Profile Analysis of Work Accidents In A Metallurgical Industry Of The Zona Da Mata Mineira

Carlos José Perciliano [#1], Zarur de Oliveira Silvano [*2]

[1] *Student of Industrial Engineering, Faculdades Integradas de Cataguases-FIC/UNIS*

[2]*Specialization in Business Management, Faculdades Integrada de Cataguases, Cataguases/MG, Brazil)*

Abstract *— In 2018 Brazil presented the number of 623.8 thousand accidents at work and Minas Gerais state is the second in number of work accidents with 64,888. Accidents at work cause negative impacts on industries as they reduce productivity due to the need to replace the employee. interruptions of production processes among other consequences that companies and workers may suffer due to the occurrence of occupational accidents. The general objective of this article is to analyse work accidents by the quantitative aspect that occurred in a company in the metallurgical sector. looking for which accidents happen most often crossing body part data affected and the sector where occurred. The specific objectives of this paper are to collect data on accidents through the Accident Reporting (CAT) and to form a history of occupational accidents. The work is justified because of quantitative and categorical data to analyse the characteristics of accidents occurred in the company. using tools that allow us to visualize which accidents occur the most. Because the company under study is adopting a position that seeks zero accidents. Company data can also be used in formulating occupational safety indicators. To develop the work, a literature review, data collection in the company object of study and structuring for analysis were performed. Minitab 18.1 software was used to produce Pareto Graphics. The result obtained with this work was the survey of the frequency and occurrence of occupational accidents as part of the body was hit. Brazilian Classification of Occupations (CBO) and sector of occurrence. Through the analysis of these data it was obtained that accidents with body part hit finger, occur in lathes with conventional machine tool operators. From the history it was observed that the most serious accident had as part of the body hit the finger of the employee, resulting in amputation and causing 60 days of leave.*

Keywords *— data analysis, occupational safety, occupational accidents.*

I. INTRODUCTION

In 2018, 623.796 thousand occupational accidents were registered in Brazil, showing an increase in the number of occurrences concerning to 2017 when the total of 549.405 occupational accident notifications was accounted, representing an increase of 13.54% in the total. of occurrences between the years 2018 and 2017, according to data collected from the Occupational Health and Safety Observatory, an initiative between the Public Ministry of Labor (MPT) and the International Labor Organization (ILO - Brazil).

The company under study presents in the same period analysed, 2017 and 2018, a reduction of 2 accidents concerning to the previous year, equivalent to 50% of fall, however from 2017 to 2018 there was a reduction from 4 to 2 accidents.

The data collection and processing allow analyses that help in decision making with process improvement objectives. In production engineering, work accidents impact the production processes, generating costs. The application of data analysis tools enables you to see where action is needed to develop a safe work environment, as higher safety standards are increasingly required. According to the Statistical Yearbook of the Metallurgical Sector (2018), it has great significance in the Brazilian economic scenario, having a vast production chain of segments related to metallurgy, machining and production of metallic manufactured goods, serving as a basis for other important activities for the country, such as construction, the auto industry, and capital goods. Even with such importance for the economic sector, the work environment in many enterprises still presents the occurrence of several types of accidents caused by various reasons, either by the human factor or by conditions that pose risks to the worker.

This paper is justified by the increasing demands related to occupational safety and health. These requirements, today works in conjunction with the quality of production, making accident prevention an important objective regarding the company's image.

The general objective of this paper is to analyse the work accidents, by the quantitative aspect, occurred in a company of the metallurgical sector,

looking for which accidents happen more frequently crossing data of the affected body part, the sector where the accident occurred and the function of the injured. The specific objectives are to collect data on accidents through the Accidents at Work Announcements (CAT), to form a history of accidents at work in a structured way.

II. LITERATURE REVIEW

A. *Occupational Safety*

According to [1], Occupational Health and Safety are the set of factors and conditions that affect and / or can affect anyone who is providing services by organizations.

Knowledge in occupational safety became very important after the industrial revolution in order to regulate working conditions and prevent occupational accidents [2].

Health and safety management, makes it possible to maintain a work environment with safe conditions to carry out activities in all sectors of organizations, avoiding work-related accidents of any proportion.

B. *Work Accident Concepts*

In Brazil accidents at work is legally defined as provided in art. 19 of No 8213 Law / 91 Social Security, "work accident is what occurs in the course of the company's service business or the exercise of work that may cause bodily injury or functional disorder that causes death, loss or reduction, permanent or temporary, the ability to work [3].

In an anticipatory manner, an occupational accident can be defined as: "Unforeseen and undesirable occurrence, instantaneous or otherwise, related to the exercise of work, which results or may result in personal injury.", As defined in Brazilian norm NBR 14.280 / 01, Accidents at Work - Procedure and Classification [4].

