

NOISE HAZARD IN SAWMILLING INDUSTRY IN PAKISTAN

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ABSTRACT

Studies conducted on the noise level in large and small scale sawmills and exposure of workers to it, reveal that the noise of all the machines in the near work positions and in most cases in far work positions is higher than the threshold value of 85 dB(A), a safe limit for continued exposure. The daily and total anticipated exposure of the workers to this noise is long enough to cause permanent hearing damage and other noise induced health hazards. Proper

protection measures and maintenance of machines to reduce the noise is recommended for the safety and health of workers.

INTRODUCTION

Working conditions influence the efficiency, health and safety of workers. The most important components of work place conditions in industries are noise, temperature and light. Noise is defined as unwanted sound (STAUDT, 1984) and is the most potent environmental hazard of

modern life and a major factor of work place conditions, when the operations are to be performed by machines. A constant and disturbing noise produces adverse psycho-physiological effects, such as impaired alertness, disturbed sleep and feelings of stress (GRANDJEAN, 1981) and a reduction in the efficiency of workers (ANONYMOUS, 1986). Higher noise also produce masking effect, under which the workers working in noisy surroundings can not readily recognize the acoustic warning signals and abnormal sounds produced by defective and broken parts of machines. Impaired and untimely reaction to such situations may result in serious accidents, with damage to life and property. Therefore, it is essential that noise level measurements must be carried out, for rating of work places, in sawmilling industry in Pakistan, for workers safety and to increase the work performance.

Noise at work places is measured in decibels (dB) and a "Noise Level Meter" measures the noise in decibels with filter A, as dB(A). If the noise level at a work place is more than 85 dB(A) and the continued daily exposure of workers is 8 hours or more then there is every risk of noise induced psycho-physiological disorders and hearing disability to the workers (GRANDJEAN, 1981).

Sawmilling industry in Pakistan is scattered throughout the country in towns and cities. It consists mostly of small units of one or two saw machines of local origin and owned by private people. Only two industrial scale units are operating in the public sector in the country. The noise measurement studies were carried out in these sawmills to record the noise level of different machines, workers exposure to it and to suggest measures for its control for the increased safety of the workers and higher work output.

MATERIAL AND METHODS

The study on the measurement of noise level was conducted in two large scale public owned sawmills of the Azad Kashmir Logging and Sawmilling Corporation (AKLASC) at Mirpur and N.W.F.P, Forest Development Corporation at Mansehra and 35 randomly selected small scale private owned sawmills in and around Peshawar.

Noise level near the ear of the workers was recorded in dB(A) with the help of a Noise Level Meter "INDUNORM" and with respect to their near and far work positions from a machine. Five noise level measurements were made for each worker in each work position. Duration of daily exposure and total exposure of these workers to the noise of machines were also recorded.

For practical purposes simple averages and cumulative averages of data of noise level of different machines in various sawmills were computed with respect to operator, helper and near and far work positions.

RESULTS AND DISCUSSION

1. Public Owned Large Scale Sawmills

i. Sawmill of Azad Kashmir Logging and Sawmilling Corporation, Mirpur

The sawmilling unit of the Azad Kashmir Logging and Sawmilling Corporation (AKLASC) was established in 1972 by a Polish firm in Mirpur, at a capital cost of Rs. 26.746 million (AYAZ & MEHDI, 1991). The objective of sawmilling was to produce sawn timber of high quality and proper sizes from the coniferous logs supplied by AKLASC. The total annual installed capacity of sawmill is 51,000 m³ of sawn timber. All the sawmilling machines are housed in the one

building with walls of baked bricks laid in cement mortar and roof made from steel trusses covered with G.I. sheets. Results of noise level studies carried out on different machines of this unit are given in Table 1.

Machines and Noise Level

As shown in Table 1, the maximum noise of 113 dB(A) is produced by break-down band saw, followed by resaw (band), edger, and gang saw, with noise levels of 111, 105 and 101 dB(A), respectively. Gang and band resaws produce the similar level of noise e.g., 100 dB(A).

All the machines at the time of study were 18 years old, therefore the difference in the noise produced by them is mainly because of their design and state of maintenance and higher noise in comparison to FDC sawmill is due to much older machines.

Workers and Noise Level

Table 1 shows the average noise level received by the operators and helpers in the near work position is 102 and 105 dB(A), respectively. Helpers experience a noise higher by 3 dB(A) than the operators. Except for break-down band saw and gang resaw the operators and helpers are exposed to the same level of noise.

The average noise level in the far work position as experienced by the operators and helpers is 96 and 97 dB(A), respectively. Helpers are exposed to a noise level higher by about 1 dB(A) than the operators. Maximum noise level of 108 dB(A) in the far work position is again experienced by the helpers than the operators with a noise level of 99 dB(A).

