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Abstract

As a participant and main logistics supplier for the PETROBRAS system, TRANSPETRO is a Brazilian pipeline company that considers occupational health and safety at work and environmental protection (HSE) as priorities in its operations, maintenance activities and project planning. Prevention of incidents and accidents plays a major role in all activities that take place inside the company to the extent that the company’s safety motto is “whenever in doubt, stop”.

Due to the nature of its activities, TRANSPETRO establishes contracts with several outsourced companies that work in conjunction with its own workforce. As a result, the same HSE awareness that TRANSPETRO demands from its own workforce is enforced on to the outsourced employees through a wide pallet of techniques. Ranging from HSE specific contractual items to integration courses and behavior auditing, TRANSPETRO uses several strategies seeking to achieve the same high level of HSE awareness within all its facilities.

Throughout this article, the authors expose how TRANSPETRO manages and improves its own HSE policies and transfers HSE values to outsourced companies. The results of such policies are described. Additionally, the evolution and behavior changes that take place in the outsourced companies are discussed.

1. Introduction

The companies forming the PETROBRAS system, and particularly the studied company TRANSPETRO, have historically had a lot of concern with aspects related to Health Safety at work and Environment (HSE). One evidence of such concern is the highlight given to the areas responsible for these activities. This concern is justified due to the fact that the company deals with handling and transportation of flammable liquids, where any small negligence could generate an operating fault or even a spill, with possible disastrous consequences for the people and the environment.

Spills have haunted the petroleum industry over the years. For instance, one spill of 42 million liters of crude oil from the sinking of Exxon Valdez in 1989 in Alaska polluted approximately 2,000 km of coast and seabed, killing more than 250,000 vertebrate animals. The accident resulted in expenses of US$ 2 billion only for cleaning and ecosystem recovery, besides causing a lot of damage to the company’s image (Portal Terra, 2015). Another crude oil spill occurred in 2010 in the Mexican Gulf. It was caused by the explosion of the Deepwater Horizon platform. It released 780 million liters of crude oil, killed 11 people and hurt other 17. The spill was considered by specialists the most serious environmental accident of all time. It polluted large areas of not only sea, but also the coast of Louisiana, causing incalculable losses to the ecosystem and killing tens of thousands of vertebrate animals. The accident caused losses of around US$ 40 billion only for the responsible company (Portal Ecoagência, 2015).

One such accident profoundly affected PETROBRAS’s history in terms of accident prevention. Although it featured no human victims, in the year 2000, a crude oil spill of approximately 1.3 million liters took place in Guanabara Bay in Rio de Janeiro causing severe environmental damage. As a consequence, the company developed a program named PEGASO (Excellence Program in Environmental Management and Operating Safety), whose motto “when in doubt, stop” became an icon in terms of safety. It means that, whenever a doubt arises during equipment operation, such as pipelines, the responsible technicians should stop all activities until the doubts are clarified, thus minimizing the chances and consequences of a possible accident.

1 MSc, Civil and Petroleum Engineer - PETROBRAS Transporte S/A - TRANSPETRO
2 Mechanical Engineer, Manager – PETROBRAS Transporte S/A - TRANSPETRO
3 MSc, Safety and Chemical Engineer – PETROBRAS Transporte S/A – TRANSPETRO
4 MSc, Mechanical Engineer – PETROBRAS TRANSPORTE S/A - TRANSPETRO
PEGASO encompassed a general review in all company’s equipment in terms of adding control and safety instruments. It aimed at an increase in operating system automation, as well as a review of the operating procedures and constant training for the workforce. For instance, two major pipeline related projects were conducted: the Pipeline Pump Automation and Pipeline Scraper Automation. Both represented billionaire investments in a continuous improvement activity.

In a more safety-management oriented point of view, PEGASO elaborated fifteen main safety directives to aid in controlling and enhancing the company’s operational safety. After the establishment of the text within the PEGASO’s team, the resulting directives were disclosed to all company’s areas and imposed as requirement for all current activities and new projects. This reflected directly on several operational and project procedures that were updated in the light of the values contained within the new set of directives. Moreover, HSE oriented courses were made available both to the company’s own and outsourced employees disclosing and stressing the importance of HSE values across all operational, maintenance and engineering personnel.

