NOISE EMISSION LEVELS IN GREEK WOOD AND FURNITURE PROCESSING INDUSTRY

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ABSTRACT

The noise emission levels in wood and furniture processing industry in Thessaly area in central Greece were examined. It was revealed that employees are exposed in higher than the permissible noise limits on a daily basis, which can cause hearing loss and may cause other harmful health effects. A comprehensive hearing conservation program should be implemented in order to protect these employees from excessive noise exposures in the work place.

KEYWORDS

Noise emission levels, wood and furniture processing industry

INTRODUCTION

Development of modern mechanized operations in industrial plants has been considerably decreasing the physical burden of work. But the most important and unavoidable by-product of these operations is the generation of high level noise. Occupational noise, particularly in noisier industries is a potentially serious health problem. High level noise not only hinders communication between workers, but depending upon the level, quality and exposure duration, it may also result in physical, physiological and psychological effects on the workers. Exposure to high levels of noise causes hearing loss and may cause other harmful health effects as well. Noise-induced hearing loss can be temporary or permanent. Temporary hearing loss results from short-term exposures to noise, with normal hearing returning after period of rest. Generally, prolonged exposure to high noise levels over a period of time gradually causes permanent damage (Shaikh, 1999).

The general effect of noise on the hearing of workers has been a topic of debate among scientists for a number of years (Johnson, 1991; Jansen, 1992). Regulations limiting noise exposures of industrial workers have been instituted in many places (Alton and Ernest, 1990). For example in the US, the Occupational Noise Exposure Regulation states that industrial employers must limit noise exposure of their employees to 90 dB(A) for an 8-hour period (US Department of Labor, 1996). This permitted maximum noise exposure dose is similar to the Greek Standard where noise less than 80 dB(A) is considered harmless and a suggested 85/90 dB(A) is a guide number (there is no definite limit, but both limits are accepted as long as certain

conditions are met). Yet the reliability of these exposures limits as adequate protection for worker hearing, are still vividly debated.

One sector of the industry that the employees are exposed to high levels of noise on a daily basis is the wood and furniture processing industry. Consequently, the purpose of this communication is to report results obtained in a study whose scope was to evaluate the noise emission levels in wood and furniture processing industry in Thessaly area in central Greece.

MATERIALS AND METHODS

Ten representative industries were selected in Thessaly area in central Greece and these divided in to two categories, namely wood and furniture processing industries. In order to obtain a more spherical approach to the noise emission levels in the industry, the following considerations were taken into account:

- The noise level differs among the various parts in the plant. So noise measurements were taken in the production area, in workshop, in stores and in offices.
- The various types of machines in the production area emit various levels of noise. Therefore, the most important machines were representatively selected.

The measurements were performed with a portable, digital noise meter equipped with a high accuracy microphone, according to IEC 651, DIN 45633 and JIS 150

standards. The noise meter was able to measure over very wide dynamic ranges and to measure impulsive sounds with a high degree of accuracy.

RESULTS AND DISCUSSION

The noise emission values in wood and furniture processing industries are presented in Table 1. It can be seen that wood processing industries emitted, by far, higher noise values than the furniture ones, and this is the case for both four areas examined in the plants. Production area and workshop emitted noise values above the permissible limit (85 dB(A) for an 8-hour period exposure), whereas the values in stores and offices were close enough. It is interesting to notice the extremely high values measured in the production area and in the workshop of the wood processing industries. These values correspond to temporary hearing loss, results from short-term exposures to noise with normal hearing returning after period of rest. In these noise values, the allowable exposure period is estimated to be 15 minutes (Academy of Audiology, 2001). Generally, prolonged exposure to these levels over a period of time gradually causes permanent damage (NIOSH, 1996; American Academy of Audiology, 2001). Even in the offices, which are considered the safest places to work in, the values are considerably high and correspond to a danger level (Academy of Audiology, 2001). It has to be mentioned, at this point, that an increase of 3 dB(A) equals to duplication of the initial value. This means that the duplicate of 85 dB(A) is the 88 dB(A) and not the 170 dB(A) (OSHA, 1989).

The noise levels which are emitted by the most important machines in furniture and wood processing industries are presented in Figure 1. Again, it is interesting to notice

that all the machines examined in this study, have shown noise values above the 85 dB(A) permissible limit for an 8-hour period exposure, although sewing machines seem to be an exemption. This is an alarming observation and points out the severity of the problem.