Noise level of machines in the sawmill of AKLASC in all work positions is 5 to 28 dB(A)

higher than the threshold value of 85 dB(A). Therefore, the workers in this unit have a much higher risk of noise induced health disorders.

ii. Sawmill of N.W.F.P. Forest Development Corporation (FDC), Mansehra.

The sawmilling unit of N.W.F.P., Forest Development Corporation (FDC) was established in Mansehra in 1984, with the technical assistance of Federal Republic of Germany at a total capital cost of Rs.10.917 million (KHAN, 1989). The objective of the unit was to produce sawn timber of high quality and standard sizes from the coniferous logs supplied by FDC. The annual installed capacity of the sawmill is 16,000 m³ of sawn timber. All the machines are housed in the one building with walls of baked bricks laid in cement mortar. The roof consists of steel trusses covered with G.I. sheets.

The values of noise level produced by different machines and exposure of workers to it in the Sawmill of N.W.F.P., Forest Development Corporation are given in Table 2.

Machines and Noise level

The contents of Table 2, show that the average noise level of different machines and exposure of workers in the near work position is different, ranging between 97 to 103 dB(A), which is higher by 12 to 18 dB(A) than the threshold value of 85 dB(A) for continued exposure (GRANJEAN, 1981). The maximum noise level of 103 dB(A) is produced by resaw, vertical band (5 cm) Pak-made, followed by resaw (BRENTA) vertical band (15 cm) Belgium made and break-down saw horizontal band (5 cm) Pak-made with noise levels of 101 and 99 dB(A), respectively. While the break-down saw "SCHULTE" (reciprocating frame), German made and edger give an equal and minimum noise of 97 dB(A).

Table 1 Noise level of different machines and workers exposure

Type of Machine	Noise Level dB(A)					
	Near position			Far position		
	Operator	Helper	Diff- erence	Operator	Helper	Diff- erence
Break-down band saw 23 cm saw blade	99 ¹	113	14	-	108	9
Resaw (band) 12 cm saw blade	111	111	0	98	98	0
Resaw (band saw) 15 cm saw blade	100	100	0	90	90	0
Gang saw 15 cm saw blade	101	101	0	96	96	0
Gang resaw saw blade	95*	100	5	95*	95	0
Edger 25 cm, saw dia.	105	105	0	97	97	0
Average:	102	105	3	94	97	1

As all these machines were purchased new and at the time of study were about 3 1/2 years old, therefore, the difference in the noise levels is mainly because of their design and make. The results also show that the vertical band saw as a

whole produces higher noise than the horizontal ones. Higher noise of Pakistani band saw is probably due to narrow width of saw and imbalanced wheels.

¹ Operator has a fixed position, sitting about 25 feet away from the machine, In rest of the cases operator and helper moved back and forth, almost to the same distance from the machines.

Workers and Noise Level

As evident from Table 2, the operators of machines in the near work position experience a noise of 99 dB(A), ranging from 97 to 103 dB(A), while helpers in the near work positions receive noise of 96 dB(A) varying between 90 to 101 dB(A). The average noise to which the operators are exposed in the near work position is higher by 3 dB(A), (0 to 7 dB(A)) than the helpers. In the far work position the noise level received by the operators and helpers remain the same. However, it differs for different machines and the average for all the machines is calculated as 90 dB(A), ranging between 85 to 94 dB(A).

The reason for the higher noise exposure of the operators in the near work position is that they stay closer to the machines than the helpers. The level of noise at the far work position decreases with the increasing distance to which the workers move away from the machine.

The daily and weekly exposure of workers to this noise level is 7 and 42 hours, respectively and the workers were exposed to this noise level for 3 1/2 years at the time of study.

Table 2 Noise level of different machines and workers exposure

Type of Machine	Noise level dB(A)					
	Near Work Position			Far Work Position		
	Operator	Helper	Diff- erence	Operator	Helper	Diff- erence
Break Down Saw. "SCHULTE" Reciprocating Frame (German)	97	90	7	86	86	0
Break Down Saw Horizontal Band 5 cm (Pak)	99	94	5	94	94	0
Resaw "BRENTA" Vertical Band 15 cm (Belgium)	101	101	0	85	85	0
Resaw vertical band 5 cm (PAK).	103	101	2	94	94	0
Edger	97	92	5	-	-	-
Cumulative Average	99	96	3	90	90	0

(AYAZ, 1989)

2. Privately Owned Small Scale Sawmills

Small scale sawmilling units in and around Peshawar comprise of one or two sawmilling machines. These sawmills do not produce dimension timber on regular production basis, but saw the timber in accordance with the needs of customers. Both hardwoods procured from farmlands and softwoods brought from different markets of forest department and tribal areas are sawn in these units.

