ISO management systems can be used in the best and the most efficient way possible than to obtain the certification itself.

Yin and Schmeidler (2009) tried to identify the reasons why the results from management systems based on the very same norm were quite different. One of the most important conclusions they reached is that the companies that included environmental management into their day-to-day activities reported better environmental performance.

When analyzing possible traps presented by the implementation of the ISO 14001 environmental management system in certified companies in the State of Illinois, Ghisellini and Thurston (2005) recommended, for instance, that the companies should focus not only on the regulated environmental aspects, the end-of-pipe technology, or the improvement of the system, but also on the performance itself, based on an established performance base. The authors also highlighted the importance of establishing a multi-function and multi-level team, including representatives of every department in the company.

The role of the environmental manager in an industrial company

In the decade of 1980, the introduction of quality management system into industrial operations, represented by the norms of the ISO 9000 series, gave rise to a new position or function in the structure of industrial management, that is, the "person responsible for the quality management system". This model was further copied by the environmental management system.

Groenewegen and Vergragt (1991) highlighted the historical context in which the new position of environmental manager was inserted into industrial and/or corporate activities. The authors emphasized that in the beginning, the environment-related activities aimed to comply with the laws and generate compliance reports, but in the following years the focus gradually changed to activities and programs related to prevention. Therefore, the function and the assignments of the environmental manager have evolved along with the changes imposed by business environment.

Currently, the environmental manager is integrated in the decision-making processes of a corporation, supporting the strategic definitions of a business, as well as the

technological development of processes, products, and services. Today, one can observe that there is an ever-greater pressure to align environmental performance with economic performance.

From the mid-90s, upon considering the objective information provided by the so called annual corporate reports, one can observe the beginning of the integration of environmental management into all processes of corporations, mainly within industries. From a qualitative point of view, it is possible to notice in those documents that environmental issues are getting even bolder in companies' operational approaches and are being in the spotlight.

Likewise, it is noticeable there is increased introduction of the sustainability issue into business discussions. Such discussions comprise the whole supply chain, from the supplier to the final disposal of the products after being used, as well as propose a better integration between the government and the private sector, mainly in the formulation of environmental policies by means of public hearings. This kind of dialogue is useful to establish environmental policies, and to define the methodologies and tools to support environmental management processes, enabling the civil society to have a deeper commitment and participation through the NGOs - Non Governmental Organizations.

Under this new perspective, and motivated by new requirements, additional responsibilities have been attributed to the role of the environmental manager, inside organizations, so that the demands of external stakeholders could be fulfilled.

Methodological procedure

Yin (2004) classified six different sources of information for case studies: documents, records, direct observation, participating observation, interviews and objects.

For the present study, descriptive research was carried out having an analytical and documental basis. The basis for the present case study comprised documents and records from the studied company and the observation from one participant in the process of the implementation of the ISO 14001 management system, once one of the researchers worked for the company.

The data used to compare the efficiency of models of environmental management implementation were obtained from internal and external documents published by the company. The company features an image associated with sustainable environment and has embraced sustainability as a competitiveness strategy. The company has audacious goals to reduce its emissions, uses renewable materials, recycles and reuses the waste generated by its operation, and has environmentally sound practices. Its actions are informed in the Annual Report that is published on its internet site aiming to be transparent in the relationship with internal and external stakeholders.

Among the documents that enabled the researchers to assess the management of the company, there is the "Environmental Report" that shows the public how the group takes a stance in relation to the most relevant issues regarding the environment, how the company relates with the stakeholders, and how the results of the company are assessed in comparison to its sustainability and environmental policies. Other than

that, the report provides a future vision of how the company will develop its products and what the goals to be reached are.

Theoretical and bibliographical support was obtained in the data basis of Scopus, Web of Science, as well as Google Academic for national articles.

Business context
The activities of the company and its context

The business of the company studied is tire renewal through retreading, which is the substitution of the worn tread by the new one.

According to the INMETRO – Instituto Nacional de Metrologia, Qualidade e Tecnologia (2013), a Brazilian Institute that regulates measures, quality and technology, a retread tire is the one that had its tread, which is the portion of the tire that touches the ground, substituted. When besides the tread, the lateral portion (between the tread and the flank) of the tire is also substituted, the result is a recapped tire. A recast tire, apart from having the tread and the lateral portion substituted, also has the flank substituted.

