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Ergonomic Analysis of the job of assembly and maintenance in an electronic equipment company

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Abstract

This article describes an ergonomic assessment of the production of traffic lights in an electronics company, located in Recife - PE. The workstation studied was assembly and maintenance in which we sought to identify potential ergonomic problems. Then such problems were ranked in order to determine their seriousness and the urgency of solving them using the technique of value analysis and Kepner Tregoe [10]. Video recordings and photographs were taken to support the ergonomic assessment and scientifically validated questionnaires were used to survey the profile of the workers, the characteristics of the job, health indicators and the physical and social conditions and the human labor costs. This paper also presents ergonomic recommendations for improvements in the physical, organizational and cognitive conditions in the work environment.

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1. Introduction

33 billion Brazilian reais are spent a year on issues related to accidents and prevention of occupational accidents, such as cost of the accident itself, social security benefits, prevention on workers' health, working hours lost, vocational rehabilitation, administrative costs, etc. There are about 5 million occupational accidents per year worldwide, and about 4% of gross domestic product (GDP) is spent on expenses related to diseases and accidents at

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work [1]. These accidents are influenced not only by aspects of the immediate work situation such as the machinery, the task, the technical or material means but also by the organization of the production process [2].

In this context, ergonomics plays a role of paramount importance in identifying risk factors that can lead to accidents at work and occupational diseases. According to the International Ergonomics Association - IEA (2002) [3], ergonomics is a scientific discipline that studies the relationships between man and elements of a system. This multidisciplinary area sets out to optimize the well-being of the individual and the overall performance of the systems. Ergonomics as a discipline in the fields of expertise studies the physical, cognitive and organizational characteristics of human interactions with one another and with the systems. In this dimension, Ergonomics has been a factor that has led to increasing productivity and the quality of products. It is valid to emphasize with regard to the aspect of the quality of life of workers that this requires the application of ergonomics knowledge in order to optimize the environmental conditions and to offer appropriate interaction with humans. Thus, the application of ergonomics can maximize an individual's comfort and well-being, ensure safety, reduce human costs and increase the yield from the work so that the productivity of service may be improved [4].

The ergonomic analysis has been used successfully to identify factors that put workers' health and safety at risk. This analysis also takes effect by making suggestions and recommendations, as well as by applying preventive measures in the workplace. Thus, many success stories can be seen in the industrial and service sectors [5,6,7].

According to data from the Communication of Work Accidents – CAT (in Portuguese), the number of accidents in 2013 was 717.911 [8]. Given this situation, it is of utmost importance to undertake ergonomic interventions to solve problems of different natures at work and especially to avoid fatalities. This paper presents an ergonomic analysis in the production process of assembly lines, especially of electronic equipment of the jobs of producing and maintaining electronic traffic lights in a company in the city of Recife-Brazil.

2. Methodology applied to ergonomic analysis

The methodology of this study was based on the approach of the Human-Machine-task system proposed by Moraes and Mont'Alvão [9] who describe an intervention that uses ergonomics as a method that tackles the problem from the point of setting out to identify it to adopting the solution.

The field study was organized in two stages called ergonomic assessment and diagnosis. The procedures of the research involved site visits to conduct unsystematic and systematic analyses of the production jobs of the company studied.

The study was conducted in accordance with the level of problems presented in the jobs. For this, the GUT - Gravity, Urgency and Trend – technique was used [10] which aims to identify the job that most presents problems and to select it to be the object of study. According to the authors, this technique is related to the following areas of analysis: 1. Gravity: This evaluates the possible damages or losses arising from a situation and these can be at three levels slight, medium or large. 2. Urgency: This observes the conditions of the interval of time needed to perform a given task or take a decision, the degree of urgency being considered as low, medium or great. 3. Trend: This analyzes the pattern or tendency for the situation to evolve and this can be seen as favorable, maintenance or unfavorable.

The tools of analysis were selected in accordance with the specificity of the activity developed and applied in order to investigate the ergonomic factors involved in the production process and maintenance of electronic traffic lights during the working day.

Finally, the results were analyzed and used as a basis to offer recommendations and conclusions about the problems encountered.

3. Description of the job

The production process of the company analyzed is responsible for producing three types of specific traffic signals: Vehicular Traffic signals Traffic Signals for Cyclists and Traffic Signals for Pedestrians. These types of equipment are developed in accordance with the demand for the following kinds of format: "I", GT (large 300 ml red lamp), "T", sequences, with lamp, chronometer, pedestrian and cyclists and level crossings.

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