In Brazil, the work accident needs to be reported as soon as it occurs through the Communication of the Work Accident (CAT), which is sent to the Social Security, the injured, the union of the category, the Unified Health System (SUS) and the Ministry. of Labor [5].

C. *Bird Pyramid*

The Bird Pyramid, according to [6], is the result of Frank Bird Jr.'s study, where accidents were classified into levels according to their severity. Starting from the most severe accidents at the bottom of the pyramid, to the most severe accidents at the top. Figure 1 shows the proportions between each type of occurrence and its severity.

Fig. 1 Bird Pyramid.

III. METHODOLOGY

To better meet the objectives of the research, a literature review was conducted addressing the concepts related to occupational safety and dealing with the occurrence of occupational accidents. For this, articles, magazines, rules and laws were consulted.

The study was set in a metallurgical company in Zona da Mata Mineira where the company has 80 employees distributed between the production sector (machining, assembly, painting, welding and packaging) and the administrative sector (purchasing, sales, budgets, finance, engineering, human resources and quality management).

With the support of the human resources sector, a survey of occupational accidents that occurred between 2014 and 2018 was carried out through the registration of Accidents at Work (CAT). The data regarding the CAT records formed a history that allowed us to analyse each accident in order to find out its similarities.

With the records organized in a structured way, the accidents were filtered and accounted for according to their common characteristics, having the data obtained applied to the Pareto Diagram to visualize the points that most need intervention. This diagram allows to classify the types of problems or causes in order of importance, thus concentrating the improvement actions in the areas where the greatest gain can be obtained.

For the elaboration of the Pareto Diagrams, the software Minitab 18.1 was used, this is a software used by professionals from various areas, having ease use and huge speed for the statistical treatment of data.

IV. RESULTS AND DISCUSSIONS

Data regarding the occurrence of accidents in the company between 2014 and 2018 were organized in order to generate a history of these occurrences. The accident history survey obtained the frequency of accidents according to the place where the accident occurred, the body part affected, the Brazilian Classification of Occupations (CBO) and the occurrences per year.

From the collected data, the highest incidence of accidents are lathes and public roads (26.7% to both), and events marked as public roads are related to commuting accidents. In the production sector, the

drill is the second place in occupational accidents, with 13.3% of accidents occurred.

Crossing the information collected it was observed that the most frequent occurrences are accidents involving conventional machine operators in the lathe sector with finger injuries in the hands.

The results obtained from the data reveals that are needed intervention in the lathe industry (contained in the company's machining area), in order to reach conventional machine tool operators, directing attention to hand care.

During the collection of data for the construction of the accident history, it was observed that there was no systematic record of almost accidents and unsafe conditions in the company, although several nigh accidents occur in the work routine, many of which reach the hands of employees. For [7], the Bird Pyramid is considered a statistical approach that helps to prevent accidents. The author points out that every serious accident is anticipated by 10 minor accidents; which are preceded by 30 accidents causing material or physical damage; preceded by 600 accidents caused by unsafe condition or behavior.

One event stands out among the accidents listed in history due to its severity, as it presented the longest period of absence (60 days) and the most serious injury (finger amputation).

Considering the occurrence of 8 less serious accidents involving fingers for a more serious accident reaching the operator's finger it was possible to confirm the quote on the top of the Bird Pyramid.

The survey interval pointed to an oscillation in the number of accidents from 2014 to 2018, and it was observed that in 2015 there was an increase in accidents compared to 2014, and in the years following 2015 to 2018, there was a reduction in occurrences, according Figure 2. The reduction in the number of accidents is due to work on safety-focused improvements, such as training, weekly safety technician attendance and weekly Safety Dialogue.

Year	Total Occurrences
2014	1
2015	5
2016	3
2017	4
2018	2

Fig. 2 Accidents recorded per year

During the survey of occupational accident records it was observed that the company did not have the practice of recording minor incidents, also known as near accidents, and the unsafe conditions existing at the site. Such records help in setting up a more detailed Bird pyramid because these numbers contribute to analyze the influence of these incidents with the occurrence of occupational accidents and their severity.

[8], when interviewing Antonio Carlos de Sousa Junior, who acted as Health, Safety and Environment Coordinator, cite the PDCA method as an important and efficient tool in the management of Occupational Health and Safety, as PDCA It is widely used by companies to structure management systems.

[9] in his article on the application of the PDCA method in a beverage factory, adds the Pareto method and Action Plan to complement the PDCA, as these tools make it possible to visualize the critical points, allowing to prioritize the problems that affect the production.

Such method justifies the results found by applying the Pareto method in the historical data of the metallurgical company object of study, since the method pointed out the sector, function and body part most frequently affected in the accidents that occurred.