According to the ABR – Associação Brasileira do Segmento de Reforma de Pneus (2013) (Brazilian association of companies of tire renewal), in 2012 this market share earned around R$ 5 billion in renewal services, sales of material and equipment, in 1.257 renewal plants, 18 raw-material suppliers and 52 manufacturers of equipment. Again, according to ABR, this segment employs around 40.000 workers in the renewal plants and provides around 10.000 jobs in the raw-material suppliers and equipment manufacturers.

The main environmental advantages of tire retreading are to postpone the final destination of the tire carcass and recycle its solid waste through different kinds of activities. However, there are further advantages. The scrap powder generated by the retreading process is added to the mix of materials to manufacture rubber products and ecological asphalt. Furthermore, the retreading process uses 1/3 of the total volume of petroleum required to produce a new tire. Retreading uses less material than the production of a new tire and provides the same durability with a lower cost. (ABR, 2013).

According to ABR (2013), Brazil is the second market of tire renewal in the world, while the USA is the first. This is an activity with a tradition of 60 years, encompassing 1.257 companies related to other 5.000 micro and small service enterprises. Lagarinhos and Tenório (2008) commented that in Europe there is a restriction of only one renewal per tire and that there are incentives to companies that renew tires. The same authors point out that the RI (Retreading Index), which is the ratio of retread tires over the number of new tires, is much higher in Brazil (3,25) than in the USA (1,2), in Europe (0,87) and in Japan (0,23). This result is probably due to retread costs which, according to the authors, are lower in Brazil.

Retreading activities generate more than 250.000 jobs, comprising retreaders, dealers, service shops, and suppliers. According to ABR they also provide other advantages: a) job opportunities to less qualified workers; b) in-company training; c) nationwide availability (ABR, 2013).

The implementation of environmental management system

The company studied is a corporation that has operations in the United States of America, Mexico, Brazil, Europe and Asia. The ISO 14001 certification process was initiated in all the units at the same time in October 2006, lasted eighteen months, and the certification was granted in April 2008.

In 2007, the company had around 80% of its units already certificated according to ISO 14001, and in 2011 there were more than 96% among the total of its 180 units. During this period, its operating margin grew from 3,00%, in 2008, to 5,6% in 2012.

The operations in the USA, Mexico and Europe decided to implement the process following the classical organizational design characterized by the assignment of the responsibilities of the environmental management system to only one department (with a limited number of employees), which is responsible for implementing the policies, procedures and practices, as well as monitoring the results.

The operation in Brazil chose a different path and instead of centralizing the assignments and responsibilities to a limited group of employees, it favored the matrix implementation focusing on diverse operational processes. Matrix implementation is understood to be the formation of multidisciplinary teams, with complementary competences acting in all sub-processes in the industrial sector.

The first and fundamental strategic decision in Brazil was to change the line of subordination of the human resources department, from the administrative/finance division to a direct subordination to the presidency of the company.

Such change is justified by the following main arguments, but is not limited to them:

- The human resources department needed to truly focus on the development of the skills required for the employees to face new challenges presented to them;

- When it was subordinated to the administrative/finance department, this strategic sector had to compete with the remainder of departments, such as controlling, account payables, account receivables, information technology, etc., for the limited resources, and was often left behind, due to the immediate results these departments used to bring to the operation;

- The human resources department's requirements related to the forthcoming organizational changes should be dealt with exactly as the needs of any other departments, i. e., marketing, commercial, administrative/finance, operations (industrial, logistic and services to clients), and development of products and processes.

After such changes, the human resources department worked on two fundamental issues: a) update the job description, including the new assignments related to environmental issues; and b) allocate resources to the management of the process to develop additional skills (knowledge, abilities and attitudes) required by new goals related to environmental management, which were incorporated into the industrial activities.

At the operation level, four multifunctional teams were created including representatives of all the operational sub-processes. Therefore, the teams had all the complementary skills required for a suitable evaluation of environmental issues and impacts, as well as of the risks associated to various activities.

