

Safety Management in System in an Industrial Process: The Case Study of a Manufacturing Company

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Abstract:

Purpose: Psychosocial risk factors are a major concern at European level, being the source of the increase in health complaints by workers, with implications in potential work-related accidents.

Against this background, there was a need to study this subject. We propose, in this thesis, an analysis the relationship between working conditions and health and wellness perceived by workers.

Method: The study was conducted in three Portuguese cement plants, with a sample of 192 workers in manufacturing and maintenance areas. For data collection, it was used the INSAT inquiry. To process the data, it was used descriptive statistics and regression models to examine the association between working conditions and health and wellness.

Findings: The results showed that some features of the work - relational and temporal aspects of work - are factors that affect negatively the worker's health.

Practical Implications: The implementation of a safety culture, with a strong commitment from the leaders, constitutes a mean to reduce the effects of these factors on the worker's health and daily life.

Keywords: psychosocial risk factors; perception of risk; relationship between work and health; cement industry; INSAT survey; safety culture, working conditions, leadership; safety management system; risk assessment

1. Introduction

Psychosocial risk factors are a strong concern at European level, as complaints are increasing and their consequences are increasingly serious, influencing both the health status of workers and the implication in work accidents (Eurofound, 2012).

The available statistical information shows that occupational accidents continue to have a strong incidence in Portugal. Every year there are several hundred thousand accidents, making our country one of the European states with the highest number of accidents at work, proven by the incidence rates of serious work accidents and fatal work accidents, presenting values higher than the EU27 average (Eurofound, 2012).

Among the activities where the most accidents occurred last year, the manufacturing industry comes first, followed by construction. Most of these accidents occur in industrial installations and are related to "slipping or hesitation with a fall, falling of people" (ACT, 2014).

In line with these statistics are the accidents that have occurred since 2010 to date, in the Company, the vast majority of which are caused by falls, false movements and other similar designations within the concept of movement (walking, going up, going down stairs, etc.), whose prevention seems to us not to be directly related to the technical component of the work, where significant investments have already been made resulting from legal and

regulatory requirements in terms of the protection of machines and equipment, but more with an organizational and individual component.

The number of work accidents in the Company studied seemed to be decreasing naturally, a finding that we related to the implementation of technical and organizational measures arising from the implementation of the occupational health and safety management system and until a certain point suffered a reduction in 40% from 2021 to 2022 and maintaining the number in 2023 to date. In 2024 the expectation is to reach the same value as in 2021, which warned that this indicator was not yet under control.

In addition to the high number of accidents, it was important to understand their type and the fragility of the implemented management system, as it was unable to prevent or eliminate them. In this context, there was a need to study this topic, choosing to start from the individual perception of working conditions and health status and the individual notion of risk in each workplace, to get to the less visible side of the causality of work accidents, that is, to understand the possible effect of organizational working conditions and individual health status on the occurrence of work accidents in the cement industry, so that effective prevention of work accidents could be carried out more effectively.

1.1. The Study in context.

The Company studied is a reference in its field of activity due to its management, growth and internationalization, being one of the five most solid and profitable international cement companies, achieving and sometimes exceeding the objectives it sets itself, in the most varied areas. “Unfortunately, when it comes to occupational safety, we still have nothing to be proud of” says the CEO of the Company, in his statement at the beginning of 2022. Regarding the frequency and severity rates for 2021, “We registered six cases fatal (in the entire group), an unacceptable result, which forces us to make a deep reflection on what is not happening properly.” ... “As we already have tools, I believe we need to invest deeply in leading by example. Leaders and managers must be more incisive agents, also leading all security processes. As agents of behavioural change, they must discard any permissive attitude that could potentially prioritize any result to the detriment of safety.”

2. Theoretical Review

2.1. Psychosocial Risks - Categorization of risks

In the world of work, there are no organizations or companies that are immune to occupational risks or with “zero” risk. In many situations, organizational risks are almost inevitable and are increasing. Modernity brought what some authors have already denounced as the risk epidemic (Solbakken, 1995, in Areosa, 2009). Development and research bring us to the discovery of new risks that until a certain time were not known as such, if we do not see, the number of chemical compounds that were considered harmless and with the new legal impositions have become dangerous, irritating or with other denominations (Pignata, 2022). Over the last few decades, important technological advances have

taken place in the workplace; progress that, associated with rapid globalization, has transformed the working conditions of many people around the world. These changes had visible repercussions on occupational safety and health (OSH). In certain cases, more traditional hazards and risks have regressed or been eliminated, for example, replacing the dangerousness of products, automating installations, but new technologies have also given rise to new risks. However, many of the traditional risks are still present in the workplace and the number of accidents and illnesses associated with work continues to be unacceptable (ILO, 2010).

These new risks or emerging risks, as it is also designated by the European Agency (AESST, 2007a) can be understood as those that: (1) were previously unknown; (2) is caused by new processes, new technologies, new types of workplace, or social or organizational changes; (3) it is a long-standing problem, but has recently been considered a risk due to a change in public perception; or (4) it is a long-standing issue, but new scientific knowledge allows it to be identified as a risk. By increasing risk, we mean that: (1) the number of hazards that lead to the risk is increasing; (2) the probability of exposure to the hazard leading to the risk is increasing (level of exposure and/or the number of people exposed); or (3) the effect of the hazard on workers' health is worsening (severity of health effects and/or number of people affected) (Pignata, 2022).

