INVESTIGATION OF NOISE LEVELS AND RISK MANAGEMENT IN THE MACHINERY WORKSHOP AT UITM BUKIT BESI

Intan Nureleiza Fadhlina Kamaruddin[1], Shukriah Abdullah [2], Erny Mazlin Mohamad[1], Nurul Aliah Hassan[1], Yasmine Adlin Yusuf[1], Nurfarah Aliyah Nik Kamel[1]

[1] Faculty of Applied Sciences, Universiti Teknologi MARA Cawangan Terengganu Kampus Bukit Besi, 23200, Bukit Besi, Dungun, Terengganu, Malaysia

[2] School of Mechanical Engineering, college of engineering, Universiti Teknologi MARA, Bukit Besi, Terengganu

Corresponding Author: *nureleiza@uitm.edu.my*

ABSTRACT

A noise inspection was conducted at the Machinery Workshop of UiTM Bukit Besi to evaluate noise levels and associated health risks. The study identified various noise sources and categorized them into four zones: above 115 decibel(A), 86-114 decibel(A), 82-85 decibel(A), and below 82 decibel(A). Noise measurements were taken using sound level meter applications and mapping techniques. Results showed some machines, particularly the Metal Lathe Machine and Hydraulic Shearing Machine, produced noise levels exceeding 85 decibel(A), posing significant risks of hearing damage. The inspection followed guidelines from the Occupational Safety and Health (Noise Exposure) Regulations 2019. Recommendations included implementing a hierarchy of control measures such as engineering controls, administrative controls, and personal protective equipment. The study highlighted the need for regular noise monitoring, employee education, and clearly marked hearing protection zones to mitigate noise-related health risks in the workshop. This assessment establishes baseline measurements for ongoing monitoring of noise levels and effectiveness of control measures in protecting worker health and safety in the machinery workshoporatory setting.

Keywords: Noise Hazards, Machinery, Noise Exposure, Noise Health Risks, Noise Levels, Noise Risk Assessment

1. INTRODUCTION

Noise is defined as sound that is unpleasant or loud, often interfering with communication and causing annoyance. It is a common by-product of machinery and manufacturing processes. Various machines in workshops, such as motors, generators, and cutting tools, generate significant noise. Specific activities like drilling, grinding, and milling contribute to high noise levels, which can exceed acceptable limits [1] In Malaysia, approximately 21.3% of workers in heavy machinery industries experience some form of hearing impairment, often caused by exposure to noise levels exceeding 85 dB(A), according to the Department of Occupational Safety and Health (DOSH).

The machinery workshop provides all engineering students with the practical training they seek. The workshop is equipped with all of the essential machines for conducting tensile and compression tests on metals and non-metals. Impact testing machines are used to determine the impact strength of material specimens. The tools and tasks in metal fabrication, such as hand drills, metal shears and milling machines are all tools that cut and shape metal often produce noise levels exceeding 85 decibelA [2], [3]. Workers in manufacturing are primarily exposed to non-steady noise, also referred to as complex noise. This type of noise is prevalent in industrial settings and poses a risk to hearing health [4]. Common sources of noise in this industry include angle grinders, metal presses, and welding activities, which can lead to harmful exposure levels [5]. However, the equipment workshop poses its own set of dangers and hazards to workers because of the nature of the atmosphere and the procedures involved, which require rigorous adherence to safety protocols.

Working in a machinery workshop exposes you to high levels of noise as well as a variety of complicated equipment and procedures. The cutting operation generates a loud noise, exposing workers to hazardous noise levels that might cause ear harm. The detrimental consequences associated with exposure to noise are inherently cumulative, often necessitating extensive periods—spanning months, years, or even decades—before they manifest. The extent of auditory dysfunction is influenced by both the intensity of noise exposure and the duration of such exposure [6]. Prolonged exposure to elevated levels of noise can lead to the onset of Noise-Induced Hearing Loss (NIHL) in addition to various other health-related issues, including cardiovascular diseases and psychological distress. Workers in industries such as manufacturing and construction exhibit heightened susceptibility to these hazards [1]. Instances of irreversible auditory dysfunction are frequently documented among industrial employees who are exposed to high levels of noise over extended timeframes. The World Health Organization has reported that occupational exposure to noise constitutes a significant proportion of deafness cases, particularly among male workers [5]. The World Health Organization emphasizes that noise-induced hearing loss represents a serious issue, characterized by its insidious onset and permanent, irreparable consequences. In developed countries, excessive noise exposure is responsible for auditory impairment in over one-third of the population, establishing it as the most widespread irreversible industrial affliction and the leading compensable occupational hazard [6]. Excessive exposure to noise can lead to a diverse array of adverse outcomes, including hearing loss, increased blood pressure, reduced performance, communication disruptions, sleep disturbances, cardiovascular and psycho-physiological effects, annoyance and stress, tinnitus, temporary shifts in auditory thresholds, as well as changes in social behavior [6].

