

Analysis and Investigation of Safety Environment for CDC Operators

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ABSTRACT: Work-related in safety incidents continue to be a critical societal problem. Despite continued efforts, the industry has not seen any significant reduction in record-able injury rates in the last decade. An essential component in safety management is the identification of potential hazards to establish proactive physical or procedural controls that reduce safety risk exposure. Unfortunately, studies indicate that a large portion of hazards are not adequately identified or assessed, thus compromising worker safety. Operators equipment perform various duties at work that expose them to a variety of risk factors that may lead to health problems. This was followed by a computer-based augmented virtuality training environment. The results of this study can be used by safety practitioners to strategically identify potential hazard recognition programs to complement existing methods. Future studies will focus on validating findings through field-based empirical tests on active construction projects.

KEYWORDS: Centers for disease control safety, hazard recognition, hazard identification, hazard recognition, safety risk, safety and health training programs.

I. INTRODUCTION

This study is all about understanding how the anthropometric factors affect performance in a human-CNC machine interface environment. Historical evidences suggest that many of the injuries in manufacturing are musculoskeletal disorders caused by cumulative trauma. Operate and maintain various machines such as CNC Lathe and the following manual drill presses, engine lathes, and milling machines. Position may also serve as back up for Lead CNC Machine Operator. It is estimated that over five million workers sustain overextension injuries per CNC machines and their interfaces. Workstation's ergonomic design is dependent on considering the nature of tasks to be completed, the preferred posture of the operator and the dynamics of the surrounding environment. With the accelerated pace of installation of computerized machine tools and use of human machine interaction systems, the role of ergonomists in automated industries have become crucial

II. METHODS

a) Problem Statement

As evident from preceding discussion, the effects of anthropometric considerations like machine panel height, panel angle and working distance on human performance particularly in the context of human-CNC machine interface (HCMI) are still not fully understood and thus, there exists a wide scope to investigate these effects. Accordingly, the problem for the present work was formulated. There has been a rapid growth in the use of CNC machines. These machines have entered virtually every area of our life and work environments. With the CNC machine applications getting more widespread at the global level, the musculoskeletal problems associated with these

machines have also been generating more concern. The automated technologies are getting much more popular day by day

b) Incident

Soon after the victim started the cnc lathe, the bar stock extending out the spindle bent to about an 80 degree angle (photo 3). The location of the bend in the stock was close to the center of the bar and adjacent to the sleeve bearing used to stabilize the spinning piece of stock. The bend caused approximately 3 feet of the bar stock to rotate outward from the lathe and perpendicular to the section of stock being machined, similar to a propeller

c) Acknowledgements

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- Washington State Division of Occupation Safety and Health (DOSH).
- National Institute for Occupational Safety and Health (NIOSH) FACE Program.
- Safety & Health Assessment & Research for Prevention (SHARP).
- Washington State Attorney General's Office.

1. Spot the hazard A hazard is anything that could hurt you or someone else, is unsafe, or could cause an accident. Use all your senses to spot hazards – look around, listen, notice any strange smells (like smoke or chemicals) and use your knowledge about things that might be dangerous.

2. Assess the risk Work out how likely is it that the hazard will hurt someone, and how badly they could be hurt. Always tell someone about hazards you can't fix yourself, and remember it is more urgent to make the changes if the hazard is likely to cause serious injury.

3. Minimize the risk Fix the hazard yourself if you can, or tell someone who is able to fix it. The best way to fix the hazard is to get rid of it, but as this is not always possible there are some ways you can make the hazard less dangerous:

Dispute

Designing human-machine interfaces that respect the ergonomic norms and following rigorous approaches constitute a major concern for automated systems designers. The increased need on easily accessible and usable interfaces leads researchers in this domain to create methods and models that make it possible to evaluate these interfaces in terms of utility and usability.