There are many models for categorizing occupational risks, which may have greater or lesser scope, used in different contexts, and be easily quantifiable or not, depending on their nature and the analyst's knowledge. They may only present simple risks, such as physical, chemical, biological and ergonomic risks or risks resulting from the relationship between man and machine or the work environment.

The risks resulting from different work situations are so numerous that trying to quantify and enumerate them, in all their aspects, appears to be an almost unattainable task. Areosa (2010), presents a model for categorizing the most common risks and risk factors, organized in a way that can be criticized, yet comprehensive, as it considers not only those internal to the company but others from external sources the author establishes nine major dimensions of risk, they are: 1) Physical risks that are essentially related to exposure to noise, vibrations, electricity, considered traditional risks and ionizing and non-ionizing radiation, risks that new knowledge and technologies brought. 2) Chemical risks group chemical preparations and solid and liquid chemical agents: particles, dust and aerosols; risks due to carcinogenic, mutagenic and reproductive toxic substances; explosive and flammable substances; substances and mixtures with health effects; specific chemical risks of work processes and workplaces; and multifactorial risks related to hazardous substances. 3) The biological risks identified were grouped into five categories: viruses, bacteria, protozoa, fungi and bacilli. Risks that have emerged in the world of work with the increasing use of alternative fuels, with the exposure of healthcare professionals and the export of professionals to other countries, namely Africa and Brazil. 4)

Ergonomic risks, whose risk factors identified by the author characterize, on the one hand, the workload in a more physical component: physical effort, lifting loads, inadequate postures; and on the other, the more psychological component: high rhythms, night work and repeatability of functions and tasks. Factors that are analysed in the ergonomic analysis in addition to others designated in the other dimensions proposed by the author. This is to say that the ergonomic risk designated here falls short of the set of factors that are analysed during an ergonomic analysis, where all factors that influence work are identified and analysed. 5) Risks resulting from the environment and work organization: temperature, lighting, falling objects and people, shocks, Risks that arise from the sharing of workplaces by several workers and where tidiness and cleaning has not been established or often fails. 6) Risks resulting from work equipment, where risk factors arise such as: machines and tools adapted by workers or by managers themselves due to production imperatives, the various energy sources that workers often do not have enough information to operate with them, machine instructions in languages different from those of users. 7) Social risks of natural origin, which include all natural phenomena. 8) Social risks of human origin or complex technology, which include terrorist attacks, the release of pollutants into the soil and atmosphere and 9) risks associated with individual accident-prone factors, which include interpersonal conflicts in working relationships between colleagues and managers, physical and psychological fatigue, lapses and distractions and reduced levels of risk perception.

As previously mentioned, this is a possible model for categorizing risk factors. However, it is important to mention that in a real context you cannot look at each risk in isolation, as if they were watertight entities. In most situations, risks interact with each other in a complex way. The greater or lesser impact of these risks depends on the way in which work groups and each subject individually manages them. It is with this complexity and scope that the designation of psychosocial risk arises.

The concept of psychosocial risk has been present in scientific literature for several decades, but it was towards the end of the last century, mainly from 1980 onwards, that it acquired greater technical-scientific importance (Neto, 2015), having been defined by the World Health Organization. Health as the factors that influence the health and well-being of the individual and the group, these originate from the individual and the structure of the work organization. They include social aspects, such as forms of interaction within groups, cultural aspects, such as traditional methods of conflict resolution, and psychological aspects, such as attitudes, beliefs and personality traits. (AESST, 2007b). Later, defined by the European Agency for Safety and Health at Work (AESST) as the aspects relating to the design of work, as well as its organization and management and its social and environmental contexts, which have the potential to cause damage of the type physical, social or psychological (AESST, 2007b).

For Sauter et al., (2003 in Coelho, 2009) psychosocial and organizational risk factors are conditions that lead to stress. They

comprise aspects of the workplace and the work environment such as the climate or culture of the organization, work functions, interpersonal relationships at work and the design and content of tasks. The concept of psychosocial factors also extends to the environment outside the organization (for example, domestic demands) and to aspects of the individual (for example, personality and attitudes) that can influence the appearance of stress at work.

As these psychosocial factors are increasing and serious, as they are related to the occurrence of illnesses and accidents at work, the European Agency (AESST, 2007c) through the European Risk Observatory carried out a survey and a literary study on psychosocial risks to help to “anticipate knowledge of new and emerging risks”, and in the respective report, listed the 10 most important risk factors identified in surveys.

The psychosocial risk factors identified by experts can be grouped into five areas:

1) New forms of employment contracts and job insecurity.

The use of precarious employment contracts, associated with the tendency towards outsourcing (delivering work to external organizations), can affect the safety and health of workers. On the other hand, workers with precarious contracts tend to carry out the most dangerous jobs, work in worse conditions and receive less training in occupational health and safety. Working in unstable job markets can lead to feelings of job insecurity and increase professional stress.

2) The aging workforce

It is known that a consequence of the aging of the population and the increase in the retirement age is that Europe's active population is older. Experts involved in the forecast say that older workers are more vulnerable to hazards arising from working conditions than younger workers. The unavailability of lifelong learning opportunities for older workers also increases the mental and emotional demands placed on them. This situation can affect your health and increase the likelihood of accidents at work.