The multifunctional teams included professionals, who besides having the required skills, were opinion makers influencing the rest of the employees. Those teams included representatives of the following departments: Administrative/Finance; Human Resources; Development of Products and Processes; Marketing; Commercial and Operations. In this case, the department of Operations itself included representatives from Production, Maintenance; Industrial and Process Engineering; Quality; Logistics and Planning.

The teams were subordinated to the Operations Board that was responsible for all the industrial sub-processes and reported directly to the Company President, in Brazil, and to the Worldwide Operations Vice-President, who were the sponsors of the project to implement the environmental management locally and internationally.

In Brazil, the management process was implemented based on ISO 14001 and on the best practices that were identified and used during the process of benchmarking the performance of world-class companies operating in the segment of chemicals and rubber.

A special focus was directed to the following main aspects, but it was not limited by them:

- Embrace the principles of clean production, focusing on the following: enhance the productivity (use) of materials; enhance the efficiency in energy use; improve the management of material flows and implement preventive and protective actions towards the environment; comply with all legal requirements; continuously improve towards sustainability in the use of natural capital;
- Green Chemistry;
- Zero waste policy;
- Search for eco efficiency in the development of new processes and products;
- Control every form of pollution;
- Develop a predominantly green supply chain.

Inside the company, environmental issues started to have specific goals and became an important factor to evaluate the performance of all employees. As a result of this program, the implemented management system was integrated in order to meet various norms: ISO 9001 (quality), ISO 14001 (environmental management) and OHSAS 18001 (safety management and occupational health), and the operations were certificated in 2008.

The focus on the environmental performance of the company became clear in establishment of the long term corporate goals before the ISO 14001certification process had begun. Figure 2 shows some of them.

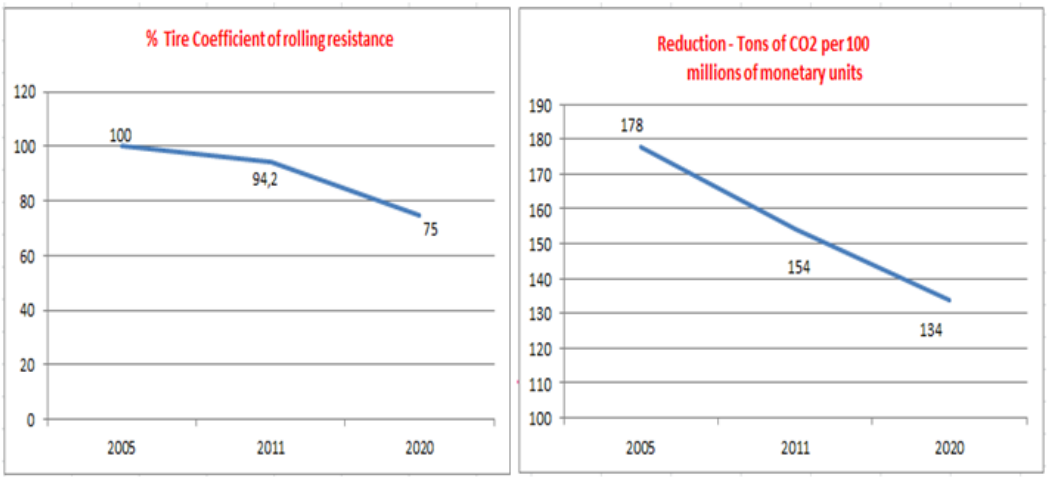

Figure 2 – Long term goals to reduce CO_2 emissions and reduce the ratio of rolling resistance.
Source: Prepared by the authors with data supplied by the company.

Both goals show the concerns with environmental impacts, either by reduction in the consumption of natural resources or improving the quality of the products, because the reduction of the ratio of rolling resistance means that less fuel is consumed and that the tire has a longer lifespan.

Results

Results from the implementation of the environmental management system

As continuous improvement of environmental performance is one of the goals of the implementation of environmental management based on the ISO 14001 norm, the percentage of improvement in the key-indicators was chosen to be the indicator of the performance of the companies that produce treads for tire renewal.

Figure 3 shows the results related to main environmental issues: electric energy consumption, fuel consumption, water consumption and generation of waste from productive processes. The results were positive for every year. The fact that the reductions declined along the years is normal and indicates that the system was maturing, once the main opportunities to improve were taken as a priority.