Hearing loss is recognized as a significant public health issue worldwide, particularly occupational noise-induced deafness, which ranks as the second most common occupational disease in China, following pneumoconiosis. The prevalence of hearing loss among manufacturing workers is notably high at 21.3% [4].

In Malaysia, a high incidence of NIHL has been reported in manufacturing industries, with a notable number of cases occurring in specific states. The need for proper assessment and control of noise exposure in workplaces is emphasized, as many workers have reported hearing problems without adequate follow-up actions [5]. Furthermore, the apparatus and equipment within the workshop need frequent maintenance, repair, and operation, which increases the likelihood of an accident if safety precautions are not strictly observed. Workers in laboratories are at risk of being crushed, wounded, or shocked by electricity.

The intricate interplay of numerous systems and processes in the machinery workshop increases the potential of mishaps. Any deviation from approved safety protocols or equipment failure can lead to catastrophic that harm both personnel and students. The study's goal is to find appropriate risk management strategies and processes for equipment workshop personnel. It strives to decrease accidents, injuries, and fatalities while also fostering a safer working environment in the machinery workshop. Noise Risk Assessment is required by the Department of Occupational Safety and Health (DOSH) under the Occupational Safety and Health (Noise Exposure) Regulations 2019. Regulations 4 of the regulation requires noise risk assessment to be conducted upon the identification that any of the employees may be exposed to excessive noise in the place of work [6].

The main objective of this project is to conduct Noise Risk Assessment at Machinery Workshop at Inovasi Building. To achieve this overall objective, there are three specific subobjectives have been formulated:

i. To identify noise source at machinery workshop and to map the layout plan of the production area into 4 defined zones; more than 115 decibel(A), 86-114 decibel(A), 82-85 decibel(A) and area less than 82 decibel(A).
ii. To conduct area noise exposure monitoring for excessive noise in the place of work under the OSHA (Noise Exposure Regulations 2019).
iii. To recommend improvement of control measures

This noise inspection study at the UiTM Bukit Besi Machinery Workshop holds significant value for various stakeholders and contributes meaningfully to the body of knowledge in occupational health and safety. This study provides data measurements for noise levels in a machinery workshop setting, providing valuable data for future comparative studies for future OSHA compliance. For students, workers, and workshop personnel, it provides crucial insights into noise-related health risks, enabling better protection and compliance with safety regulations. The practical implementation of noise control measures in an educational machinery workshop setting, making it a valuable contribution to both academic research and student for practical in Industrial Hygiene and Occupational Safety field. By categorizing noise levels and proposing targeted control measures, the study enhances the understanding of occupational hazards in machinery workshops hence demonstrates the importance of integrating safety considerations based on Industrial Hygiene and Occupational Safety field and prepare for practical training.

2. MATERIALS AND METHODS

2.1 Identification of noise hazard

2.1.1 Interview and observation

This study's research methodologies included interviews and observations adopted from [6]. Three assistant engineers were questioned to assess physical hazards at UiTM Bukit Besi. These methods are part of primary research. All of the questions asked were based on ICOP 2019. Mr Mohd Haniff, Mr Tc. Mohd Fadeli and Mr Mohd Anas Asyraf, the assistant engineer of Machinery Workshop, was interviewed. All of them provided valuable information, in addition to employee and general data. The loudness in the Machinery Workshop has reached a level that makes UiTM workers and students uncomfortable. According to the observations obtained, noise is the most significant contributor to physical dangers at Machinery Workshop. Aside from that, vibration are among the hazard there. Figure 1 illustrates a Noise Hazard Identification Checklist utilized in the noise inspection of the Machinery Workshop at UiTM Bukit Besi. This checklist is a crucial part of the noise risk assessment process, as it helps to systematically identify potential noise hazards in the workshop environment. The form consists of ten hazard identification questions, each designed to evaluate specific noise-related risks. These questions are answered with a simple 'Yes' or 'No' response.

