

REDUCTION OF MUSCULOSKELETAL DISORDERS IN THE TYRE INDUSTRY USING NIOSH EQUATION

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Abstract— Any industry in the industrial sphere needs to be safe, dependable, and sustainable to succeed. The industry must recognize the dangers, evaluate the risks they pose, and reduce the risks to acceptable levels. The Occupational Health and Safety National Institute (NIOSH). has developed a lifting equation that effectively lessens the impact of mental problem. To determine the level of risk associated with an action, a computation is performed using the data required by the equation and updated in the equation. If the weight index value is larger than 1, a considerable risk exists, according to the calculation. If the number is less than 1, the risk is modest, and it is obvious which course of action should be chosen. There are many variables that affect a load index value that can be modified to lessen the risk. The person's working posture, turning angle, frequency and duration of employment, working environment, and workplace, among other factors. The aforementioned factors have undergone some adjustment. Additionally, the risk listed on the MSDS is significantly decreased.

Keywords: NAICS, NORA, YRC, RWL.

I. INTRODUCTION

Physical factors known as ergonomic hazards might put workers at risk of musculoskeletal injuries. Awkward postures, immobile postures, high forces, recurrent movements, or brief breaks between activities are examples of ergonomic risks. When several conditions are present, the chance of harm is frequently increased. Negative interactions with the user or worker can be attributed to elements like whole-body vibration or hand/arm vibration, bad lighting, and inadequately constructed tools, equipment, or workstations.

Injury-prone body parts include, but aren't restricted to, the following: Repetitive strain injuries, which can occur in various areas of the body as well as others, can lead to musculoskeletal disorders, which are thought to be responsible for around one-third of all non-fatal injuries, diseases, and expenses. Both occupational and non-occupational contexts, such as workshops, construction sites, offices, homes, schools, or public spaces and facilities, might have ergonomic risks. Injury risk can be decreased by finding solutions to eliminate or lessen ergonomic risks in any environment. NORA Agenda for National Occupational Research NORA is a collaborative initiative to promote original research and enhance workplace procedures. Manufacturing

The Japanese company Yokohama Rubber co. Ltd. has a division called Yokohama. The division oversees the off-highway tyres business on behalf of a group of YRC wholly owned subsidiary companies. With its main brands Alliance, Galaxy, and Primex, YOHT manages the full spectrum of duties associated with designing, developing, producing, marketing, and distributing these specialized tyres in nearly 120 countries across the world.

II. EXISTING SYSTEM

Mohd Kamal Bahardin (2018): The machinery and procedure, which were created and passed down from Malaysia's specialty tyre create in the early years of independence, still rely largely on semi-automated technology and require a labor-intensive production process. One of the procedures that is most tightly linked with conventional tyre manufacturing processes is the creation of off-the-road, or OTR, tyres utilizing the OTR Tyre Building Machine.

JOHN POLAND (2018): Introduction One of the risk factors for musculoskeletal problems is manual material handling. The purpose of this study was to compare the MAC approach and the NIOSH equation to evaluate lifting activities. Techniques and Resources: The rubber business served as the setting for this cross-sectional investigation. The 136 male workers who participated in the study were chosen proportionally to size from different areas.

Carl Mikael Lind (2016): On the initiative of two multinational manufacturing businesses, a tool has been created to assist practitioners in evaluating manual pulling and pushing activities. The tool's purpose is to aid occupational health and safety professionals in their risk assessment or mitigation efforts of pulling and pushing operations in the manufacturing or logistics sectors.

III. PROPOSED SYSTEM

Recommended Weight limit (RWL):

The main outcome of the updated NIOSH lifting equation is the RWL. Healthy employees are those who don't have any underlying medical issues that can make them more susceptible to musculoskeletal injuries.

Lifting Index (LI):

The word "LI" offers a relative assessment of the degree of physical stress connected to a certain manual lifting operation. The link between the weight of the load being lifted and the advised weight limit determines the estimated amount of physical stress.

