81 - ERGONOMIC ANALYSIS IN A COMPANY OF PLASTIC CONTAINERS MANUFACTURING

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1. INTRODUCTION

Ergonomics is concerned with making the human-machine interface and human-environment as safe, efficient and comfortable as possible, concerned first with the health of workers and their satisfaction with the work and secondly by increasing the company's profitability.

Besides the prevention vision that should guide the work of companies, Ordinance No. 3.214 / 78, the Secretariat for Safety and Health at Work, the Ministry of Labor, establishes in its NR-17 - Ergonomics, parameters that allow adapting working conditions to the psycho-physiological characteristics of workers in order to provide maximum comfort, safety and efficient performance, and should be observed and implemented by employers (BRASIL, 2015).

The practical application of ergonomics can be made through an Ergonomic Work Analysis (AET), which according to Iida (2005), aims to apply ergonomic knowledge to correct a real situation, through analysis, to further develop a diagnosis. This is divided into 5 stages: demand analysis, task analysis, activity analysis, diagnosis formulation, and ergonomic recommendations.

According to Grandjean (1998) the term ergonomics comes from the Greek and is nothing but "ergon = work" and "nomos = law standards". One of ergonomic functions is to provide the employee a more pleasant and comfortable environment, ensuring quality of life for them.

2 LITERATURE REVIEW

2.1 Ergonomics

Ergonomics evolved from man's efforts to adapt tools, weapons and tools to their needs and characteristics. The first documented use of the word ergonomics occurred in 1857 in Poland, but not until the twentieth century that began to appear more organized studies in the area (Couto, 1995).

2.2 Muscle fatigue

For Couto (1995) all situations static or isometric stress, lead to muscle fatigue called primary result in pain that occurs in segment affected due to lactic acid accumulation. Fatigue can also cause the appearance of tremor, contributing to the occurrence of errors in the execution of activities. According to this author all situations in which, to make a physical strain, the distance from the power output point support is very small and the distance from the resistance to the point of support is too long, all of the muscular effort breakdown situations, i.e. when the individual has to make a slow effort under control, the opposite to what would be the natural motor action.

2.3 Overload postural work-related

Over the past 20 years have increased the studies on the spine and upper limbs, the manifestations of postural changes caused most often by maintaining posture in the demands of work activities. The lifestyle of modern population leads to muscle inadequacies that provide structural overloads (CHAFFIN, 2001).

Mooney (2000) reports that one of the biggest causes of long distance work and human suffering are the disorders of the spine. The neck pain and back pain have a remarkably high incidence in workers, often precipitated by working conditions resulting from the incorrect use of biomechanically "human machine." Mandal (1981) and Iida (2005) state that a worker during a workday can take hundreds of different positions, and each type of approach, a different set of muscles is required.

Araújo and Alexander (1994), confirm in their studies, the pains and chronic complaints related to the spine is a complex challenge for occupational health. Corlett et al. (1979) showed the location of back pain related to poor working posture.

3. METHODOLOGY

This case study was carried out through interviews and assessments with nine employees, photographic records for analysis of activities and implementation of specific ergonomic analysis of the work of a plastic ware manufacturing company posts tools in Curitiba - PR, finishing industry.

The observation of the posts and descriptive work posture was carried out - detailed viewing spot, at each station, associated with interview and exchange of information with workers.

The perception questionnaire was applied - ergonomic method to listen to the user, adapted from Renault Method (general issues; physical work environment, physical load, mental strain, autonomy, interpersonal relationships with colleagues and managers; repeatability) as a tool to the improvement of the study and facilitating the implementation of changes when necessary; and application diagram of Regions Painful (CORLETT, MANENICA, cited IIDA, 2005), requesting the appointment to employees in the diagram regions the body part I felt pain / discomfort during work activities. The questionnaires were answered anonymously and used in the ergonomic analysis of the workplace.

Checklist of Couto - Script goal, where it achieves an overall assessment for the job, making it possible to quantify the risk of developing RSI / MSDs - Work-related musculoskeletal disorders and back pain.