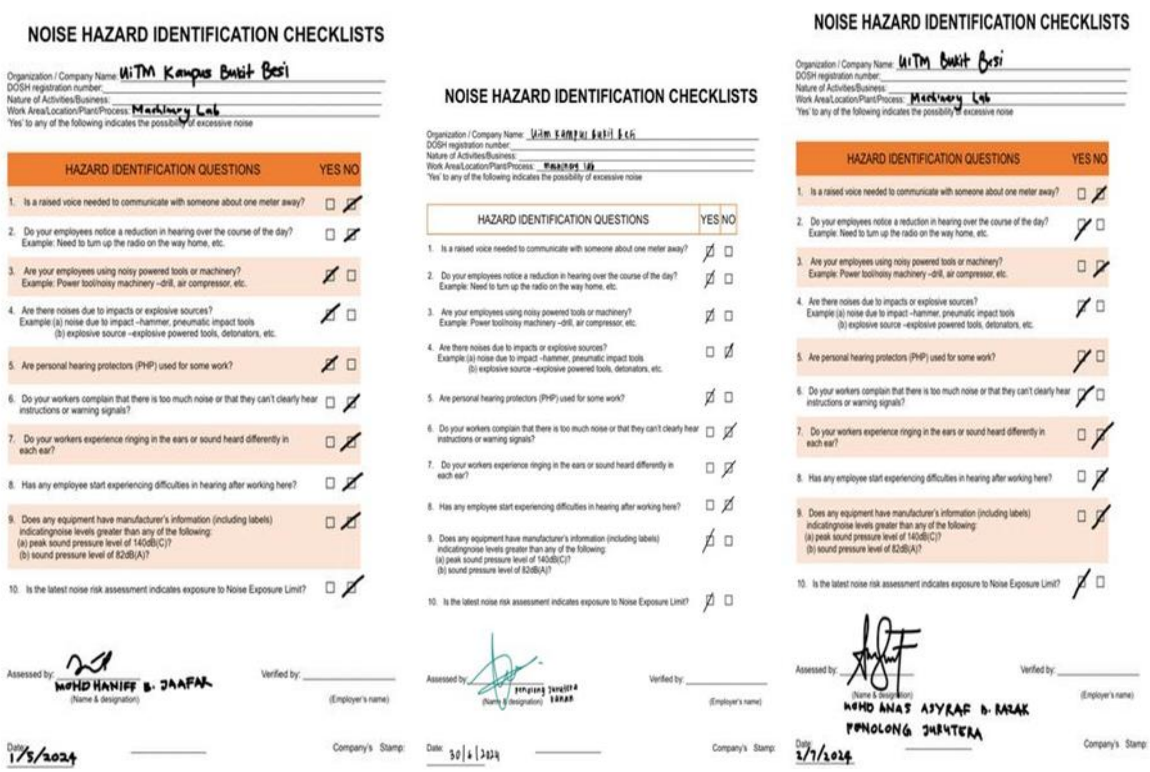
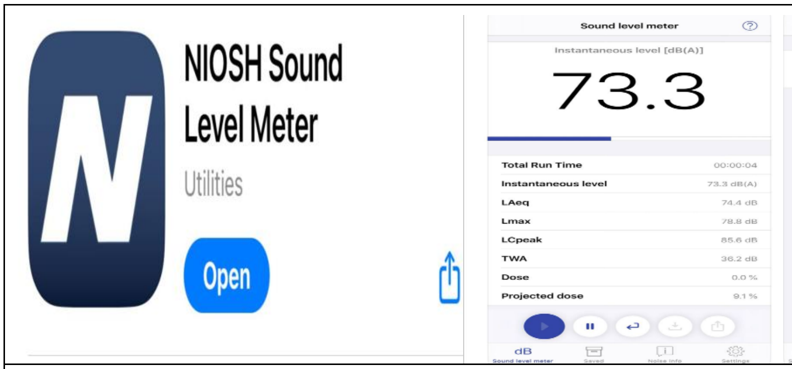


Figure 1: Noise Identification Checklists

2.1.2 Area noise monitoring

This research also includes area monitoring in order to identify potential noise sources and type of noise generated and employees who may be exposed to noise levels that can cause hearing impairments. First, Sound Level Meter applications and measuring tape were delivered and assembled in the machinery workshop for 7 machines (Plater roller machine, Bench drilling machine, Pedestal grinding machine, Bending machine, Metal lathe machine, Horizontal band saw and Hydraulics shearing machine). Noise mapping was accomplished using the

Machinery workshop layout. Next, source noise was measured. To measure source noise, all noise background sources were temporarily turned off. To proceed, stand around 1 meter away from the machine and at a height of 1 meter. The measurements were read and taken, and the average values were calculated and recorded. This action was repeated with another 5 machines. Figure 2 shows the equipment used during the noise area monitoring process, which includes the NIOSH Sound Level Meter application and a standard measuring tape. The NIOSH Sound Level Meter Application is a mobile tool developed by the National Institute for Occupational Safety and Health (NIOSH) that measures real-time noise levels in work environments. The application displays various key parameters such as the instantaneous sound level in decibels (dB), the average noise level over a period (L_{avg}), the equivalent continuous sound level (Leq), and peak noise levels. In this particular monitoring session, the recorded noise level is 73.3 dB, which is generally within a safe range for occupational exposure. Additionally, the measuring tape is used to ensure that all noise readings are taken from a consistent distance (usually 1 meter) from the machinery or noise source, adhering to standard noise measurement protocols.



