ELIMINATION OF ERGONOMIC HAZARDS BY IMPLEMENTING THE HIERARCHY OF CONTROL MEASURES IN WAREHOUSE LOGISTICS

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ABSTRACT

Safety plays an important role in human beings' life. Occupational health and safety become a vital part in every Industry. The background of this project is to control the ergonomic hazards in warehouse logistics by using HIRA technique. The main objective of this paper is to identify the ergonomic hazards in warehouse logistics. To assess the safety means, it needs to reduce the risk everywhere, so that Hazards Identification Risk Assessment (HIRA) can be done for the manual handling activities. To find the hazards means, then risk can be accessed from the hazards and then to analyze the severity rating for the hazards. Calculating the severity and probability of occurrence and suggesting the hazards are acceptable or not acceptable. By using HIRA techniques, we can provide various hierarchy of control measures to reduce the severity & probability level of the risk. Introducing Engineering controls, Administration controls we can reduce the ergonomic related issues in warehouse logistics. Workplace ergonomics is the science of designing the workplace, keeping in mind the capabilities and limitations of the worker. A workplace ergonomics improvement process removes risk factors that lead to musculoskeletal injuries and allows for improved human performance and productivity.

Keyword - *Hazards, HIRA Technique, Logistics, and Risk Assessment etc….*

1. INTRODUCTION

Many industries have successfully implemented ergonomic solutions in their facilities as way to address their workers' MSD injury risks. These interventions have included modifying existing equipment, making changes in work practices and purchasing new tools or other devices to assist in the production process. Making these changes has reduced physical demands, eliminated unnecessary movements, lowered injury rates and their associated workers' compensation costs, and reduced employee turnover. In many cases, work efficiency and productivity have increased as well.

Engineering controls are the most desirable, where possible. Administrative or work practice controls may be appropriate in some cases where engineering controls cannot be implemented or when different procedures are needed after implementation of the new engineering controls. Personal protection solutions have only limited effectiveness when dealing with ergonomic hazards.

There are many ways to reduce ergonomic risk factors and help fit the workplace to the worker. Solutions can be grouped into three main categories: eliminate the hazard, improve work policies and procedures, and provide personal protective equipment.

These are some examples of engineering controls:

- Redesign workstations and work areas to eliminate reaching, bending, or other awkward postures.
- Provide adjustable tables and chairs that can be used by workers with a range of sizes and shapes, and that allow neutral postures.
- Provide carts for transporting material and mechanical hoists to eliminate lifting.
- Use tools that fit the hand, have no sharp edges, and eliminate awkward hand and wrist positions.

- Change where materials are stored to minimize reaching.
- Design containers with handles or cutouts for easy gripping.

2. LITERATURE REVIEW

N.Jaffar, A.H.Abdul-Tharim, I. F. Mohd-Kamar, N.S.Lop:(2011)Ergonomics normally are known to be related to human and their job. In larger scope ergonomics examines human behavioral, psychological, and physiological capabilities and limitations. Professionals in the field of ergonomics normally will design new work environments or modify established work environments based on the studies on the human capabilities and limitation. 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 fulfill the goals and objectives of the organization. The focus of ergonomics implementation should removes barriers to quality, productivity and safe human performance by fitting products, tasks, and environments to people instead of forcing the person to adapt to the work. In order to assess the fit between a person and their work, ergonomists will consider the worker, the workplace and the job design

Somnath Kolgiri , Rahul Hiremath, SheelratanBansod: (2016)Workplaces traditionally have been designed to move products or support machines efficiently. Since people havealways seemed so adaptable, how they fit into the workplace has received less attention. The increasing number of injuries caused by repetitive motion, excessive force and awkward postures; ergonomics has become a critical factor in workplace safety. According to ergonomics and human factors are often used interchangeably in workplaces. Both describe the interaction between the worker and the job demands.

