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To cite this article: ABDEL AZIZ A. EL-DAKHAKHNY , MADBULI H. NOWEIR & NAGIRIZK ALLAH KAMEL (1975) Study of Some Parameters Affecting Noise Level in Textile Spinning and Weaving Mills, American Industrial Hygiene Association Journal, 36:1, 69-72, DOI: [10.1080/0002889758507210](https://doi.org/10.1080/0002889758507210)

To link to this article: <https://doi.org/10.1080/0002889758507210>



Published online: 04 Jun 2010.



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# Study of Some Parameters Affecting Noise Level in Textile Spinning and Weaving Mills

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Noise was evaluated in six spinning and five weaving halls located in three textile mills in Egypt. Spindle speed (rpm) and loom speed (picks per minutes) were found to be important parameters affecting the noise level in these mills. Reduction of the number of spinning machines to five spindles per square meter of floor area will probably bring the noise level below the TLV. In the weaving departments, the decrease in the number of looms will not effectively reduce the noise level.

## Introduction

NOISE PRESENTS A SERIOUS HEALTH PROBLEM in the textile industry, especially in spinning and weaving operations. In Egypt, noise levels as high as 103 dB(A) and an average of 98 dB(A), for the region 1200 to 4800 Hz, were encountered in some of the weaving operations.<sup>1</sup> As a consequence of exposure to these high levels of noise, textile workers are subject to loss of hearing. A previous medical study in a textile mill in Egypt showed that 67% of the examined population and 92% of those exposed to noise in the weaving departments for more than ten years had some hearing impairment.<sup>2</sup>

The main sources of noise in the spinning and weaving operations may be summarized as follows<sup>3,4</sup>:

1. The electric motor, the gear train which drives all moving parts of the frame, and the rotating parts such as bearings, spindles, and ring travelers in the spinning machines.

2. The impact of the picking stick on the shuttle, the reciprocating motion of the

heavy mass on the slay beam, the gear train, and the cams in the weaving machine.

The level and spectra of noise are affected by many parameters such as type and model of machine used, speed of rotating parts, material of gears, maintenance conditions, and type of mountings. Floor area, volume of the room, and the interior building construction materials for walls, ceiling, and floor may also be considered as important factors.

The threshold limit value (TLV) for noise has been recently recommended at 85 dB(A) for 40 hours of exposure per week.<sup>5</sup> Before that it was 90 dB(A). Many attempts have been made in the textile industry to reduce the noise to the recommended level by applying new mechanisms, by modifying the looms and spindles, and by improving the construction of the working places by use of acoustical materials in the walls, ceilings, and floors.<sup>6</sup>

It is intended here to study the effect of some parameters which would help in finding other control methods to solve the noise problem in the textile industry.

## Methods

Two textile mills in Alexandria and one

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This work was supported by USPHS PL-480 Project 03-002-3.

in Mehalla El-Kobra were selected for this study. In these mills, different types and models of textile machinery of both old and new designs are in use.

Noise was measured with a Bruel and Kjaer sound-level meter, type 2204, equipped with a 1-inch condenser microphone, type 4145, covering the range from 15 to 140 dB(A) and frequency of 2 Hz to 18 kHz. The sound-level meter was coupled with an octave-band filter, type 1613, which permitted noise measurement in the different center frequencies ranging from 31.5 Hz to 31.5 kHz covering eleven bands. The instrument was calibrated with a B & K pistophone prior to each set of measurements.

In each of the departments studied, about twenty-five locations were selected for noise measurements. In each location, measurements were taken on three different days in order to get a representative average of the noise level there. The following data were also collected:

1. Number, model, and type of ring

spinning frames and looms.

2. Speed of spindles and looms.

3. Yarn count, ring diameter, and lift of spindles.

4. Weight of shuttles and maximum reed space of looms.

5. Room size and construction details of wall, ceiling, and floor.

### Results and Discussion

Six spinning and five weaving halls were investigated. A total of 266 ring spinning frames containing 103,800 spindles and 1612 looms of different types and models were used. Room size and machinery details of each spinning and weaving hall are presented in Tables I and II.

In all the mills, the heights of the halls ranged from 5 to 6 meters, the walls were painted brick, the floors were concrete blocks or terrazzo, and the roofs were reinforced concrete. No acoustical materials were applied to the interior surface of walls, floors, or ceilings.

