ISSN 2278-8808 SJIF 2014 = 4.889
An International Peer Reviewed & Referred
SCHOLARLY RESEARCH JOURNAL
FOR INTERDISCIPLINARY STUDIES

RISK ASSESSMENT OF MECHANICAL WORKSHOP

Roshan Ramkrushna Rajas

Kingdom of Bahrain

Abstract

The risk assessment was conducted for mechanical workshop of a selected vocational the institute from Bahrain(name of the institute is kept confidential).In risk assessment it was revealed that two of the lathe machines drive mechanism was exposed where operator's cloths, hair or jewellery could get entangled causing cut, bruise, fracture, amputation or fatality. Moreover, the report also suggests temporarily isolation of two unguarded lathe machine by lockout tag out to prevent an accident as deadlines of practical submission force trainees to bypass the safety procedures. Investment on making these two lathe machines ready for use will help mechanical department to reduce load on other lathe machines. All these measures can ensure a safe working environment that is without injuries or accidents in the mechanical workshop. The report makes an assessment of the context and proposes the financial commitment required by an the instituteto put in place the safety systems. Thereby, ultimately the institutecomplies with the Bahrain Labour law of safety and ILO standards.

Introduction:

Universities and colleges are meant to deliver education which is considered as a core objective of such institutions. Occupational health and safety (OHS) is linked with any employee in any organization including universities. There are cases of injuries and even deaths of students and instructors in universities.As per ILO Code of practices on Safety & Health regarding the use of machinery, employer should provide protection for risk arising from moving parts of the machine and therefore risk assessment can help to suggest appropriate control measures to avoid the risk of accident. The first step to protect trainees is being able to recognize hazards in the workshop. Methods used to identify hazard in mechanical workshop are by conducting survey, interviewing trainees and trainer, analysing previous incident and accident records.

Following are the different types of hazards found in mechanical workshop with their implications

Hazard Identification

The first step to protecting trainees is being able to recognize hazards in the workshop they are working in. I have divided these hazards into Physical hazards and Health & welfare hazards.

Physical hazards:

Physical hazards are the most common and present in most places in workshop at one time or another. They include unsafe conditions that can cause injury, illness and death. They are typically easiest to spot but, sadly, too often overlooked because of familiarity, lack of knowledge, resistance to spending time or money to make necessary improvements. None of these are acceptable reasons for trainees to be exposed to physical hazards.

Following are the physical hazards I spotted in mechanical workshop:

1. Oil spillage around oil storage area in workshop may cause slipping hazard.
2. Trailing electrical cords running across the floor may cause tripping hazard.
3. Hair or cloth entanglement with lathe machine.
4. Trapping in between the wall & milling machine.
5. Ejection of metal particle from lathe machine and drill machine.
6. Abrasion or friction from lathe machine.
7. Power Saw machine without guards can give cut and eject metal particles.
8. Trainee may fall or trip from broken pallets stand.
9. The trainee may get electrocuted from faulty or ungrounded electrical components.
10. The welding arc creates extreme temperatures and may pose a significant fire hazard.
11. Trainees may get skin Burn from hot electrode used in welding process.

Health and Welfare hazards:

Trainees operating and maintaining machines can suffer adverse effects other than physical injury caused by moving parts. They are also exposed to hazards through inhalation, ingestion, skin contact, or absorption through skin. For example, without adequate safeguards, control measures, and personal protective equipment, a worker may be at risk of occupational disease resulting from exposure to: Toxic or corrosive chemicals, dust, noise, fumes.

Following are the health and welfare hazards I spotted in mechanical workshop:

1. Frequent Lifting and stacking of iron rods and cabinets manually can cause musculoskeletal disorder to trainees.

2. Dust in the workshop can be harm full for trainee's lungs.
3. Frequent contact with oil while working on lathe machine may cause dermatitis to trainees.
4. Deadlines of project completion can pose stress (psycho-social) for the trainees.
5. Constant loud noise from lathe, grinding, drill, power saw machines can have adverse auditory & non auditory effects on trainees.
6. Vibration hazard while sharpening of tools on grinder machine.
7. Welding fumes and gases can be hazardous to health.
8. Uncomfortable ambient temperature inside the workshop.
9. Insufficient space between machines in the workshops can create difficulty while emergency evacuation.
10. Inadequate air ventilation inside workshop.
11. Non availability of cloak room to hang clothing's used in workshop.

