

**OCCUPATIONAL HEALTH AND SAFETY IN AUTOMOTIVE BATTERY
MANUFACTURING COMPANIES: CASE ANALYSES IN THE STATE OF
SÃO PAULO - BRAZIL**

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Abstract

Companies have been pressured to modernize their management mechanisms aimed at reducing costs and adapting product and production process characteristics to market needs. Occupational health and safety management systems have been an increasingly more adopted alternative by organizations to adapt to this reality. These systems gain even further importance when we consider the automotive battery manufacturing sector due to the risks to employee health inherent to the characteristics of the production process. For this reason, the main objective of this paper is to present and analyze the main practices related to occupational health and safety in two automotive battery manufacturing companies in the state of São Paulo, Brazil, identifying which management tools are used as well as their positive aspects and the main obstacles to their implementation.

Key words: Management system; Safety engineering; Occupational health and safety; Automotive batteries.

1. Introduction

Companies have been pressured to modernize their management mechanisms aimed at reducing costs and adapting product and production process characteristics to market needs.

In the global market's current economic and dynamic environment, the pace of change is increasingly faster and therefore demands organizations to develop management systems that can better handle this condition.

Occupational health and safety management systems have been an alternative adopted by more and more organizations in order to adjust to this reality because they permit productive activities to be carried out with greater precision, quality and lower costs due to more aware and healthier workers.

Along these lines, the automotive battery production sector gains fundamental importance in the use of this management tool due to the health risks inherent to the production process.

For this reason, the main objective of this paper is to present and analyze the main practices related to occupational health and safety in two automotive battery manufacturing companies in the state of São Paulo, Brazil, identifying which management tools are used as well as their positive aspects and the main obstacles to their implementation.

In order to ensure focus, an attempt was made to delimit the scope of the research in relation to the following elements: object of study (Occupational Health and Safety Management Systems), geographic area (city of Bauru – midwest state of São Paulo, Brazil) and company work segment (automotive battery sector).

2. Research Methodology

This paper was elaborated using qualitative research based on double case study methodology.

According to Santos, Rossi and Jardimino (2000), qualitative research is fundamentally concerned with the understanding and interpretation of studied phenomena where the main objective is to understand it, explore it and specify it. It is a method that requires creativity and intuition to conduct a comparative analysis of a small, minutely selected “sample”.

According to Silva (*apud* OLIVEIRA, 2005), the case study is a method characterized by simple steps for positive construction on an object that will be studied in depth.

In this study, we opted for conducting two case studies, since this choice, according to Yin (2005), produces valuable results and generally exceeds the results that could be reached by a single case study considerably.

The data collection instruments used were semi-structured interviews conducted from open questions and answered by company safety technicians, production managers and some shop floor employees; *in loco* observation; and document analysis, especially work procedures and instructions.

The script for the semi-structured interviews at the surveyed companies includes general questions, such as the company’s name, main products produced, total number of employees, certificates, about the professional being interviewed, addressing the position held, how long he/she has held it, the major attributions; about occupational health and safety related activities, such as management of the Occupational Health and Safety Management System (OHSMS), the main accidents and near accidents that have occurred and the measures taken to mitigate them, the types of environmental risk, unsafe conditions and unsafe acts, how the risk map was planned and about

Occupational Health and Safety Legislation in Brazil, identifying how the Regulatory Norms influence the studied company and how the activities contained therein were implemented and executed.

3. Safety and Occupational Health Management

According to the International Labor Organization (ILO), the main objective of Occupational Health and Safety is to promote and maintain a high degree of worker physical, mental and social well-being in all their activities, impeding any damage caused by work conditions and protecting them against the risks of agents that are harmful to their health (ILO *apud* BENITE, 2004).

Safety and occupational health differ from many areas because the success measured by managers is the result of the absence of a situation (injuries or jeopardized health), rather than their presence. However, few injuries or high health levels, even over several years, is not a guarantee that the risks are under control and that there may not be injuries or health problems in the future (MEARNS; HÅVOLD, 2003).

According to OHSAS 18001 – *Occupational Health and Safety Assessment Series* (2007), occupational health and safety are conditions and factors that affect, or could affect, the health and safety of employees or other workers (including temporaries and outsourced workers), visitors or any other person at the workplace.