Criteria Suzanne Rodgers - ergonomic method to assess the exposure of individuals to positions, time and frequency forces and muscle activity. Developed by Suzanne Rodgers (1992), as shown in Table 1

Table 1 - Criteria Suzanne Rodgers

	Time stress level	Effort	Effort per minute
	1-Low	1 = 0 a 5 sec.	1 = 0 a 1
	2- Moderate	2 = 6 a 20 sec	2 = 2 a 5
	3-Heavy	3 = + de 20 sec.	3 = + de 5
Neck			
Shoulders			
Trunk			
Arms / Forearms			
Hands / wrists / fingers			
Legs / feet / fingers			

Scoring cirteria: 1 – low / 2 – moderate / 3 – highAlto / 4 very high

After analyzing the results, the Ergonomic Risk Rating was carried out, with a degree in risk A, B, C or D, as specified below:

a) Risk Grade: is indicative of Down Ergonomic Risk. Does not present relevant situations and / or very low ergonomic risk, and presents more than 50% of the scores identified as low risk;

b) Risk Grade B: it is indicative of Ergonomic Risk Moderate. Ergonomic features not relevant situations (SIGNIFICANT BIT) and at least one moderate risk score;

c) Risk Grade C: it is indicative of Ergonomic Risk High. It features ergonomic situations not relevant (SIGNIFICANT) and in need of improvement, and at least two moderate risk scores or high risk;

d) Risk Grade D: is indicative of the Most High Ergonomic Risk. Ergonomic features not very meaningful and relevant situations that require immediate intervention, and with at least one very high risk score.

The posts of assessed work are shown through some pictures in Table 1.

Table 1 – Picture the work posts

4. RESULTS AND DISCUSSION

4.1 Profile of workers

The results presented refer to the evaluation of nine officials from finishing the analyzed company sector. The following information is tabulated in a 22.5% sample of the total population. The sector is predominantly female, with the majority to the age group 26-35 years (33%), as shown in Figure 1.

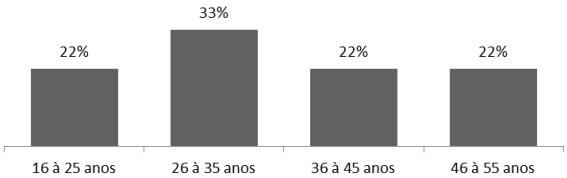


Figure 1 - Between the ages of workers.

All workers interviewed have completed or are enrolled in high school and analyzing Figure 2, it is clear that most of these, has little working time in the company. One hundred percent of these are right-handed. Most have height ranging from 1.61 to 1.70 m (55%). In terms of weight, the range is between 51 to 60 kg (22%), 61 to 70 kg (55%) and 81 to 90 kg (2%). The preferred sleeping position is the lateral position (side) to 88%, allowing a good rest and replacement of physical and mental energy and 11% sleep in the supine position, ideal position. Among the workers evaluated, seventy-seven percent said they did not perform any physical activity which contributes as a negative factor for the health of human beings.

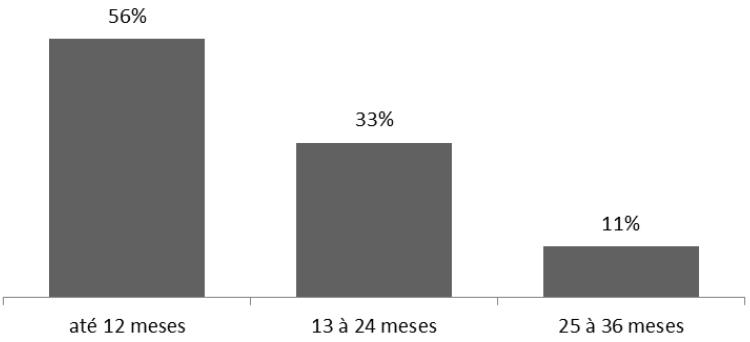
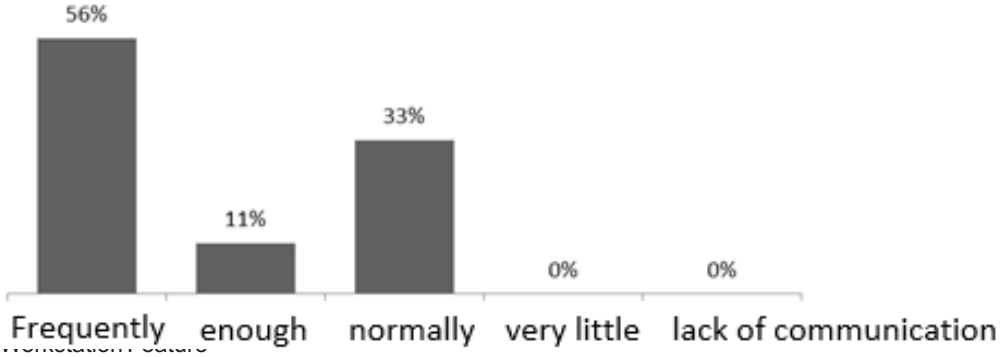


Figure 2 - Strip-time company employees.