Figure 1 shows sound pressure levels

TABLE I  
Room Size and Machinery Details of the Spinning Halls

Hall Number	Area (m <sup>2</sup> )	Number and Model of Machine	Total Number of Spindles	Total Spindle Speed (rpm), $p \times 10^6$
1	2488.5	43 Reiter Model (18 & G4)	16,196	129.4
2	1813.5	43 Reiter Model (18 & 44)	18,060	175.2
3	826	20 Reiter Model (G3 & G4)	8,136	76.1
4	2204	24 Reiter Model (18) 24 Platts	19,540	165.7
5	468	12 Reiter Model (18)	5,040	44.9
6	5544	100 Ingolstadt	36,828	280.4

TABLE II  
Room Size and Machinery Details of the Weaving Halls

Hall Number	Area (m <sup>2</sup> )	Number and Model of Machine	Maximum Reed Space (m)	Total Picks per Minute
1	5380.5	600 Draper	1.00	109,200
2	1760.0	72 Sulzer	3.25	13,752
3	2700.0	256 Mills and Butterworth	1.30	43,520
4	3375.0	400 Chinese automatic looms	1.07	73,600
5	3360.0	284 Alsecienne and other types	1.28	45,268

(SPL) at eleven bands with center frequencies ranging from 31.5 Hz to 31.5 kHz for the spinning and weaving halls. The upper part of the figure represents a comparison among the six spinning halls. They all had nearly the same noise spectrum pattern, characterized by a peak at 500 Hz. The lower part of the figure represents the noise spectrum curves for the five weaving halls. The curves differ in noise pattern from 31.5 Hz up to 1 kHz and then behave similarly. In all the eleven departments the weighed SPL in dB(A) were above the TLV.

Since spindles are responsible for about 80% of the total noise generated in the spinning operations,<sup>7</sup> they were considered an important parameter affecting the SPL in the spinning departments. Figure 2 presents the weighed SPL in dB(A) versus the number of spindles and the total spindle speed per square meter of floor area in the six spinning halls. The SPL increased with

the increase in number of spindles and with the increase in the total spindle speed per unit area. As the average spindle speed increased from about 5000 rpm to 9700 rpm in the different halls, the total spindle speed per square meter became a better parameter than the number of spindles. It has also been shown that the number of spindles per square meter ranged from 6.64 to 10.77, and the total spindle speed per square meter ranged from 50,000 rpm to 100,000 rpm. Reduction of the number of spindles to five spindles per square meter, or of the total spindle speed per square meter to 25,000 rpm, will bring the noise level below the TLV. If these figures are applied, for example, to hall 1 and hall 2, the number of spindles should be reduced to about 75% and 50%, respectively.

In the weaving operation, the impact of the picking stick on the shuttle is the main source of noise. The loom speed (picks per

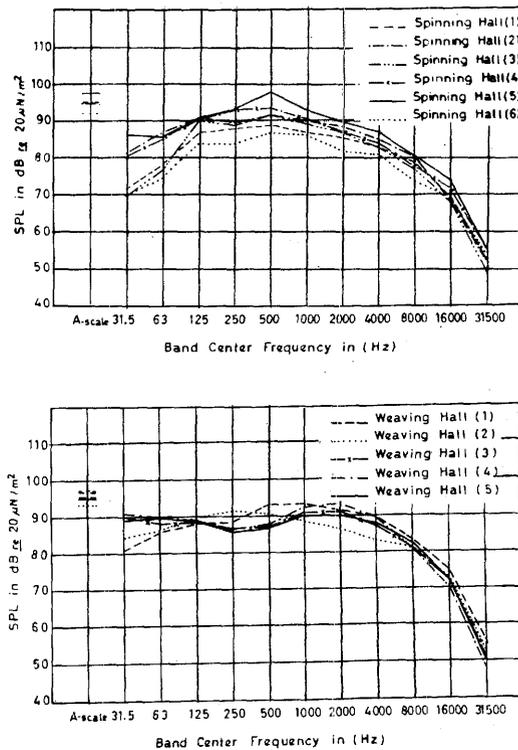


Figure 1. Noise spectrum curves in the spinning and weaving halls.

