Ergonomics and safety for hydraulic press machine

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Abstract - *Most of the engineers' activities are related to workers and working process, therefore the majority of engineers have some sorts of communications with employees, directly or indirectly. Otherwise industrial hygiene and safety are known as an important issue for all of staffs, so the engineers need some appropriate information about occupational health. Undoubtedly, universities have an effective role to train the engineering students about human being and work related health and safety problems. One of the sciences which considers to human health, human performance and body activities is "Ergonomics". In this study, the knowledge of the engineering students about ergonomics has been considered. The study showed that more than 71% of students did not have fair information about ergonomics and its importance in their future jobs.*

***Key Words*: ergonomics, engineering, safety, hydraulic press, failure, ergonomic principle.**

1. INTRODUCTION

Ergonomics normally are known to be related to human and their job. In larger scope ergonomics examines human behavioural, psychological, and physiological capabilities and limitations. The basic premise of ergonomics is that job demands should not exceed workers' capabilities and limitations to ensure that they would not be exposed to work stresses that can adversely affect safety and health as well as the company's productivity. Therefore, the objective of an ergonomics program is to provide a safe and productive workplace to the worker's comfort to fulfil the goals and objectives of the organization.

2. DEFINITION OF ERGONOMICS

Reviews of numerous researches of ergonomics are using a variety of definitions to describe the concept. Following are the some definitions of ergonomics stated by previous authors:

Te-Hsin & Kleiner :- Ergonomics is a combination of the words ergo, a Greek word meaning "work" and nomics, meaning "study" - the study of work. An applied science that co-ordinates the design of devices, systems and physical working conditions with the capacities and requirements of the workers.

Tayyari & Smith:-A branch of science that is concerned with the achievement of optimal relationships between workers and their work environment

Lee :- Promoting compatibility between humans and systems Fernandez :- The design of the workplace, equipment, machine, tool, product, environment and system, taking into consideration the human's physical, physiological, biomechanical and psychological capabilities and optimizing the effectiveness and productivity of work systems while assuring the safety, health and wellbeing of the workers. In general, the aim in ergonomics is to fit the task to the individual, not the individual to the task

Brooks: - A system of interacting components which includes the worker, the work environment both physical and organizational, the task and the workspace

3. ERGONOMIC PRINCIPLE

i. Joints must be in a neutral position: In the neutral position the muscles and ligaments, which span the joints, are stretched to the least possible extent

ii. Avoid bending forward: The upper part of the body of an adult weighs about 40kg on average. The further the trunk is bent forwards, the harder it is for the muscles and ligaments of the back to maintain the upper body in balance

iii. Avoid excessive reaches: It is necessary to limit the extent of forward and sideways reaches to avoid having to bend over or twist the trunk

iv. Limit the weight of a load that is lifted: There are guidance weight limits for both males and females

v. A twisted trunk strains the back: Twisted postures of the trunk cause undesirable stress to the spine

3.1 Ergonomics Consideration for Hydraulic Press Machine

I. Lever Operated Hydraulic Machine

i. Lever does not give natural position of wrist.

ii. If lever is at down position from normal position then bending forward not avoided.

iii. When worker is standing for doing operation he cannot avoid excess reaching for lever.

iv. Generally lever operated press machine is used in weighted machines operation so cannot limit weight of work piece.

v. In operation of hydraulic press generally child parts are keeping at backside of worker.

II. Solenoid Operated Hydraulic Machine

i. Push button operated for solenoid gives Natural position to the wrist.

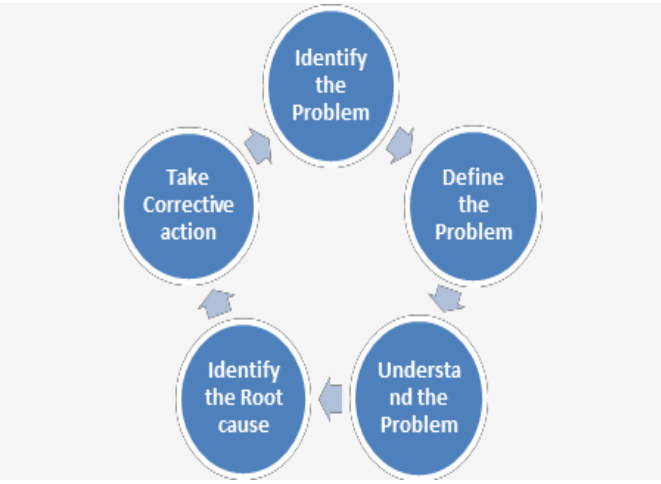
ii. Generally button used for solenoid operation is at well positioned with respect to operator.

iii. Due to well positioned solenoid switch operator avoid excessive reaching.

iv. Generally solenoid operated press machine are advanced so lifting of work piece is done by hoist.

4. ROOT CAUSE FAILURE ANALYSIS

Root Cause Failure Analysis provides the concepts needed to effectively perform industrial troubleshooting investigations. It describes the methodology to perform Root Cause Failure Analysis (RCFA), one of the hottest topics currently in maintenance engineering. It also includes detailed equipment design and troubleshooting guidelines, which are needed to perform RCFA on machinery found in most production facilities.



3) Contaminated oil can harm the component, unplanned down time and the whole machine.
4) Whether the press is of all-welded construction or is a tie-rod model, it relies on numerous nuts and bolts for proper operation.
5) If replacement of components is not done before the service life of component.
6) Small leakages in press machine can lead to large problems.
7) If preventive maintenance of machine is not carried out consistently.

5. CONCLUSIONS

This study was focused on the ergonomics definition and ergonomics mainly can be defined as the relationship between humans, machine systems, job design and the work environment. Ergonomics applies information about human behavior, abilities and limitations and other characteristics to the design of tools, machines, tasks, jobs and environments for productive, safe, comfortable and effective human use. This study also states that ergonomics in hydraulic press machine. Ergonomics about different types of hydraulic press viz. lever operated and solenoid operated.

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4.1 Failure Modes of Hydraulic Press

1) Improper oil levels can lead to pump inefficiency due to cavitation, where air enters the liquid being pumped.
2) During operation the oil temperature increases, which can lead to premature breakdown.