3) Intensification of work

Many workers deal with ever-increasing amounts of information and have to cope with greater volumes of work, as well as greater pressure on employment. Some of them, especially those working in new forms of employment or in very competitive fields, tend to feel less secure. For example, they may be afraid that their effectiveness or production will be evaluated more rigorously and, therefore, they tend to work longer to complete tasks. Sometimes, they may be compensated for work overload, or not receive the necessary social support to carry it out. A greater volume of work and increased demands placed on a smaller number of workers can lead to an increase in professional stress and affect the safety and health of workers.

4) High emotional demands at work

This issue is not new, but it raises great concern, especially in the growing and increasingly competitive health and services sectors. Workplace bullying is identified by experts as a contributing factor to the increased emotional demands placed on workers across all professions and sectors. For both victims and those who witness them, violence and psychological or physical intimidation cause stress and can seriously affect mental health

5) Difficult to reconcile professional and private life

Professional problems can have repercussions on people's private lives. Uncertain and occasional work, large volumes of work and variable and unpredictable working hours, especially when the worker has no possibility of adjusting them to their personal needs, can lead to a conflict between professional demands and private life. The result is a difficult balance between professional and private life, which negatively affects the worker's well-being.

Currently, the most frequently identified psychosocial risk factors in EU-28 companies are: 1) Having to deal with difficult clients, students and patients and 2) Pressure to meet deadlines. "Almost one in five companies that report having to face difficult clients or pressure regarding deadlines to meet also say they do not have the appropriate information or tools to deal with the risk effectively" (AESST, 2015, p.2). Other factors are highlighted, but in a smaller percentage, such as: 1) Long and irregular work, 2) Poor communication or cooperation within the organization, 3) Precarious employment, 4) Lack of workers' control over the pace and 5) Work processes and in a very small percentage discrimination, whether based on gender, age or ethnicity (AESST, 2015).

One of the problems associated with the increase in occupational risks derives from the strong pressure from the economic and productive field on the field of prevention and safety. "Organizational hierarchies sometimes tend to pressure or encourage most workers to prioritize production over safety" (Areosa, 2010, p.70). If it is true that the risks to which we are exposed in the workplace can influence our attitudes and behaviours, the opposite situation can also be true. We know that accidents at work always occur through the implementation of a certain occupational risk. "Thus, the articulation between risk perceptions, attitudes and behaviours of workers seems decisive to understand and explain how some types of risks can lead to work accidents.

3. Methodology

This point defines the methodology used to carry out the fieldwork. The population that was chosen for the study and sample composition. The instrument used to collect the data, the procedure that was carried out to apply the questionnaires and the methodology for processing the data collected.

3.1. Population

The starting population was made up of all the Company's direct workers, belonging to the three Production Centres: Central Zone Production Centre – 100 workers; Production Centre in the South Zone – 58 workers and Production Centre in the Lisbon and Tagus Valley – 76 workers, for a total of 305 workers.

The validation criterion established for this study was to have at least two thirds of the questionnaire completed and the inclusion criteria were: belonging to the group of workers with direct contracts with the company, being male and carrying out their work in the areas of maintenance and /or manufacturing.

3.2. Instrument

To analyse the relationship between working conditions and the health status perceived by workers, the INSAT survey - The Health and Work Survey (Barros-Duarte & Cunha, 2010) was used. This is a questionnaire survey whose objective is "to understand how workers evaluate the characteristics and conditions of their work, their health status, and what type of relationships they establish between their health and their work" (Barros-Duarte, Cunha, Lacomblez, 2007, p.59).

This instrument was built to respond to the complexity of studying the relationship between work and health. Designed based on the contribution of European surveys, it appeared in 2007 (Barros-Duarte, Cunha & Lacomblez, 2014) and this version was updated in 2010 and again in 2013, based on the new challenges that emerged in working life, a version that was used in this work.

By emphasizing an analysis of the relationship between health and work based on workers' statements, this survey constitutes an interface instrument in the assessment of working conditions. As the authors state, "INSAT can be seen as a mediator of dialogue between interlocutors involved in the prevention and promotion of health at work, within the framework of an intervention that is intended to be concerted" (Barros-Duarte, Cunha & Lacomblez, 2014, p .339). This is because the perception that workers have of working conditions may not correspond to the conditions proposed by employers.

To study the complexity that characterizes the relationship between health and work, it was necessary to understand a set of factors that interact mutually and at different levels of an individual's life, thus requiring a global and multifaceted approach, supported by five anchor points (idem).

Understanding the work context is something quite comprehensive and complex, which requires an assessment instrument, whose questions encompass both the work activity and the context in which it takes place, namely the organization of work and the social relations of work.

This complexity of the work context individually influences the

worker's health, aspects that are considered in the instrument, since the questions are centred on the individual, making it possible to analyse the various dimensions of the individual, physical, psychological and social constraints.

Using this instrument is intended, above all, to characterize working conditions, exposure to professional risks, and their impact on the health and well-being of the worker. Allowing the worker, when completing, a gradual and progressive awareness of the consequences of work and health. There are seven main axes that structure INSAT: I – Work; II – Working conditions and characteristics; III – Living conditions outside of work; IV – Training and work; V – Health and work; VI – My health and my work and VII – My health and well-being.