- All the sawmills both vertical and horizontal are locally made with a saw blade width of 5 cm, except one with the Pak-German Wood Working Center, Kohat Road, which is German made and has a blade width of 15 cm.
- Walls of the buildings are made of baked bricks laid in mud. Roofs are made from round timber covered with grass screens and mud plaster. However, the structures are never fully closed, with either one or two sides open.
- The age of sawmills ranged mostly between 2 to 10 years and are therefore, grouped in 5 age classes given in Table 3.

Table 3. Percentage of sawmills by age

Age year	No. of sawmills	% age of total
2	9	25.7
4	5	14.3
6	11	31.4
8	5	14.3
10 and above	5	14.3

As shown in table 3, the majority (31.4%) of sawmills are 6 years old. 25.7% of the total are established within the last 2 years at the time of study. Sawmills having an age of 4, 8 and 10 years and above are equally frequent (14.3%).

Machines and Noise Level

The maximum noise level produced by the small sawmills is 104 dB(A) in the near work position. In sawing of dry wood of mulberry and poplar, in the near work position, a maximum noise level of 107 and 106 dB(A) is recorded.

Noise levels differ with the age of machines due to wear and tear over long use. Table 4, gives the age of machines and the noise produced by them in the near work positions.

Table 4 Noise level by age of machine

Age years	Noise level dB(A)
2	99
4	100
6	100
8	100
10 and above	101

Two years old machines produce a minimum noise level of 99 dB(A) and in case of 4, 6, and 8 years old machines the noise level is higher by 1 dB(A), but remained constant as 100 dB(A). For machines having an age of 10 years and above the noise level increased to 101 dB(A).

Workers and Noise Level

As shown in Table 5, operators and helpers experience equal noise levels both in near and far work positions. In near work position the noise level is 100 dB(A) while, in far work position, it is 91 dB(A). Both these values are higher by 15

and 6 dB(A), respectively than the threshold value of 85 dB(A) for continued exposure and therefore, there is every risk of noise induced disorders and hearing disability to the workers.

Table 5. Average noise level

Noise Level dB(A)			
Operators		Helpers	
Near	Far	Near	Far
100	91	100	91

However, in small scale sawmills in and around Peshawar, peak noise level of machines in the near work position is higher by 1 dB(A) than FDC sawmill and lower by 9 dB(A) than the sawmill of AKLASC. While in the far work position the peak noise level in the small scale sawmills is 3 to 17 dB(A) lower than the large scale sawmills, mainly due to limited number of machines and quick dissipation of noise in the buildings. Moreover, in large scale sawmills all the machines work under the same roof, therefore the noise of other machines also interfere with the noise measurements. It is also clear from the results of this study that older the machine the more noise it produces.

CONCLUSION AND RECOMMENDATION

The results of the study show that the noise level of different machines in all types of sawmills is much higher than the threshold noise level of 85 dB(A) for continued exposure. Moreover, with a weekly exposure of 42 hours or more and a total exposure of about 30 years upto the retirement age of the workers, there is a great risk that most of them may suffer from a permanent hearing disability. The reported noise level in the sawmilling industry in developed countries is between 90 to 95 dB(A), (GRANDLEAN, 1981).

While, in this study in the near work position the noise level of machines is very high ranging between 90 to 113 dB(A). Therefore, the sawmill workers in Pakistan have a much higher risk of hearing disability and noise induced occupational health disorders than their counterparts in industrial countries. Noise level situation in the sawmill of AKLASC is the worst, followed by small scale sawmill units and FDC sawmill. In addition to the design, age of the machines seems to be the main reason for higher noise in the sawmill of AKLASC and small scale sawmills.

In daily work higher noise level produce psycho-physiological disorders with reduced working efficiency, impaired alertness and increased risk of accidents. Following recommendations are given to avoid health hazards and hearing disability to the sawmill workers in Pakistan.

There are two approaches for the control of noise. One is the protection of workers and other is its control at the source.

Protection of Workers

a. Proper ear protection devices such as ear plugs and muffs must be provided to all the workers working in the sawmills.

b. If the period of exposure of workers to higher noise levels is not long, the hearing damage incurred is temporary and the recovery to normal hearing is very quick, if the workers are shifted to the lower noise or noise free work places. Therefore, job rotation is an appropriate work organizational measure to reduce the risk of permanent hearing damage to the workers.

Control at the source

a. Great care should be exercised in the selection of

machines for their noise level and sound proofing arrangements.

b. Due attention must be paid to the maintenance of machines, such as timely replacement of worn out parts, proper greasing and oiling. This practice on one hand shall greatly enhance the service life of machines and on the other shall also reduce their noise.

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