

Evaluating Workplace Ergonomics of Manufacturing Sector at Union Territory of Puducherry



Management

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ABSTRACT

Indian manufacturing sector depends largely on human or labor resources. Their physical and mental capabilities contribute to a greater extent in productivity and yielding revenues. The contribution towards productivity has made employees in Indian manufacturing sector to spend enormous time behind production and lifting heavy equipments. This research aims at studying human capabilities in relationship to work demands and it examines frequent bodily movements and static posture and its impact on employees. It has considered various human related ergonomic factors to identify its impact on employees in Indian Manufacturing sector. The research is conducted in Union Territory of Pondicherry, India. The samples of employees from the different manufacturing sector are chosen and interviewed through questionnaire and their responses are analyzed with the help of research methods such as Weighted average, and Anova. The research reveals that employees confront turbulent problems of wrist pain, back pain and other health disorders due to static postures and repetitive and frequent bodily movements. The research has suggested various ways to improve workplace ergonomics of Indian Manufacturing Sectors

Introduction

Ergonomic term, which has been derived from the Greek *ergon* and *nomos*, means consideration of laws into the work. Te-Hsin,P & Kleiner,B.H. (2001). It is the method or technique to simplify the jobs of the workers. It helps the workers to perform their jobs systematically thereby reduces pain and increases the quality and the development of the work. There are many definitions regarding ergonomics. According to OSHA it is defined as designing the job to fit the workers, instead of forcing the worker to fit the job. (OSHA 3125) (2000).It means that while deciding the place for a specific job, its design, prettiness, propensity and financial aspects must be taken in to consideration along with other significant factors such as human anatomy and physiology for improving the quality of the work. According to Tayyari,F & Smith, J.L. (1997).it is defined as a branch of science that focuses on obtaining optimal relationships between workers and their work environment. Lee K.S described it as fostering compatibility between humans and systems. Some other interpretations used instead of ergonomic can be Man-Machine Systems, Human-System Interface and Human Factors Engineering. Deborah, M. I, Donald J. P .It can be revealed, in each of these terms, humans are in the center of consideration. The scope of ergonomics surrounds the physical, cognitive and organizational aspects which all of them should be taken into an account.

Ergonomics risk factors & problems

Ergonomics Risk Factors (ERF) is situations that exist or created intentionally or unintentionally that could or might contribute to results contravene or against the principles or philosophy of ergonomics that could or might harmful to the health and well-being of workers or users at work or after work. Mat Rebi Abdul Rani (2003). Applied ergonomics literature identifies a small set of common physical risk factors across many occupations and work settings .Cohen A.C et al (1997). Since the prolonged, repeated or extreme exposure to multiple Work Musculoskeletal Disorders (WMSD) risk factors can lead to damage to a worker's body, these factors, their causes and implementing remedial programs against them should be taken into consideration seriously. Risk management process can be so effective in identifying, eliminating or reducing these WMSD risk factors. The process consists of hazard identification, risk assessment, risk control and reviewing risk control in such circumstances where there are changes in the work environment, new technology is introduced, or standards are changed. At the initial stage, the meaning of WMSD risk factors, their causes and parts of human's body in which they have harmfully affect are better to be identified and then some remedies should be designed and recommended to eliminate or reduce the consequences.

Review of Literature

Robertson MM and O'Neill MJ(2003) examined the effects of an office ergonomics workplace and training intervention. They made the use of an instructional systems design to develop an office ergonomics training program. In this study, various evaluation tools were used to measure the effectiveness of the training program on workers' office ergonomics knowledge and skills. The study stressed that providing sufficient training and workplace intervention would help the workers to use their workplace effectively through increased office ergonomics knowledge and skills. Therefore in the study after providing training and workplace intervention, there was a significant increase in knowledge and awareness about workers' office ergonomics

DE Treaster & D Burr (2011) studied the Gender differences in prevalence of upper extremity musculoskeletal disorders. Two factors such as age and physical work factors were undertaken. The purpose of this study was to examine the type of gender that faces the higher amount of UEMDs. It was found that women do have higher prevalence than men for many types of UEMDs even after controlling age and work factors.