The first axis, “Work”, includes a set of questions relating to the work situation: it corresponds to the specification and characterization of the type of activity carried out, also making reference to the type of employment relationship and the working hours practiced.

The second axis brings together questions related to the analysis of worker exposure to certain conditions, organized into three categories: Category 1 - Environment and Physical Constraints - which includes the risks of the physical environment, namely noise, vibrations, thermal environments, radiation, biological agents and chemicals, among others; and physical constraints, more specifically gestures, efforts, postures as well as ergonomic issues at the workplace. Category 2 - Organizational and Relational Constraints – reference to the pace of work and working time; autonomy and initiative at work; to social work relations, as well as to relationships established in contact with the public. Category 3 – Characteristics of work – questions relating to the way in which each person characterizes and qualifies their work, encompassing both dimensions associated with dissatisfaction and difficulties at work, and dimensions related to the feeling of pleasure and personal fulfilment.

The third axis corresponds to the analysis and characterization of sociodemographic dimensions, with the worker being asked for information about marital status, number of children and home-to-work journey. The problem of reconciling work life with life outside of work is questioned, as is the time spent on domestic and/or family support tasks.

The fourth axis allows us to characterize the type of training carried out by workers and to what extent it is directly related to work or not.

The fifth axis is organized into two domains: the identification of work accidents and occupational illnesses that the worker may have suffered or situations that resulted in an occupational disease; the information that the company provides, or does not provide, about professional risks and their prevention.

The sixth axis lists various health problems, physical and

psychological, which the worker must report if they have or have had. If the answer is yes, you will also be asked for an opinion on the relationship between that problem or complaint and work: whether it could have been caused or worsened by work.

In the seventh axis, more specific questions about health and well-being are assessed through the Nottingham Health Profile (NHP), and their identification with work. This profile defines several questions totalling thirty-eight, to which you answer yes or no, and at the end you are asked whether the problem identified is related to work.

Questions that are part of the six dimensions that make up this instrument: Energy, Pain, Emotional Reactions, Sleep, Social Isolation and Physical Mobility, with a logic of relationships between the health status perception scale and the average scores recorded in the various dimensions of the Nottingham Health Profile.

3.3. Procedures

This study project was presented to the administration and directors in April and operationalized through the application of surveys in the three production centres, throughout the month of May 2020. An approach to the survey was made in management meetings of the various manufacturing units, the scope and objective of the study were explained, and the number of questionnaires and respective informed consents were distributed to each director, corresponding to the direct reports in each area. They distributed and collected completed questionnaires from their group of people. Monitoring was carried out on the three shifts, in each unit, to reach as many workers as possible. In the vast majority, the surveys were returned on the day they went to the manufacturing unit, others were returned by post during the months of June and July 2020.

3.4. Data Processing

Descriptive statistics were performed to characterize the sample (parameters of central tendency and dispersion for continuous variables and relative frequencies for nominal variables).

In a second phase, descriptive statistics (absolute and relative frequencies) were carried out on the variables relating to work conditions and characteristics. With a view to analysing inconvenience, this variable was recorded by grouping the responses: very, quiet and inconvenient, in a single value (1) and little or not at all inconvenient, in another value (0).

Health variables were also the subject of descriptive statistical analysis. The relative frequencies of the affirmative answers given in the list of health problems were calculated and of these the answers that indicated they were related to the work situation. The relative frequencies of affirmative answers to one or more questions per dimension of the NHP were calculated in the same way. The scores (total values) per dimension were also calculated. The nominal variables relating to work conditions and

characteristics whose relative frequency of affirmative responses was equal to or greater than 20% in the descriptive analysis were integrated into a bivariate logistic regression analysis (enter method) with a view to examining the association with health problems most reported. The variables that showed a significant association in this first approach were integrated into a multi-factor logistic regression analysis (backward conditional method) after calculating confidence intervals and standard errors. A significance level of $p < 0.05$ was considered.

We also sought to verify the association between the same nominal variables of work conditions and characteristics and the scores of the NHP dimensions, whose relative frequency of affirmative responses was revealed to be greater than 20% in the descriptive analysis. They were integrated into a univariate regression analysis using the same inclusion criteria for variables in the models. Among the factors analysed, those that proved to be significant ($p < 0.05$) were included in a multiple regression model.

Data processing was carried out using IBM SPSS 20.0 statistical analysis software.

4. Results

4.1. Sample Characterization

Of the 305 workers who made up our population, only 192 met the criteria for inclusion in the sample and validation of the questionnaire, being distributed across the three Production Units: 43% belonged to Unit 1; 24% belonged to Unit 2 and 33% belonged to Unit 3.

The level of education was considered high, since 38% of the population has basic education, 50% secondary education and the remainder a bachelor's degree or more (11%), a characteristic that is repeated in the three units.

Regarding the average age, it is 43 years old with a standard deviation of 12.1 and a median of 45 years old. Noting that 48% of respondents were under 45 years old and 51% were 45 years old or over. Analysing the sample by unit, we were able to verify that the population of unit 1 is the youngest and the population of unit 3 is the oldest. In unit 2, the distribution between these two classes is the most balanced.

Most workers are experienced (66%), only 11% of respondents had less than 1 year of service and 21% had less than 5 years of service at the Company, 36% had between 5 and 10 years, and the remaining 30% had more than 10 years of experience with the Company. This trend is reflected in the three units, with the workers who had the lowest seniority belonging to unit 1.