NIOSH Sound Level Meter Application

Measuring Tape

Noise Mapping

Figure 2: Noise Area Monitoring Layout and Equipment

Figure 3 depicts the actual process of noise area monitoring within the machinery workshop. The images show personnel conducting measurements using the NIOSH Sound Level Meter application. They are positioned at various points around the workshop, near different machines, to collect accurate noise data. The layout of the workshop and the positioning of the machinery are visible, indicating that noise levels are being assessed across multiple locations to account for different noise sources. The images illustrate the careful measurement of noise levels to identify areas where noise may exceed permissible thresholds, with the goal of ensuring a safe work environment through noise control strategies.

Figure 3: Noise Area Monitoring

2.1.3 Noise mapping

Noise mapping is the research's final method. First, the precise noise zones were determined based on the mapping's goal and preliminary study. Then, a sketch of the Machinery lab was created, complete with the machinery arrangement and floor grid. The general region was then walked through using the Sound Level Meter app. Following that, the Sound Level Meter was held at a height of about 1 meter. Furthermore, the instrument's reaction was monitored for approximately 5 seconds for each measurement, and the suggested mean sound level value was computed before marking the spot on the sketch. The technique was done several times until a contour map was obtained. Thereafter, the noise zones were plotted by connecting the measurement points. Finally, the area has been colour-coded according to ICOP 2019.

The equivalent continuous sound pressure levels, Leq were then used to construct noise contour line of 85 decibel (A) indicating excessive noise areas. (Refer to bold zoning lines, where applicable). Reading was marked on the layout and the noise zone was differentiated as table 1 and 2 as below:

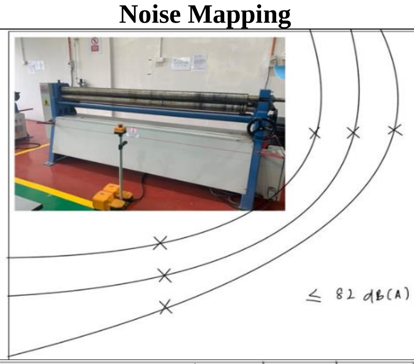
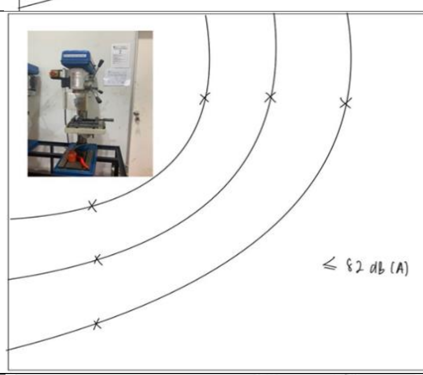
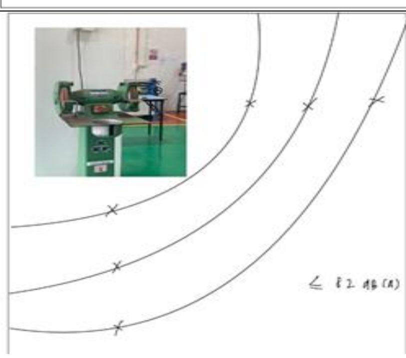
Table 1: Noise Zone

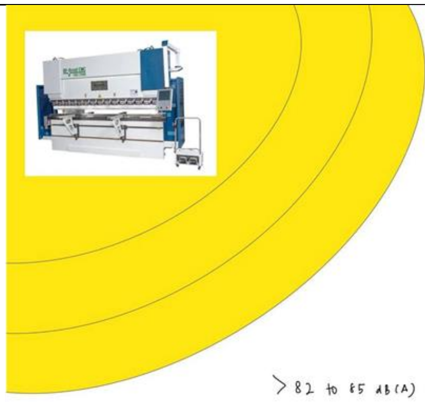
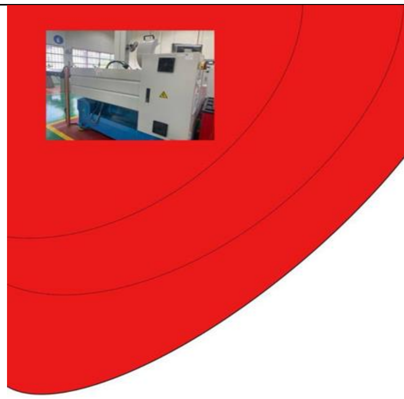
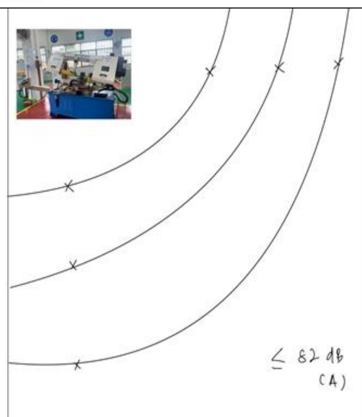
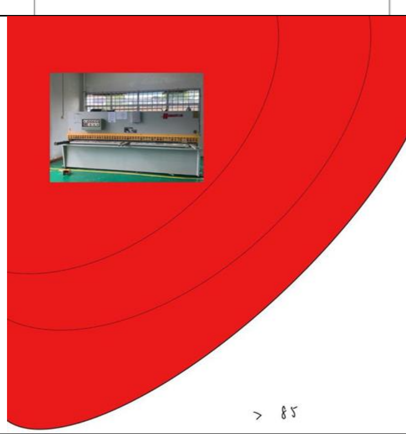
Sound Pressure Level	Colour Zone
> 140 decibel(C)	Purple
> 115 decibel(A)	
> 85 decibel(A) to 115 decibel(A)	Red
> 82 decibel(A) to 85 decibel(A)	Yellow
≤ 82 decibel(A)	White

