Machine-Machinery and Workplace Safety

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Abstract— The profound need of knowledge derived technology from various fields into machinery design has been achieving in this modern day technology. Technical issues and economical issues with ergonomic disciplines are become equal important in present time, the fact found from this is, regardless enhancing technology in machinery advancement but there is a necessity to ensure the safety of the operator along with the machine and machinery, new principals which are already involved in the design of machinery have been introduced to fulfil the requirement of operator along with machine and machinery safety. This has to be done in almost every case for the concern of safety in new materials and manufacturing techniques. More than this these machines should be designed of like this way that they can be exploited up to a highest point we could say they should be designed in such way that can exploited again and again. Machine safety should be assured in such way regardless of giving any disturbances in the work environment (example: Humidity affect, temperature changes in the environment, chemical factor influence etc). The safety value for any company and machines relies on machinating physique of the operator and the matching the machine obligations .Hence the machinery safety is risk based and it depends on the level of indication which provide awareness about the safety precaution required. To deal with this machinery safety meant to add up the design flaws, manufacturing flaws and the way they are used.

Keywords: Machinery Design, Machinery Safety, Manufacturing Techniques

I. INTRODUCTION

At the time of adjusting a conveyor belt, a worker was drawn into the unguarded tail drive of a belt conveyor and gone through fatal crushing injuries. A machine called guillotine shear cycles unexpectedly when a young worker was feeding sheet rubber into it; as a result the worker lost both hands. A worker strangled onto a lumber pile sorting table while cleaning up for his loose clothing caught into the keyway which is exposed at the end of the slow rotating shaft.

These above mentioned three cases are the perfect example of serious injury or death resulting from unguarded and inadequate safeguard of machinery and equipment in industries like those who use powered equipment or automatic machines. Every year, physical contact with machinery and powered equipments causes significant number of life threatening injuries that includes of amputations and disfigurement, and may can cause death of the worker

This maximum number of accidents can be prevented by effective good guarding of machine, by obtaining LOTO procedures and supervision and training. So the big question is why safeguarding of machines and machineries is important? At times it is nearly impossible to predict what people do while using powered machinery? Here it doesn't matter their level of experience and training. Human errors and lapses in judgment, accidentally coming in contact with machines and moving parts always can be avoided by effective safeguarding.

A. Objective of the paper:

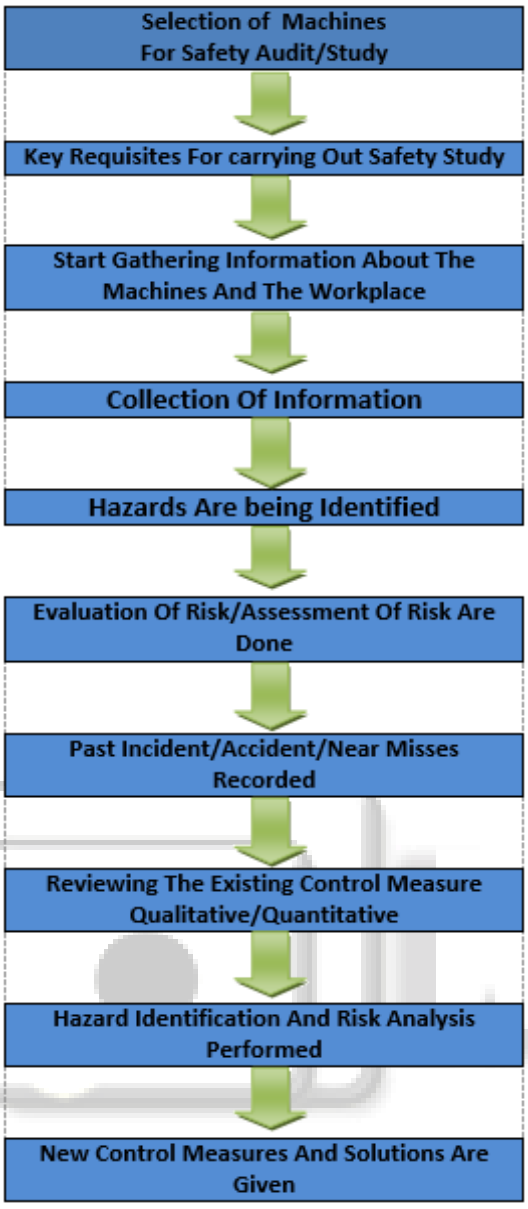
- Why safety is important for a human life.
- To conduct the mock drills
- Safety awareness to the employees and workers.
- Consequences of bad material handling.
- Hazards identification and risk assessment and control measure in the machining process.

II. EXISTING WORK

'Machinery design safety' research work was carried out for practical verification of machinery design safety take as a example lathes, milling and drilling machines etc with the help of existing law on that particular country, and the result of the study states that assure safe work process. Number of safe guarding of machines has been enlarged as in machine design safety is valuable aspect the motto was to establish proper law for machinery design and proper eye on the processes as per the Directives enforced in Polish law by Regulation of Ministry of Economy on fundamental requirements for machinery and Regulation of Ministry of Economy, Labour and Social Politics on minimal requirements for machinery the Investigation concerning design safety was carried out, similarly different approaches for work place safety and machinery safety for safe workplace has been carried out by different authors at different times.

III. IMPLEMENTATION AND RESULT

The survey or the observation and then implementation have been done by visiting various multi speciality workshops and spacenex aero pvt limited. A detail workplace safety at these places was studied thoroughly to complete this paper. The below written Methodology has been used to determine machinery safety and data's has been taken by visiting small scale workshops and industries.