Manufacturing is the most represented area (55%), followed by maintenance (45%). Analysing by unit, we were able to verify that the representation of the Manufacturing and Maintenance areas are similar, apart from unit 1 which has a greater number of respondents from the Manufacturing area.

The employment situation of the majority is stable, 90% of respondents were permanent or had a permanent contract, only 7% were on an internship or scholarship and 3% had a fixed-term contract.

Regarding working hours, 49% of the workers surveyed had a normal working schedule and 51% had a rotating shift schedule. Most workers (72%) attended training courses in the last twelve months. Around 30% of workers in unit 1 reported having attended training in the last year, 34% reported the same in unit 2 and 21% in unit 3. Participation in training in the last 12 months was mostly determined by the company, mentioned by 68% of workers, contrasting with that mentioned on their own initiative, with only 32% of responses. Trend that is reflected in production units. One of the training topics most covered in training actions was "health, safety at work" (55%), followed by training on "the current work situation" (45%), "topics of general interest" (32%) and in a smaller percentage (14%), on "future work", a distribution that is balanced across the three production units.

It is not reflected in the data, but it was also found that of workers who attended training in the last year, 43% attended one or two training sessions, (17%) attended three or four training courses and the remaining 9% received more training, which may be associated with new workers or workers who changed roles. The duration of the training actions received in the last twelve months was, for the most part, one week, a trend also mentioned in the three production units.

4.2. Discussion

By applying the INSAT questionnaire, it was possible to characterize a large part of the Company's population, also providing us with information about the worker's perspective on the conditions and characteristics of work and their effects on their health and well-being. It was thus possible for us to collect relevant information about the physical, psychological, organizational and relational constraints experienced by workers in the three production units analysed.

The physical and environmental constraints that affect most workers are dust, noise and intense heat/cold; risk factors that are part of traditional risks and that, due to the nature of the activity, are inherent to the manufacturing process. These are well-known risk factors and are therefore easily identified by workers, monitored periodically by the company, especially those relating to the environment, and disclosed to workers through training and information.

In a smaller percentage, physical load conditions are identified: frequent climbing and descending, standing with movement and remaining in painful postures, risks identified by workers that characterize the size in terms of extension of the factories and the constant request of these two groups of workers: manufacturing and maintenance operators, to intervene in various locations and sometimes very far apart. However, when physical load is

associated with muscle and joint pain, we did not obtain significant results.

Comparing the results of this work with those of the European report on working conditions (EWCS, 2012) we see that proportionally our data are inverted, that is, in Europe and Portugal exposure to risks related to the work environment (e.g.: noise) have suffered a decrease over the years (since 1991) and in the case of this study they remain high. Likewise, the risks related to repetitive movements or even handling of loads have been increasing, and more significantly since 2005, with Portugal ranking as the 5th worst country among the 34 and in this study they are less significant, in frequency, than those of the environmental dimension. Facts that may be associated with the type of companies questioned or even with the information available from those questioned, which translates into the perception that workers have of the risk to which they are subject.

If we compare the results of the organizational and relational dimensions with the European report, this difference no longer exists. Our results show that work rhythms are increasingly intense, where it is often necessary to extend working hours, increasing demands, as this is a type of work that regularly occurs at unusual hours, since a large part of respondents work rotating shifts without fixed days off. A third of respondents' report having little autonomy at work, being little recognized by managers and consequently receiving unsatisfactory pay. One of the conclusions of the European survey (EWCS, 2012) states that physical risks continue to be very present at work, since the last study in 2005, however, psychological risks have grown proportionally to the growth in work intensity and are not being accompanied by growth autonomy, a factor that appears to be protective in relation to work intensity. Factors that are identified as stressors and even affect the state of health, for example, epidemiological studies carried out by the college of experts on psychosocial risks at work, demonstrate that the lack of autonomy increases the probability of cardiovascular disease. Adding that the combination of high levels of task demands with low autonomy leads to a propensity for cardiovascular disease and mental health problems (Coutrot & Mermilliod, 2010). Related or not, we found that the highest percentage of medication taken by workers (20%) is for cardiovascular diseases (information collected in the INSAT questionnaire, but which was not transcribed into the results).

Psychological risk factors are closely linked to the way work is designed, organized and managed (AESST, 2010). It is also influenced by the economic and social context of work, resulting in an increase in stress, which, if maintained, can lead to a serious deterioration in the mental and physical health of workers. Research carried out allows us to group the causes of professional stress into three broad categories: 1) specific sources of work/tasks, 2) organizational sources and 3) individual sources. Within these categories, six events that cause stress related to work can be distinguished: intrinsic characteristics of work, roles in the organization, relationships at work, career development, structure and organizational climate is, and work and family relationship

(Cooper, 2004). Later studies by Pichler and Wallace (2009 in EWCS 2012) point to a fourth category associated with macroeconomics and social conditions, which highlights the unemployment rate, salary level.