Table 1 provides a classification of noise zones within the machinery workshop based on sound pressure levels, with each zone color-coded to indicate the severity of noise exposure. The highest noise zone, indicated in purple, represents areas where sound pressure exceeds 140 dB(C), which poses a significant risk of immediate hearing damage. The next level, where noise is above 115 dB(A), also indicates dangerous exposure levels that require immediate protective measures. The red zone, ranging from 85 to 115 dB(A), identifies areas where long-term exposure can lead to noise-induced hearing loss (NIHL), making it necessary for workers to use personal protective equipment (PPE) such as earplugs or earmuffs. In the yellow zone, with noise levels between 82 and 85 dB(A), there is still a moderate risk, and while the noise is lower, protective measures and monitoring are advised. Finally, the white zone, where noise levels are at or below 82 dB(A), is generally safe for extended exposure, though regular monitoring and maintenance should still be conducted to ensure noise levels remain within acceptable limits. This table helps identify and manage areas with varying noise risks, ensuring that appropriate safety measures are in place to protect workers' hearing.

Table 2, Noise Mapping provides a detailed visual representation of noise levels across different machines within the workshop, categorizing them based on their sound pressure levels. The table includes both noise mappings and the types of machines associated with each noise zone. The plate roller machine, bench drilling machine, and pedestal grinding machine all operate in noise zones with sound pressure levels at or below 82 decibels (A), which is generally considered safe for long-term exposure. These zones are mapped in grayscale, indicating minimal risk. In contrast, the bending machine operates within the yellow zone, where noise levels range from 82 to 85 decibels (A), suggesting a moderate risk that requires periodic monitoring and protective measures. The metal lathe machine and hydraulic shearing machine are mapped in the red zone, indicating noise levels between 85 and 115 decibels (A). These machines present a significant risk for hearing damage over time, and workers in these areas must use personal protective equipment (PPE) to mitigate noise exposure. The horizontal band saw operates in the safe zone with noise levels at or below 82 decibels (A). This table serves as a critical tool for understanding the distribution of noise hazards within the workshop and implementing appropriate noise control measures.

Table 2: Noise Mapping

Noise Mapping	**Type of Machine**
	Plate roller machine (⩽ 82 decibel(A))
	Bench drilling machine (⩽ 82 decibel (A))
	Pedestal grinding machine (⩽ 82 decibel (A))

	Bending machine (> 82decibel (A))
	Metal lathe machine (>85 to 115 decibel (A))
	Horizontal Band saw (≤ 82 decibel (A))
	Hydraulic shearing machines

2.2 Flowchart of inspection process

2.2.1 Before noise inspection

Figure 4: Flowchart before noise inspection illustrates the step-by-step process involved in obtaining approval and scheduling a noise inspection at the UiTM Bukit Besi Mechanical Lab. The process begins with the supervisor submitting an application letter requesting permission to access the machinery lab for the noise inspection. This letter is then approved by the assistant rector of UiTM Bukit Besi and subsequently handed to the student, granting them formal permission to proceed with the inspection. After receiving the approval, the student sets a date for the inspection and coordinates with the lab staff to ensure that the inspection can take place at the scheduled time. The student makes an appointment with the lab assistant to confirm the logistics and to secure the necessary equipment and space for the inspection. Once the arrangements are finalized, the student begins the noise inspection on the agreed-upon date.
This flowchart outlines a clear procedural framework, ensuring that the necessary administrative approvals are obtained, and that proper coordination occurs between the student and lab personnel before conducting the noise inspection.

