

PRODUCTIVITY AND WORKPLACE IMPROVEMENT USING ERGONOMICS; A CASE STUDY

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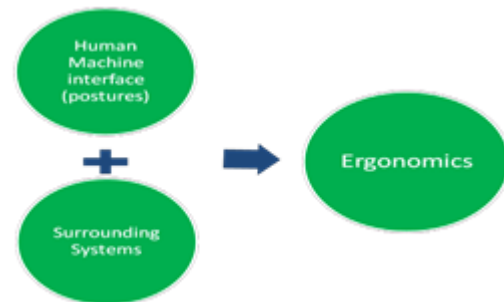
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Abstract— State –of –the-art the industrial success greatly depends on the Quality, delivery and uptime. In order to achieve this industry should implement new techniques which will increase the quality, productivity and decrease worker fatigue. One such technique is ergonomics. This paper is a case study on application of ergonomics in improving the quality of work system design, reducing musculoskeletal disorders and increasing productivity. The existing workstation design was studied and suggestion was given to improve the method for productivity by reducing shoulder and wrist injury and fatigue.

Index terms- Ergonomic workplace Evaluation, Musculoskeletal Disorders, MMTD socket cell.



I. INTRODUCTION

The word Ergonomics comes from two Greek words: ERGO: meaning work, NOMOS: meaning law, Ergonomics can be defined simply as the study of work. More specifically, ergonomics is the science of designing the job to fit the worker, rather than physically forcing the worker's body to fit the job. Adapting tasks, work stations, tools, and equipment to fit the worker can help reduce physical stress on a worker's body and eliminate many potentially serious, disabling work related musculoskeletal disorders (MSDs). Ergonomics covers all aspects of a job, from the physical stresses it places on joints, muscles, nerves, tendons, bones and the like, to environmental factors which can affect hearing, vision, and general comfort and health, when there is a mismatch between the physical requirements of the job and the physical capacity of the worker, work-related musculoskeletal disorders (WMSDs) can result. Physical stresses include repetitive motions such as those caused by typing or continual use of a manual screwdriver. Other physical stresses could be tasks involving vibration such as using a jackhammer, or tasks which involve using excessive force, such as lifting boxes of heavy books. Types of work which pose ergonomic hazards are Manual handling, Manufacturing and production, Heavy lifting, Twisting movements, and Long hours of working in awkward positions.

II. ERGONOMIC DESIGN

'Ergonomic design' is a way of considering design options to ensure that people's capabilities and limitations are taken into account. This helps to ensure that the product is fit for use by the target users. The principles of ergonomic design can be applied to everyday objects and work spaces. Mass production of various products does not take into account that humans come in various shapes and sizes.

A. Ergonomic Workplace Evaluation:-

Poor working postures, repetitive tasks and heavy workloads can lead to increased risk of workplace injuries. An Ergonomic assessment can identify these risk factors by using a variety of data capture and risk assessment tools. By performing an Ergonomic assessment, business can benefit from: Prevent costly litigation, comply with health and safety citations, decrease injury risk, error rates and lost working days, increase efficiency and productivity It covers the major areas like Controls and displays, lightings, material Handling, surrounding Environment..