Later on, PETROBRAS and TRANSPETRO hired DuPont, a worldwide company known for its safety practices, with the purpose to incorporate their HSE expertise and support the establishment of the fifteen directives within the company. Similar contracts were signed with Enbridge and the American Bureau of Shipping (ABS) aiming mainly at enhancing operational safety. The workforce as a whole assimilated the directives in all fields and engineering disciplines leading to a reduction in number of accidents and safety non-conformities. Such result can be clearly observed in Figure 1 as PETROBRAS holds a considerable better result in terms of average product spill when compared to other companies of the segment.

![Figure 1: Spilled oil volume in liters per year](source: PETROBRAS, Sustainability Report (2015))

This article is particularly interested in an specific aspect of the seventh directive that states that the performance in HSE of any of the PETROBRAS’s suppliers, partners or outsourced labor force should be compatible with the company’s own performance. In order to reach this threshold, PETROBRAS and all its subsidiaries requires from its contractors the same level of HSE care as demanded from the company’s own internal sectors and employees. In all relations with outsourced companies or suppliers, the PETROBRAS team must observe the following:

- HSE values and demands are included on the contract itself. That way, they can be monitored and the contractors are required to address any non-conformity immediately;
- all materials supplied by vendors or contractors must be in accordance with PETROBRAS own HSE values;
- contractors must be audited according to the HSE contractual criteria;
- the contractor HSE performance is evaluated by the PETROBRAS team and all non-conformities must be addressed;
- actions must be taken by PETROBRAS aiming at stimulating outsourced companies and partners to adopt the best practices as long as HSE is concerned;
- the contractor’s HSE indicators should be incorporated in the PETROBRAS own HSE indicators of the sector responsible for the contract.

As a consequence, PETROBRAS acts from the hiring process – which is made only from companies that are able to attend to the desired HSE level – up to an accompaniment of the HSE performance on the field.

This paper proposes an investigation whether TRANSPETRO is successful in its role as a HSE inducer as required by the company’s own seventh HSE directive. The study was conducted assessing the relationship between the São Paulo and Central West TRANSPETRO’s Engineering Regional and its contractors.

2. Literature Review

In order to study the role of TRANSPETRO as a HSE inducer on outsourced companies, one should better understand the learning process, how to manage and transfer HSE knowledge – knowledge management (KM). “It is by means of the learning process and knowledge management that the organizations may develop the necessary
competences for the accomplishment of their competitive strategy” (Fleury & Fleury, 2000). For Fleury apud Dutra (2001), the learning process in a company may occur in three levels: individual, group and organization. The organizations develop memories that retain and recover information from organizational artifacts, such as rules, procedures and symbolic elements in order to deal with internal and external problems, and gradually “such routines are incorporated to the organizational memory”.

According to Rodriguez (2002), the learning company must “have the culture of learning from mistakes and motivate people towards their permanent development”. Still according to the author, a research project performed in Europe in 2000 by E&Y Survey identified the main challenges to be overcome for company transformation to be customer-oriented and based on knowledge (Table 1).

<table>
<thead>
<tr>
<th>Percentage of companies (%)</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>56</td>
<td>Change people behavior</td>
</tr>
<tr>
<td>43</td>
<td>Measure intangible assets’ value and performance</td>
</tr>
<tr>
<td>40</td>
<td>Determine that knowledge must be managed</td>
</tr>
<tr>
<td>34</td>
<td>Justify the use of resources for knowledge management</td>
</tr>
<tr>
<td>28</td>
<td>Map the organization’s existing knowledge</td>
</tr>
<tr>
<td>24</td>
<td>Define the adequate focus on knowledge management initiatives</td>
</tr>
<tr>
<td>24</td>
<td>Define processes and standards for knowledge work</td>
</tr>
<tr>
<td>15</td>
<td>Make knowledge available</td>
</tr>
<tr>
<td>13</td>
<td>Overcome technology limitations</td>
</tr>
<tr>
<td>12</td>
<td>Identify correcting team/leader for knowledge management initiatives</td>
</tr>
<tr>
<td>9</td>
<td>Attract and keep talents</td>
</tr>
</tbody>
</table>

These “challenges” are assessed by TRANSPETRO, particularly the change in people’s behavior. Therefore, supported by the seventh directive, TRANSPETRO performs behavioral audits among the workforce. From the audits, the company established a policy of learning from detected non-conformities. That way, it motivates the workforce by acting directly on the detected problems. For instance, every accident results, by company procedure, in a deep analysis to determine the causes. Based on the causes found, new HSE recommendations are then disclosed to all workers as well as the results of the accident investigation in order to provide the basis for improvement and prevention of future occurrences.