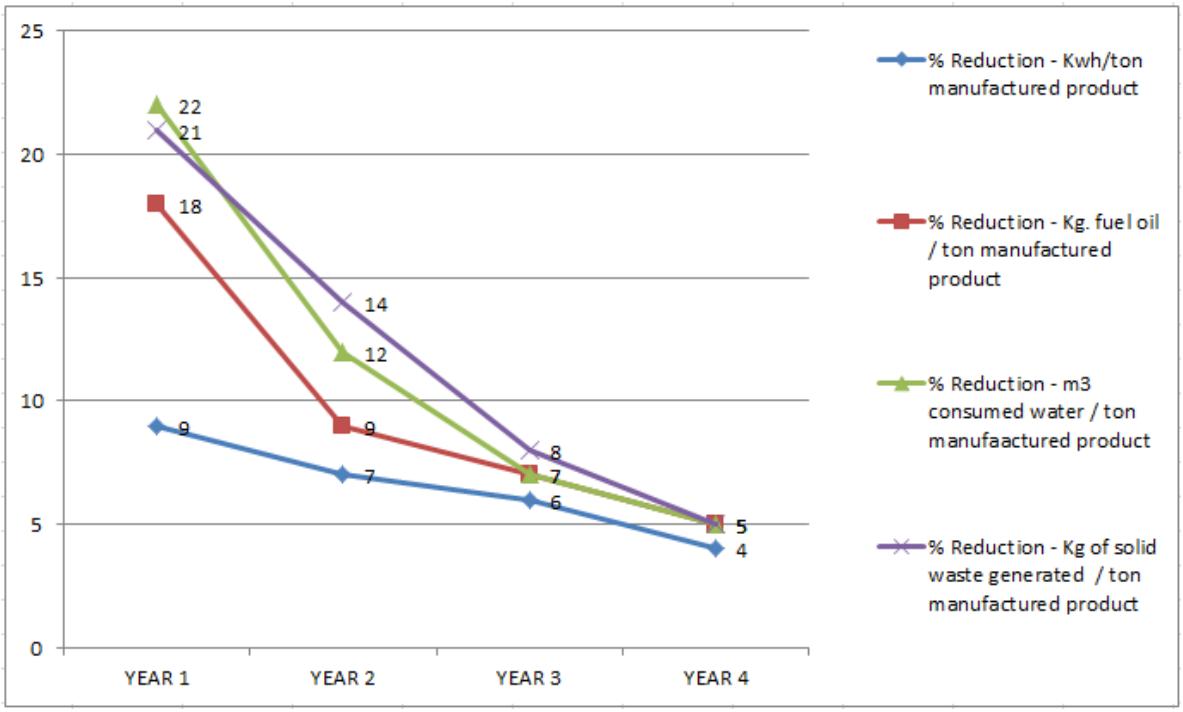

Figure 3 – Percentage of the reduction of electric energy, fuel, water and waste, compared to the previous year

Source: Prepared by the authors with data supplied by the company

The absolute results presented in figure 3 are the evidence of how the implementation of environmental management process contributed to a significant improvement of the specific consumptions of the company. Therefore, there was a reduction in the consumption of natural resources in the first four years of implementation, through a 26% cut of electricity, 36% of fuel, of 44% of water, as well as a reduction of 48% in the generation of waste.

The relative results compared to the ones from the USA, Mexico and Europe show that the performance in Brazil was systematically superior, as per Figure 4. It is very important to stress that the units compared featured operational similarities such as the level of the technology of the processes, the production processes, the size, the product portfolio and the variety of manufactured products. Hence, the operations in those several units were perfectly comparable.