4.2 Interpersonal Relationship

Regarding communication, 55% feel frequent need for communication with other people, 11% reported having enough need, 33% say they have a normal communication, as shown in Figure 3. The factor that contributes to the discriminated result was the degree of autonomy individual, in this case 33% of employees say they have enough autonomy to organize their work, 44% say they organize their work fully, 11% medium and 11% somewhat. Contributing to the previous result, 11% consider it to be easily likely to leave their job without interfering with the production, 11% do very well,



The environmental conditions of the workplace were assessed in terms of physical environment, being considered the noise, temperature, lighting and vibration or shock. With regard to lighting, 44% identified themselves as nice, 22% and 33% as indifferent as unpleasant. The thermal environment in summer is considered by 11% of employees as nice, 22% indifferent, 55% and 11% as unpleasant very unpleasant. However, in winter, considered 11% nice, 55% indifferent and 33% unpleasant.

4.4 Labour Organization

The work is done during the whole journey in a standing position and is considered more or less light to 44%, maybe 33% for heavy and cumbersome to 22%. From the physical point of view, 33% thought a little stressful activity, 33% and 33% extremely stressful stressful. This percentage is associated with mental demand on attention paid to perform tasks considered to 66% as a duty to keep attention to work continuously. Of these, 88% think their average work and 11% uninteresting.

Liability issues also interfere with fatigue, reported to be too big for 22% of workers, 33% for large, medium to 44%.

Analyzing repeatability, work is considered for 11% of workers as varied, 22% as normal, 44% somewhat varied and 22% nothing varied. Thus, the indicator of error chances pointed out by 11% of workers is as small, 77% medium and 11% large, who then choose their own way to make their work in 11% of the time, another 66% say they sometimes choose 11% say they always choose and only.

4.5 Interpretation of Diagram Corlett

Nine questionnaires were completed, totaling a percentage of 22.5% of the business population As shown in Table 2, the majority (64%) of the sample reported feeling muscle pain, and 25% in the lumbar region, 24% in the shoulders, 14 % reported neck pain, 14% wrists, 9% in the knees, elbows and 8%, but 26% reported not feeling any discomfort or muscle pain.

Analyzed by body part, it was observed that the trunk and neck presented as the most affected region, and that the most frequently mentioned areas, in descending order, were located in the lower region of the back, shoulders, the neck, wrists, knees and elbows.

The pain and / or discomfort frequently been reported in form of moderate pain, shoulder being D, D arm and right and left legs (44%), followed by the upper back region of 33%. Analyzed by body part, the intensity 4, that is, enough pain presented in the regions of right and left legs, upper back and shoulder and right arm. For many regions were highlighted: the right upper back, left and right legs.

Muscle pain complaints foci are in upper limbs and lower limbs, showing that the standing posture is an important factor to be relaxed in the corrective and preventive interventions.

Table 2 – Results of the questionnaires – Progressive scale of pain/discomfort

Body parts	5 Intolerable	4 Very Moderate	3 Moderate	2 Any	1 No	NR
Neck	0	0	3	5	1	0
Region cervical	1	0	3	4	1	0
Costas- topr	1	3	0	2	3	0
Back average	1	1	2	2	3	0
Lumbar	2	0	3	1	3	0
Basin	0	0	1	0	8	0
Shoulder E	1	0	2	5	1	0
Arm E	1	0	2	3	3	0
Elbow E	1	0	0	3	5	0
And forearm E	1	1	0	3	4	0
Handle E	1	2	0	4	2	0
Hand E	1	1	0	3	4	0
Thigh E	0	0	3	3	3	0
Leg E	1	4	1	0	3	0
Shoulder D	1	4	3	0	1	0
Arm D	1	4	0	2	2	0
Elbow D	1	1	0	3	4	0
Forearm D	2	0	3	0	4	0
Handle D	2	0	4	0	3	0
Hand D	1	2	1	3	2	0
Thigh D	0	0	3	3	3	0
Leg D	1	3	2	0	3	0

4.6 Interpretation of use ergonomic tools

Regarding the implementation of the Checklist for evaluation of the ergonomic conditions of the workplace - risk of developing RSI / RSI: 6 jobs have reasonable and 3 have good working conditions.

