"An Overview of Techniques Used In Garment Manufacturing Industry For Ergonomic Survey''

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Abstract

In garment manufacturing industries, sewing machinists suffer from several health problems, like musculoskeletal disorder of neck and shoulder which have been attributed to poor working postures as well as to the repetitive hand and arm movements. It causes increment in sick leaves, mental disturbances on the working time, less productivity. The modifications to the sewing workstation of garment manufacturing industries have great potential for improving the operator's working postures. These can be done by studying the ergonomic issues in industry. Hence the investigation of ergonomic issues becomes a need in a sewing machine workstation of garment manufacturing industries.

Keywords: Musculoskeletal disorders, Ergonomic design, Productivity.

1. Introduction

Garment manufacturing industries (tailoring, cutting cloth, fixing buttons, finishing, checking, ironing, packing) has repetitive and monotonous requiring strong visual demands, improper postural requirements, involving long hours sitting or standing in one position. Most of the women workers complained of backaches and breathing problems linked to their work. Ergonomics plays a key role in areas where conflicts between man and machine arises. It deals with fitting the man to the job by weaving the different components into a single system such that each components work in synchronized manner with the others. These components include the worker, the work environment both physical and organizational, the task and the workspace. Thus recognizing ergonomic risk factors in the workplace is an essential first step in correcting hazards and improving worker protection.[1,2]

Ergonomics can be defined as the application of knowledge of human characteristics to the design of systems. People in systems operate within an environment and environmental ergonomics is concerned with how they interact with the environment from the perspective of ergonomics. Although there have been many studies, over hundreds of years, of human responses to the environment (light, noise, heat, cold, etc.) and much is known, it is only with the development of ergonomics as a discipline

that the unique features of environmental ergonomics are beginning to emerge.[3] Also it can defined as a discipline in its own right, as the theoretical and fundamental understanding of human behavior and performance in purposeful interacting socio-technical systems, and the application of that understanding to design of interactions in the context of real settings. This definition is justified in the financial, technical, legal, organizational, social, political and professional contexts in which ergonomists work. On the basis of the history of ergonomics and contemporary contributions, it is proposed that it is one of the modern sciences, drawing as much from the field as from the laboratory, and including elements of an art and a craft as well. Justification for the new definition is provided by examining the interacting systems which are prevalent in the modern. Finally a number of challenges for ergonomics are identified. So there is need to re-examine the ergonomics.[4]

The sewing task involves moving the material through the machine using the left hand, holding and feeding the material using the right hand, controlling the speed of the machine by using a foot pedal and viewing the work point while also performing various manipulations of the material. These activities have a strong influence on the work posture. Seating and workstation dimensions also severely constrain the operator's postures. Several studies have shown previously that modifications to sewing machine workstation arrangements could improve the operator's postures.[5,6,7] Rotator cuff tendinitis showed a higher degree of persistence than myofascial pain syndrome. Both disorders highly influenced the perception of general health. [8] Some studies internationally have highlighted musculoskeletal risk factors associated with the textile industry and garment making jobs because of highly repetitive work in awkward work postures Back, neck and shoulder discomfort are highly prevalent among these sewing machine operators.[9] People who work within a shift work schedule are more susceptible to the stress between this type of working time organization with circadian and social rhythms, and consequently, to suffer a variety of health and well-being problems such as chronic fatigue, digestive and sleep disorders, work dissatisfaction and work-family conflict due to this they can loss their age and life by reported that increasing on-shift number of days was significantly associated with incidents leading to an occupational injury or accidents.[10]The intervention strategies including the redesign of the workstations and seating and the provision of training in basic ergonomics principles for improving the work life of these operators. [11,12]

2. Techniques used for Ergonomic Investigations

The use of ergonomics in workplace designing or workstation designing has been started way back in industries. Ergonomics should be regarded as one of the "first truly multi-, inter- and cross-disciplinary subjects that the world requires if we are to understand and improve the lives of people and societies going into the 21st century. The role of ergonomics as the holistic approach to understanding complex interacting systems involving people. The ideas and expertise from different disciplines interested in the effectiveness of human performance (anatomy, physiology, psychology, industrial medicine, industrial hygiene, design engineering, architecture and illumination engineering), and re-design of

workstations may define this as physical ergonomics. To reduce workplace health risk exposures through redesign of processes, tools and equipment to improve the musculoskeletal health of workers. In the industries some models are design for dealing with worker according to ergonomics. Some of introducing human software tools for investigating the postural behavior at sewing machine work stations with the help of ergonomics changes.