Another consequence of this procedures and quick action is the establishment of a clear bond between the company and its workforce as far as HSE values are concerned. The workforce and the company both work together to achieve a single goal: enhance the safety of the activities. Dutra (2002) states that the existence of a learning culture in the organizations depends on the bonds established between the people and the organization: “the ones centered in mutual understanding between the people and the organization in participative management and in search for continuous renovation will have more chances of success by being aligned with the values that have been consolidated in our society”. On the contrary, “an organization looking to the past, passive, authoritarian, with work relations based on instability, lack of qualification and commitment of its members, will hardly be able to develop a learning culture” (Fleury, 1995).

As far as KM is concerned, several authors define stages or phases to describe how the process that should be organized. It is possible to observe that there are convergences and divergences among the authors when it comes to the definition of those stages, but it is clear that all authors concur that the first of them is the Knowledge Creation stage, also known as construction or acquisition (Goldoni and Oliveira, 2010). Other phases are described such as Refinement, mentioned by Bose (2004) who points out the importance of refining and filtering the knowledge within the organization phase. Bose (2004) stresses the importance of organizing and codifying knowledge in a Storage stage. After Creation, Refinement and Storage stages, the KM process goes into the Dissemination stage. Throughout this stage, “knowledge should be made available in a useful format to anyone in the organization who needs it anywhere and anytime” Bose (2004). Additionally, Demarest (1997) and Bose (2004) stress the importance of keeping the knowledge updated and current. The information within the repositories should be verified to be relevant and accurate defining a Management stage.

In summary, the management process can be grouped in four common stages among the authors plus a Measuring stage (Goldoni and Oliveira, 2010):

1. Creation – addition and adjustments to existing knowledge
2. Storage – codification of knowledge for its storage in knowledge databases and repositories
3. Dissemination – sharing the information within the organization
4. Utilization or Use – application of the knowledge
5. Measurement – evaluation of the KM process and results attained
Figure 2 exemplifies how the different stages defined by the literature could be allocated inside the four main groups.

![Knowledge Management process stages](source: Adapted from Goldoni and Oliveira (2007))

In addition to the four main groups, the fifth stage, Measurement, also presented by Demarest (1997) and Ahmed (1999) suggests that the performance of the KM process should be evaluated for all the other stages in every level of the organization (Goldoni and Oliveira, 2010).

However, according to Ahmed et al. (1999), there is a difficulty in measuring an evasive concept as knowledge, and when a measuring system is created, care must be taken in choosing a balanced set of benchmarks that shows the company’s reality, as there is no single complete benchmark to be adopted. A balanced set shall include “financial, non-financial, cost, non-cost, internal, external, process and results performance benchmarks” (PRICE WATERHOUSE, 1997). As an example of the measuring process, Goldoni and Oliveira (2010) proposed metrics for the case-study of software development in Brazil.

There are two types of benchmarks, process or trends, and results. Process benchmarks highlight the organization’s initiatives regarding the KM process, whereas results benchmarks demonstrate whether the objectives have been reached. Teixeira et al. (in Silva and Neves, 2004), however, alert that “the effort benchmarks do not obviously mean result (that is, KM effectiveness). And the result indicators do not only rely on KM (but also the macroeconomic picture, investment capacity, etc.)”.