According to Quelhas, Alves and Filardo (2003), good occupational health and safety practices are important to avoid accidents and to guarantee worker health, where motivation and commitment are “products”. These good safety practices are mainly associated with improved working conditions and therefore underestimate or are indifferent to work environment risks, creating an environment that is ripe for accidents.

Government, business owner and union concerns to improve safety, health and work environment conditions gain increasing importance. For such, it is necessary to

have a plan that permits the participation of top management and employees to find practical and economically feasible solutions (ALEVATO *apud* QUELHAS; ALVES; FILARDO, 2003).

Regardless of how elaborate the SST program is and how good the tools it makes available for diagnosing and solving work risks are, if there is no willingness and committed participation by all those involved in their actions, especially the company's management, the results produced will be limited from a quantitative and qualitative perspective. Worse than the sparse results in correcting work risks is the poor performance in maintaining corrective measures that may have been implemented (OLIVEIRA, 2003).

3.1 Occupational Health and Safety Management Systems

A management system is a set of interrelated elements used to establish the policy and objectives, and to reach these objectives, it includes an organizational structure, planning activities, responsibilities, practices, procedures, processes and resources (OHSAS 18001, 2007).

Lin and Mills (2001) affirm that the main factors that influence safety are the organization's performance, company size, management and employee commitment to safety and occupational health.

The perspective of these results becomes even more important when we consider the automotive battery sector, the object of study of this paper, by virtue of its economic importance and its peculiar characteristics, such as the large scale and intensive handling of chemical elements that are harmful to human health.

This sector is responsible for the consumption of large amounts of lead, and although its toxic effects are well-known and several diseases are associated with

contamination by this metal, evidence suggests that high exposure to lead continues to be one of the greatest occupational and public health problems (MATTOS *et al.*, 2003).

The implementation of OHSMS has been the main strategy to combat the serious social and economic problem of work-related accidents and illnesses and it can also be used by companies as a factor to increase competitiveness (TRIVELATO, 2002).

However, as with any other new system, implementation runs into a series of difficulties that can be avoided or mitigated if considered in advance during planning and if instruments and techniques available for such mitigation are used.

Organizations can also standardize their OHSMS by means of norms and guidelines where the most known and used is OHSAS 18001 (Occupational Health and Safety Assessment Series), a norm formulated in 1999 by a group of international entities (BVQI, DNV, LOYDS, SGS and others) and published by the British Standards Institution (BSI) to meet company needs from around the world in relation to managing occupational health and safety obligations.

This norm was elaborated in a short period of time (nine months) and used the British BS 8800 norm as a basis, since it was already broadly disseminated. OHSAS 18001 requirements are shown in Table 1.

Table 1: OHSAS 18001 Requirements

4.1 General Requirements
4.2 OHSAS Policy
4.3 Planning
4.3.1 Identification of dangers, assessment of risks and determination of controls
4.3.2 Legal requirements and others
4.3.3 Objectives and programs
4.3.4 OHSAS management program
4.4 Implementation and operation
4.4.1 Resources, functions, responsibilities, account rendering and authorities
4.4.2 Competence, training and awareness
4.4.3 Communication, participation and consultation
4.4.4 Documentation
4.4.5 Control of documents
4.4.6 Operational control
4.4.7 Preparation and response to emergencies

4.5 Verification
4.5.1 Monitoring and measuring performance
4.5.2 Assessment of meeting legal requirements and others
4.5.3 Investigation of incidents, non-conformities, corrective action and preventive action
4.5.3.1 Investigation of incident
4.5.3.2 Non-conformities, corrective action and preventive action
4.5.4 Control of records
4.5.5 Internal audits
4.6 Critical analysis by top management

Source: OHSAS 18001 (2007).

Similar to norms related to quality management and environmental management, OHSAS 18001 does not define performance standards or indicate how its elements can be developed. They merely present basic requirements to be followed. This condition can result in companies with SST management systems based on the same norm and with completely different performance results.

In July 2007, OHSAS 18001:1999 was replaced by OHSAS 18001:2007, thus reflecting the experience of 16,000 certified organizations in more than 80 countries (QSP, 2007). Figure 1 indicates the macrostructure of the OHSAS 18001 norm, which is based on PDCA (plan, do, check and action) methodology (OHSAS 18001, 2007).