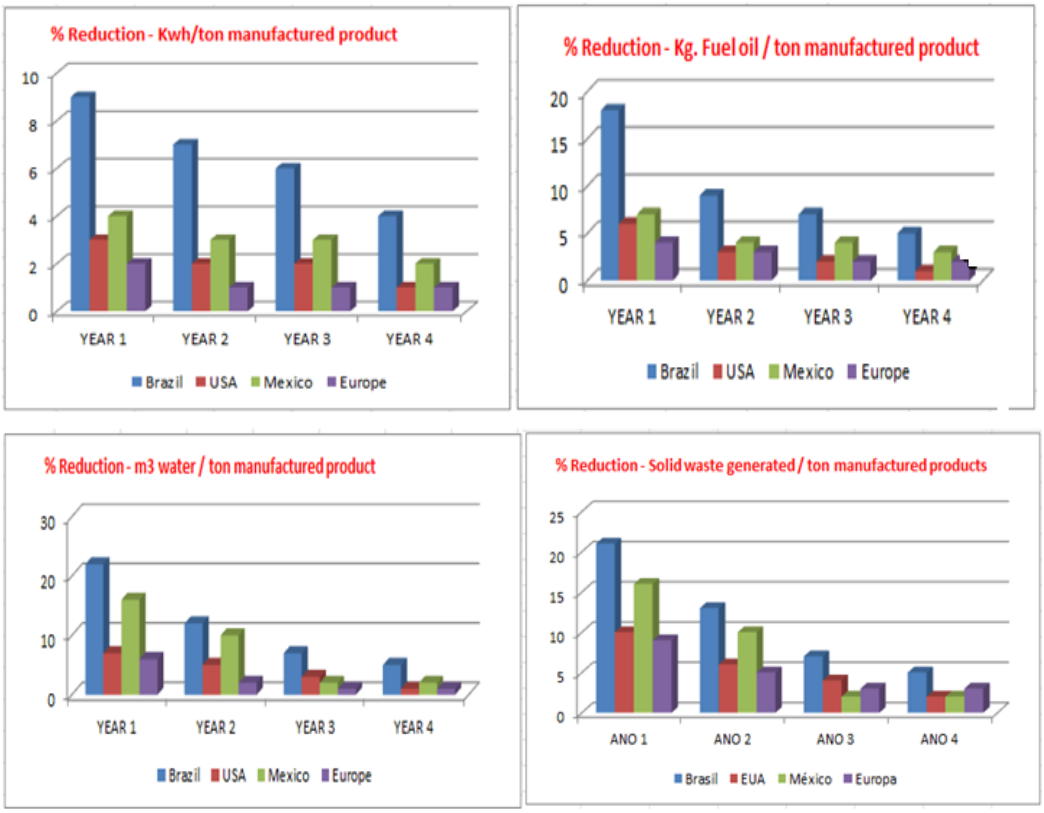

Figure 4 – Comparison of the improvement of environmental issues between various units of the company

Source: Prepared by the authors with data supplied by the company

Table 1 shows some important technical characteristics. The data provide an acceptable comparison between the results, once the absolute values of environmental indicators are consistent and quite homogeneous in year 1.

Table 1 – Characteristics of the organization

	Consumption of electricity (kWh/t)	Consumption of fuel (kg/t)	Consumption of water (m3/t)	Generation of waste (kg/t)
Brazil	900	38	3,5	43
USA	890	42	4,2	38
México	911	38	3,3	47
Europe	**880**	**44**	**4,1**	**39**

Source: Prepared by the authors with data supplied by the company.

The results presented in figure 4 and table 1 indicate that better efficiency in obtaining the results from the environmental management system was motivated by the way in which the system itself was implemented. Differently from the classical method of implementation, all employees in the organization were responsible for environmen-

tal performance, and not only a selected group, motivating the development of new competences and assignments for every employee.

Strategic perspectives and long term goals

Another differentiation of the environmental management in the studied company was the establishment of long term goals. The company established a projection for the year 2050 of how recycled material would be used, how new input of renewable material would occur, and how non-renewable material would be used. The company also established goals of CO2 reduction, in order to eliminate the use of non-renewable material, keep the use of recycled material and introduce new renewable sources in what the company called "ecological capacity line".

Three lines of action were established:

a) Reduce consumption of materials (improve productivity of the resources): technology of half the weight, technology to run the tire without air (which means no spare tire is needed), and technology to provide a longer lifespan. The objective of this action is to bring the consumption of resources to the level of an "ecological capacity";

b) Recycle the resources: retreading technology, non-pneumatic tire (without air), to use recycled rubber. The main goal is to improve the use of recycled materials.

c) Improve and diversify the use of natural resources: improve the productivity of rubber and diversify the use of resources such as biomaterials. The goals of those actions are to promote the use of recycled materials, enhance the use of renewable materials, and eliminate the non-renewable ones.