Terminology and Data Definitions:

The list of succinct definitions afterwards is helpful when using the updated NIOSH lifting equation. Refer to the specific sections where each of these concepts is explored for more in-depth definitions.

The Equation and Its Function:

The revised lifting equation for calculating the Recommended Weight Limit is based on a multiplicative model that provides a weighting for each of six task variables. The weightings are expressed as coefficients that serve to decrease the load weight to be lifted under ideal conditions.

Definition and Measurement

The mid-point of the line connecting the inner ankle bones, known as Horizontal Location (H), is measured. This point is projected onto the floor precisely below the mid-point of the hand grasps, which is determined by the large middle knuckle of the hand.

Horizontal Restrictions

H is set to 10 inches if the horizontal distance is smaller than that. The majority of objects that are closer than 10 inches from the ankles cannot be lifted without causing interference from the abdomen or overextending the shoulders, even though they can be carried or held closer than this distance.

Frequency Multiplier

The average number of lifts per minute (F), the vertical position of the hands at the origin (V), and the length of continuous lifting all affect the FM value. Set the frequency to .2 lifts/minute for lifting tasks that need fewer than .2 lifts per minute. However, the recovery time will typically be enough to use the 1-hour time category for infrequent lifting.

Definition & Measurement

The type of coupling between the hands and the object, or gripping technique, can influence both the maximum force that an employee can or must apply to the object and the vertical position of the hands during the lift.

IV. TESTING AND VERIFICATION RESULTS

Based on the operator work mentioned above, the following information is gathered and used with the NIOSH Equation:

Operator Feedback:

When opposed to b and c shifts, the worker in a shift does their job less frequently. As a result, they have reduced stress and back pain. Due to the repetitive action of the work, the Operator may incur back pain, weariness, and possible bone and muscle injury. to get rid of it.

The operator is experiencing fewer MSD illnesses as a result of this project. after conducting a thorough analysis for this project. Because this works in two out of six mixtures, it can be applied to all mixtures. This has positive effects. So, a suggestion is made to incorporate it into the entire composition.

RESULT OF THE NIOSH EQUATION



Figure: Operator bent and lift the rubber from the storage box



Figure: Operator again bent to drop the lifted rubber to drop into conveyor

AFTER IMPLEMENTATION OF VACUUM LIFTER



Figure: Operator lifting the rubber with the help of vacuum lifter

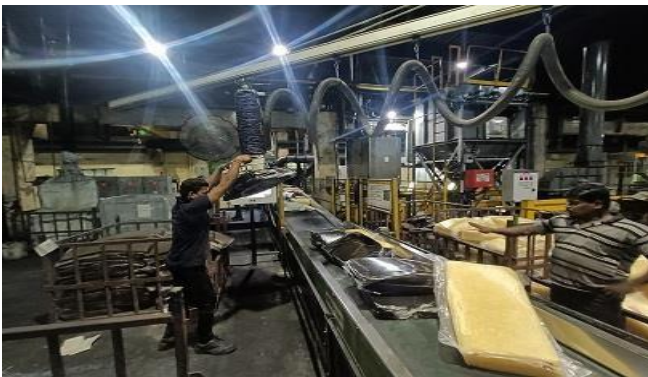


Figure: Operator transfer of weight from box to conveyor



Figure: Placing of the rubber in the conveyor for the mixing process

V. CONCLUSION

In order to use the NIOSH equation, this project extensively examine dan extensive examination of the workplace in the tyre industry in several sections, such as the mixing, curing, and warehouse. Due to limitations in the equation, the mixing area is an ideal spot for its application. where material is manually put into the mixing chamber from the conveyor belt. Here, the equation enables the worker to complete the task quickly and simply, without exerting much effort. The workplace is modified in some way to get what is needed. Vacuum suction cups are being added, and certain workplace changes are also being made. This initiative assists in lowering the worker's MSD hazards. And the employee is capable.

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