In line with these studies, the percentages of responses to certain variables within the dimensions are: Organizational constraints (work pace, meeting deadlines, depending on colleagues, being frequently interrupted, forced to go to bed after midnight, sleeping at unusual hours and little autonomy); Relational constraints (having to help colleagues, little recognized by managers and having to endure complaints) and Characteristics of the work (varied, unpredictable, complex, which it is difficult to perform at the age of 60/65 and whose remuneration is unsatisfactory). Considering the advancement of age in the various activities they carry out; they are concerned about the future. As we saw, the sample has an average age of 43 years, the age at which the first effects on health in terms of vision, effects of shift work and other more individualized effects begin to appear. In addition to the most common risk factors related to work activity (noise, dust, physical exertion, going to bed after midnight), others arise that are related to the restructuring of the company and the process weight loss policy, which in many cases This is reflected in the dismissal of workers on the one hand and the intensification of work for those who remain, in addition to constant changes. Factors that are not visible in a preliminary assessment, but that are present and that affect the work capacity and health of workers.

According to the European report (EWCS, 2012, p.115) "the relationship between work and health is complicated to study and measure. Workers are affected by their work, but also by the lack of it." Exposure to risk can have a direct impact on health, for example exposure to noise can lead to deafness. Likewise, exposure to specific risks can have an indirect impact on health. Studies have shown that the collective defines strategies of certain construction workers were achieved through alcohol consumption (Motta, 2002) to reduce the fear of carrying out certain tasks, with some workers being more affected than others by these indirect impacts. Depending on individual characteristics, risk perception is felt and resolved differently. In this case, the reaction to fear, for example of working at heights, leads certain individuals or groups to consume substances that will affect their consciousness and attention, skills necessary for good work performance. Increasing the risks associated with the task they perform.

The respondents' perception of their health status revealed that 70% consider that they are in very good or good health, 29% consider that their health is reasonable and 1% consider that their health is in poor condition. Around 38% of workers consider that their health has been negatively affected by their working conditions. Results that are like the responses presented in the European survey (EWCS, 2012) where there appears to be no perception on the part of workers of the negative relationship between working conditions and their health. However, the same report points out some risks, raised in the literature, as affecting health, they are exposure to physical risks, postural risks, psychosocial risks, job insecurity,

innovation in the workplace, compensation and cognitive dimension of work and relationship homework.

In relation to the health of the workers surveyed in this work, the results reflect the physical constraints of the horizontal and vertical dimensions of the factories, as well as the characteristics of the activity, in terms of hearing problems and muscle and joint pain, and organization, in terms of insomnia and anxiety. However, the analysis of the association between diseases and working conditions only revealed significant relationships between back pain, which is being affected by variables of physical load and working time, and muscle and joint pain, which is being affected by relational, temporal variables and work characteristics. Curious results that reveal that physical fatigue is not only affected by the physical characteristics of the size of the factories and tasks with a physical predominance, but also by the pressures of the pace of work, relationships between peers and managers, the characteristics of the shift and accumulation fatigue, less visible factors in the causality of work accidents and occupational illnesses.

In most of the dimensions of the health profile studied, more specifically the dimensions identified by the multiple regression analysis carried out, we found that emotional reactions, pain and sleep are strongly influenced by working conditions, in terms of characteristics work and labour relations.

Regarding the pain dimension, two factors that influence it were identified in this sample: expressing at will, a variable in work relationships, and the fact of being subject to conditions that undermine dignity, a variable in work characteristics. Factors that are easily minimized and/or eliminated if there is openness to active participation by workers in their workplace.

Regarding the sleep dimension, two factors that influence it were identified: the suffering of other people, a variable in relationships with service providers, and being subject to conditions that undermine dignity, a variable in work characteristics. Sleep is being affected by concern for others, in this case with service providers who very possibly work in conditions that are sometimes less dignified, inferior to direct workers and with conditions that undermine dignity, far below the expectations they intended for this phase of their lives. Factors that have a more significant weight than working a rotating shift system with variable days off, as would be expected.

Regarding the emotional reactions dimension, two factors were identified that determine them: being forced to get up before 5am, a variable in working time, and where the necessary resources are lacking, a variable in the characteristics of the work. Emotional reactions are affected by working hours, especially the morning shift and the lack of the necessary means to carry out the work, which can be understood as the lack of physical means, the lack of a tool or equipment, such as a lack of human resources, which are often the most vocal complaints by workers. The varied work factor was also identified, a characteristic of work that mitigates

the emergence of emotional reactions. The characteristic of work being varied motivates workers and challenges them permanently, mitigating the appearance of emotional reactions.

Among the risk factors evaluated and valued in the current risk assessment, many are those that were identified and perceived by workers in this work. About these risks, e.g.: noise, vibrations, temperature, physical load; there is training, information for workers, they are monitored and controlled, and protective and preventive measures are applied. Other risks, namely those of organizational and relational origin, are not reflected in the risk assessment grids and are not identified by the Company or by the OSH management system.

They affect workers, some more than other workers, they have repercussions on health, however they are not measured or controlled. External audits already mention them at the interview stage, regarding the system requirement, legal compliance, but it is not yet recorded as non-compliance. Occupational medicine refers in meetings to the need to identify psychosocial risks, and the importance of hiring a clinical psychologist for individual approaches to monitoring cases of emotional reactions that have already been identified. Reactions, which can affect workers' decision-making capacity while carrying out their work and which can lead to the occurrence of work accidents.