The difference between them is ergonomics focuses on how work affects workers, and human factors emphasize designs that reduce the potential for human error. While Bongers et al stress that by addressing traditional and environmental risk factors, it can keep workers injury free. Risk and risk factors are common concepts used in safety and applied ergonomics literature. Risk includes a component of how likely or what the probability of an event is and the seriousness of the consequence or what the severity is if something does occur. Risk is often defined on how many injuries or accidents resulted for a given exposure. At the extremes, injury risk can be viewed as very low probability but extremely high consequence

Antonio Cimino, Duilio Curcio, Francesco Longo, Giovanni Mirabelli: (2014) The high complexity of manufacturing systems in terms of interaction between humans and their working environment continuously provides challenging problems for researchers working in this specific field. An ergonomic approach to the design of an industrial workplace (ergonomic effective design) attempts to achieve an appropriate balance between the worker capabilities and worker requirements, to optimize worker productivity, as well as provide worker physical and mental well-being, job satisfaction and safety.

During the last years this research area has became more and more important due to its effects on system efficiency and productivity. In this regards, different research works have been proposed and several scientific approaches have been developed trying to achieve the ergonomic effective design of the workplaces belonging to the manufacturing system. It is the intent of the paper to present a literature review on this specific area clustering the high quality research works according to the scientific approach they propose. In this regards, the authors identify three different scientific approaches based on different principles, methods and tools.

KassuJilcha: (2016) musculoskeletal disorders are one of the main causes of occupational disorders and are highly associated with socioeconomic burden to individual, organization and society in general view. The purpose of this study is to determine the prevalence of musculoskeletal disorders and associated risk factors in metal manufacturing industry workers and summarize the findings associated and identify existing gaps. The article summarizes publications on the subject area; identify existing gaps on impact of physical Ergonomics on Musculoskeletal Disorders (MSDs). Findings show, the working conditions in the work environment result in high absence rate among employees due to illness and work related musculoskeletal disorder.

This results in lower productivity and higher medical and compensation cost Metal manufacturing industries are stressful, with poor safety, weak interfacing with work equipment as well as physical workplace layout design. Work environment conditions results revealed noise, vibration, climate, illumination, and working posture were not an acceptable limit as ergonomic perspective. This literature review assess the gap by examining the cost incurred due to poor working condition and offer ways for considering ergonomic solution in reducing MSDs to improve productivity, reduce workers' compensation and healthcare costs.

3. PROBLEM IDENTIFICATION

The severity of ergonomic hazards often depends on the level of exposure over time. Injuries sustained from these safety hazards can include anything from sore muscles to long-term illnesses. Ergonomic hazards include:

- Improperly adjusted workstations and chairs
- Frequent lifting
- Poor posture
- Awkward movements, especially if they are repetitive
- Using too much force, especially if it's done frequently
- Vibration

Ergonomic hazards are often a result of the way a space is designed, meaning that planning ahead and thinking about how employees interact with their work space is crucial.
Working in awkward postures or being in the same posture for long periods of time. Using positions that place stress on the body, such as prolonged or repetitive reaching above shoulder height, kneeling, squatting, leaning over a counter, using a knife with wrists bent, or twisting the torso while lifting.
Ergonomic risk factors are workplace situations that cause wear and tear on the body and can cause injury.
These include repetition, awkward posture, forceful motion, stationary position, direct pressure, vibration, extreme temperature, noise, and work stress.
By using HIRA techniques we can implement the engineering & Administration controls we can reduce the exposure of ergonomic hazards.

4. METHODOLOGY

4.1 HIRA

A HIRA(Hazard Identification Risk Assessment) is a risk assessment tool that can be used to assess which hazards pose the greatest risk in terms of how likely they are to occur and how great their potential impact may be. It is not intended to be used as a prediction tool to determine which hazard will cause the next emergency.

One of the core challenges faced by industries & Logistics are how to prevent, mitigate, prepare, respond and recover from different types of hazards.
Several questions must be asked when faced with this challenge:

- What hazards exist in or near my community?
- How frequently do these hazards occur?
- How much damage can they cause?
- Which hazards pose the greatest threat?

This Hazard Identification and Risk Assessment helps to guide you to reduce the severity level &Occurrence level

RISK = SEVERITY X PROBABILITY

4.2 Risk ranking matrix

In order to do a risk rating, we normally make use of a matrix scoring system. Numerical scores are given to the different elements (e.g. consequence, exposure, likelihood) of risks and these scores are added or multiplied to get a rating for the risk. For the initial risk evaluation, consider the risks identified in the worst case scenario before any controls are applied.

Example: Electricity is a hazard, it can kill but the risk of it doing so in an office environment is low providing the components are insulated, the metal casing is properly earthed and appliances are used correctly and tested regularly.