Standard (ELOT 413, 1985), accepted and adopted by industry throughout Greece, predicts that the percentage of people with hearing problems will increase almost exponentially with the years at work in high noise environments. Audiometric examinations of the studied workers in Cyprus industry, ranging from timber to food and beverage, showed that 27.8% suffered some hearing damage while 7.7%suffered serious hearing loss (Eleftheriou, 2002). Similar studies in US (Chung *et al.* 1983) and UK (Burns and Robinson, 1970), report even more adverse effects, attributing hearing handicapping conditions to noise in the US and British workplace. National Institute for Occupational Safety and Health's (NIOSH) estimates that at least 420,000 US construction workers are potentially exposed to hazardous noise (exposure levels above 85 dBA) (NIOSH, 1996).

From the above discussion, it is evident the employees in Greek wood and furniture processing industry are exposed in higher than the permissible noise limits on a daily basis. Exposure to high levels of noise can cause hearing loss and may cause other harmful health effects as well. Government measures and inspection procedures do exist, but little priority is given to issues of noise. The appropriate governmental department does offer some education and literature on the subject, but apparently a more widespread effort is required. It is clear that a comprehensive hearing conservation program minimally should be implemented in order to protect these

employees from excessive noise exposures in the work place. This may considers, for example:

- ❖ Changes in machinery and equipment

The machines or machine pars to be controlled must be identified. Methods of maintenance and servicing must be taken into account in noise control design. Attempts should be made to:

- prevent or reduce impact between machine parts.
- reduce speeds gently between forward and reverse movements
- replace metal parts with quieter plastic parts.
- enclose especially noisy machine parts.

In a new plant, it is sometimes possible to make more extensive changes such as:

- Installing quiet electric motors and transmissions.
- designing ventilation ducts with fan inlet mufflers and other mufflers to prevent noise transfer in the duct between noisy and quiet rooms.

It has to be mentioned at this point that, the Commission of the European Communities (CEC) issued a directive in July 2000 which mandates noise labeling for equipment sold in the European Union states. This directive establishes guidelines for the measurement of sound power and labeling of 22 types of equipment, and also sets acceptable sound power emission requirements. The directive specifies a two-stage adoption of noise limits: the first stage becomes effective in March 2002, the second

in March 2006. The second stage lowers the allowable noise levels by 2-3 dB; this will require changes in, or elimination of, an estimated 50% of equipment currently on the market. All EU-marketed equipment must have a CEC label and carry what is essentially a guarantee on the noise levels produced by the equipment. As part of this directive, a repository of noise level data will be designed and maintained by the Commission (Irmer, 2000).

❖ Materials handling

Existing workplaces may be changed to prevent impact and collision during manual and mechanical materials handling.

- Increase the rigidity of containers receiving impact from goods, or damp them with damping materials.
- Use soft rubber or plastic to receive hard impacts.

❖ Enclosure of machines

If it is not possible to prevent noise, it may be necessary to enclose the machines.

- Use a dense material, such as sheet metal or plaster-board, on the outside.
- Use a sound absorbent material on the inside. A single hood of this type can reduce the sound level by 15-20 dB(A)
- Install mufflers on cooling air openings during enclosure of electric motors, etc.

- Install easily opened doors as required for machine adjustment and service.

❖ Control of noise from vibrating surfaces

- Isolate the floor from machine vibrations.
- Place large and heavy machines which will not be vibration isolated on separate bases. They may be put on a separate piece of ground without contact with the remainder of the building.
- Provide vibration isolation of machine surfaces to reduce sound emission. Fasten plates to the machine by flexible means in order to reduce the vibrations of the surfaces. Plates with special damping design may be used.

❖ Sound insulating separate rooms

With automation of machines and processes, remote control from a separate room may become desirable. Some control measures may include:

- providing good sealing around doors and windows.
- providing openings for ventilation with passages for cables and piping equipped with good seals.

In an attempt to increase the acceptability of noise controls to the industry, an effort is underway, in USA, to create a "one-stop shopping" information source on noise controls. This effort is being conducted by a group called the "Construction Noise

Control Partnership". (Irmer, 2000). The NCP is working to promote knowledge and use of noise controls in several of ways. The first is through the development of an equipment-specific noise database. The NCP is developing a protocol for making standardized sound pressure level measurements. With this protocol in place, comparable sound pressure data can be collected on a variety of construction equipment. This data can then be maintained in a searchable public database, allowing contractors to review and select similar equipment. The NCP is also working to develop informational materials and a best practices guide, and to make them available to the industry. The best practices guide will describe typical construction equipment and common noise exposure scenarios, and will list a variety of proven ways (and expected costs) to address these exposure issues through noise controls.