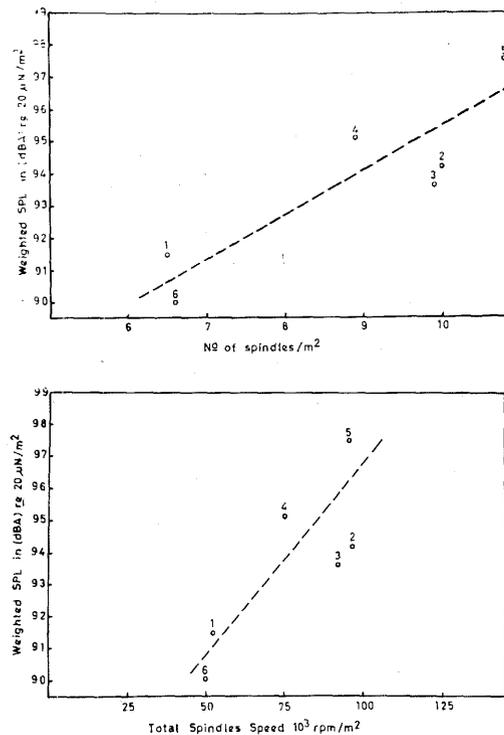


Figure 2. Relation between number of spindles, total spindle speed, and noise level in the spinning halls.

minute) is considered for this reason the main parameter affecting the SPL. Figure 3 presents the weighted SPL in dB(A)

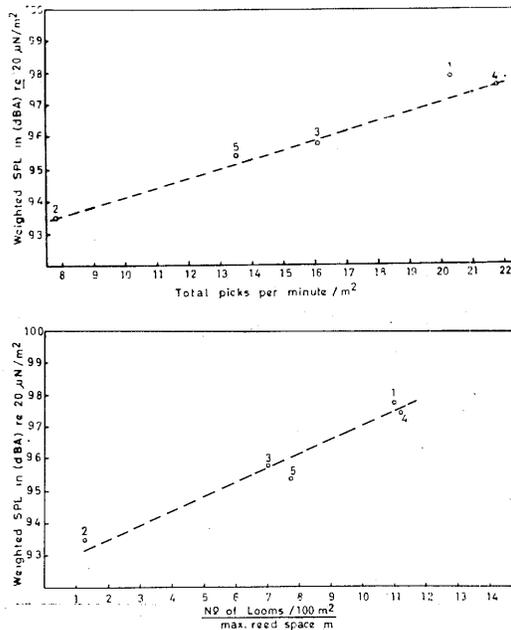


Figure 3. Relation between loom speed, number of looms, and noise level in the weaving halls.

versus the number of looms per square meter corrected for maximum reed space and versus the total picks per minute per square meter. In both curves, the SPL increases with the increase in the above two parameters. If reduction in the number of looms is considered as a means to lower the noise level below TLV, their number in the surveyed places should be decreased from eleven looms (of 1 meter maximum reed space) per 100 square meters, to say, one loom per 100 square meters. The loom speed should also be reduced from about twenty-two to five picks per minute per square meter. This means that the looms should be reduced to about one-tenth of their actual total number.

## Conclusions

It may be concluded from the data presented in this study that:

1. To reduce the noise in the spinning halls to a level below the TLV, without the application of acoustical materials to the interior surfaces of these places or without any mechanical treatment of the machines, five spindles per square meter may be recommended for conventional ring spinning frames with the following specifications (present in this study): (a) Ring diameter: from 42 to 55 mm. (b) Spindle speed from 5000 to 9700 rpm. (c) Yarn count: from eight to forty.

2. The total spindle speed per unit area was found to be the main factor contributing to noise in the spinning operations, and 25,000 rpm/m<sup>2</sup> (or less) may be used as a good guideline for noise control.

3. In the weaving operations, the increase of the floor area or the decrease in the number of looms will not effectively reduce the noise level. Loom speed (picks/minute) has been found to be a good index for noise evaluation for conventional weaving machines.

## References

1. Noweir, M. H., El-Dakhakhny, A. A., and F. Valic: Exposure to Noise in the Textile Industry of U.A.R. *Amer. Ind. Hyg. Ass. J.* 29:541 (1968).
2. Mostafa, H.: Occupational Hearing Loss. *J. Egyptian Med. Ass.* 46:406 (1963).
3. Harris, C. M.: *Hand-Book of Noise Control*, McGraw-Hill, New York (1957).
4. Goss, B. L.: Electric Motor Noise—Control of Noise at the Source. *Amer. Ind. Hyg. Ass. J.* 31:16 (1970).
5. *Threshold Limit Values for Physical Agents*. American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio (1973).
6. Mills, R. O.: Noise Reduction in a Textile Weaving Mill. *Amer. Ind. Hyg. Ass. J.* 30:71 (1969).
7. Emerson, P. D., and H. S. Overman: Reduction of Noise from Rotating Textile Spindles. *Amer. Ind. Hyg. Ass. J.* 33:252 (1972).