4.3 Elements of risk

Consequence/ severity (How serious)

Consequences are the expected severity. The severity is expressed in terms of the effect on the person, whether injury or ill health, and ranging from minor injury to death.

Think about how serious the likely outcomes would be if harm from a hazard was realized. The risks are clearly higher if an accident is likely to result in serious injury or death, for example, than a bruise or a scratch.

Probability/ Likelihood (How likely)

By evaluating the risks associated with each hazard you have identified, you're deciding how likely it is that harm will occur from the hazard. The likelihood is the probability of loss when a sub-standard act occurs or sub-standard condition exists. The likelihood should be based on the worst case scenario, ranging from a remote possibility to the inevitable.

4.4 Steps for HIRA

- Identification of hazards
- Identify People who might be affected
- Identify the Risk
- Evaluate the Risk rating by probability & Severity level
- Implementation of control measure to reduce the risk

4.5 Implementation of Control Measures

Controlling exposures to occupational hazards is the fundamental method of protecting workers. Traditionally, a hierarchy of controls has been used as a means of determining how to implement feasible and effective control solutions

Hierarchy of controls

- Elimination
- Substitution
- Engineering controls
- Administration controls
- Personal Protective Equipment.

Elimination and substitution, while most effective at reducing hazards, also tend to be the most difficult to implement in an existing process. If the process is still at the design or development stage, elimination and substitution of hazards may be inexpensive and simple to implement. For an existing process, major changes in equipment and procedures may be required to eliminate or substitute for a hazard.

Engineering Controls

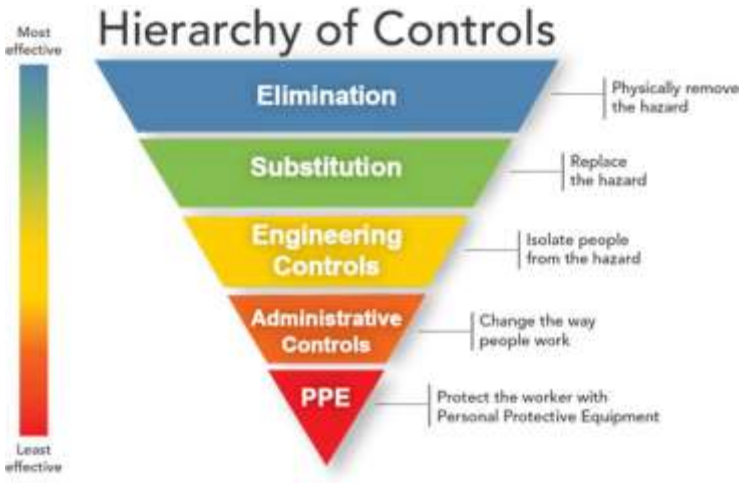

Fig 4.1 Hierarchy of Controls

Engineering controls are favored over administrative and personal protective equipment (PPE) for controlling existing worker exposures in the workplace because they are designed to remove the hazard at the source, before it comes in contact with the worker. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.

Administrative controls and PPE are frequently used with existing processes where hazards are not particularly well controlled. Administrative controls and PPE programs may be relatively inexpensive to establish but, over the long term, can be very costly to sustain. These methods for protecting workers have also proven to be less effective than other measures, requiring significant effort by the affected workers.