Kevin Berner¹, Karen Jacobs (2002) analyzed the gap between exposure and implementation of computer workstation ergonomics in the workplace. The study covered the population using computers at home, school and work environment. The main objective was to analyze the various types of musculoskeletal disorders due to continuous usage of computers. It was found that 55 respondents ranged from the age of 21 to 65 and spent on average of 5.3 hours at the computers during a workday. Due to this 70% of the respondents faced increased amount of musculoskeletal disorders due to excess computer usage. Only 10% of the respondents had knowledge about workstation ergonomics. Hence the study interpreted that in order to reduce the musculoskeletal disorders, proper awareness and training must be given about workstation ergonomics

M.L Resnick and A.Zanotti (1997) used the concepts and principles of ergonomics for target productivity improvements. He stressed that by using the principles and concepts of ergonomics at workplace can reduce the number of occupational injuries, postures that create significant musculoskeletal stresses and improve productivity. In this study, the variables such as the effects of tool mass, work height and movement distance on performance were measured. The study revealed that all three variables had significant effects on performance. Hence in the study, it was suggested that workstations can be designed to maximize performance and reduce costs by considering both ergonomics and productivity together.

Kvarnström S (1983) conducted a study on occurrence of musculoskeletal disorders in a manufacturing industry with special attention to occupational shoulder disorders. Around 11000 employees of Swedish company were taken for the study. It was found that 47% of long term sick-absences were found due to musculoskeletal diseases. The neck and shoulders disease were found common among the employees. 112 cases of prolonged shoulder disorder were further studied and it was found more often among the women, immigrants and within certain occupations. Therefore, a long list of variables showing the patients and their jobs were identified, practical measurements to the women had been introduced and EMC equipment for easy analysis of muscle tension on actual work situations had been constructed.

Objective of the study

In this present research work the main objective is to evaluate the workplace ergonomics of manufacturing sectors in the Union Territory of Pondicherry

Methodology: In order to evaluate the workplace ergonomics of Puducherry manufacturing sectors, the sample of 125 employees from ten manufacturing companies have been chosen. These samples were studied and evaluated with the help different statistical tool such as weighted average and Chi-square. These statistical were used to order to analyze the relationship between employees and their workplace in terms of space, employees jobs, types of equipments, nature of the work.. etc.

Result Analysis

1. Weighted Average Method: The weighted average method can be calculated by the following formula. This tool is used to find the rank given by the respondents to the various factors in performance appraisal.

It can be calculated as, $X = \frac{WX}{W}$

TABLE No. 1 Ranks given by the respondents about the various types of postures in which they perform their job

Factors	Weight (W)	Not at all	Rarely	Sometimes	Often	Very Often	Total	Rank
		1	2	3	4	5		
Awkward posture	X1	1	9	74	16	25		
	X1W	1	18	222	64	125	430	III
Repetitive motion task	X2	4	7	63	25	26		
	X2W	4	14	189	100	130	437	I1
Stress at work place	X3	1	2	32	29	61		
	X3W	1	4	96	116	305	522	I
Forceful movement	X4	36	52	24	4	9		
	X4W	36	104	72	16	45	273	V
Sitting in the same posture	X5	2	3	72	19	29		
	X5W	2	6	216	76	145	345	VI

Source: Primary Data

From the **Table No.1**, it is clear that the respondents normally work in all the above mentioned postures. Among them, majority of jobs are repetitive in nature and follows repetitive motion tasks, many respondents work in a awkward postures and perform jobs with forceful movements and few perform by sitting in same and static postures for a long duration.

Due to repetitive motion tasks, the respondents face problems in their hands and ankles. Sometimes they face the problem of numbness in their fingers, due to awkward postures they face sever pain in their neck and joints, due forceful movements (i.e.), by lifting heavy equipments and by performing drilling work, they face problems such as headache, body ache and tiredness and due to heavy stress at work they face the problem of High Blood Pressure and tension.