It seems to us that the tools that are being implemented in the Company: new methodology for risk assessment; encourage workers to report risky conditions and behaviours (Reason, 2013); having the presence of an occupational physician in monitoring meetings on OSH issues to bridge the gap between risk situations in the workplace and complaints that appear individually at the medical station, are essential to help identify the risks that influence the performance of the work and affect workers. Promoting work planning, communication and providing training to workers so that they can carry out a critical analysis of their working conditions themselves, together with health and safety technicians, so that they can appropriately decide to carry out work safely, fulfilling the Company's motto "we will do it safely or we won't do it at all", with the openness to allow them to propose changes to improve their jobs, a situation that is slowly being introduced in factories, with greater or lesser adherence depending on with the importance and monitoring that each manager, in the various hierarchies, gives to safety issues.

In the case of this study, it was not possible to relate work accidents to working conditions.

Dwyer, (2008) states that workers' complaints regarding poor sleep quality (little sleep, insomnia, etc.) seem to be related either to the increase in the number of accidents or to their greater severity and that the relationship between high noise in some workplaces and the occurrence of accidents is a relatively well-studied field, where it is concluded that noise tends to increase accidents.

We think that if it had been possible to include indirect workers,

workers who perform the most demanding tasks and who in greater numbers have suffered work accidents that have occurred in recent years, it would have been possible to study the association between certain conditions and characteristics of work and the occurrence of accidents.

If we analyse the results of the questionnaire from the point of view of the model - Failures in barriers, we see that there is a lot to be done in the Company in terms of strengthening and permanent control of defending barriers (Reason, 2013), particularly at the level of supervision: control of documentation, level of experience and training; at task level: checking work methods, characteristics and conditions of the workplace; at an organizational level, checking the time and pace of work required of service providers, a task that we believe is only possible through the evolution of the safety culture in the Company. Disseminating it not only to direct workers in the various supervisory hierarchies, but to everyone who enters and stays at the facilities, until reaching the ideal situation of having workers who naturally care about their safety and health and that of others. Another aspect that we think to improve is the tendency in accident investigation to consider the main cause of accidents, “unsafe acts” to the detriment of “unsafe conditions” (Reason, 1998), an aspect that also reflects the process of evolution of culture security in the Company.

Although the instrument used (INSAT) is not suitable for measuring safety culture, we can identify some of the factors considered by Fleming and analyse the constraints perceived by the workers studied. (contradictory instructions, complying with standards/deadlines, participating in decisions, little autonomy) and the working relationships they establish (maintaining permanent availability, depending on colleagues and needing to help colleagues).

In the case of the Company studied in this work, it seems to us to be in the middle of the evolution process, stage two was achieved by the implementation of the safety management system, in which there was a need to establish indicators and targets to achieve the objectives, substantiating them by a complex documentary structure. It grew under the commitment of security technicians with the patronage of top management. Currently, the topic of safety is already part of management meetings and is beginning to be aligned with production, but still in a reactive situation. There are already signs of stages three and four, but with little consistency.

If we recall the theoretical framework presented previously, we see that there are fundamental pillars for preventing risks and stabilizing a safety culture. (Choudhry, Fang & Mohamed, 2007 in Filho, Andrade & Marinho, 2011) carried out a literature review and came up with five factors that characterize a safety culture: 1) management's commitment to workplace safety; 2) mutual trust between managers and workers; 3) autonomy for work; 4) continuous monitoring and 5) improvement of working conditions. A strong contribution from leadership is therefore necessary. As we saw previously, the ideal would be to have a balanced

management style that bases the premises and decisions on the four quadrants of the model of contrasting values, enabling the achievement of objectives for the creation of value, through the monitoring of processes, with the active accountability of workers, encouraging creativity and innovation.

Caldeira, (2014) describes that a true leader makes a difference in the organization by ensuring: 1) the creation and commitment of people to the company through training, adoption of the best work practices in safe conditions, the organization's standards and rules that aim at the security of people, assets and property; 2) continuous improvement and the involvement of everyone (team spirit and the notion of the common and the whole, focusing on sharing knowledge and setting an example in the application of good security practices); 3) Outputs supported by a culture of safety, people's autonomy, an attitude of non-conformity (believing that zero accidents are possible), a sense of ownership and sharing. The leader must adopt a set of good practices, reinforce new safe behaviours and encourage change, followed directly by the remaining employees and, gradually, by the resistant ones who understand the benefit of a safety culture in the company, which involves: 1) treating the employees in the same way the organization treats its best customers; 2) Do not criticize and/or blame people sounds, but the procedures and work practices that generate accidents; 3) end the fear of making mistakes, adopting proactive behaviour, learning from errors and eliminating their occurrence; 4) the result of teamwork must be disclosed as soon as good practices are developed/identified and must not encourage competitiveness between teams; 5) actively listen to and evaluate all suggestions made voluntarily by the people who work at their jobs, whose risks they identify better than any technician, giving them a sense of ownership and respect; 6) meetings to analyse safety indicators, suggestions for improvement and other related topics must be short-lived and focused on finding the identified solution, the root cause of the problem; 7) the data to be analysed must be collected in the workplace and after evaluation must be made available in the same place, in a simple to interpret way, to guarantee people's involvement and participation.

To define a very operational management model, disseminate it throughout the organization to have several managers spread across different areas, focusing on the quality of the products and services they provide, encompassing safety in all processes. By having knowledge of the daily reality through experience between managers and their teams, it will be easier to detect those factors that are not visible, that are not pathological cases, but that disturb the well-being of workers and make their day-to-day life difficult. -a-day work.

