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Abstract

Logging companies are extremely important in the economy of the country, but the large number of occupational accidents is of concern in this sector. It is therefore essential to act preventively in the cause of these accidents by identifying and controlling hazards. Thus, the objective of this work was to elaborate an Occupational Health and Safety Risk Matrix in a logging plant in Criciúma - SC. To this end, the applied matrix is based on the requirements set forth in BS OHSAS 18001: 2007. As a result it was observed that the greatest risk is incorrect posture and intense physical effort, as well as noise and projection of wood residues in the eyes and skin. It was inferred that with the matrix it was possible to identify the points in which a company should seek quick solutions to minimize the risks to which its employees are subjected daily.

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Abstract

Logging companies are extremely important in the economy of the country, but the large number of occupational accidents is of concern in this sector. It is therefore essential to act preventively in the cause of these accidents by identifying and controlling hazards. Thus, the objective of this work was to elaborate an Occupational Health and Safety Risk Matrix in a logging plant in Criciúma - SC. To this end, the applied matrix is based on the requirements set forth in BS OHSAS 18001: 2007. As a result it was observed that the greatest risk is incorrect posture and intense physical effort, as well as noise and projection of wood residues in the eyes and skin. It was inferred that with the matrix it was possible to identify the points in which a company should seek quick solutions to minimize the risks to which its employees are subjected daily.

Keywords: Loggers, matrix, accidents.

1. Introduction

Abundant in nature, wood is an irreplaceable resource, since the beginning, has always been within the reach of man, provided his defense, shelter and food. Planted forests follow the sustainable model of forest exploitation (VECHI & MAGALHÃES JÚNIOR, 2018). In Brazil, there are 7.84 million hectares of planted trees, which generate about 3.7 million direct and indirect jobs, besides being responsible for collecting R$ 11.5 billion in federal, state and municipal taxes (IBA). 2017).

With the generation of so many jobs, the sector presents problems regarding job security. Souza et al. (2002) report that the wood industries present the third highest frequency coefficient of fatal accidents in Brazil, second only to mineral extraction and construction. The Digital Observatory on Health and Safety at Work set up by the Public Prosecutor's Office (MPT) in cooperation with the International Labor Organization (ILO) shows figures and statistics on occupational accidents in Brazil. According to the observatory, from 2012 to 2018 Brazil recorded about 4.2 million occupational accidents, of which 15,768 resulted in deaths. Estimates show that around R$ 28.7 billion was spent from 2012 to 2018 on accidental benefits, including sickness benefits, disability retirement, death benefits and accident benefits. Almost 334 million working days were lost due to work accidents.

Given this scenario, the Ministry of Labor has intensified inspection in the sector, thus emerging a major concern in companies to adapt the current rules, prioritizing worker safety and obtaining safety

management systems. An example is the Occupational Safety and Health Management System (OSHAS 18001: 2007) and the mandates of Regulatory Standard 18 (NR 18), where companies need to establish measures to achieve and evidence solid and constant safety and health performance (CABRAL & RODRIGUES, 2015). This system enables any type of organization to more effectively control its occupational accident and disease risks and improve its occupational health and safety performance. One of its requirements is hazard identification, risk assessment and determination of control measures, these data can be obtained by elaborating the risk matrix. It is a useful tool for finding, storing and defining risk frequency and occurrence categories that helps in understanding the causes of occupational accidents so that action can be taken, always seeking to plan general and specific measures to prevent them.

2. Methodology

The research was carried out in a logging company in the city of Criciúma - SC, where technical visits were made to obtain data based on the physical arrangement of equipment and facilities. To improve the understanding of the process, the processing was divided into stages, which were the receipt of the raw material, processing of the raw material, storage and delivery of the processed wood, maintenance and cleaning, office and bathroom, in which the risks were observed. to which operators are exposed in each process.

The collected data were submitted to the analysis of which was elaborated a matrix of evaluation of risks associated to Occupational Health and Safety, whose purpose is to elaborate preventive actions prioritizing the activities that present higher risk.

