International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 01 | Jan 2022 www.irjet.net p-ISSN: 2395-0072

Occupational Health and Hygiene Study of Sawmill Workers in Sathyamangalam

M Mohamed Irsath [1], T Jishin Jayan[2]

[1](P.G) Student, Dept of Industrial Safety Engineering, Bannari Amman Institute of Technology, Sathyamangalam, Tamil Nadu, India
[2]Asst. Professor, Dept. of Industrial Safety Engineering, Bannari Amman Institute of Technology, Sathyamangalam, Tamil Nadu, India

---

Abstract - *An occupational health and hygiene study was carried out in saw mill workers around sathyamangalam. Postal questionnaires and observational walk-through surveys were used to gather data. At three work sites, industrial hygiene walk-through inspections were done, with measures for wood dust and noise taken. The study's goal was to gather information on the present state of Occupational health and safety issues, as well as an estimate of wood dust and noise exposures. The exposure to wood dust were lesser and the noise were higher than the exposure limit. Total dust concentrations in the air ranged from 0.001 mg/m3 to 3.87 mg/m3, and noise exposure was between 65 to 110 dB. From this survey we also can able to get they are also affected from various Work-related symptoms like cough, lower back pain, Eye irritation, sneezing, chest pain, Breathlessness, Rashes and Musculoskeletal pain*.

Key Words: saw mill, Industrial hygiene, Wood, Wood Dust, Noise, Survey, Work-related symptoms, Occupational health and safety.

1.INTRODUCTION

Wood processing activities involve various procedures which convert raw wood into usable forms. Sawmills, the wood furniture business, and the door manufacturing sector are all places where such processing is done. A sawmill is a facility where timbers are machine-sawn into various widths of planks or boards. The sawmill industry has various risks, one of which being dust. Wood dust is the fine, powdery debris that results from the processing of wood. The carcinogenic effects of wood dust, particularly hardwood dust, on the nasal cavity, paranasal sinus, and nasopharynx are well documented. Other risks mentioned by sawmill workers include unprotected moving components of machinery, noise, and heat, in addition to dust.

Jacobson (2008) says that His review concluded that wood dust exposure is a risk factor for the development of asthma, chronic bronchitis, rhino-conjunctivitis, and chronic impairment of lung function. Eye irritation and upper airway symptoms have been reported after exposure to spruce and pine dust levels in the range 0.1–6.3 mg/m3 [1]. According to hangstrom k (2008) exposures to wood dust and monoterpenes are commonly measured in the wood-refining industries. Personal wood dust exposure levels at wood pellet production plants have been noted to be between <0.60 and 8.0 mg/m3 as inhalable dust and levels of monoterpene (only α-pinene) were <0.28 to 25 mg/m3. Peaks in exposure can, however, be measured using personal real-time monitors [2]. Paul Adekunle onakoya (2013) he explains the noise produced in saw mills and how they can affect people after prolonged period of exposure. The prevalence of hearing loss and the pattern of hearing loss are evaluated among the workers. The prevalence of hearing impairment was said to be 89.7%. Finally, it was found that hearing loss and tinnitus were the auditory effects of prolonged exposure to noise [3].

Ayodele and Olubayo-Fatiregun (2013), says that majority of sawmill workers with respect to their educational level and background are not well educated or trained in the areas of occupational hazard identification and evaluation. Thus, the rate of occupational hazard exposure from this industry is very high.

1.1 SAW DUST

Sawdust, also known as wood dust, is a byproduct of cutting, grinding, drilling, sanding, or otherwise pulverizing wood or other materials with a saw or other tool; it is made up of fine wood particles. It can be a hazard in manufacturing industries, and wood dust can cause health problems such as asthma. Inhaling dust into the lungs can cause breathing difficulties and lung diseases such as occupational asthma and lung cancer. The most common method of exposure to wood dust is inhaling it. Getting dust in your eyes can irritate and damage them. Skin contact with wood dust can result in skin ulceration, irritation, and dermatitis.

1.2 NOISE

Wood Processing machines used in industries leads to the generation of high noise level. Exposure to high levels of noise, particularly in the workplace, has been a global concern due to strong evidence linking it to a number of serious challenges. Short or long periods of noise exposure can cause auditory effects such as fatigue and hearing loss, as well as indirect non-auditory effects such as speech

interference, annoyance, decreased mental peace and task performance, and a variety of psychological changes.