5. IMPLEMENTATION TO ELIMINATE THE ERGONOMIC HAZARDS

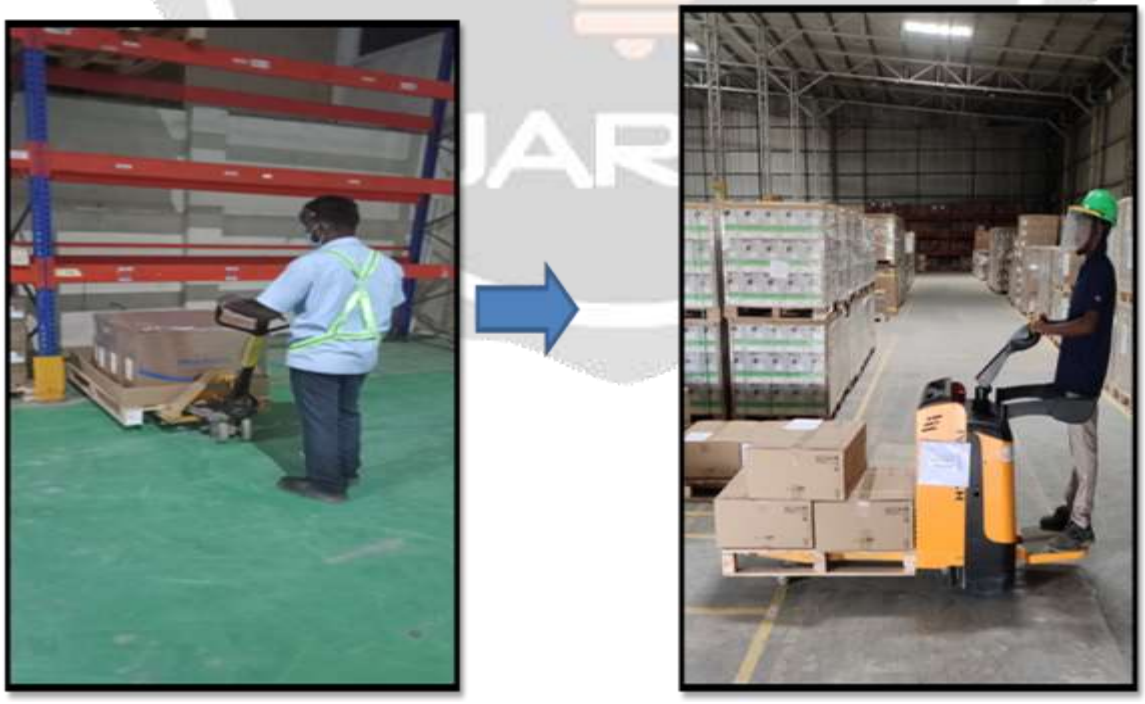

Fig 5.1 Implementation of BOPT for HPT

BENEFITS OF BOPT

- To avoid manual handling.
- Increase the efficiency
- Less manpower required
- Time consumption reduction
- Avoid property damage
- Reduce ergonomic hazards
- Reduce error occurrence
- Reduce the time consumptions

Fig 5.2 Replace HPT for cart trolley.

BENEFITS BY USING CART TROLLEY

- Easy to access in the mezzanine area.
- Easy to picking for small quantity of materials.
- Avoid ergonomic hazards
- Reduce fatigue
- Reduce the time consumption
- Increase the efficiency

5.1 IMPLEMENTATION OF ERGO-FRIENDLY CHAIR

For Data Entry Operation operators facing back pain due uncomfortable sitting posture.To avoid these issues we provide & implement the Ergo-friendly chair for good backrest posture to avoid the ergonomic issues.

Fig 5.3 Implementation of ergo friendly chair

Benefits due to implementation of ergo friendly chair

- Reduce fatigue
- Reduce error occurrence
- Easy to work
- Increase efficiency
- Avoid ergonomic hazards
- Adjustable based upon the workstation
- Increase the clear vision

5.2 IMPLEMENTATION OF CAMERA IN REACH TRUCK

This implementation comes under engineering controls It reduces the neck pain of the operator. And it is easy to pick from the HD rack & from the shelving.

Benefits:

- It creates comfortable reduce ergonomic issue
- Reduce the fatigue
- It increases the efficiency
- It reduces the incident rate

Fig 5.4 Camera in RT

6 CONCLUSIONS

Ergonomics helps people to be more comfortable at work, reducing stress and injury caused by incorrect positioning and repetitive tasks. As a good user, we need to use ergonomics because it gives big influence in our life. Solutions can be grouped into three main categories: eliminate the hazard, improve work policies and procedures, and provide personal protective equipment. Often the best solution involves a combination of approaches.

The most effective way to control ergonomic hazards is to eliminate the risk factors altogether. So only we followed the hierarchy of control measures to eliminate theses hazards. The goal of ergonomics (i.e. the scientific study of people at work) is to prevent soft tissue injuries and musculoskeletal disorders (MSDs) By designing a job to allow for good posture, less exertion, fewer motions and better heights and reaches, the workstation becomes more efficient.

Exposure to these known risk factors for MSDs increases a worker's risk of injury. Work-related MSDs can be prevented. Ergonomics fitting a job to a person helps lessen muscle fatigue, increases productivity and reduces the number and severity of work-related MSDs

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