Statement of research argument:

As per Bahrain Labour law, Chapter 15, Occupational Safety and Health & Work Environment Article (166), as part of managing the health and safety of mechanical workshop, the instituteshould control the risks. To achieve this they need to think about what might cause harm to trainees and decide whether they are taking reasonable steps to prevent that harm. This is part of risk assessment and it is something the instituteis required by law to carry out. Therefore this report will find out "If the workshop and machines are well designed to protect users form health and safety hazards as most of the users are young and inexperienced."

Objectives of Research Article:

Following are the objectives of this research:

- Identify the hazards and assess the risk in the Mechanical workshop.
- Identify the existing safety arrangements in the Mechanical workshop
- Suggest the adequate control measures for the high priority hazards found in the Mechanical workshop

Risk Assessment:

The selected institutealready has taken a few steps to protect staff and trainees, however, this risk assessment would help to decide whether the institutehas covered all it needs to do. This reports attempts to examine how accidents and ill health could happen and concentrate on

high risks hazard found in workshop i.e. entanglement which is most likely and can cause the most harm.

Risk assessment of Entanglement

Machines in Mechanical workshop like lathe, grinder, drill and power saw are with different pinch points, nip point, crush points and wrap points created by exposed rotating components which are without guards. Therefore, it increases the probability to get entanglement of dress (Thobe or Abaya, the traditional and formal dress worn by male and female Arab trainees), long hairs and jewellery of trainees. These unguarded machines, pose immediate danger causing trainees losing a finger/arm or it can lead to fatality. Therefore it is required to assess risk from entanglement.

Methodology used:

The following tabular template (www.hse.gov.uk website) is used to present 5 steps of risk assessment of entanglement.

Following are the methods that are used to identify hazards in mechanical workshop:

- Inspecting the workshop and observing how practical tasks are performed.
- Conducting safety survey, consulting trainees, Trainers, Workshop assistant and Safety manager about any health and safety problems they have encountered while conducting practical's in workshop
- Analysing records of workshop accident, incidents, maintenance book, and trainees complaints in consultation with health and safety committee.
- Reviewing QAAC report and Occupational health and Safety committee report.

Risk Assessment

Division	:	Mechanical Division	Date of Assessment	:	06-11-2014
Date of review	:	06-01-2015	Assessor:	:	---------
Name of Activity	:	Operation of Lathe machine.			

#	Hazards	Possible consequence	Who might be harmed and how	Existing Control Measures	Risk level	Recommended control measures	Action by whom?	Action by when?
1.	Exposed drive mechanisms (pulley, belts and gears of lathe are	While operating lathe machine operator's cloths, hair or jewellery can get entangled in unguarded pulleys, belts or gears resulting into cut,	Trainees, Trainers, workshop assistants and Cleaners cloths, hair or jewellery can get entangled in operation or	Trainees are supervised by a trainer and workshop assistant while operating two unguarded lathe machines	High	Two of the lathe machines which are unguarded should be locked and tagged with "DO NOT	Trainer and Workshop assistant	Immedi-ately

	exposed)	bruise, fracture, amputation or fatality.	maintenance of lathe machine.			OPERATE" sign. Fix guard should be install to cover the exposed drive mechanisms at front and back of the lathe.	Maintenance Manager	31-12-2015
2.	Lathe controls can only be reached by passing hand through working zone of Lathe	Operator's cloths, hair or jewellery can get entangled in unguarded drive mechanisms, chuck, chuck assembly or work piece when the lathe is in operation resulting into cut, bruise, fracture, amputation or fatality.	Trainees, Trainers, workshop assistant and Cleaners cloths, hair or jewellery can get entangled in operation or maintenance of lathe machine.	trainees are supervised by a trainer or workshop assistant while operating two of the unguarded lathe machines	High	Ensure controls are within easy access of operator and away from working zone. Remote control engine shut-off can be installed.	Trainer and Workshop assistant	Immedi-ately
3.	Exposed chuck	Operator's cloths, hair or jewellery can get entangled on uneven surface of chuck or work piece when spinning resulting into cut, bruise, fracture, amputation or fatality.	Trainee, trainer, workshop assistant and Cleaners cloths, hair or jewellery can get entangled in operation or maintenance of lathe machine.	None	High	Interlocking guard should be installed. Trainer must ensure guarding does not stop operator using the lathe in a safe manner or block the view of the task. Where multiple chucks are used, guarding should cover the swing of the lathe, not the size of a chuck.	Trainers, Head of the Mechanical department	Immedi-ately
4.	Oversized work piece in self-centring chuck	Chuck jaws in full extension to allow for oversized work pieces can be propelled from the lathe when	Trainee, trainer, workshop assistant and Cleaners cloths, hair or jewellery can get entangled	None	Medium	Use of appropriate-sized chuck for turning work piece.	Trainer and Workshop assistant	Immedi-ately