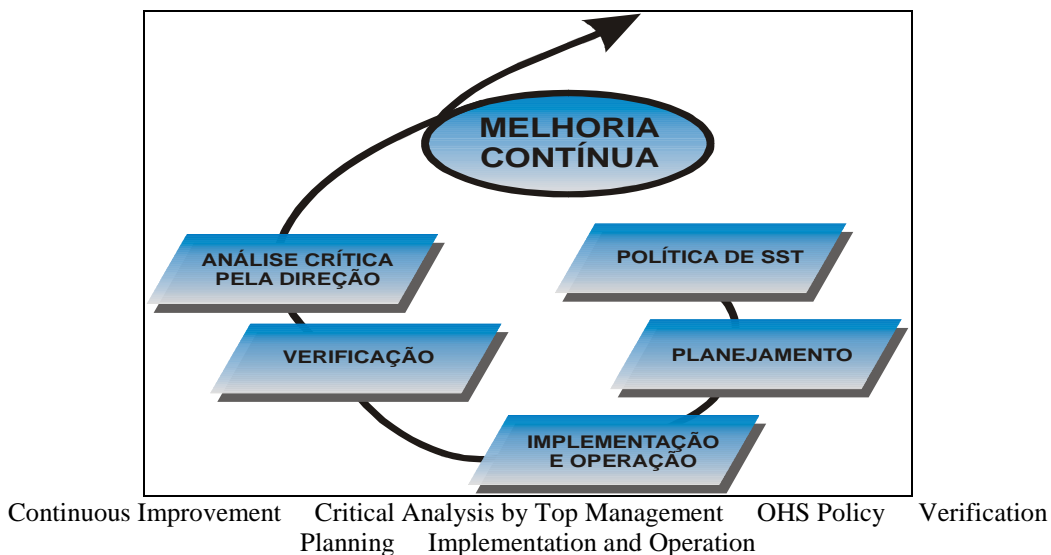


Figure 1: Spiral of the Occupational Health and Safety System

Source: OHSAS 18001 (2007).

Barbosa Filho (2001) underscores that initially the perception an employee has of the physical and social environment encountered will influence in how he behaves in everyday life. That is why aspects such as order, cleanliness and personal hygiene, normally relegated to lower levels, are of utmost importance, as is the organization and utilization of space by means of an appropriate layout.

In that sense, OHSMS are management tools that contribute to the efficient improvement in company performance with regard to occupational health and safety issues, aimed at full compliance with legislation, increased productivity, fewer accidents, credibility before public opinion and growing awareness in relation to the safety and health of the organization's workers and partners.

3.2 Environmental Risks

Recent studies have pointed out problems related to worker health who threatened by the current critical economic situation, accept the unhealthy and dangerous conditions generated in work processes and adopted forms of organization (FREITAS *et al.* *apud* MATTOS *et al.*, 2003).

Many factors contribute to the emergence and worsening of environmental problems, such as: the growth in population, industrialization, accelerated urbanization, pollution and depletion of natural resources. The way these phenomena interact, reproduce themselves and perpetuate themselves has been causing the growing degradation of human quality of life, with unpredictable effects for all life on the planet (RUIZ; LIMA, 2006).

In the specific case of this study, it is worth underscoring that bacteria contain substances that offer physical-chemical danger and toxicological effects at several levels and in several forms. For example, lead is extremely toxic even in small quantities and

one of its main effects is renal dysfunction and anemia when absorbed by the skin or lungs (FURTADO, 2004).

2.4 Difficulties and recommendations in managing OHS

Globalization and internationalization of markets have increased competitiveness between companies, which has led them to work hard at projects that can guarantee their survival, such as the development of OHSMS. However, these projects need to be appropriately planned, organized, monitored, controlled and evaluated under the penalty of not generating expected results (RAYMOND; BERGERON, 2008).

Safety should not only be evaluated through regulations, but also become a part of the organization's culture through compliance at every level of administration (MOHAMED, 2002). Studies show that success in the implementation of a health and safety system in an organization depends on the skills of those agents responsible for change in controlling complex and unpredictable situations (HASLE and JENSEN, 2006).

Human behavior at work is one of the most important items in implementing new systems and it has been broadly studied recently, with worker satisfaction in his activity standing out at the emotional level. There is no single determining factor for this satisfaction. It depends on work conditions and environment, that is, on the quality of life at work (MARQUEZE; MORENO, 2005; HASLAM *et al.*, 2005).