1.3 OBJECTIVE

The main object of this project is to identify the health and hygiene of the saw mill workers in sathyamangalam and estimate the amount of wood dust and noise a level exposure.

2. MATERIALS AND METHODOLODY

Materials used in the study were noise level meter for noise level measurement and Personal Air Sampler for dust level measurement.

2.1 NOISE LEVEL METER

Noise Level Measurement was taken for different types of wood processing machinery used in the saw mill. A sound level meter is used because it closely mimics the loudness perceived by the human ear.

Fig-1: Sound Level Meter

Fig-1 shows the digital data logging sound level meter, model SL-4010, manufactured by Lutron Instruments was used in this Project. The equipment complies with ANSI S1.4 and IEC 61672-1 Type 2 requirements, measuring and displaying Sound Pressure Level (SPL) from 35dB(A) to 130dB(A) with 1.0dB(A) accuracy in three measurement ranges. The background noise for each sawmill was measured when the sawmill was active and the machines were in use. Noise level for each machine was taken and noise level survey also taken for all the wood processing machines in the sawmills.

2.2 PERSONAL AIR SAMPLER

Wood Dust concentration for each site was taken for consecutive days using a personal level air sampler. Fig-2 is the personal air sampler used for personal air sampling for workers, instrument used was a Polltech make Model PEM-AFH37 Filter Holder Acrylic Body (for GF/A Filter Paper of 37 mm diameter) for PM sampling. Filter Paper used for sampling is 47mm dia whatman Filter paper.

Fig-2: Personal Air Sampler

Before attaching the filter paper to the ceramic cup, the initial weight of the filter paper was measured. After the sampling time once again the filter paper was measured to find the weight of the dust that deposit on the filter paper

The sampling time was set to 8 hours and volume of air was set to 2 l/m3. Whatman Filter with diameter of 47mm was attached to the ceramic cup. Once the sampler is switched on the motor inside the sampler started to create suction due to the dust will come and settle near the filter paper. The ceramic cup needs to place near the breathing area.

$$Q\ (mg/m^3) = (Wb-Wa) * 1000/(f*t) \quad (1)$$

Where,

Q- Dust Concentrarion

Wa- Initial weight of filter Paper

Wb-Final weight of filter Paper

f- Flow rate

t- Total time

3 Questioner Survey

This questioner survey was carried among sawmill workers around sathyamangalam. The questionnaire considered, hazards (heat, noise, dust, and vibration), health problems (musculoskeletal disorders, low back pain, cough, breathlessness, chest pain, chest tightness, sneezing, rashes, eye irritation, and injuries), awareness and use of PPE, and hygiene practices (hand washing, bathing, and changing of clothes at close of work) among the wood workers. The health problems were classified into two types one is

Respirable and other is non-Respirable health problem among saw mill workers.

3. RESULTS AND DISCUSSION

3.1 Noise level Measurement

Noise levels of each machine are given below in table-1. The noise level for four different types of machines used in saw mill was measured.

Table-1: Noise level for each machine

S.no	Machine	Idea condition(dBA)	Minimum level (dBA)	Maximum Level (dBA)
1	Vertical Band Saw	80	88	98
2	Horizontal Band Saw	80	90	99.4
3	Surface Planner	79	85.1	88.4
4	Thickness Planner	80.5	86.5	87.1

The Occupational safety and health administration (OSHA) recommend permissible noise exposure for workers exposed to a TWA noise level is 85 decibels or higher over an 8-hour work. From the Table-2 it clearly says that noise level was higher than the permissible limit

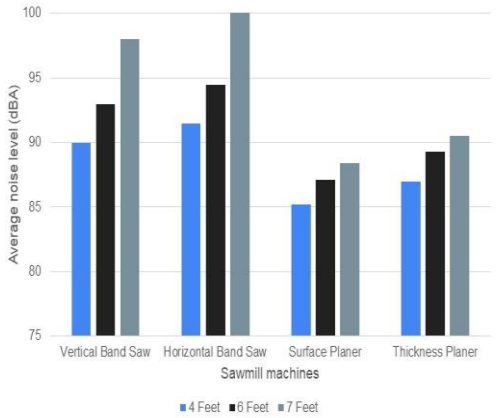

Fig-1: Average noise level chart for Sawmill Machines

The average level of noise in the Sawmill machines are represented in the Fig-1. In sawmill they mostly work on four sizes of woods 4 feet, 6 feet and 7 feet. The average noise levels of machines at sawmill ranged from 85dBA to 100dBA for 7 feet wood with the highest value recorded for horizontal band saw and the lowest value recorded for the surface planner machine. The average noise levels for vertical band saw are varies from 90dBA to 98dBA, average noise levels for Horizontal band saw are varies from 91.5dBA to 102.4dBA, average noise levels for Surface planner varies from 85.2dBA to 88.4dBA, and average noise levels for Thickness planner varies from 87dBA to 90.5dBA.