Chi-Square Method:

Hypothesis : Ho = There is no significant association between educational qualification and income level of the respondents

H1 = There is no significant association between educational qualification and income level of the respondents

Table No. 2 Analysis of opinion of the respondents regarding the experience and income level

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	99.594 ^a	12	.000
Likelihood Ratio	101.533	12	.000
Linear-by-Linear Association	.240	1	.624
N of Valid Cases	125		

From the above SPSS generated result, it is clear that significant value is below 0.05. Hence , the researcher failed to reject the null hypothesis and accepted the alternate hypothesis. Therefore, It can be concluded that there is an association between educational qualification and Income level of the responds. It means that as the educational level of the respondents' increases, the income level also increases.

Findings

Only (65%) of the respondents are comfortable with the present the present posture of their work .It is inferred that majority (58%) of the respondents are spending 6-8hrs in an average working day for doing their task. Majority (54%) of the respondents have responded there are only occasional changes in the posture. Most (63%) of the respondents felt worried about the working long hours in an inconvenient position. Due to awkward postures they face sever pain in their neck and joints. Nearly (47%) of the respondents have replied that their job is repetitive in nature. Due to repetitive motion tasks, the respondents face problems in their hands and ankles. Sometimes they face the problem of numbness in their fingers, due forceful movements (i.e.), by lifting heavy equipments and by performing drilling work, they face problems such as headache, body ache and tiredness.

Only (37%) of the respondents feel neutral about handling equipments.. Nearly (43%) of the respondents are satisfied with the present working environment.. From the chi square it is found that there is a significant association between the experience and income level of the respondents. From the chi square it is inferred that there is a significant association between the educational qualification and income level of the respondents. From the weighted average method it is understood that, most of the respondents ranked stress at workplace at first about the causes for ergonomic problem. Due to heavy stress at work they face the problem of High Blood Pressure and tension. From the weighted average method its shows that, most of the respondents are given first rank to fatigue as an effect of workplace stress.

Suggestions and Recommendations

From the study it is found that few of the respondents feel inconvenient due to some work postures during long hours working .For example, lack of proper space between seating's and computers. Therefore, it has been suggested to the management to provide proper space between seating's and computers. This in turn will share reduce musculoskeletal Disorders such as hand pain, body pain, fatigue etc.

It is found that constant and continuous eye movement is required for a long hour which if found to be a major problem among the respondents. So, the management may adopt two ways. One is providing enough duration for rest pauses. Another is providing convenient environmental setting. For eg: Setting greeneries, Fish tanks etc. From the research it is identified that, the servicing and maintenance of equipments are done in occasional basis. Hence it has been recommended to the management to maintain the equipments on a regular basis. This in turn

will reduce physical stress such as hand strain, arms pain etc.

The researcher found that the nature of job is repetitive, which may cause carpal Tunnel Syndrome (It is a disorder which is cause due to job stress and repetitive task). Hence, the management may allot the job to the workers on rotation or random basis. In general, workers finds difficult in achieving their goals due to some ergonomics problems. Therefore, it is suggested to the management to maintain good ergonomics `which in turn will increase high employee morale and productivity

Conclusion

Ergonomics, often referred as human engineering, is the science dealing with designing as per human needs and comfort. Research in ergonomics deals with studying the relationship between various human capabilities and their working demands. This leads to the final evaluation and design of products and systems so as to tailor them to the abilities and limitations of people. The end product is a healthy home or work environ-

ment. The study is emphasized on employees' views on nature of job, wok environment and their present work postures at work. It interprets that employees of puducherry manufacturing concerns are provided with best working environment but they also confront with works involving vibrations and static sitting postures for longer duration. It also reveals that employees are moderately satisfied with the present ergonomics at their workplace. Based on the above views and findings, the researcher concludes that "**Work Place Ergonomics of puducherry manufacturing sector need to be improved.** To improve and to strengthen the present workplace ergonomics , the researcher has suggested the management to train the employees with proper sitting postures which in turn will resist Musculo-skeletal Disorders (MSD) and to allot the jobs at rotation basis which in turn will reduce Repetitive Strain Injuries (RSI) and to design the equipments in a manner that it improves grip with hooks or straps or magnets which in turn will reduce the vibration level or force in handling the drilling equipments.

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