Goldoni and Oliveira (2007) state the proposed trend benchmarks per stage of the KM process:

- a) creation – amount of discussion groups on process or product innovation, amounts of valid contributions for the organizational memory / intranet (Teixeira et al. in Silva and Neves, 2004);
- b) storage – amount of messages or documents stored in the system, number of registered users that use the system, quality of stored knowledge, experts’ assessment to verify quality, amount of revisions or updates made, how up-to-date the knowledge is, user feedback (Robertson, 2003);
- c) dissemination – amount of active practicing communities, statistics of intranet/organizational memory use, employees’ perception regarding available internal means of communication (Teixeira et al. in Silva and Neves, 2004); distribution cost (Armistead, 1999);
- d) use – amount of useful suggestions incorporated to the productive processes and/or products (Teixeira et al. in Silva and Neves, 2004); statistics of system usage and search mechanism usage (Robertson, 2003); number of ideas or patents (Armistead, 1999).

For the analysis of work accidents, which reflects the safety culture of a company, the Brazilian standard NBR 14280, “Work accidents log – Procedure and classification” proposes the use of the lost time injury frequency LTIF; known in Brazil as TFCA and the frequency rate of injuries without lost time, known in Brazil as TFSA, among others. Throughout this article the terms TFCA and TFSA are refereed. These are described as follows.

\[
F_L = \frac{N_L}{1,000,000} \quad (1)
\]

Where:

- \( F_L \): Lost time injury frequency
- \( N_L \): Number of lost time injuries
For the TFSA, “the calculation must be made the same way” as the TFCA (NBR 14280). Some companies use the Occupational Safety and Health Administration (OSHA) standards in order to calculate the TFCA. In this case, in order to allow the comparison with the values calculated by NBR 14280, the values must be multiplied by 5.

3. Case study – São Paulo and Central West Engineering Regional

PETROBRAS and TRANSPETRO are two of the largest companies in Brazil. Therefore, in order to study the role of the companies as HSE inducers, it is assessed the data provided by the São Paulo and Center West Engineering Regional of TRANSPETRO S/A (STTPCO). In order to achieve this objective, the authors analyzed the KM process of the outsourced companies looking for the influence of TRANSPETRO’s actions. The four stages of the KM process (Acquisition, Storage, Dissemination and Use) were assessed, and additionally the Result Analysis stage was performed (Figure 3).

Figure 3: Process indicators in Knowledge Management

The items to be verified in each stage, as well as the research instruments, are stated in Table 2.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Items to be verified</th>
<th>Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition</td>
<td>Corporate-demanded activities</td>
<td>Literature research</td>
</tr>
<tr>
<td></td>
<td>Administrative programs</td>
<td>Semi-structured questionnaire</td>
</tr>
<tr>
<td>Storage</td>
<td>How document storage is performed</td>
<td>Semi-structured questionnaire</td>
</tr>
<tr>
<td>Dissemination</td>
<td>Number of training sessions</td>
<td>Semi-structured questionnaire</td>
</tr>
<tr>
<td></td>
<td>Amount of people trained</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of training hours</td>
<td></td>
</tr>
<tr>
<td>Use</td>
<td>How stored documents are accessed</td>
<td>Semi-structured questionnaire</td>
</tr>
<tr>
<td>Results Analysis</td>
<td>Index of accidents with lost time</td>
<td>Semi-structured questionnaire</td>
</tr>
</tbody>
</table>

3.1. Acquisition – transferring knowledge from TRANSPETRO

The acquisition stage is the first step of the knowledge transferring. According to the seventh directive, TRANSPETRO is supposed to support and demand from the contractors the same level of HSE that is present inside the company. In order to assess if knowledge is actually being transferred from TRANSPETRO to the outsourced companies, a semi-structured interview was performed aiming at discovering:

- What precautions TRANSPETRO takes when selecting candidates to the contracting process in order to guarantee that they will be able to achieve and maintain the desired level of HSE awareness.
- What actions are taken by TRANSPETRO to effectively transfer HSE knowledge to the outsourced companies.