CONCLUSIONS

This work has demonstrated that employees in Greek wood and furniture processing industry are exposed in higher than the permissible noise limits on a daily basis, which can cause hearing loss and may cause other harmful health effects. Even in the offices, which are considered the safest places to work in, the noise levels are considerably high and correspond to a danger level. This is the first consistent study of its kind made for detection of noise problems in Greek wood and furniture processing industry. More and repeated measurements should be made to fully quantify hearing problems in wood and furniture processing industry. Also, a comprehensive hearing conservation program minimally should be implemented in order to protect these employees from excessive noise exposures in the work place.

REFERENCES

ALTON B. and ERNEST J. 1990. Relationship between loss and noise exposure levels in a large industrial population: a review of an overlooked study. Journal Acoustic Society 88:73-76.

AMERICAN ACADEMY OF AUDIOLOGY 2001.

BURN WD and Robintson G. 1970. Hearing and noise in industry. London: Her Majesty's Stationery Office.

CHUNG DY, HARDIE R and GANNON R. 1983. The performance of circumaural protectors by dosimetry. Journal of Occupational Medicine15:679-682.

ELEFTHERIOU P. 2002. Dimensional Industrial noise and its effects on human hearing . Applied Acoustics 63: 35-42.

ELOT 413. 1985. Acoustics-Assessment of occupational noise exposure for hearing conversation purposes. Greek Organization for Standards.

IRMER V. 2000. Recent development in European noise legislation concerning construction equipment. National Conference on Noise Control Engineering. Newport Beach, USA.

JANSEN G. 1992. The effects of noise on human beings. VGB 72:60 64.

JOHNSON D. 1991. Field studies: industrial exposures. Journal Acoustic Society 90:170-174.

NIOSH 1996. Criteria for a recommended standard occupational noise exposure, NIOSH – Education and Information Division of Biomedical and Behavioural Science. Draft Document, 108pp.

OCCUPATIONAL NOISE EXPOSURE. 1996. 29 CFR 1910.95, US Department of Labor.

OSHA. 1989. Industrial hygiene field operation manual. US Department of Labor, Occupational Safety and Health Administration, OSHA Instruction CPL 245B, Washington DC.

SHAIKH GH. 1999. Occupational noise exposure limits for developing countries. Applied Acoustics 57: 89-92.

Table 1. Noise emission levels dB (A) produced in wood and furniture processing industries. The values shown are means from 90 measurements. Standard deviations in parentheses.

Industry part	Wood industries	Furniture industries
	dB(A)	
Production area	88 (5.3)	103.2 (4)
Workshop	83.5 (2.1)	92.9 (2.4)
Stores	79.8 (5.7)	85.2 (0.2)
Offices	72.9 (2.5)	77.8 (2)
Allowable limit (for an 8 hour exposure) 85 dB(A)		

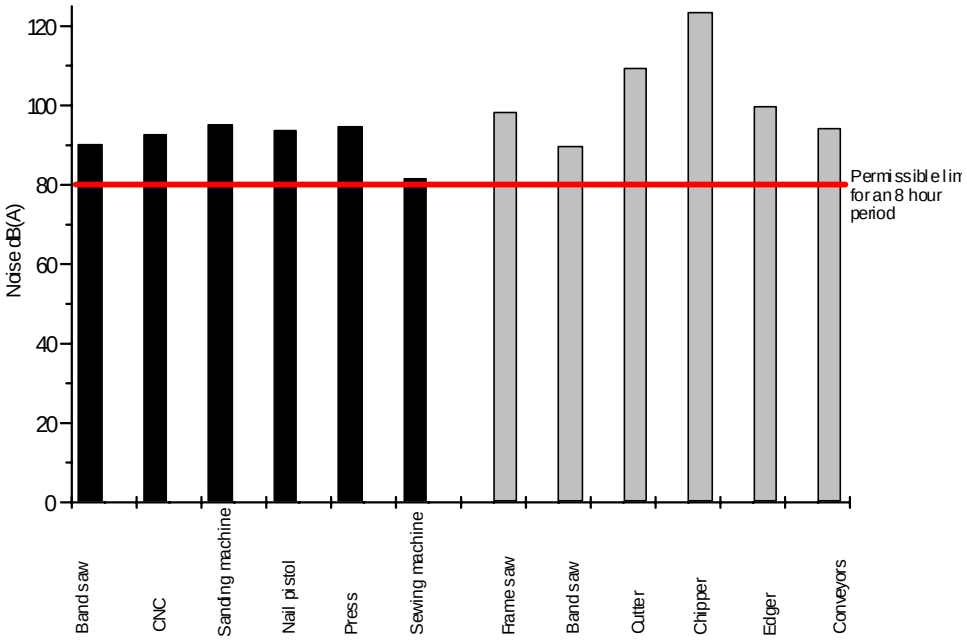

Figure 1. Noise levels which are emitted by the most important machines in furniture (shown in black) and wood (shown in grey) processing industries.