According to Aggelogiannopoulos, Drosinos and Athanasopoulos (2007), the lack of experience and knowledge on the part of employees regarding the new system to be implemented is an important obstacle that must be overcome. The inappropriate flow of technical information, legislations and requirements applicable to the company's

business, as well as the lack of disclosure of performance results are limiting factors for the management system implementation process to achieve good results.

Chan and Wong (2006) underscore that top management has a very important role in the implementation and maintenance of these systems, because without their commitment and involvement the program does not gain credibility among collaborators and this will have a direct effect on its performance.

The employees become more willing to cooperate with the proposed changes when they begin to believe in management's real commitment (LANGFORD; ROWLINSON; SAWACHA, 2000). This joint participation between management and collaborators provides the feeling of mutual responsibility, becoming a decisive factor for the success of the change (CHOUDHRY; FANG; MOHAMED, 2007).

4. Case Studies

The studied companies were named Company 1 and Company 2 for this study. They are automotive battery manufacturers located in the city of Bauru in midwestern state of São Paulo, Brazil. They were mainly chosen due to the importance of OHS in this sort of activity and the contribution their study could provide the automotive battery sector.

Data collection was made by means of *in loco* observation, analysis of documents (procedures, work instructions, records, etc.) and interviews with safety technicians, production managers and some key shop floor employees. In Table 2, we present the OHS main characteristics.

Table 2: Summary of the main occupational health and safety practices in studied companies

	Company 1	Company 2
# of Employees	417	362
SESMT (Specialized Services in Safety Engineering and Occupational Medicine) composition	1 Safety engineer; 1 Occupational doctor; 3 Work safety technicians; OHS Department directly subordinate to top management	1 Occupational nurse; 3 Work safety technicians; OHS Department directly subordinate to top management
Certifications	ISO 9001 (Quality management) and ISO 14001	ISO 9001 (Quality management)

	(Environmental management)	
Formal OHS policy	Do not have	Safety is mentioned in the Quality Policy
Investments in OHS	Investments in individual protection equipment (IPE), Collective protection equipment (CPE) and training (technicians)	Investments in IPE and CPE and training (technicians and awareness: motivational and management)
Top Management	Invests in OHS improvements, but does not consider it a priority	Invests in OHS and actively participates in action planning and analysis of results.
OHS Programs	Has the programs required by law such as the Program for the Prevention of Environmental Risks (PPRA), the Program of Medical Control of Occupational Health (PCMSO) and the Risk Map.	Has the PPRA, the PCMSO, the Risk Map and maintains a program of some OHS indicators
Internal Communication related to OHS	Holds a weekly meeting on OHS where accidents occurred, and corrective and preventive actions taken are reported to workers; Little investment in internal communication tools	Holds meetings on OHS only when it deems so convenient; Internal communication occurs through bulletin boards and banners spread about the factory
Human Resources (HR)	Little involvement by HR in OHS related training A leadership development program is being initiated that will directly help OHSMS	HR participates considerably in actions by the Safety Department, especially with regard to employee training, transfers to other sectors or functions and general instructions
Training related to OHS	Has a formal training program on OHS Training is held at least once per year.	Also adopts the annual training policy
Measurement and Analysis of Performance in OHS	Has no OHS performance indicators; All occurrences and actions are revealed at weekly meetings and managerial meetings where actions taken are discussed	The organization has monitoring indicators of lead levels of employees, raises the main risks in each sector and classifies the main occurrences.
Corrective and Preventive OHS Measures	Has Collective Protection Equipment (CPE) in its installations and demands its employees to use IPE; Problems detected are corrected by means of participation by the main people involved	Safety technicians and CIPA members conduct inspections at the work place; Non-conformities are forwarded to the sector responsible for correction
OHS incentive programs	There are none	There are none

In general, at Company 1, what stands out is the considerable investment in improvements in the health and safety area as well as the support for safety technicians in developing OHS at the company and the low involvement of HR in this process.

One of the biggest complaints by the company's safety technicians is non-compliance by some collaborators with the adopted safety rules. This resistance most often occurs in middle management, which ends up generating conflicts with the other collaborators, who also feel no obligation to follow them.

A study carried out by the company in 2006 showed that around 44% of the accidents were caused by collaborators who had been hired less than one year before. Therefore, a deficiency in adopting safety measures can be observed, especially among older employees who are more resistant to change.

The work by safety technicians is carried out individually with each employee according to their level of acceptance of safety-related norms and procedures, always

trying to develop a personalized program to instill the culture of safety in the most resistant.