The TRANSPETRO’s representative informed that a deep analysis of the contract is performed in order to assess the required HSE level. TRANSPETRO has at its disposal a four quadrant HSE classification, each quadrant with a higher HSE level requirement, among which the possible candidate companies are divided. After determining the quadrant of the contract, TRANSPETRO invites to the contracting process the companies that have the same...
classification. That way, the company expects that unsuitable candidates, from the HSE point of view, are quickly removed from the process. For instance, some examples of requirements include the companies deploying the Environmental Risk Prevention Program (PPRA), the Work Environment and Conditions Program (PCMAT) if applicable, and the Occupational Health Medical Control Program (PCMSO) for the employees, in full compliance with the Work Ministry Regulating Standard n° 07 (NR-07). The documentation regarding these programs has to be presented to TRANSPETRO before services are initiated. Regarding the activities to be performed, the companies must prepare the Risk Analysis (RA) in order to identify all the aspects and impacts, hazards and consequences, as well as the tolerability of the risks associated to the accident scenarios, so as to avoid their occurrence; regarding the environment, the Environmental Risk Prevention Program (PPRA) and the Work Environment and Conditions Program (PCMAT) if applicable.

The TRANSPETRO’s representative also informed that, in addition to the items required by TRANSPETRO, some HSE initiatives/programs have been implemented with successful results:

- Adequate Tool – A program for the assessment of hand tools used by the contractors’ employees that verifies the quality of the tool, its preservation state and fitness for purpose.
- Friendly Personal Protective Equipment (PPE) – An assessment program of PPE used by the contractors’ employees that verifies the quality of the PPE, their state of preservation and adequacy to use.
- Proceed – A program that verifies the compliance of the contractor’s standards. Before beginning the execution of any non-routine services, the contractor antes must gather the workforce and explain in detail the procedures to be adopted; in case an opportunity for improvement is detected, the standard shall be revised.
- 5S in the service fronts – The company assesses and awards the contractors’ service fronts by assessing the adherence to the 5S program, the 5S being the initials of 5 Japanese words: Seiri (use), Seiton (organization), Seiso (cleanliness), Seiketsu (standardization) and Shitsuke (discipline). The objective is to mobilize, motivate and make people aware of the organization and the discipline in the workplace.
- Learning presented at contract signature – The STPPCO delivers TRANSPETRO policy to the contractor’s representatives, explains the safety culture and presents relevant facts and actions that must be taken in order to avoid work accidents.
- Good practices attachment – The STPPCO delivers an easy-reading report at the kick-off meeting, containing descriptions and pictures of learned lessons from problems, as well as desired actions, such as pictures of well-organized PPE and tool lockers.
- AUDICOMP – This program promotes Behavioral Safety Audits in the service fronts. This program not only supplies data for safety monitoring but also an opportunity to correct any unsafe behavior in the workplace.

3.2. Storage, dissemination and use

By means of a semi-structured questionnaire responded by 3 contractors, it was possible to determine how HSE documents are stored, disseminated and used by asking the following questions:

- How are HSE documents stored?
- How many and what kind of HSE training sessions are provided to the employees?
- What do these training sessions comprise? (for instance: percentage of trained employees per site).
- What is the workload of these training sessions? (for instance: number of hours per person per year)
- How are HSE documents accessed?

3.2.1. Storage

Two consulted companies informed that they store the documents in digital media in their online portals, and keep a paper copy at the construction site in duly identified lockers. The other one stores the documents only in print, both in the office and the construction sites.

3.2.2. Dissemination

The companies informed that generic training sessions are given on safety and specific training sessions according to the works to be performed.

For the generic training sessions, the following topics were mentioned: First aid, Firefighting, NR 20 – Health and Safety at work with Flammable and Combustibles, 5S Program, NR 6 – Personal Protective Equipment – PPE and NR 17 – Ergonomics, among others. Besides formal training sessions, other topics are made effective by means of simulations and testing, such as the emergency simulation (sudden illness), and various emergency simulations involving other situations that bring risk to the workers’ physical integrity.

Regarding the São Paulo and Central West (STSPCO) Regional administration initiatives, the companies mentioned that their employees are oriented to permanently follow the concepts of the Adequate Tool, Friend PPE, Proceed and 5S programs, besides reading the Good Practices Attachment and constantly receiving information on the safety concepts, relevant facts and actions that must be followed in order to avoid accidents.
For the specific training sessions, the following topics were mentioned: NR 35 – Work in heights, NR 33 Work safety and health in confined spaces, NR 10 - Safety in electrical installations and services and NR 11 - Transportation, storage and handling of materials, among others.