IV. Agenda of the Paper

I worked with the workers working on CNC controlled lathe and milling machines in the different workshops there was computer numeric controlled milling and drilling machine and three automated laths were available for precision machining my observations and calculations were based whether the workers following safe wok practices or not in the different shifts, than to find hazards and possible hazards. To give control measures, doing risk assessment, evaluation of risk motivating the workers for using PPE'S and introducing pep talks, tool box talks spreading awareness about safety, information about emergency evacuation, why PPE is important, safety education is important , bad material handling how can affect and etc.

A. Hazards Found:

Some hazards found by the methodology i used in the area of my observation is listed below:

- Barricading absent in the machining area.
- SOP is not maintained.
- Improper material handling
- Evacuation road indications absent.
- Lack of first aid box
- No proper safe assembly point.
- Inadequate fire extinguishers.
- No eye washing station.
- No proper parking area mentioned.
- Lack of awareness about using PPE
- No labeling in the pipeline.
- Helmets are absent.
- Proper boards are not there in the storage area.
- Inadequate First-Aid Box.
- No marked place for logistics
- No evacuation routes in case of emergency.
- No awareness about workplace safety.

B. Hazard Identification and Risk Analysis:

Hazard Identification And Risk Analysis (HIRA) can be defined as collective term that comprises all the activities of involving hazard identification, evaluation , analysis of the risk in a process during the cycle, it comprises the evaluation risk to the employees, environment and how can be controlled with the organization risk tolerance.

V. Method

- Probability of Occurrence
- Know the Exposure Rate
- Severity
- Calculate RPN

A. RPN Formula:

severity*er*pr (* Denotes Multiplication)

1) Types of Controls and Their Effectiveness in HIRA:

Sl.No	Type Of Controls	Effectiveness
1.	Eliminate The Hazard Completely	100%
2.	Engineering Controls: Create a barrier between the person and the hazard.	40-99%
3.	Administrative Controls: by use & implementation of regulation, law, SOP/SMP, safety procedures, etc.	20-40%
4.	Provide personal protective equipment.	1-20%

2) Probability Factor:

Probability	Factor
Virtually Impossible(Once in Carrier)	0.2
Convincible but Impossible (once in 20 Years)	0.5
Improbable(Once in 10 years)	1
Unusual (once in 3 Years)	2
Possible (once in 6months)	4
To be expected(once in Week)	10

3) Exposure Factor:

Exposure	Factor
Very rarely(less than 1 per year)	0.5
Rarely (Few times per year)	1
Sometimes (12times/ year)	2
Now & Then(ONCE/week)	3

Frequently (daily)	7
Continuous (more than two times /day)	9

4) Severity Factor:

Severity	Factor
Normal	1
Minor	2
Major	4
Serious Irreversible effect	8
Critical	16
Disaster	40

5) Risk Score:

Risk Score	Interpretation	Priority
Less than 20	Very limited risk acceptable	4
20 to 70	Measures required	3
70 to 200	Immediate measures required	2
Greater than 200	Stop the work until measures are taken	1

6) HIRA Activities:

Activity	Hazard	Risk	P	E	S	RPN	Control Measures	P	E	S	RPN
General Main-tenance	Falling Objects	Possible fatality/severe bodily injury due to falling from height	3	.5	4	6	Ensure correct use of PPE including hard hat at all times of risk Ensure others working in area are aware of your presence	1	.5	1	0.5
Bad House keeping	Slips, Trips and Falls	Possible severe bodily injury	4	1	4	16	Ensure that access to and from site is gained via designated routes as advised in site induction. Ensure that all engineers wear suitable safety footwear at all times.	2	1	4	8
Packaging	Dust and Fibers from packing material	Possible inhalation/skin irritation from Blast tube insulation packing material	2	3	2	12	Ensure correct use of PPE. Availability of Material Safety Data Sheet.	1	2	2	4
Machining Operation	Hot Substances	Possible severe bodily injury due to burns to skin from rotating chucks/tool holder	2	1	2	5	Ensure correct of PPE for task. Ensure that all joints are checked for leaks before starting work.	1	1	1	1
At Emer-gency Situations	Fire Extinguisher access obstructed	Possible severe bodily injury-economic loss etc	4	2	4	32	Clear the Obstruction, make sure same does not happens any more	4	1	2	8
Machine Lubri-cation	Spillage	Falls, fires in some cases	2	4	2	16	Ensure very good housekeeping.	2	2	1	4
During Opera-tion	Machine Guarding	Amputations, stuck in the machine	2	1	1	2	Ensure machine guarding-and proper Standard operating procedure	1	1	1	1
Machine Opera-tion	Storage Pallets	Worker can fall in to the raw materials can cause severe injury	2	2	2	8	Ensure pallets has been placed for the raw material to be machined at the place of machining operation	.5	2	2	4.5

VI. CONCLUSION

Safety precautions to be taken while using machine and machineries at workplace is completed. The investigation results demonstrate an excellent study and auditing result to improve the quality of working and safety standard at workplace. This investigation demonstrate the condition of the industries now a days and their safety standard at workplace, this investigation gave a throughout result to improve the ergonomic safety at the company I visited and similar type of industries. Workplace safety is very much related with the man machine relationship and the machineries, so ensuring the safety of the machine and machineries is as important as anything. I carried out risk analysis, risk assessment for the company and provided

various checklists for them to keep in along with my review and recommendations and hence I am winding up here any further recommendations and work towards this is always welcomed and featured.

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