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THE NOISE ENVIRONMENT IN TWO TYPICAL PORTUGUESE INDUSTRIES IN THE FRAMEWORK OF EC DIRECTIVE 86/188/EEC

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1. INTRODUCTION

The European Community Directive 86/188/EEC [1] was transcript into Portuguese legislation by the Law-Decree no. 72/92 of 28 April, regulated by the Regulatory Decree no. 9/92 of 28 April. According to this document, whenever the measurement of each worker's daily personal exposure to noise at work reveals the existence of workers subject to an exposure exceeding the so-called "action level" (85 dBA), the employer must take the following measures:

- perform periodic measurements of the daily personal exposure to noise ($L_{EP,\,d}$) and of the maximum value of the unweighted instantaneous sound pressure level ($MaxL_{peak}$) that each worker is subject to;
- record the measurements, filling in Annex IV of the Regulatory Decree no. 9/92 of 28 April;
- provide workers with personal ear protectors, whose attenuation is adequate to the noise levels that workers are exposed to;
- submit workers who are exposed to noise to medical and audiometric examinations, every three years.

Whenever the measurements of $L_{EP,\,d}$ and $MaxL_{peak}$ show the existence of workers who are exposed to levels equal to or greater than the so-called exposure "value limit" (90 dBA) or "peak value limit" (140 dB), respectively, besides the previously mentioned measures, a set of technical actions aimed at decreasing the noise levels must also be taken.

The importance of industrial noise control in Portugal is obvious, since deafness is the second most important occupational health problem in the country [2]. The present work describes the situation, in terms of workers' exposure to noise, in two typical Portuguese industries, namely the wood and cork industries.

Most of the industrial units of the wood and cork sector are located in Northern Portugal. This region has 51,5% of the enterprises, employs 57,7% of the workers and generates about 50% of the net added value. Small companies are dominant, since 91% of them employ less than 20 workers.

2. NOISE SURVEYS

The data presented herein is the result of various surveys of workers' exposure to noise in the wood and cork industries. In all places of work, measurements were made of the equivalent continuos and octave band sound levels. In general, workers are subject to rather high values.
Table 1 shows the values of equivalent continuos sound level, L_{eq}, and peak sound pressure level, L_{peak}, measured at about 1 m of each of the most characteristic machines of the wood industry. As one can observe, most places of work are very noisy, with typical values of L_{eq} usually in the range 90 to 100 dB(A). Machines like the multi-saw, the dethicknesser, the four-sided moulder, the shaper and the cross cut saw are particularly noisy.

Table 1. Measurements of the equivalent continuos sound level, L_{eq}, and peak sound pressure level, L_{peak}, obtained at different places of work of the wood industry.

Place of work	Equivalent continuos sound level, L_{eq} (dBA)	Peak sound pressure level, L_{peak} (dB)
Table band saw	89,3 - 96,9	113,0 - 120,4
Cross cut saw	91,5 - 97,7	117,8 - 120,8
Sliding table saw	89,0 - 96,7	112,4 - 116,8
Shaper	92,0 - 99,6	114,6 - 121,6
Mortiser	83,2 - 88,5	105,0 - 123,8
Sander	84,0 - 88,3	103,1 - 119,9
Wood turning machine	81,2 - 87,7	105,4 - 122,3
Double surface planer	92,4 - 93,9	114,4 - 115,6
Pantograph	90,6 - 98,3	107,0 - 116,0
Four-sided moulder	91,2 - 102,6	110,0 - 126,4
Multi-saw	97,0 - 98,1	106,5 - 116,5
Planer	84,9 - 91,5	107,6 - 117,6
Radial saw	86,1 - 97,1	108,6 - 118,0
Tenoning machine	91,2 - 93,6	118,4 - 124,0
Dethicknesser	92,9 - 98,0	112,9 - 116,9

Figure 1 shows the octave band spectrum obtained in the vicinity of a multi-saw, one of the noisiest machines of the wood industry.

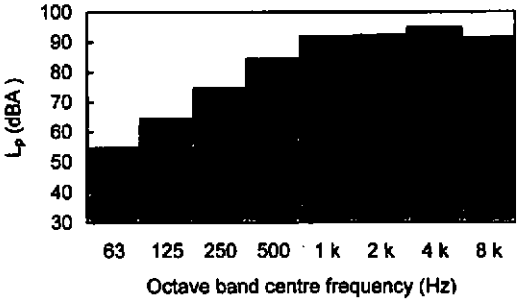

Figure 1. Octave band analysis of the noise produced by a multi-saw.

Several surveys performed in the wood industry in Portugal showed that the number of workers subject to noise levels greater than the "value limit" of personal daily exposure imposed by Regulatory Decree no. 9/92 (90 dBA) is 63%.

The cork industry is a traditional sector, where one can find both antiquated and modern machinery working in the same industrial unit. This curious situation yields the existence, in the same factory, of very different noise environments. Table 2 shows the values of equivalent continuos sound level, L_{eq}, and peak sound pressure level, L_{peak}, measured at about 1 m of each of the most characteristic machines of a cork factory.

Table 2. Measurements of the equivalent continuos sound level, L_{eq}, and peak sound pressure level, L_{peak}, obtained at different places of work of a cork factory.

Place of work	Equivalent continuos sound level, L_{eq} (dBA)	Peak sound pressure level, L_{peak} (dB)
Grading mill	95,2	114,4
Hammer grading mill	94,2	111,5
Staff cutting machine	91,2	110,5
Weighting	89,3	107,6
Mixer sieve	88,0	107,4
Extrusion equipment	82,9	102,1
Chamfers	90,2	109,1
Colmatation	80,9	105,5
Cork washing	82,2	107,0
Sorting	77,1	110,5
Laboratory	66,1	97,0
Packaging (labels)	79,0	100,3
Packaging (capsules)	82,3	101,1
Surface treatment	71,6	97,6
Counting machine	77,1	96,6

As one can see in Table 2, the noisiest place of work is that of the grading mill. Figure 2 displays the octave band analysis of the noise produced by that machine.

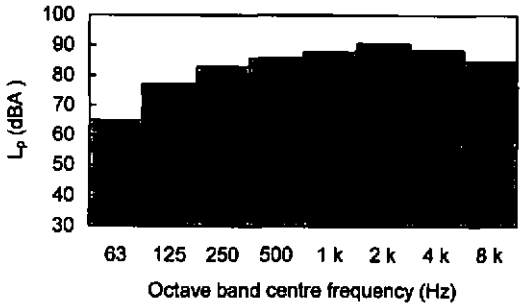

Figure 2. Octave band analysis of the noise produced by a grading mill.

It was found that 27% of the places of work are subject to noise levels greater than the "value limit" of personal daily exposure imposed by the Regulatory Decree no. 9/92 (90 dBA), while 13% of the places of work are subject to exposure levels greater than the "action level" (85 dBA), as defined by the Portuguese law.

4. CONCLUSIONS

The transcription of the European Community Directive 86/188/EEC into Portuguese law enforced a set of measurements of workers' exposure to noise. The measurements obtained in the wood and cork industries showed that a large number of workers were exposed to noise levels above legal limits.

REFERENCES

[1] EEC (1986), Council Directive of 12 May 1986 on the protection of workers from the risks related to exposure to noise at work (86/188/EEC), *Official Journal of the European Communities*, **L 137**, 28-34, 24 May.

[2] Samagaio, A. (1992), "A Legislação Comunitária sobre o Ruído e o seu Impacte no Mercado Único Europeu", *3rd National Conference on the Quality of the Environment*, Volume II, 513-521, Aveiro, 5-7 February.