5. Conclusion

This work began with concerns about the fluctuation in frequency rates of work accidents, recorded over five years at the Company, with the aim of analysing the relationship between working conditions, the health status of workers and the occurrence of accidents, for the identification and implementation of mechanisms

to prevent work accidents.

With a deeper analysis of the Company's statistics and the data collected, we found that it would not be possible to maintain the initial objective and it was necessary to reformulate it, focusing on the relationship between working conditions and the state of health and well-being. be perceived by workers.

From the analysis carried out on the results, we were able to verify that traditional risks, of environmental dimensions and physical load, are present in the workplace, perfectly identified by workers and controlled by the Company. Risks related to the organization, relationship and characteristics of work are not so easy to identify and the majority are not controlled at an organizational level, nor by the health and safety management system.

We found that there are variables in working conditions that influence the health and well-being of workers, highlighting the variables of work and relational characteristics as the most affecting pain, sleep, emotional reactions and mobility. There are therefore aspects to improve, namely in the way work is organized, improving worker participation, reinforcing teamwork, sharing experience and knowledge, increasing the level of communication and information.

We believe that the occupational health and safety management system is an effective instrument for improving the conditions and evolution of health and safety in companies, as it aims to guarantee the protection and physical and mental integrity of workers, through conditions that can prevent and protect against health risks when performing their duties.

We know that implementing the system alone does not give us this guarantee, without it being supported by everyone's motivation and involvement. Even because the data that comes to us from European reports indicates that there is a strong correlation between companies that adopt OSH management systems and effective risk prevention, however the way in which these systems are managed, with more or less intervention from workers and managers' commitment seems to be an important and even imperative detail for the success of this implementation.

All safety management systems have management commitment as an initial step, ensuring that nothing is initiated without the awareness and express will of top management. Their permanent and proactive involvement in the development and implementation of the OSH management system is crucial. Following the risk assessment, which must be comprehensive, identifying all risk factors that are present in the workplace and those that influence it and preparing teams to be able to manage all those risk factors that are not identified in the assessment grids of risks, but which influence performance and labour relations, such as stress.

For those who have an inside look at the organization, the evolution of the security culture is evident, which went from a set of bureaucratic documentary procedures, with a very limited

reporting system, to a more participatory and organized culture, but I would say that it is still in the process of evolution, which is built daily and matures in each of us. A safety culture is a culture of managing daily problems and a culture of permanent learning where the safety of an organization is the priority, initiated and defended by top management.

Many researchers consider that safety culture can evolve in the organization through different stages (Fleming, 2001), and an advanced safety culture is an important factor in preventing accidents and occupational illnesses. From this perspective, it is important that it is measured, so that an action plan can be established and made to evolve, a task that is beginning in the Company studied. We are experiencing developments regarding safety in the creation of work tools, common rules for the various activities and for the various countries. Regarding health promotion, it is still in a corrective phase, there are isolated initiatives, but there is still no long-term program.

The safety culture can be supported and easily maintained in a Lean management model, through the development of its fundamental pillars, which we believe to be the current vision of top management: 1) Leadership, in which the model is based on an integrated perspective of the teams in perfect value chain with those responsible, designated as a support structure, from the base to the top of the pyramid inverted organizational environment. The exercise of leadership must be carried out through the example of teamwork and in the operational field; 2) Problem Resolution, carried out using the PDCA (Plan, Do, Check and Act) tool, which allows developing strategic and operational principles for any activity, in an integrated, logical and practical way. Not conflicting with business or other objectives, since several factors are analysed. Always starting from a diagnosis phase and culminating with an action plan; 3) Internal communication is one of the fundamental vehicles for creating and maintaining a safety culture in organizations. This culture involves a constant application of upward and downward communication, with particular emphasis on the first variant, that is, listening very frequently to workers.

There are no places or situations that are 100% safe and healthy, but there are safe attitudes, practices, habits and behaviours, barriers that protect us from accidents and illnesses. Thinking about prevention is preventing, and preventing is protecting people, because without people there are no risks, bearing in mind that work accidents and occupational illnesses have indirect costs that are always much higher than the direct costs. Thus, awareness of risk management, including psychosocial risks, cannot be a passing concern, a technical or administrative fad but, on the contrary, must lead to the redefinition of the organization, even becoming the complex and interdependent integrative axis that is the company.

This work comes at a time of changing mentalities, in which the Group of the new Company, although already in Portugal since 2013, is beginning to uproot the old habits of closed leadership, to implement more participatory management, launching this year the ten attitudes, by which all workers must govern themselves and

adopt. Among them, management by example stands out, thinking safely before carrying out any work, strengthening the team, optimizing processes and exerting a positive influence by reinforcing teamwork, work planning, team motivation and autonomy, the participation and consultation of workers and the active commitment of management, felt down to the lowest level within the organization.

We are convinced that by adopting these principles throughout the hierarchical chain, it will be possible to effectively face and manage psychosocial risks, creating a healthy work environment in which workers feel valued, making the organizational culture of the workplace more positive, which, consequently, improves the company's performance at all levels, including the health and safety indicators that interest us.

In the future, it would be interesting to use the INSAT instrument again to verify the relationships between working conditions and safety and health, after reaching stage five of the safety culture.

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