	(three-jaw chuck)	operated or become a point of entanglement due to extended parts sticking out, resulting into cut, bruise, fracture, amputation or fatality.	in operation or maintenance of lathe machine.					
5.	Exposed lead and feed screws	Operator's cloths, hair or jewellery can get entangled in exposed lead and feed screws when the lathe is in operation, resulting into cut, bruise, fracture, amputation or fatality.	Trainee, trainer, workshop assistant and Cleaners cloths, hair or jewellery can get entangled in operation or maintenance of lathe machine.	All trainees are supervised by a trainer and workshop assistant.	Medium	Where appropriate, ensure lead and feed screws are fix guarded	Trainer and Workshop assistant	Immedi-ately
6.	Unguarded protrusions on the work piece	Operator's cloths, hair or jewellery can get entangled on protrusions on the work piece being turned, resulting into cut, bruise, fracture, amputation or fatality.	Trainee, trainer, workshop assistant and Cleaners cloths, hair or jewellery can get entangled in operation or maintenance of lathe machine.	None	Medium	Where possible, ensure the area of the working zone where access is not necessary is guarded	Trainer and Workshop assistant	Immedi-ately
7.	Machining process produces continuous or unravelled cuttings	Operator's cloths, hair or jewellery can get entangled in turning cuttings, resulting into cut, bruise, fracture, amputation or fatality.	Trainee, trainer, workshop assistant and Cleaners cloths, hair or jewellery can get entangled in operation or maintenance of lathe machine.	None	Medium	Consider appropriate cutting speeds, feed rate and chip thickness during task planning. Use lathe tools with chip breakers of the gullet or step type.	Trainer and Workshop assistant	Immedi-ately
8.	Incorrect methods used for polishing Work pieces with	Operator's cloths, hair or jewellery can get entangled in the lathe, resulting into cut, bruise, fracture, amputation or	Trainee, trainer, workshop assistant and Cleaners cloths, hair or jewellery can get entangled in operation or	Safe operating procedures are displayed at the lathe. All trainees are	Medium	Ensure emery cloth is applied using backing board or good quality wood tool post . Hold emery	Trainer and Workshop assistant	Immedi-ately

	emery cloth	fatality.	maintenance of lathe machine.	supervised by a trainer and workshop assistant.		cloth only by ends, never to be used to wrap around hands or all the way around the work piece. Ensure speeds (RPM) are not excessive.		
9.	Loose clothing, cuffed or rolled back sleeves, neckties, jewellery (including watches) and long hair	Loose clothing, accessories and hair can become entangled in moving parts of the lathe, chuck assembly or work piece, resulting into cut, bruise, fracture, amputation or fatality.	Trainee, trainer, workshop assistant and Cleaners cloths, hair or jewellery can get entangled in operation or maintenance of lathe machine.	Safe operating procedures are displayed at the lathe. All trainees are supervised by a trainer and workshop assistant.	High	Ensure close-fitting (cover all) clothing with no catch points is worn by operator. Ensure jewellery (including watches, rings, bracelets, chains, etc) is removed before operating the lathe. Ensure long hair is tied back (by tie or hairnet).	Trainer and Workshop assistant	Immedi-ately
10.	Inappropriate type and position of lighting	Operator's cloths, hair or jewellery can get entangled in the lathe, resulting into cut, bruise, fracture, amputation or fatality	Trainee, trainer, workshop assistant and Cleaners cloths, hair or jewellery can get entangled as flashing effect of fluorescent light can make a spinning lathe appear to have stopped. This can lead to operator' entanglement.	Safe operating procedures are displayed at the lathe.	Medium	Workstations should be lit with lights that do not produce a flashing effect (e.g. incandescent lights). Lighting should not be positioned where it can be damaged. If damage is a risk, lighting should be protected.	Trainer and Workshop assistant	Immedi-ately
11.	Untidy	Operator can slip or	Trainees,	None	Medi	Ensure liquids	Trainer and	Immed