2.1 Risk Assessment Parameters

To build the risk matrix associated with Occupational Safety and Health (OH&S), bibliographic research was performed and the model proposed by Meller (2011) and Bruch (2015) was adapted.

The first columns describe the activities performed and the agents, hazards and risks associated with it. To classify the risks, two parameters were considered: situation and incidence (Table 01).

Parameter	Classification	Symbology	Criterion
Situation	Normal	N	Routine activity
	Not normal	A	Non routine activity
Incidence	Direct	D	Direct Cause / Effect
	Indirect	I	Indirect Cause / Effect

Table 01 - Risk classification
Source: Authors (2019)

The situation is weighted to Normal (N) when activities are routine and Abnormal (A) when not associated with routine operations. The incidence may be Direct (D) when associated with the cause and effect relationship arising from the activity and Indirect (I) when associated with the cause and indirect

effect relationship and / or side effects of the activity.

To estimate the frequency at which a certain risk occurs, we used numbers from 01 to 03, as follows:

1. Sporadic: Exposure happens at most once a month;
2. Occasional: Exposure happens once or more a week;
3. Frequent: Exposure happens once or more a day;

The assessment is performed using frequency, duration, scale, duration and conduct parameters, with numerical values from 01 to 03, which are calculated and result in the significance of the risk to OHS (Table 02).

Parameter	1	2	3
Frequency	Sporadic	Occasional	Frequent
Duration	Max. 30 min.	Between 30 to 60 min.	Greater than 60 min.
Escale	Up to 3 people	4 to 10 people	Over 10 people
Conduct	Irrelevant	Relevant	Shocking

Table 02: Risk Assessment Parameters

Source: Authors (2019)

The scale parameter refers to the number of people at risk and is rated from 1 to 3; 2 - from 4 to 10; and 3 - with more than 10 of the employees exposed. The duration is represented by values from 1 to 30 minutes, 2 - between 30 to 60 minutes and 3 - over 60 minutes of the workday and indicates the exposure time of employees to risk. Conduct is associated with human behavior in the workplace. Bruch (2015) classifies it as irrelevant assigning value 1 when behavior does not interfere with worker safety during the execution of the activity, relevant (2) when worker conduct interferes with safety during the execution of the activity and Impactant (3) when the behavior It is crucial to the safety of the employee.

According to Bruch (20150, in the legislation, value 1 is assigned when there is legislation applicable to the identified risk and value 0 when none exists. Another factor analyzed is the work routine, being Routine (Value 0) for activities that occur daily in the sector, Non-Routine and Emergency (Value 1) for sporadically occurring activities or unplanned events that may cause significant incidents and damage to company personnel or infrastructure.

According to Berkenbrock (2010), the methodology for hazard identification is not standard due to differences in the production process. Each organization should carry out its own methodology, which meets the needs and characteristics in terms of detail, for these reasons not only the risk matrix, but other factors such as whether the company provides training, whether workers are trained for certain jobs, whether the use of personal and collective protective equipment (including site signage), cleaning and maintenance.

After collecting and analyzing all parameters, it is possible to calculate the probability of an occurrence, which is the number of times a hazardous situation can materialize as an accident, being the sum of the factors: exposure frequency, duration, scale, amount of exposed persons, human conduct, applicable law and routine work. The values and probability rating are low (4 to 8), medium (9 to 11) and high (12 to 14).

Another aspect to observe to analyze the risk is the severity that is defined in relation to the damage

caused due to the materialization of the risk, as follows:

Low: no personal injury, transient discomfort, minor injuries without any disability; average:

Medium: Minor occupational injury or illness with or without temporary disability, requiring medical assistance, but not on leave from work.

Discharge: Damages or serious occupational diseases, injuries with temporary or permanent disability, requiring medical assistance, with absence from work.

2.2 Risk assessment and classification

Risk is the combination of the likelihood of a hazardous event or exposure occurring with the severity of the injury or disease that may be caused by the event or exposure (OHSAS 18001, 2007). It is classified according to the combination of severity and probability and forms the basis for deciding on the acceptability and controls required for risk reduction.