Regarding the application of low back pain Checklist, 2 jobs at moderate risk, 6 have low risk and one has a very low risk of low back pain.

In applying the criterion Suzanne Rodgers, when refers to the neck, 11% have undergraduate 4, 22% had grade 3, 33% workers have undergraduate 2:33 1% have graduate.

Shoulders: 44% of employees have grade 3, 22% have undergraduate 2:33% of employees have undergraduate 1. Body: 66% of employees have undergraduate 2:33% have graduate 1. Arms: 22% of employees have undergraduate 3, 44% have undergraduate 2 and 33% graduation 1. Hands: 33% workers with undergraduate 2 and 66% with undergraduate 1.

Legs: 33% of workers with graduate 3, 55% with undergraduate 2:11% of workers with undergraduate 1.

Ergonomic risk: 6 jobs at risk B = moderate ergonomic risk and 3 stations have low ergonomic risk.

4.7 Results and discussion as to the general questionnaire

The company's finishing sector has an open layout, easy to access, being distributed on the ground floor and access to the 2nd floor deck to go to the stock.

The lighting of the second sector assessment by the ergonomist, according to NBR 5413/1992 is not evenly distributed and diffused in the workplace, where it realizes the visual task. Ventilation is artificial (fan / hood).

The noise is on average 85 dB (A) according to the PPRA, being above the level of tolerance being alleviated with the use of the ear insert.

5. CONCLUSIONS

It is recommended to prioritize items checked in the opinion, through greater attention stations, schedule preventive and ergonomic fixes actions.

Are important trainings / ergonomic guidelines, postural and daily living habits for employees due to the fact of using the standing posture for most of the working time. For this, we recommend the implementation of ERGOTUR (postural individual guidelines and benches adjustments / jobs for all employees) Owing be applied in the workplace, these guidelines do not hinder productivity, causing an education process employees of the co-responsibility for their health and consequent improvement of their performance and the reduction or disappearance of musculoskeletal symptoms.

The awareness of micro-breaks with targeted exercises for each activity / post to distension is of great value, since there are employees with muscular discomfort complaints (which can be practiced during the work activities and should be incorporated along with the program of gymnastics).

The suggestions reported in the assessments of the jobs described here should be taken into account in order of priority, as follows: Conduct guidelines in the form of training / collective training or individually in the workplace, organizing the job, within the basic actions oriented (operative mode and reach areas), purchase of furniture accessories in specific cases (footrests - on the bench).

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ERGONOMIC ANALYSIS IN A COMPANY OF PLASTIC CONTAINERS MANUFACTURING

ABSTRACT

Ergonomics is the science that seeks to adapt working conditions to the worker. It involves the application of knowledge about the characteristics of the human being to benefit your well being and labor results. All work activities can be seen as a man-machine system within an environment. The objective of this study was to identify the ergonomic working conditions in a manufacturing company of plastic artifacts as methodology Ergonomics Manual Ministry of Labor and Employment within the NR-17 requirements - Ergonomics, through the development of Ergonomics Analysis Work / Ergonomic Report of the jobs of the company's finishing industry. Workers were interviewed with the methodology diagram of Regions Painful (Diagram Corlett) and questionnaire with closed questions about worker profile, environmental conditions, the workplace and the organization of this. The results showed that the biggest complaint this in this environment was spine and lower limbs. By analyzing the results, it is concluded that the implementation of ergonomic improvements is required, guidelines and training for workers, aimed at correcting poor posture and improvement of health conditions while performing their activities.