B. Systematic Approach for Ergonomic workplace Evaluation:

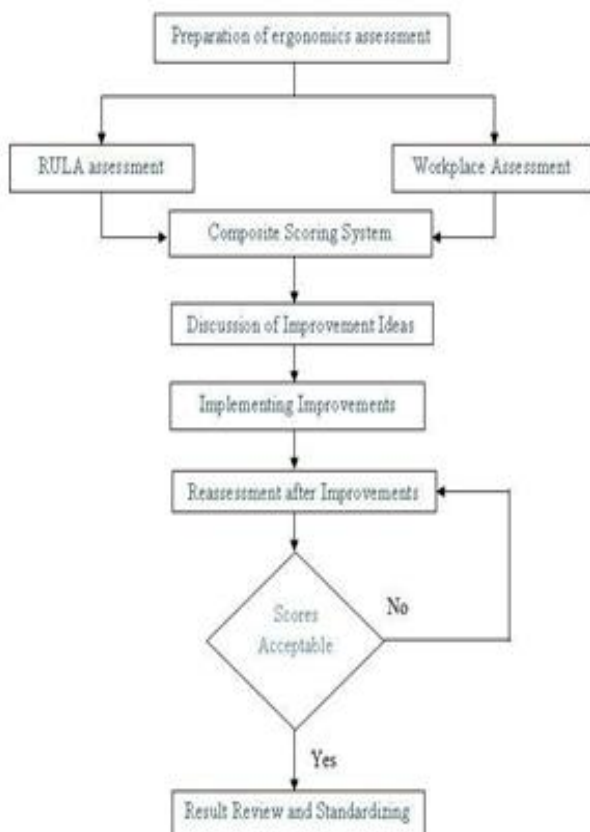


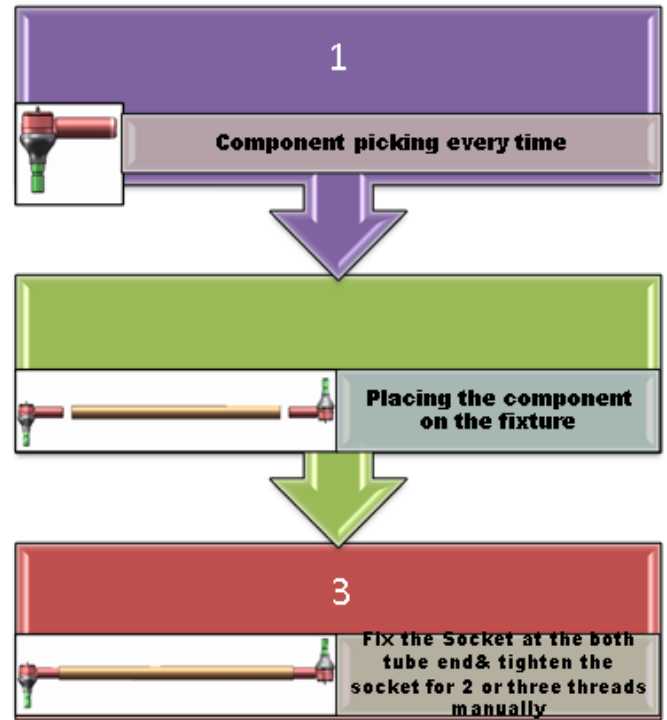
Fig 1. Approach for ergonomic workplace assessment

III. CASE STUDY

Ergonomics workplace improvement using Ergonomics – During the initially conduction of the study of ergonomics at the Industry, the critical areas having the maximum critical ergonomic areas which means having a unfavorable working postures which leads to human fatigue which needs immediate attention, are suggested them to reduce the human fatigueless and improve productivity.

MMTD Assembly Cell:

In RML(Rane madras Ltd) Plant mysuru, the MMTD(Mahindra & Mahindra tractor division) Assembly work-station, assemble of sockets to the tube at both ends carried out using manually, It is fully manual operation and has to produce 450 nos. per shift, this project important to reduce Operator Fatigue and improve productivity at present who’s working facing high Musculoskeletal Disorders.



IV. LITERATURE REVIEW

Baba MdDeros et al.,[1] studied that assembly workstation at Company a need to be redesign to eliminate awkward postures and anthropometric mismatches to lower MSDs problem and improve productivity among assembly workers.

Ravikumar Kamble et al.,[2] studied the cycle time and existing method of different work stations and suggesting improved method for the same so as to reduce the cycle time and to improve productivity. The importance of the work study is directly related to the reduction of the inefficient time and increasing the productivity. He also Suggested a proper sequence of operations which reduces the cycle time of the work stations.

Sandip B. Wanave et al., [3] evaluated the workstation to improve the productivity by reducing the back pain, shoulder injury, fatigue etc. Productivity is an important indicator of economic growth and social health. High performance and productivity require the right sitting posture. So for considering this factor operator needs proper seating arrangement such that their problems regarding the MSDs. It is revealed that the suggested workstation improved working posture and results in reduced postural stress on operators’ bodies and consequently reduced prevalence of MSDs symptoms. Analysis and implementation of ergonomic chair give a great difference in the readings taken for different factors. Capability and concentration of workers increases due to less fatigue observed.