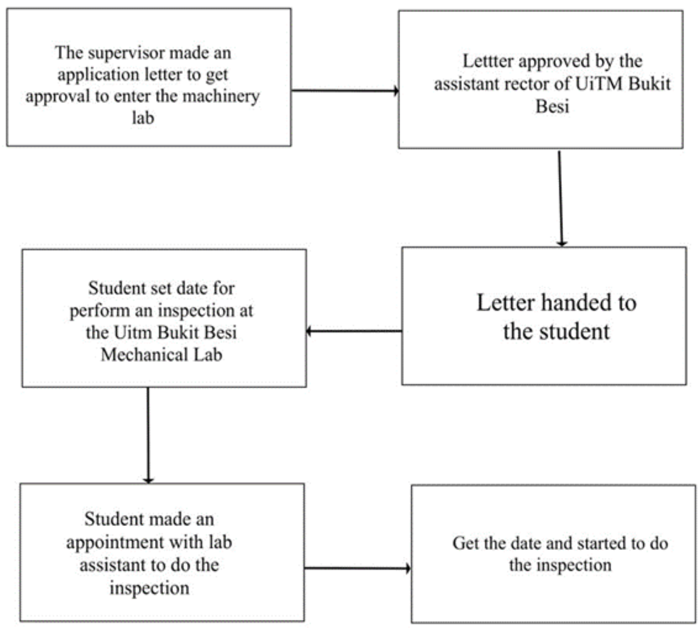


Figure 4: Flowchart before noise inspection

2.2.2 During noise inspection

Figure 5: Flowchart during noise inspection outlines the procedural steps followed during the actual noise inspection in the machinery lab. The process begins with the lab assistant explaining the do's and don'ts of the machinery lab to the student, ensuring that the student is aware of safety protocols and the proper procedures to follow during the insection. Once the safety instructions are understood, the student selects the machines that produce the loudest noise to begin the noise measurements. The next step involves taking noise readings at specific distances from the machines. The noise measurements are recorded every 1 meter away from the machine, and readings are taken three times from different angles to ensure accuracy and consistency in the data collection. After recording the noise levels from one machine, the student repeats the same process for six additional machines, continuing the noise measurement at each machine. After all measurements have been taken, the average noise level for each machine is calculated to provide a comprehensive assessment of the noise exposure. Finally, once all measurements and calculations have been completed, the noise inspection is considered settled, concluding the inspection process. This flowchart illustrates a systematic and methodical approach to conducting a noise inspection, ensuring thoroughness and accuracy in data collection.

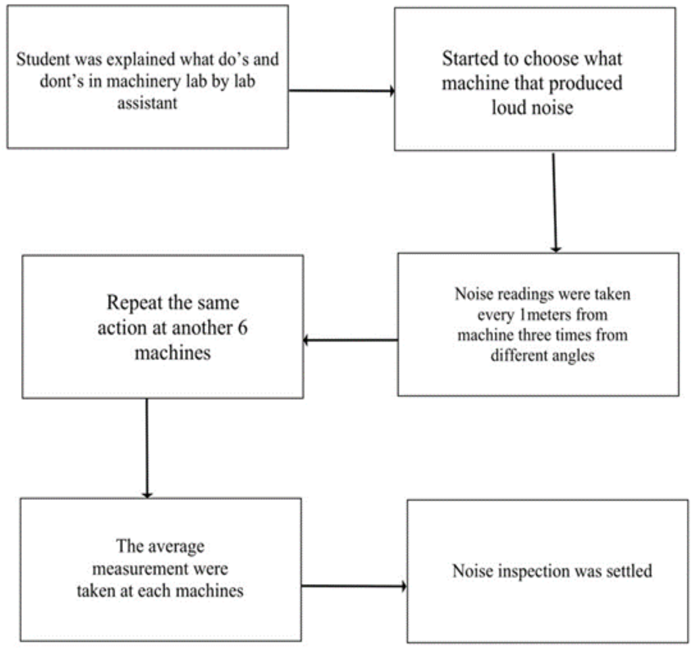


Figure 5: Flowchart during noise inspection

3. RESULTS AND DISCUSSION

3.1 Noise Risk Assessment

Based on Table 3, analysis of the noise risk assessment based on sound pressure levels and in accordance with the OSHA (Noise Exposure) Regulations 2019, reveals critical insights into the potential hazards and necessary control measures for various machines. The machines in the workplace were found to produce noise levels that fall into three categories: ≤ 82 decibel (A), > 82 to 85 decibel (A), and > 85 to 115 decibel (A). Machines such as the Plate Roller Machine, Bench Drilling Machine, Pedestal Grinding Machine, and Horizontal Band Saw operate within the ≤ 82 decibel (A) range, which is within acceptable limits and poses minimal risk of hearing damage [7]. The Bending Machine, operating in the > 82 to 85 decibel (A) range, presents a higher risk, especially with prolonged exposure. The most significant concern arises with the Metal Lathe Machine and Hydraulic Shearing Machine, which produce noise levels in the > 85 to 115 decibel (A) range, exceeding the permissible exposure limits and posing a substantial risk of hearing damage. According to [1] found that the lathe machine's noise levels varied depending on the type of operation performed. For instance, plain turning at 125rpm generated 81.7decibel, while boring at a lower speed produced only 73.6decibel. This suggests that operational parameters significantly influence noise emissions

Table 3: Result of Noise Risk Assessment (dB for decibel)