According to [10], "it can be affirmed that each company needs to create its own pyramid in order to adopt actions and control accident management in order to significantly reduce accidents and thus promote health and physical integrity. of your employees. However, for [11], it is necessary to analyze a pyramid that contains fatalities, serious and medium accidents, almost accidents in order to make a more accurate comparison with the theoretical pyramid, thus limiting the application of the Bird pyramid.

V. CONCLUSIONS

In 2018 Brazil presented many occupational accidents, 623.786 occupational accidents. Accidents at work cause impacts on the production system, as they can cause production downtime, loss of time to service the injured, damage to equipment, replacement of employees who are not properly trained or inexperienced, a situation that poses a risk of occurrence. of new accidents.

The registration of occupational accidents, in addition to being legally binding, can be used to produce indicators for OSH Management, as well as the registration of near misses and unsafe conditions allows completing safety information and assisting in the work to mitigate risk situations. Working with tools like the Pareto method and the Bird Pyramid make it easy to find which safety hotspots, especially when accident histories, near misses, and unsafe conditions are surveyed.

Occupational Health and Safety Management is important for the improvement of production processes, reduction of work accidents and quality of

life of employees in carrying out their activities inside and outside the company.

The work entitled Tool-based Work Safety Management System for Safety Culture Development, by [12], reinforces the importance of safety management and shows various tools and procedures that can be applied in companies. The relevance of these practices is in their results.

REFERENCES

[1] RIBEIRO N. J. B. M, TAVARES, J. da C., HOFFMANN. S. C,: Sistema de Gestão Integrados; qualidade, meio ambiente, responsabilidade social, segurança e saúde no trabalho. São Paulo. Ed. SENAC, 2008.

[2] MATTOS, U. A. de O. MASCULO, F. Higiene e segurança do trabalho. 1. ed. Rio de Janeiro: Campus, 2011. 360 p.

[3] PLANALTO. Planos de benefícios da Previdência Social e das outras previdências. Disponível em: < http://www.planalto.gov.br/ccivil_03/leis/L8213cons.htm#art19.> . Acesso em: 06 nov 2019.

[4] ASSOCIAÇÃO BRASILEIRA DE NORMAS TÉCNICAS. NBR 14280/2001: Cadastro de acidente de trabalho – Procedimento e classificação. Rio de Janeiro, p. 24. 2002.

[5] MARZIALE, M. H. P.; RODRIGUES, C. M. A produção cientifica sobre os acidentes de trabalho com material perfuro cortante entre trabalhadores de enfermagem. Revista LatinoAmericana de Enfermagem, Ribeirão Preto, v. 12, n. 1, p. 571-577, jan./fev.2002.

[6] G. ARRA, Evolução da Segurança do trabalho e da saúde ocupacional. Disponível em: <http://www.processos.eng.br/wpcontent/uploads/2017/07/evolucao_daseguranca_

[7] FERRARI, J. A. Análise de riscos e prevenção de acidentes na gestão: uso da ferramenta "Pirâmide de Frank Bird. In: I Workshop de pós-graduaçãoe pesquisa–Centro Paula Souza 5 (CPS), São Paulo. Anais...São Paulo: CPS, 2006.

[8] BALDUINO, E.; MEDEIROS, L. (2018). UTILIZAÇÃO DO PDCA NA GESTÃO DE SEGURANÇA E SAÚDE NO TRABALHO. Revista Interface Tecnológica. 15. 13. 10.31510/infa.v15i1.312.

[9] RAMOS, A. C. D. C. Utilização Da Metodologia Pdca Na Indústria: Estudos De Caso. Universidade Católica do Salvador. Salvador, 2018.

[10] BASTOS, D. F.; RESCH, S. O USO DA PIRÂMIDE DE BIRD PARA A GESTÃO DA SEGURANÇA NO TRABALHO: A análise de um caso. Encontro Internacional de Gestão, Desenvolvimento e Inovação (EIGEDIN), [S.l.], v. 2, n. 1, dez. 2018. ISSN 2594-8083. Disponível em: <https://periodicos.ufms.br/index.php/EIGEDIN/article/view/7086>. Acessado em 02 de Novembro de 2019.

[11] KRÜGER, I. Análise comparativa de auditorias comportamentais em uma planta petroquímica entre os anos de 2012 e 2013. Trabalho de Conclusão de Curso (Graduação)–Universidade Tecnológica Federal do Paraná, Curitiba, 2014. p. 41.

[12] ANTUNES, R. C., 2018 – Sistema de gestão de segurança do trabalho baseado em ferramentas para o desenvolvimento da cultura de segurança, Florianópolis, 2018.