Other than the above mentioned actions, the company has reduced its greenhouse gas emissions by 14%, measured in CO2 ton/sales, and has established a further reduction of 35% for 2020. From the technical point of view, the improvement of the tires in relation to the rolling resistance (a technical parameter associated to fuel consumption) has a goal to improve 25% in comparison to the ratio from 2005, which can also provide additional indirect improvements.

In view of the locally attained results, it is possible to perceive that as a consequence of the model of implementation chosen, the operation in Brazil is closer to reaching the corporate results as established, thanks to implementation of an environmental management system that permeated the whole organizational fabric with its commitment with the process.

Discussion

The comparison of the results from the indicators suggests that the model of implementation of the environmental management system at the Brazilian unit showed a differential that yielded more advanced results in its performance. Once the technical characteristics of the units worldwide were similar, it is possible to suppose that the strategy of implementing the matrix process in the organizational structure of the operation in Brazil had a predominant role to reach its goals and to present better results when compared to the operating units in the USA, Mexico and Europe.

Choosing a multifunctional team with complementary competences rather than concentrating the responsibilities in one environmental manager (the classical way) follows the advice from Ghisellini e Thurston (2011). The concerns of the human resources department of redefining the job descriptions, incorporating new assignments and supplying human resources and their required competences, also follow the recommendations from Ghisellini e Thurston (2011), as well as the ones from Sambavisan and Fei (2008), and are in accordance with the proposal of Corazza (2003) and Nascimento et al (2008) relative to the role of functional areas when working in environmental management.

The managers' stance, the work of the cross-functional team and the approach of the processes and sub-processes, instead of the focus on the elements of the norm itself, made it easier to incorporate day-to-day activities of the employees into the implementation, confirming the aspect highlighted by Yin e Schmeidler (2009) as being decisive to get the best results.

In addition, it is important to stress that the company had not just focused on the regulatory aspects, such as licenses and the proper destination of waste, but also regarded the aspects related to the efficiency of the processes, such as a more efficient use of energy, better management of the flow of materials and better eco-efficiency in the development of new products. The afore mentioned concerns are in accordance with the recommendations of Ghisellini et Thurston (2005) and Boiral (2011) of not focusing the implementation only on the certification and the formal framing of the system, but also on the benefits that the certification can bring.

The long term perspective also plays an important role because it establishes the goals that lead to technological innovation and not simply comply with the law. Perhaps the concerns to comply with the law, as demonstrated by the companies that Oliveira et al (2010) have researched, show that Brazilian companies may have mistaken or limited the focus to implement an environmental management system. On the other hand, it could be interesting to have more research to identify the differences between legal systems of various countries that could present additional difficulties to the Brazilian companies in general. By all means, in the case of the company studied, this kind of difficulty has not been significant.

Conclusion and final considerations

The work sought to innovate by analyzing the implementation of environmental management system and its results, and studying the differences in order to implement it in a corporation, whereas previous studies have sought to identify the motivation for the implementation; the role or importance of specific tools, such as training or evaluation methods of environmental aspects and impacts, or comparing certified and non-certified companies.

When compared to a centralized environmental system, the above discussed results show that environmental performance is better and more consistent when the environmental management process was implemented according to the matrix model, involving all company's employees and demonstrating its strategic importance to the business. It is important to show the employees the importance of developing new

competences that are required for a much better performance, as well as to introduce the environmental performance as a parameter to evaluate their individual performance.

The better pace of improvement reached in the Brazilian unit in the first years after the certification was granted, confirms the arguments presented in the references as to the need to include and articulate various working areas in a company.

It is hereby suggested that similar studies be made in other companies from different segments, in order to confirm the results in different contexts so that it could be verified if the same results could be generalized.

It is important to stress that in the studied case, the good results influenced the Corporation in the establishment of more ambitious long term goals, including the aspects of the life cycle of the products.

The result may not be the same as in other certificated companies. Experiences have shown examples in which, following the first years after being certified, companies start to face difficulties to establish new goals to their environmental performance, then they end up not daring much and looking for an almost "make up" improvement. This fact could be the subject of further research. Other than this, future research could approach the issue of law constrains, which was not significant for the studied company, but was important in other studies.

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