V. PLAN SEVERAL MEASURES

Table 1. different techniques

Sl.no.	Measures	Evaluation Method			Remarks
		Q	C	D	
1	Outsource the assembly operation so that no manpower is used for Assembly	○	○	○	It will increase the cost & will have no control on the delivery.
2	Assembly operation to be done at customers end	○	○	○	Will increase the cost due to no of transit, packing/unpacking works
3	Assembly operation with robo	○	○	○	Due to higher initial investment not viable
4	Assembly operation to be made Semi automation	○	○	○	Can reduce the number of operator & speed up the Output

for assembly, by reducing MSD's (Musculoskeletal Disorders) and improve the productivity by considering three parameters like quality, cost and delivery.

BEFORE



AFTER



A. kaizen:

Kaizen is a continuous improvement process in which it involves empowerment of each employee to train for each operation, analyze them for future favorable condition for productivity improvement with worker safety at all levels of condition. based on three parameters like quality, cost and delivery four methods are suggested and implemented.

B. List of ideas to improve productivity in MMTD assembly cell:

1. Outsourcing
2. Assembly operation to be made at customers end
3. Robotic assembly
4. semi automation

1) Outsourcing:

By outsourcing MMTD socket assembly to tube, based on quality, cost and delivery may varies. RML plant has all required sources for assembly but they do it by manually so it consumes man power and excessive time for socket assembly so its better to suggest another method for ease of assembly.

2) Assembly operation to be made at customers end:

It reduces cost of assembly but may damages the necessary assembly components while transportation.

3) Robotic assembly:

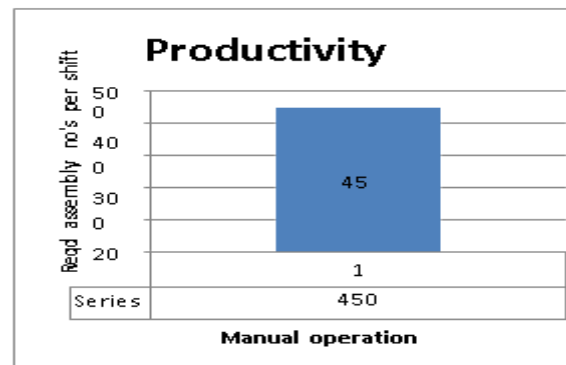
Robotic assembly increases productivity but it costs the higher with space, installation and power consumption.

4) semi automation:

By suggesting semi automatic machine with supplying sockets at both ends of the machine, workers will easily fix them to the tube at both its end while placing on the fixture

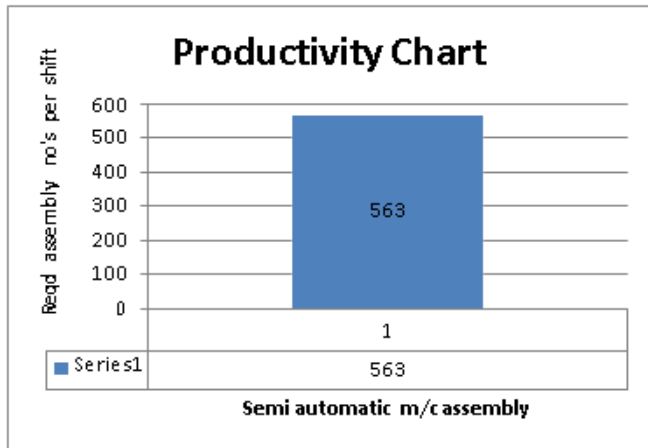
C. Productivity Increment Result:

It's clear that the use of semi automatic machine for assembly of MMTD socket cell at the RML plant Musuru, the productivity increased from 450 no's to 563. by using manual operation to semi automatic machine in MMTD socket assembly cell, Below graphs shows its result.



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VI. CONCLUSION

This study aimed to test the efficacy of an individual workplace intervention of workplace evaluation among workers by evaluating musculoskeletal disorders (MSDs), body posture, upper extremity kinematics, muscle activity and psychosocial factors were tested. The proposed ergonomics interventions effectively reduced MSDs and improved body posture with increasing productivity.

Ergonomic study carried out at workstations of the MMTD assembly station, the changes made were based on the interview with the operators, evaluation and observations. After the study, best possible suggestion was Semi Automatic machine has proven to be remarkable with the drastic changes in its working postures and also in production. The idea of Semi Automatic has been successfully implemented. After the implementation of this kaizen the productivity of tube assembly with sockets increased from 450 to 563 numbers. The method has proved to be economical and effective. Without high investment by the company the problem has been solved.