The company has 417 collaborators and a degree of risk of 4 due to its classification as a manufacturer of batteries and accumulators for vehicles. According to Regulatory Norm # 4, its SESMT is correctly dimensioned for its structure and activities.

The results of the occupational health and safety management system are not linked to any type of remuneration system or any other incentive; however, there are some studies for this to be implemented in the future.

At Company 2, greater efficiency can be observed in carrying out OHS measures and in monitoring and developing improvements in the OHSMS than in Company 1. Most activities are conducted by safety technicians; however, great effort on the part of human resources to get involved in these activities can be observed, especially in terms of employee training.

According to RN 4, the company, with 362 employees and a degree of risk of 4 (manufacturer of batteries and accumulators for vehicles) has an improperly dimensioned SESMT for its structure and activities.

The existence of important documents for compliance with and coordination of OHS activities was ascertained. The main ones were the *safety history*, the *service request form*, *identification of accidents by sector*, *training records*, *minutes of safety meetings*, *inspections of improvement*, *data on average lead count in blood by sector*, etc.

The organization has trained operators, equipment in good state of conservation, corrective, preventive and predictive maintenance procedures, and a checklist aimed at worker safety and health and a healthy and productive environment.

It is worth underscoring that the OHS results at Company 2, even with an undersized SESMT, are better than at Company 1. This is mainly due to top management's commitment and support and the partnership established with HR that made available and trained 3 occupational safety technicians. These initiatives have made the difference in safety system performance.

In conclusion, in Table 3 we highlight the main difficulties encountered by the studied companies related to OHS.

Table 3: Main difficulties encountered in OHSMS management at studied companies

Company 1	Company 2
Resistance to change	Resistance to change
Difficulty in the elaboration of instructions and procedures;	Internal conflicts
Internal communications failures	Failures in communicating the objectives to be achieved with the implementation of new OHS systems
Little involvement of organization sectors that felt the Safety Department was the only one responsible for OHSMS results	Fear of audits due to insecurity and fear of error
Lack of performance indicators in occupational health and safety	High turnover of outsourced employees
Lack of commitment by middle management	Difficulties in understanding the OHS system implementation process.
Employees' low levels of awareness in relation to OHS	Insufficient financial resources for OHS

5. Conclusion

The theoretical basis used in this study, although condensed, was fundamental for the contextualization and interpretation of the study in question and to better understand safety with regard to the automotive battery production area.

The qualitative research based on the case study method proved appropriate for this study because allowed reality and the main characteristics of battery companies to be appropriately interpreted and understood.

After analyzing the data, it was ascertained that the studied companies have the objective of only meeting regulatory norms and other legal requirements pertinent to the automotive battery sector. Adjustment to the external norms that refer to the implementation of occupational health and safety management systems, such as

OHSAS 18001, is one of the companies' objectives, although as part of long-term planning.

Furthermore, it was also observed that support by Top Management, Human Resources and the participation of collaborators is a determining factor for the success or failure of the referred to occupational health and safety management system, which corroborated the theory.

The difficulties presented in the case studies are linked to diverse factors, but we can underscore the most important ones as being communication failures between the higher management levels and the shop floor or operational level, the low degree of worker participation in OHS, inadequate planning of procedures and instructions to be taken and the lack of indicators to measure performance.

The real benefits the implementation of an occupational health and safety management system can provide to employees and the company are generally not duly explained. It thus becomes much more difficult to motivate and obtain commitment from collaborators in the safety cause, thus resulting in uncertainties and fear in relation to this type of change.

The studies made it possible to verify which OHS practices are carried out by the companies and conclude that several difficulties are encountered when managing OHS management systems. They could be minimized through appropriate strategic and financial planning, investments in training, hiring of skilled professionals and employee commitment with regard to the company's health and safety system.

It also made it possible to verify top management involvement with regard to the occupational health and safety management system, the obstacles encountered by safety area professionals in making shop floor workers and middle management aware, the recognition that the involvement of human resources is important for the program's

success, the need to hold constant training as well as the importance in seeking the appropriate internal communication system within the company, which permits the understanding and direct involvement of all employees in search of common objectives.

Thus, knowledge of such information also makes it possible for organizations to identify deficiencies and to establish appropriate control measures, and consequently eliminate or reduce the probability of putting their employees at health and safety risk.

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