Noise level survey was taken for the machines in saw mill with the distance of .5m,1m,1.5,2m. The obtained values of the vertical band saw, Horizontal band saw, surface planner and Thickness planner machines are mentioned in the Fig-2, Fig-3, Fig-4 and Fig-5. The noise level at the .5m is higher than the 2m. The noise level for Horizontal band is 102.4 dBA which higher in this survey, from that distance only the operator will operate that machine which is highly hazardous, without the right Personal protective equipment that noise will damage the hearing.

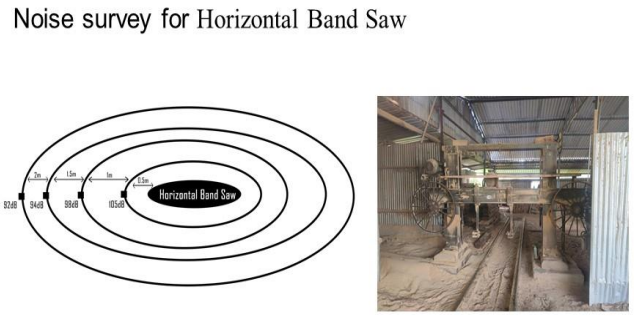

Fig-2: Noise level survey for Horizontal band saw

Fig-3: Noise level survey for vertical band saw

Fig-4: Noise level survey for Surface planner

Fig-5: Noise level survey for Thickness planner

All the machine in the saw mills is exceed the OSHA Threshold limit, it was hazards to the employee, from the Questioner survey it is clearly shows that some employee having hearing deficiency.

The Noise can be reduced in several ways like engineering and administrative control. Engineering controls are the best long-term solution to the occupational noise problem controls like buying quite machinery and equipment, maintaining machinery and equipment frequently, reducing machinery and equipment vibration, Isolating the noise source in an insulated room by operating the equipment remotely, Placing a barrier between the source and employee. If the noise is not reduced, then we have to go for administrative control.

Administrative control includes marking hearing protection zones with notices, supervising the use of hearing protectors, usage of correct PPE for the level of noise, monitoring, and conducting regular audiometry test to check whether hearing protection measures are working perfectly.

3.2 Dust level Measurement

Filter paper weights are given in the Table-2. Time duration and flow rates are 400minutes and 2 Liter/minutes for all sampling.

Table-2: Weight of the filter paper

S.no	Initial weight (g)	Final Weight (g)
1	0.17	0.34
2	0.17	0.30

By substituting the above values in the equation (1). The Dust concentration value ranges from 0.01mg/m3 to 0.2125 mg/m3 for 8 hours of work. According to the obtained result and comparing with the TLV. The amount of dust exposure was very less. The dust concentration depends on environmental conditions. In rainy season most of woods are in wet condition so while cutting most of the dust will settle with that wood itself. But in summer season the woods are in dry condition, while cutting wood dust will not settle on the wood so the dust concentration have to be high when compared to raining season.

Dust level concentration in the area was lesser then the Threshold limit. However, in questioner survey some employee says that they are having eye irritation and cough. Cough was mentioned by 71.4% of Worker, this is because of the respirable dust present in that area. They are controlled by applying engineering and administrative control. Usage of Local Exhaust Ventilation to capture dust, Use of on-tool extraction on saws and grinders to control wood dust at source, Proper maintenance, Usage of lubricant, by wearing RPE and other personal protection equipment, providing washing facilities at work site, and Advise workers to wash their face and hands immediately after finishing.

3.3 Occupational health disease.

A total of 35 workers were participated in this survey. The common occupational hazard reported by the response were separated into two types respirable

Table-3: Respirable health Problems.