No.	Machine Name	Reading			Average	Type of Noise	Sound Pressure Level
		1	2	3			
1.	Plater roller machine	73.9 72.0 70.2	71.0 70.9 70.1	81.5 80.2 79.1	72.0 70.7 80.3	Steady Continuous	≤ 82 decibel (A)

2.	Bench drilling machine	69.9 68.3 67.1	76.2 73.5 72.9	79.7 77.3 76.0	68.4 74.2 77.7	Steady Intermittent	≤ 82 decibel (A)
3.	Pedestal grinding machine	78.7 77.3 76.2	67.1 66.3 65.6	83.3 81.6 79.1	77.4 66.3 81.3	Steady Continuous	≤ 82 decibel (A)
4.	Bending machine	76.1 73.9 72.9	75.0 74.6 73.2	85.9 83.5 82.9	74.3 74.7 84.1	Steady Continuous	> 82 to 85 decibel (A)
5.	Metal lathe machine	82.0 81.0 80.8	84.3 83.7 81.3	88.1 87.8 85.6	81.3 83.1 87.2	Steady Continuous	>85 to 115 decibel (A)
6.	Horizontal band saw	81.1 80.8 78.8	78.8 77.1 75.3	80.3 78.8 77.5	80.2 77.1 75.5	Steady Intermittent	≤ 82 decibel (A)
7.	Hydraulics shearing machine	81.0 74.2 73.1	80.3 79.6 78.1	88.1 87.3 85.5	76.1 79.3 86.9	Steady Continuous	>85 to 115 decibel (A)

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3.2 CONTROL MEASURES

According to WHO guidelines, noise levels should not exceed 85 dB(A) for an 8-hour work shift. The graph figure 6 above visually represents the noise levels measured across different machines in the workshop, compared to the WHO recommended limit of 85 dB(A) for an 8-hour work shift. Machines such as the Metal Lathe and Hydraulic Shearing Machine exceed this limit, with noise levels of 90 dB(A) and 88 dB(A) respectively, indicating a higher risk of hearing damage for prolonged exposure. These machines are marked in red to highlight the need for immediate protective measures, such as the mandatory use of hearing protection. On the other hand, machines like the Plate Roller, Bench Drilling Machine, and Pedestal Grinding Machine operate below the 85 dB(A) threshold and are marked in green, indicating they are within safer noise levels. However, regular monitoring is still recommended to ensure these levels remain safe over time**.**

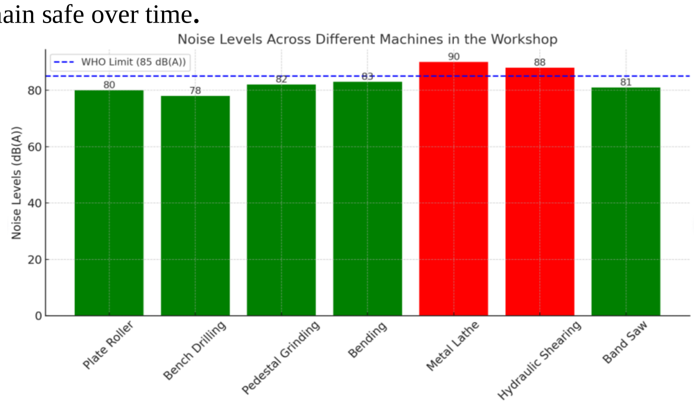

Figure 6: the noise levels measured across different machines in the workshop.

Based on the Table 4, implementing noise control measure is imperative ensuring a safer working environment for all employees involved in their operation [8]. To maintain safety for machines in the ≤ 82 decibel (A) range, the following control measures are essential:

i. Regular Noise Level Assessments: Continuous monitoring of noise levels ensures that any changes in machine performance or maintenance needs are promptly addressed.
ii. Consistent Maintenance: Regular servicing of machines helps to keep them operating efficiently and reduces the likelihood of increased noise levels due to wear and tear.
iii. Administrative Controls: Educating workers about hearing conservation practices is vital. This includes training on the importance of using personal protective equipment (PPE) and understanding the risks associated with noise exposure.

Table 4: Control Measures by Sound Pressure Levels

Noise Level	Control Measures
≤ 82 decibel (A)	- Regular monitoring and maintenance.
	- Administrative controls: worker education and safe practices.
	- Optional PPE for proactive protection.
> 82 to 85 decibel (A)	- Engineering controls: noise reduction materials, barriers.
	- Administrative controls: job rotation, exposure limits.
	- Mandatory PPE: earplugs, earmuffs.
	- Clear signage for hearing protection requirements.
> 85 to 115 decibel (A)	- Elimination/substitution: replace noisy equipment.
	- Engineering controls: soundproof enclosures, vibration isolation.
	- Strict administrative controls: exposure time limits, hearing conservation programs.
	- Mandatory PPE: proper fitting and use of hearing protection.
	- Prominent signage indicating high noise levels and mandatory PPE.