One of the companies stated that training is given on around 38 topics every year. Regarding training scope, the 3 companies informed that 100% of the employees receive training, and the number of training hours per year per employee varies among them from 41 to 49 hours.

One of the companies stated that 2014 totaled 4,518 training hours, representing 2.7% of the hours worked by the construction teams.

3.2.3. Use

Regarding user access to documentation, the companies that keep digital documents feature internet access, and in construction sites the documents are accessed in person.

3.3. Result Analysis

Once established the four stages of the KM process, it is necessary to seek metrics to assess the efficiency of the actions taken by TRANSPETRO. As a first approach, TRANSPETRO’s main actions were studied and quantified. It was made available to the authors the data from the AUDICOMP program related to early 2015. It is important to note that the behavioral audits are performed both by the outsourced employees as TRANSPETRO’s own workforce. The results of such audits can be seen in Figure 4, in which is related the mean number of non-conformities detected in early 2015:

![Figure 4 – Number of non-conformities detect in relation to the number of behavioral audits performed](image)

It is important to note that the number of non-conformities follow a descending curve. This behavior is expected as the relationship between TRANSPETRO and the contractors should increase the HSE awareness of the outsourced labor thus preventing/reducing the occurrence of non-conformities. The descending number of non-conformities is also a reflection of the efficiency of the Adequate Tool, Friendly Personal Protective Equipment, Proceed and Good Practices Attachment programs.

Another important aspect of the HSE culture transferring is the data gathered from the 5S program. In Table 3 it can be seen that the contractors have embraced the idea of the 5S obtaining a satisfactory performance on the audits.

<p>| Table 3 – 5S Results – five level Lickert scale (poorly organized to highly organized) |</p>
<table>
<thead>
<tr>
<th>Company</th>
<th>Site</th>
<th>Jan/2015</th>
<th>Feb/2015</th>
<th>Mar/2015</th>
<th>Apr/2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha</td>
<td>Uberaba</td>
<td>4.25</td>
<td>3.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beta</td>
<td>Uberaba</td>
<td>3.30</td>
<td>3.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gama</td>
<td>Uberaba</td>
<td>3.25</td>
<td>3.25</td>
<td>3.35</td>
<td>3.75</td>
</tr>
<tr>
<td>Delta</td>
<td>São Caetano do Sul</td>
<td>4.20</td>
<td>4.33</td>
<td>4.31</td>
<td>4.43</td>
</tr>
<tr>
<td>Delta</td>
<td>Barueri</td>
<td>4.76</td>
<td>5.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Épsilon</td>
<td>Pipeline right of way</td>
<td>4.17</td>
<td>4.41</td>
<td>4.62</td>
<td>4.43</td>
</tr>
<tr>
<td>Épsilon</td>
<td>Pipeline right of way</td>
<td>4.75</td>
<td>4.66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Épsilon</td>
<td>Pipeline right of way</td>
<td>4.34</td>
<td>4.42</td>
<td>4.54</td>
<td>4.57</td>
</tr>
<tr>
<td>Digama</td>
<td>Barueri</td>
<td>4.86</td>
<td>5.00</td>
<td>5.70</td>
<td>4.89</td>
</tr>
<tr>
<td>Zeta</td>
<td>Pipeline right of way</td>
<td></td>
<td></td>
<td></td>
<td>4.60</td>
</tr>
</tbody>
</table>
TRANSPETRO also monitors the number of accidents that take place inside its site’s perimeters having the TFCA (with lost time) and the TFSA (without lost time) as their main indexes. Figures 5-a and 5-b show the development of those indexes over the last six years.

![Figure 5 – TFSA and TFCA development](image)

On Figure 5 one can see that the curves have a descending tendency that indicates the HSE awareness enhancement over the years. The TFCA is especially critical since it involves major injuries leading to lost time. The company has had zero accidents of the kind since 2010. Table 4 shows the verified rates of large companies and sectors that disclose the data through the internet along the last 5 years.