The higher the probability and severity, the greater the risk and the lower the probability and severity, the lower the risk. On what :

• Very Low: No intervention required, activity follows normally.

• Low: No additional risk control and mitigation measures are required.

• Moderate: Additional risk control and mitigation measures can be identified, but their implementation is conditional on cost-benefit analysis.

• High: The activity should not be started until the risk has been reduced. Control measures should be established to ensure the execution of the activity within a minimum risk of "Tolerable".

• Not Tolerable: The activity should not be started until the risk has been reduced. Control measures should be established to ensure the execution of the activity within a minimum risk of "Tolerable".

With the parameters properly evaluated, it was possible to analyze the risks associated with occupational safety and health.

The development of the research was elaborated through an existing method, adapted to the reality of the company and thus developed and introduced in the textile industry. The problem was related to the organization and layout to choose the appropriate final arrangement of the pilot parts. As it is a confection, it is used to follow in pilot parts, which serve as a sample of how the product should be manufactured.

Before the product is marketed, a line is developed with several product samples, which are sent to the customer. After placing the purchase orders, the customer sends only samples approved for manufacturing, which will be used as an example of the finished products. These approved samples are called pilot parts, and are important to the company during the manufacture of the product because if the batch of an order is different from the customer approved pilot part, it is cause for order disapproval and cancellation.

Over time, and due to high order demand, a large number of pilot parts were realized in stock. For in most cases, upon completion and shipment of orders, the pilot parts were left in boxes stored in the stock of raw materials. With the need for storage area, it was questioned the occupation of this space, bringing to light the decision about choosing a more suitable destination for these pilot parts. Thus, the best options for solving this problem were analyzed using the AHP method.

Based on the need for free stock space, three options have been suggested for solving this problem: disposal, sale of parts or archiving of pilot parts.

3. Results Analysis

The timber production process has its risks, for a critical analysis, they were divided into activities and / or sectors, which are the receipt of raw material, processing of raw material, storage and delivery of the benefited wood, maintenance and cleaning, Office and bathroom.

In the receiving stage of the raw material the risks of being run over, breaking of the moorings and presence of venomous animals were considered moderate, as they do not occur frequently. In the company, there were no accidents with being run over, although they are not in accordance with current regulations, employees are aware of this risk and the truck has audible warning, but to avoid future accidents to the area should be delimited and signaled to performing these activities, whether by cones or color delimitation, and training of employees, especially the driver, as to the precautions that must be taken when transporting and unloading materials. Logs are well tied by employees, but there is a risk of breakage, it is recommended that the lashes be replaced when worn, the raw material arranged in the truck to prevent them from tipping over and the vehicle not to be overloaded. . Regarding the presence of venomous animals, employees reported that they have already found snakes, scorpions and spiders in the middle of the logs, but there have never been serious accidents, in which case it is indicated that the company should train employees on the associated risks and procedures to be taken. In the event of an accident and having the first-aid box available to employees, as well as the location and numbers of the hospitals and health posts near the company, which provide anti-fiduciary serum for emergency situations.

Incorrect posture and intense physical exertion to which these workers are subjected were considered non-tolerable risks, as these activities are performed incorrectly, are frequent, long-lasting and routine. Although the assistants and the driver use ankle boots, proper clothing and leather shaving gloves, the physical effort is intense and can pose serious health risks, it is advisable that the company purchase auxiliary machinery, train the employees and adopt a postural correction strap. column, both for unloading activity, as for storage, unloading and delivery of wood pieces, as they presented the same classification and are activities performed by the same employees.

In the Raw Material Processing activity, it shows that 33% of the activities presented moderate risk, and refer to the detachment of the machine saw and the incorrect operation of the chainsaw. According to employees, these risks occurred a few years ago and both caused limb amputation. The accident caused by the chainsaw was due to recklessness of the employee, who did not use the safety equipment provided by the company and did not operate the equipment correctly, the chainsaw used in the company has safety devices in accordance with NR 12 Annex V. This is due to the lack of periodic maintenance and cleaning of the machinery, which will be addressed in the next paragraphs. These activities were considered moderate, as the danger is not frequent.