The Bending Machine, which operates in the > 82 to 85 decibel (A) range, poses a higher risk of hearing damage, particularly with prolonged exposure. This necessitates the implementation of effective control measures to safeguard workers' health such as:

i. Engineering Controls: Noise Dampening Materials: Incorporating sound-absorbing materials in the machine's design can significantly reduce noise levels. This can include installing acoustic panels or using vibration isolation mounts to minimize sound transmission.
ii. Administrative Measures: Job Rotation: Implementing a job rotation system can help limit the duration of exposure for individual workers. By rotating tasks among employees, the time spent near the Bending Machine can be reduced, thereby minimizing the risk of hearing damage.
iii. Personal Protective Equipment (PPE): Hearing Protection: Providing workers with appropriate hearing protection, such as earplugs or earmuffs, is essential. This equipment can effectively reduce the noise exposure levels experienced by workers, especially in environments where noise levels exceed safe limits.
iv. Regular Monitoring and Training: Continuous monitoring of noise levels is crucial to ensure that they remain within acceptable limits. Additionally, training workers on the importance of using hearing protection and understanding the risks associated with noise exposure can foster a culture of safety in the workplace.

The Metal Lathe Machine and Hydraulic Shearing Machine are significant concerns due to their noise levels exceeding 85 to 115 decibel (A), which poses a substantial risk of hearing damage. This necessitates immediate action to mitigate these risks.

i. Operational Parameters Influence: Noise levels from the lathe machine can vary significantly based on the type of operation. Therefore, careful selection of operating conditions to minimize noise operational parameters play a crucial role in controlling the noise emissions.

ii. Elimination or Substitution: Where possible, consider eliminating or substituting the Metal Lathe and Hydraulic Shearing Machines with quieter alternatives. This could involve investing in newer, quieter models or alternative technologies that produce less noise during operation.
iii. Engineering Controls: Implement robust engineering controls such as soundproof enclosures around the machines. These enclosures can significantly reduce the noise that escapes into the work environment, protecting workers from excessive exposure.
iv. Administrative Controls: Enforce strict administrative controls, including scheduled breaks to limit continuous exposure to high noise levels. A comprehensive hearing conservation program should be established to educate workers about the risks of noise exposure and the importance of protecting their hearing.
v. Mandatory Use of Personal Protective Equipment (PPE): The use of PPE, such as earplugs or earmuffs, is non-negotiable in high-noise areas. Ensuring that all workers are equipped with appropriate hearing protection is essential for their safety.
vi. Awareness and Compliance: Clear signage should be placed in high-noise areas to ensure that all employees are aware of the risks and the necessary precautions. This can help foster a culture of safety and compliance within the workplace.

3.2.2 Hierarchy of Control Measures for Noise Exposure

Implementing strategies to manage environmental noise according to hierarchy of control is more effective than relying solely on personal protective equipment, such as hearing protection, which depends on individual compliance. According to [9], to lower exposure levels among workers, several specific noise reduction strategies can be implemented such as reducing noise at the source is the most effective approach, achieved by using quieter tools and machinery. Installing physical barriers, such as sound walls or enclosures, helps block and absorb noise, making it ideal for noisy environments like factories or construction sites. Additionally, workplace design plays a key role, with strategic equipment placement away from main work areas to minimize workers' exposure to harmful noise levels.

Implementing hearing conservation programs can educate workers on the dangers of noise exposure and encourage the use of hearing protection, while promoting regular hearing tests to monitor auditory health. Regular equipment maintenance is also key in reducing noise levels, as it prevents excessive noise from worn or damaged machinery. Although not the primary solution, providing hearing protection like earplugs or earmuffs helps reduce noise exposure when other methods are inadequate, though efforts should prioritize reducing noise at the source and using engineering controls.

4. CONCLUSION

The study focused on the noise inspection at the Machinery Workshop of UiTM Bukit Besi. Highlighting the significant health hazards posed by high noise levels and complex machinery operations. The study successfully identified various noise sources within the machinery lab, categorizing the noise levels into four defined zones: above 115 decibel(A), 86-114 decibel(A), 82-85 decibel(A), and below 82 decibel(A). There are potential health risks, particularly hearing damage, due to prolonged exposure to high noise levels in the workshop. The requirement for regular noise exposure monitoring and risk assessment in compliance with the Occupational Safety and Health (Noise Exposure) Regulations 2019 to mitigate these risks effectively. The results serve as a benchmark for assessing machine conditions and the necessity for preventive maintenance. To reduce noise risks and improve safety in the workshop, regular maintenance can help keep machines in good condition, potentially reducing noise emissions and improving worker safety. Employee training on noise exposure and proper use of hearing protection is crucial as well as employers must provide and maintain hearing protectors, clearly mark high-noise areas as "HEARING PROTECTION ZONES," and implement control measures like soundproofing, worker rotation, and regular noise assessments. These combined efforts ensure a safer work environment.

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