KEYWORDS: Ergonomic Analysis of Work, Posture, NR-17

ANALYSE ERGONOMIQUE DANS UNE ENTREPRISE DE PLASTIQUE CONTENEURS DE FABRICATION

RÉSUMÉ

L'ergonomie est la science qui cherche à adapter les conditions de travail au travailleur. Il implique l'application des connaissances sur les caractéristiques de l'être humain à bénéficier votre bien-être et du travail résultats. Toutes les activités de travail peuvent être considérées comme un système homme-machine dans un environnement. L'objectif de cette étude était d'identifier les conditions de travail ergonomiques dans une entreprise de fabrication d'objets en plastique que la méthodologie Ergonomie Manuel ministère du Travail et de l'Emploi dans les NR-17 exigences - Ergonomie, à travers le développement de l'analyse Ergonomie Travail / ergonomique Rapport des emplois de l'industrie de finition de l'entreprise. Les travailleurs ont été interrogés avec le schéma de la méthodologie des Régions douloureuse (Schéma Corlett) et le questionnaire avec des questions fermées environ profil des travailleurs, les conditions environnementales, le lieu de travail et l'organisation de cette. Les résultats ont montré que la plus grande plainte présent dans cet environnement était la colonne vertébrale et des membres inférieurs. En analysant les résultats, il est conclu que la mise en œuvre des améliorations ergonomiques est nécessaire, les directives et la formation des travailleurs, visant à corriger une mauvaise posture et l'amélioration des conditions de santé dans l'exercice de leurs activités.

MOTS-CLÉS: analyse ergonomique,NR17

ANÁLISIS ERGONÓMICO EN UNA EMPRESA DE PLÁSTICO ENVASES DE FABRICACIÓN

RESUMEN

La ergonomía es la ciencia que trata de adaptar las condiciones de trabajo para el trabajador. Se trata de la aplicación de los conocimientos acerca de las características del ser humano en beneficio de su bienestar y laborales resultados. Todas las actividades de trabajo pueden ser vistos como un sistema hombre-máquina dentro de un entorno. El objetivo de este estudio fue identificar las condiciones de trabajo ergonómicas en una empresa de fabricación de artefactos de plástico como metodología Ergonomía Manual Ministerio de Trabajo y Empleo dentro de los requisitos NR-17 - Ergonomía, mediante el desarrollo de análisis de Ergonomía Trabajo / ergonómico Informe de los puestos de trabajo de la industria de acabado de la compañía. Los trabajadores fueron entrevistados con el esquema de la metodología de las Regiones dolorosa (Diagrama Corlett) y un cuestionario con preguntas cerradas sobre el perfil de los trabajadores, las condiciones ambientales, el lugar de trabajo y la organización de este. Los resultados mostraron que la queja más grande esta en este entorno era la columna vertebral y las extremidades inferiores. Mediante el análisis de los resultados, se concluye que se requiere la implementación de mejoras ergonómicas, directrices y formación para los trabajadores, dirigidas a corregir la mala postura y la mejora de las condiciones de salud en el desempeño de sus actividades.

PALABRAS CLAVE: Análisis Ergonómico del Trabajo, NR17.

ANÁLISE ERGONÔMICA EM UMA EMPRESA DE FABRICAÇÃO DE ARTEFATOS DE PLÁSTICO

RESUMO

A ergonomia é a ciência que procura adaptar as condições de trabalho ao trabalhador. Envolve a aplicação dos conhecimentos sobre as características do ser humano para beneficiar seu bem estar e os resultados laborais. Todas as atividades de trabalho podem ser vistas como um sistema homem-máquina dentro de um ambiente. O objetivo deste estudo foi identificar as condições ergonômicas de trabalho em uma empresa de fabricação de artefatos plásticos, conforme metodologia do Manual de Ergonomia do Ministério do Trabalho e Emprego dentro das exigências da NR-17 - Ergonomia, por meio da elaboração da Análise Ergonômica do Trabalho/Laudo Ergonômico dos postos de trabalho do setor de acabamento da empresa. Os trabalhadores foram entrevistados com a metodologia do Diagrama de Regiões Dolorosas (Diagrama de Corlett) e questionário com perguntas fechadas sobre perfil do trabalhador, condições do ambiente, posto de trabalho, bem como a organização deste. Os resultados apontaram que a maior queixa presente neste ambiente de trabalho foi coluna e membros inferiores. Por meio da análise dos resultados, conclui-se que é necessária a implantação de melhorias ergonômicas, orientações e treinamentos aos trabalhadores, visando à correção de posturas inadequadas e melhoria das condições de saúde durante a execução de suas atividades.

PALAVRAS-CHAVE: Análise Ergonômica do Trabalho, Postura, NR-17.