The earlier research on Methods used in garment industries are as follows:

1. Introduced SPSS version 20.0 software program for analysis of associated risk factors of work related elbow and wrist musculoskeletal disorders among sewing machine operators of garment industries.[2]

2. Make prototype sewing machine and check the ergonomic postures. Modify the design of sewing machine, incline the table position[6]

3. Statistical analysis were performed with computer software to analyze the working conditions of shift workers. Study analyzed the relationship of age and tenure with occupational accident severity of 156 male shift workers at an industrial plant. [10]

4. NASA Task Load Index (NASATLX) questionnaire to identify and describe possible ergonomics deficiencies in the workstation of sewing machine operators. To identify and describe possible ergonomics deficiencies in the workstation of sewing machine operators in a textile industry in Botswana as well as their perception of workload and bodily discomfort. [11]

5. Use of a Computer Aided Engineering(CAE) system such as DESIGN to create and modify a Product Structured Data Base for a machine and to analyze relationships between volumetric models of the parts of a machine. A volumetric model created for studying every element within the machine. [12]

6. Prepare Mathematical Model for ergonomic design using well-established methods in optimization and workspace analysis. Visualize the limb's workspace envelope in 3D and to mathematically explore operations that can be conducted on workspace. [13]

7. Prepare spreading and cutting sequencing SCS. model using GA to solve the sequencing problem of the computerized cutting system used in the garment industry. Minimize the fabrication time and the idle time of the computerized cutting machine.[14]

8. Create IP(Integer programming) model for solving layout problems. Finding good combinations of templates and solving lay out problems.[15]

9. Analyze & new work station design with using ERGO Plan software package. Economic evaluation is done for cost benefit by considering the ergonomic factors. [16]

10. Introduce fuzzification scheme for genetic optimization procedure is also proposed to search for fault-tolerant schedules using genetic algorithms.Fuzzify the static standard time so as to incorporate some uncertainties, in terms of both job-specific and human related factors, into the fabric-cutting scheduling problem. [17]

11. A genetic optimization approach using adaptive ESs is developed to genetically synthesize the cut order plan in order to complete the order with minimized costs.[18]

12. A discrete event simulation model was developed for process durations, task allocations. Collection of data such as process durations, task allocations and process relationships for the study was undertaken

by the author and employees of the organization in order to construct the process maps and simulation used in the analysis of the process designs Line balancing. [19]

13. Questionnaire and rapid upper limb assessment (RULA) for identification of the prevalence of musculoskeletal symptoms and ergonomic risks in female sewing machine operators at a textile company.[20]

14. Used Heuristic methodology and grouping genetic algorithm (GGA) for to complete the task with balance load. Also a grouping genetic algorithm (GGA) for sewing lines with different labour skill levels in garment industry is developed.[21]

15. Used intelligent hierarchical controller for the robotized sewing of two plies of fabrics, Fuzzy logic and neural networks. The ergonomic study in the production department is conducted by a survey and also by the data collection. And concluded about worker satisfaction. [22]

16. Software tools like JACK, RAMSIS, SAFEWORK, SAMMIE for investigating the postural behavior at sewing machine work stations. To investigate ways in which the JACK computer-aided ergonomics system can be used to evaluate workstations.[23]

3. Performance Parameters

For any industry it is very much important that their employee should get work satisfaction as they are the main asset of the plant. For increasing productivity and smooth running of the plant, workers should get good comfort while working because worker plays vital role in the industry. To get this, study of the ergonomic conditions is needed. The parameters need to be identified related to the ergonomics in sewing machine workstation are as follows.

➢ Study of sewing machine workstation in detail.
➢ Study of ergonomics involved in sewing machine workstation of garment manufacturing industry.
➢ Identify various parameters affecting sewing machine operator and productivity related to ergonomics in sewing machine workstation.
➢ Identify factors affecting overall working and quality output of the garment manufacturing industry.
➢ Study of effects of light, noise, vibration, and thermal environments on the health.
➢ Correlate various parameters with anthropometric data of sewing machine operator and various measures of sewing machine workstation.
➢ Prepare mathematical model to optimize various parameters related to workplace design of sewing machine workstation.
➢ Recommendations for re-dimensioning of the workstation.
➢ Recommendations on workstation adjustment and modifications needed to minimize the load on the musculoskeletal system and health.

➢ Recommendations for Computer aided work station design with skilled operator and lot of knowledge of ergonomic design.

4. Conclusion

1.The research study findings may give the ergonomic comfort to the operators by adopting suitable workplace design and working conditions.

2.The ergonomic changes in the sewing machine workstation saves the time of manufacturing.

3.Due to the correct ergonomic postures MSD (Musculoskeletal disorders)can be prevented.

4.Productivity may increase with the normal working conditions.

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