It is essential from the ergonomic point of view that the work place design of a CNC machine environment be compatible with the biological and psychological characteristics of the operators. The effectiveness of the human-CNC machine combination can be greatly enhanced by treating the operator and the CNC machine as a unified system. When the CNC operator is viewed as one component of a HCMI system, the human characteristics pertinent to the ergonomic design are physical dimensions, capabilities for data sensing, for data processing, for learning etc. Quantitative information about these human characteristics must be co-ordinate with the data on CNC machine design of the CNC machine interface environment

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This was accomplished by separating the total variability of the grey relational grades, which was determined by sum of the square deviations from the total mean of the grey interaction was ignored in the analysis of variance

The employer was aware of the hazards associated with having unsupported bar stock extended past the spindle but had no written safety policies or procedures* to address or control the hazard until after the incident. The employer also reported that the victim was verbally corrected at least two times for setting up the HAAS TL-3W lathe with bar stock extended past the spindle.

Safety policies and procedures are the basis of a safe workplace and should be created and documented before starting work on a new or existing job/task. The employer should perform or have a designated safety person perform

a hazard analysis on all machine and task combinations. The hazard analysis should be used to identify and characterize the hazards as well as develop and document methods to control the hazards.

Safety plans should include enforcement policies and be updated before a new job or machine becomes part of the company's work practices. Employers should also periodically review their safety plans to ensure that they effective in controlling hazards.

III. LATHE

The employer referred to the lathe as a "tool room model." A tool room lathe is considered a top of the line center lathe and is most often used by general machinists who manufacture smaller batches of a product from metal or other man made materials. The TL-3W lathe is 132 inches long and 116 inches high. The lathe operates at 360-480 volts, 20 amps, and has a maximum cut diameter of 30 inches and a maximum cut length of 60 inches.

The maximum rotational speed of the lathe is 1,800 revolutions per minute (RPM).[3] However, the employer limited the speed to 1,000 RPM. The employer manufactured a sleeve bearing system to help support materials that extended into or through the spindle (photo 3). According to a HAAS representative, sleeve bearings like this are commonly used and recommended by the manufacturer to support material in the spindle but should not be used as the only support system for material extending past the spindle.

IV. PLINTHS HAZARDS

Before the session, change the picture in this slide to one of significant hazards in the participants' work area. Ask the participants to identify the hazards in each picture.

When the hazard has been identified work through the safe working behaviours and PPE required to reduce the hazard.

For example in the picture provided the hazard/s are:

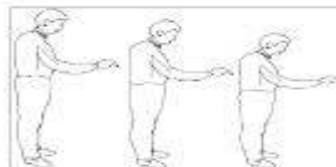
- Noise
- Sparks

The safe working behaviours are:

- Working behind welding screens
- Tips for removing photographs and inserting new ones are included in the trainer's guide

Specific safety precautions in operating cnc machines.

The precautions outlined here assume that the operator/student has received appropriate instructions and demonstrations on how to safely program, set up and operate a HAAS computer numerically controlled (CNC) machine tool. Since CNC equipment follows only programmed instructions, these safety instructions must be adhered to when operating any such machine in the Manufacturing Systems lab





V. CONCLUSION

Injuries sustained during cnc operations were analyzed in order to identify priorities for further investigation and potential injury prevention strategies. Injury records with accident type classified as “struck against moving object” and accident injury illness classified as “slip or fall of person (from an elevation or on the same level)” accounted for a large proportion (70%) of the total injuries recorded between 2017

For the “struck against moving object” injuries, the majority occurred while the operator was driving the haul truck and the majority of operators sustained back injuries. Further investigation showed the impact to the haul truck was primarily vertical jarring while driving in the forward direction, thus causing jolting and jarring to the operator. The primary factor contributing to these vertical jarring events were hidden voids (e.g., potholes) that were noted on the haul roads. Driving in the backward direction, however, resulted in different outcomes. A large number of injuries resulted in haul truck rollovers, failovers, or falling into hidden voids.

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