Symptoms	Subject n=35	Percentage
Cough	25	71.4
Sputum	20	57.1
Sneezing	23	65
Chest Pain	3	8.5
Chest Tightness	5	14

Table-4: Non-Respirable health Problems

Symptoms	Subject n=35	Percentage
Lower Back Pain	20	57.14
Eye Irritation	24	68.57
Joint Pain	20	57.14
Hearing Deficiency	5	14
Mechanical Injury	10	28.5

and non-respirable problem in respirable health are shown on Table-3 and Table-4. The diseases reported by workers are cough 25 (71.4%), Sputum 20(57.1%), Sneezing 23(65%), Chest Pain 3(8.5%), Chest tightness 5(14%). Non-respirable health problem reported was Lower back pain 20(57.14%), Eye irritation 24(68.57%), Joint Pain 20(57.14%), Hearing Deficiency 5 (14.2%), Mechanical injury 10(28.5%).

A large proportion of the respondents reported was cough 25 (71.4%), Eye irritation 24(68.57%), and Lower back pain 20(57.14%). Mechanical injury is happening due to long periods of standing, repetitive/strengthening jobs, bending, and manual lifting of heavy logs of wood can all cause injuries, as can exposure to unguarded machine parts. Low back pain can also be caused by prolonged standing, repetitive/strengthening jobs, bending, and manual lifting of heavy logs of wood. In addition, over three-quarters of the respondents in this survey worked 8–10 hours every day. This could have contributed to low back pain, as well as exhaustion, a decreased capacity to concentrate, and an increased risk of accidents.

4. CONCLUSION

Based on the results, wood dust exposure is found to below than the OSHA's threshold limit, but it can be in excess in different environmental condition. Noise level is more than the OSHA's threshold limit. Hearing conversation program and other controls need to be taken to reduce the noise level. Occupational health hazards are more in sawmilling process, the use of Personal protective equipment is less and risky behavior among sawmill workers are statistically related to occupational hazards. Workers in sawmills should be trained on the need of using personal protection equipment in the workplace. To ensure a healthier workforce, occupational health services should be made available to this group of workers.

REFERENCES

[1] Jacobsen G, Schlunssen V, Schaumburg I, Taudorf E, Sigsgaard T. Longitudinal lung function decline and wood dust exposure in the furniture industry. Eur Respir J.

[2] Halpin DM, Graneek BJ, Lacey J, Nieuwenhuijsen MJ, Williamson PA, Venables KM, et al. Respiratory symptoms, immunological responses, and aeroallergen concentrations at a sawmill. Occup Environ Med.

[3] Demers PA, Teschke K, Kennedy SM. What to do about softwood? A review of respiratory effects and recommendations regarding exposure limits. Am J Ind Med.

[4] Barcenas CH, Delclos GL, El-Zein R, et al. (2005) Wood dust exposure and the association with lung cancer risk. Am J Ind Med;

[5] Halpin DM, Graneek BJ, Lacey J, Nieuwenhuijsen MJ, Williamson PA, Venables KM, et al. Respiratory symptoms, immunological responses, and aeroallergen concentrations at a sawmill. Occup Environ Med

[6] Demers PA, Teschke K, Kennedy SM. What to do about softwood? A review of respiratory effects and recommendations regarding exposure limits. Am J Ind Med.

[7] Harper M, Muller BS. An evaluation of total and inhalable samplers for the collection of wood dust in three wood products industries. J Environ Monit.

[8] Axelsson A, Barrenas ML (1991). Tinnitus in noise-induced hearing loss. Mosby Year book 1991 Eds. Dancer, Handerson, Salvi & Hammernik. pp. 269-276

[9] Berglund B, Linvall T, Schwela DH (1999). Guildlines qfor Community Noise. World Health Organisation, Geneva.

[10] Ghoroje ADA, Marchie C, Nwobodo ED (2004). Noise induced hearing impairment as an occupational risk factor among Nigerian traders. Niger. J. Physiol. Sci. 9:14-19.

[11] Wu TN, Liou SH, Shen CY, Hsu CC, Chao SL, Wang JH, Chang SF, Ko KN, Chiang HC, Chang PY (1998). Surveillance of noise-induced hearing loss in Taiwan, ROC: A report of the PRESS-NIHL results. Prev. Med. 27(1):65-69

[12] Agbalagba E.O., Akpata A.N.O., Olali, S.A. (2013) Investigation of noise pollution levels of four selected sawmill factories in Delta State, Nigeria. Advances in Applied Acoustics Journal.

[13] Ali, S.A. (2011) Industrial noise levels and annoyance in Egypt. Applied Acoustics

[14] Ampofo, D.K. (2012) Evaluation of noise levels of corn mills Ablekuma north submetro, Accra.M.Sc Dissertation at Kwame Nkrumah University of Science and Technology, Kumasi.