<table>
<thead>
<tr>
<th>METRO SP (Sustainability Report 2013)</th>
<th>2013</th>
<th>2012</th>
<th>2011</th>
<th>2010</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Itaipu (Sustainability Report 2013)</td>
<td>19.82</td>
<td>1.45</td>
<td>7.97</td>
<td>6.38</td>
<td>4.48</td>
</tr>
<tr>
<td>Paraná Metallurgy Companies (Bachmann &amp; Associates)</td>
<td>13.04</td>
<td>10.82</td>
<td>11.67</td>
<td>10.04</td>
<td></td>
</tr>
<tr>
<td>SABESP (Sustainability Report 2013)</td>
<td>6.60</td>
<td>5.50</td>
<td>7.20</td>
<td>6.20</td>
<td>5.10</td>
</tr>
<tr>
<td>Heavy Construction in Paraná (Bachmann &amp; Associates)</td>
<td>6.07</td>
<td>5.23</td>
<td>8.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PETROBRAS (Reports)</td>
<td>0.75</td>
<td>0.83</td>
<td>0.68</td>
<td>0.52</td>
<td>0.48</td>
</tr>
<tr>
<td>Vale (Sustainability Report 2014)</td>
<td>0.69</td>
<td>0.70</td>
<td>0.76</td>
<td>0.90</td>
<td>1.00</td>
</tr>
<tr>
<td>TRANSPETRO (Reports)</td>
<td>0.68</td>
<td>0.90</td>
<td>0.95</td>
<td>0.85</td>
<td>0.92</td>
</tr>
<tr>
<td>Mendes Jr. (Sustainability Report 2012)</td>
<td>1.88</td>
<td>1.14</td>
<td>1.57</td>
<td>3.72</td>
<td></td>
</tr>
<tr>
<td>Odebrecht (Sustainability Report 2012)</td>
<td>2.05</td>
<td>1.86</td>
<td>2.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP Region and Central West</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.23</td>
</tr>
</tbody>
</table>

The company representative also informed that the behavioral audits that TRANSPETRO performs, mainly in contractors’ construction sites, has detected a low number of non-compliance items, coherently with the frequency rate of bodily injured people with lost time (TFCA). This suggests that this level of excellence in safety can only be reached due to the importance given to the subject by the company as a whole, as well as the challenges embraced by the São Paulo and Central West Regional’s representatives in not letting accidents happen in the work fronts.

4. Conclusion

The data gathered by TRANSPETRO’s employees and analyzed by the authors indicate that contractor accidents and non-conformities have a descending tendency. Such tendency can be observed through, at least, the last six years. The TFCA/TFSA indexes, in particular, show this scenario clearly. Therefore, it can be concluded that the contact with TRANSPETRO has been accompanied by improvement on the HSE awareness of the contractors. As the TRANSPETRO’s programs results, measured throughout this article, work directly on the bond between the companies as far as HSE awareness, it seems clear to the authors that TRANSPETRO is indeed functioning as a HSE inductor on the outsource labor and hired companies. The qualitative and quantitative measures verified in each KM stage suggest that the relationship between TRANSPETRO and the engineering contractors has been effective in terms of safety, resulting in a gradually lower TFCA over time. Furthermore, also from a qualitative point of view, during the interviews with the representatives of the contractors, one of them clearly stated that TRANSPETRO’s HSE values had been absorbed by the company and that they intended to take them to other contracts in which TRANSPETRO is not involved.

There have been difficulties in obtaining rates from other companies for comparison purposes, as few organizations disclose these data on the internet in their sustainability reports. Even when they do so, the information is not clear and standardized. For instance, Eletrobras calculates only the total rate of accidents, including the ones with
and without lost time, and they do not use the NBR 14280 formula. Itaipu only considered contractors’ employees from 2013 in their calculations, and both SABESP and TRANSPETRO exclude the commuting accidents. Nevertheless, the data obtained, indicates that the programs performed by TRANSPETRO in the São Paulo and Central West Engineering Regional did enhance the HSE results when compared to other companies, including PETROBRAS/TRANSPETRO global results. The availability of PETROBRAS/TRANSPETRO’s indexes is a direct reflection of the company’s own safety oriented policies and directives as well as the effort of regional safety dedicated teams.

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6. References