In wood processing, there is noise generation and projection of saw dust into the saws' eyes and skin, so they use appropriate clothing, boot, leather shaving glove, transparent face visor, ear protector and face respirator. This risk could be low, because in addition to sawmills using personal protective equipment, the company has an exhaust fan that aspirates the saw dust to a closed place where it is stored, but there is no cleaning and maintenance of PPE, and some already are worn and the face respirator filters are not changed periodically as instructed by the manufacturer. Another activity that accounts for 17% of the risks is the

incorrect operation of various machinery, which can cause injury, cuts, limb amputation and even death. The necessary precautions for the handling of the saws are indispensable for the reduction of accidents and greater gain in productivity. The company could be regularized according to NR 12, which provides for protective measures on machines and equipment. This was the sector that was most in contradiction with the legislation, the area of circulation of the machinery sheds was not demarcated, there were also some obstructions, the harvester; tupia; thickener; The trimmer and performer do not have safety and emergency system to stop in case of failures or abnormal situations, there are no safety signs, nor instruction manuals, yet there is a lack of investments in side guards that prevent involuntary contact with the saws.

Incorrect posture and intense physical exertion of the sawmills were considered Not tolerable risk.

Stocking, unloading and delivery of the raw material was the activity that presented the highest risk, 60%, and is due to the fact that the helpers remove the wood from the mat without ear protector and face respirator, which is a routine activity, usual and long lasting. In this case, it is recommended that the company provide the appropriate personal protective equipment to the auxiliaries. At this stage, activities with moderate risk corresponded to 40% and refer to the possible breaking of the moorings and running over.

In maintenance and cleaning the results indicate that it is one with moderate risks, but it was observed in the logging that this step can not be neglected, and this is due to the fact that the maintenance of the machines and equipment is done by the sawers themselves, who do not have adequate training. In addition, the company does not have a checklist for periodic maintenance, they are made when the sawmill deems it necessary. Materials such as oils, greases and broken parts from maintenance are left in the company's own backyard and are not properly disposed of.

The office and bathroom are the areas that need little modification. The company must provide a clean and organized environment, always seeking to comply with safety standards. For the office it is recommended that the company provide postural correctors and employees take breaks of 15 minutes every 1 hour for stretching and resting the lower back.

Logging activities need further adjustments and controls, with 55% of total risks being moderate and the implementation of protective measures conditional on cost-benefit analysis. Still, 36% and 9% of the activities were classified as non-tolerable and high risks, respectively. These categories should not be started until the risk has been reduced.

4. Conclusion

Small industries have greater difficulty in meeting safety standards due to the costs related to the implementation of new machinery in accordance with NR 12. Given this scenario, the risk matrix facilitates the identification of sectors / activities that need specific measures, being a great tool to assist in decision making.

With the matrix it was observed that despite the costs to adapt the machinery to the legislation, some simple and low cost measures can be taken to improve the productivity and quality of life of employees. Measures include cleanliness and environmental organization. It is suggested that the company demarcate hazardous areas, remove obstacles that may cause falls and keep the environment always clean and

organized. Another simple measure refers to the maintenance step of both personal protective equipment and machinery. This step is fundamental and is not performed correctly by the company, it is necessary to adopt measures such as checklist with scheduled dates for maintenance of machinery and PPE's.

In addition, the company must not only provide PPE's but also require employees to use them, as well as appropriate and periodic training for their employees.

Therefore, it is inferred that the risk and hazard matrix is a tool for the recognition, prevention and reduction of accidents in companies, but each organization must carry out its own methodology that meets the needs and characteristics in terms of details. Therefore, it is important to analyze other factors for risk assessment, such as continuing education and training, personal and collective protective equipment, site signage, cleaning, maintenance and others.

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