	and unorganised working environment	trip on cutting oils, swarf or cuttings that are not cleaned from the floor. Operator can also trip over lathe parts or work pieces that are not returned to storage areas.	Trainers, Workshop assistants and Cleaners cloths, hair or jewellery can get entangled in operation or maintenance of lathe machine.		um	and cuttings are cleaned from the floor as soon as possible after they spill or are produced. Ensure lathe parts and workpieces are returned to storage areas when they are no longer being used	Workshop assistant	i-ately
12.	Poorly trained and supervised trainees machining on the lathe	Inexperienced operator's cloths, hair or jewellery can get entangled in the lathe, resulting into cut, bruise, fracture, amputation or fatality.	Trainees who are inexperienced, lack training or adequate supervision are at risk of injuring themselves and others by becoming entangled in moving parts of the lathe or using poorly fitted chucks and work pieces that can become projectiles, resulting into cut, bruise and fracture.	All trainees are supervised by a trainer and workshop assistant. Safe operating procedures are displayed at the lathe.	Medium	Ensure all trainees are appropriately trained and competent before beginning work on the lathe.	Head of the mechanical department, Safety Manager	31-12-2015
13.	Lack of power isolation switch that can be locked out	Operator can get entangled in the lathe resulting into cut, bruise, fracture, amputation or fatality	Trainee, trainer, workshop assistant and Cleaners cloths, hair or jewellery in lathe can get entangled if it is accidentally activated during maintenance and repair activities,	None	Medium	Ensure a lockable isolation switch is present on the lathe. Remote control engine shut-off can be installed.	Trainer and Workshop assistant	Immedi-ately
14.	Wearing gloves while using the lathe	While using or cleaning the lathe, gloves can get caught in moving parts, resulting into	During operation or maintenance of lathe machine trainees, trainers, workshop	Safe operating procedures are displayed at the lathe. Trainees are	Medium	Ensure gloves are not worn when operating or cleaning the	Trainer and Workshop assistant	Immedi-ately

		cut, bruise, fracture amputation or fatality	assistants or cleaners gloves can get caught in moving parts.	provided with safety glasses.		lathe.		

Table No. 4: Risk Assessment Entanglement

Conclusion:

For risk assessment different hazards in mechanical workshop are identified by conducting survey, interviewing staff and trainees, analysing previous incident and accident records. After analysis of all identified hazards it was found that entanglement and noise are the most serious hazards, and therefore need to be control first. In risk assessment of entanglement hazards it was found that all machines present in mechanical workshop are having different pinch points, nip point, crush points and wrap points created by exposed rotating components. Two of the lathe machines drive mechanism was exposed where operator's cloths, hair or jewellery could get entangled in pulleys, belts or gears causing cut, bruise, fracture, amputation or fatality. The deadlines of practical assignment submissions lead trainees to bypass the safety procedures, which lead to accidents.

Recommendation:

The recommendation with highest priority of this research paper is to isolate the two of the lathe machines with exposed pulley, belt and gear by locking the switch and tagging with "DO NOT OPERATE" sign because it is very risky to perform practical on these machine as probability of operator getting entangled with machine is very high. Till these machines get guarded trainees can use remaining 10 lathe machines to perform practical. By looking at the level risk from these unguarded machines and less time and almost no cost involved in implementation of this control will get management approval easily.

Bibliography

Health and Safety Executive (HSE), 1995. Health and Safety in Engineering Workshops (Guidance Booklets).Edition.HSE Books.

International Labour Office, 2013. Safety and Health in the Use of Machinery: ILO Code of Practice. Edition.International Labour Office.

International Labour Office, 2001. Ambient Factors in the Workplace (ILO Code of Practice).Edition. International Labour Office

ILO, 1984. Protection of workers against noise and vibration in the working environment. ILO Code of practice (ILO codes of practice). illustrated edition Edition. International Labour Office.

Health and Safety Executive, 2014. Risk Assessment: A Brief Guide to Controlling Risks in the Workplace (INDG). 4th Revised edition Edition. HSE Books