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[N190] Control of noise exposure of workers in car damage repair companies

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ABSTRACT

Workers in car damage repair companies are exposed to high sound levels. The most relevant activities in relation to noise induced hearing loss are grinding, hammering, sawing, chipping, sanding, cleaning with compressed air and assembling. All these activities cause noise levels at the working places higher than 80 dB(A), unless special sound reducing measures are taken. By means of a broad survey the actual noise levels, daily doses and the "state of the art" of sound reducing measures have been determined. Measures to reduce the sound levels are presented and evaluated with respect to feasibility in practice. An important conclusion is that training of workers with respect to certain skills can reduce the daily dose substantially. This paper discusses the current noise exposure of workers and the ways to reduce noise levels by application of measures related to noise sources, noise transmission and organisational optimisations.

INTRODUCTION

To reduce the risk of noise induced hearing loss an agreement is planned between the Dutch government and the branch of car damage repair companies. In order to provide adequate information for such an agreement research was done to assess the noise levels at the working places and the average exposure time for each activity. From this information daily doses have been derived.
Furthermore practicable sound reducing measures have been evaluated with respect to operational, technical and financial aspects.
Similar research has been done in other branches; see for instance [1].

AIM OF THE RESEARCH

First priority was to obtain adequate information about the situation regarding occupational noise exposure of workers in this branch. The following information had to be obtained:
- number of workers exposed to harmful noise levels;

- average exposure time during different activities in order to determine daily doses;
- the most important activities in relation to contributions to the daily dose.

Furthermore, information was required regarding the state of the art of sound reducing measures in this branch. Special interest concerned:

- the actual application of sound reducing measures;
- the costs and benefits of these measures.

From this information measures had to be derived which could be regarded as the most optimal and should be stimulated by the agreement between government and branch.

RESEARCH STRATEGY

The required information has been obtained by:

- sending a questionnaire to a representative number of companies (about 360 of the 1450);
- visiting a number of different companies (40);
- consulting a number of companies which fabricate and/or provide “noisy” equipment or noise reducing provisions specific for this branch.

Part of the visit to companies was doing sound measurements.

TYPE OF COMPANIES

Companies can be subdivided roughly as follows:

- Big companies with more than 15 employees, in which relatively new cars are repaired (with lease contracts), paid by insurance companies. Often damaged parts are replaced instead of repaired (see figure 1);
- Middle sized companies (5-15 employees). These companies deal with “insurance damage repair” as well as damage repair of private cars;
- Small companies (less than 5 employees), which deal relatively often with damage repair of private cars: damaged parts are mostly repaired instead of replaced.

Figure 1: Damaged car at a car damage repair company

All companies have a relatively uniform working process that consists of departments for sheet metal works, pretreatment, assembly/disassembly and paint spraying.
At most big and middle sized companies the separation between these different departments is clearly visible. At smaller companies workers mostly exercise different tasks.
For most companies the aspect "occupational noise" does not play an important role, mainly by lack of information about this subject. At most firms noise surveys have not been carried out (sometimes only in a superficial way by providers of personal hearing protection devices). On the other hand most firms showed a positive attitude to implementing possible provisions to reduce occupational noise.

NOISE EXPOSURE

By means of the results of the questionnaire and company visits the average exposure time as well as the sound levels have been determined. From this the contribution of each activity to the daily dose has been derived (daily dose defined as the average 8 hour noise exposure on a weekly base). In table 1 the most relevant data are summarized.

Table 1 Summary of occupational noise exposure in car damage repair companies

Description	Total number of workers	Equivalent sound level during activity in dB(A)	Duration of activity in minutes per day per worker	Contribution to daily dose in dB(A)
Sheet metal works department:				
- grinding	2.100	100 (92)[2]	25	87 (79)[2]
- cutting with pneumatic chisel[1]	2.100	105	4	84
- hammering	2.100	97	20	83
- cutting with pneumatic saw	2.100	105	4	84
- drilling	2.100	86	18	72
Pretreatment department:				
- sanding	2.325	88	165	83
- cleaning with compressed air	2.325	97 (87)[3]	10	80 (70)[3]
- spraying with primer	2.325	84	45	74
Assembly/disassembly department:	1.500	95	10	78
- pneumatic nut spanner[4]	1.500	85	3	63
- pneumatic screwdriver	1.500	75	15	60
- electric screwdriver				
Paint spraying department:				
- cleaning with compressed air	1.275	97 (87)[3]	3	75 (65)[3]
- paint spraying	1.275	85	150	80
- room ventilation	1.275	71	330	69

[1.] Used by 30% of the companies.
[2.] Concerns the use of flap grinding discs (used by 70% of the companies); see figure 2
[3.] Concerns blow pistols of multiple jet type (used by 60% of the companies)
[4.] Used by 70% of the companies

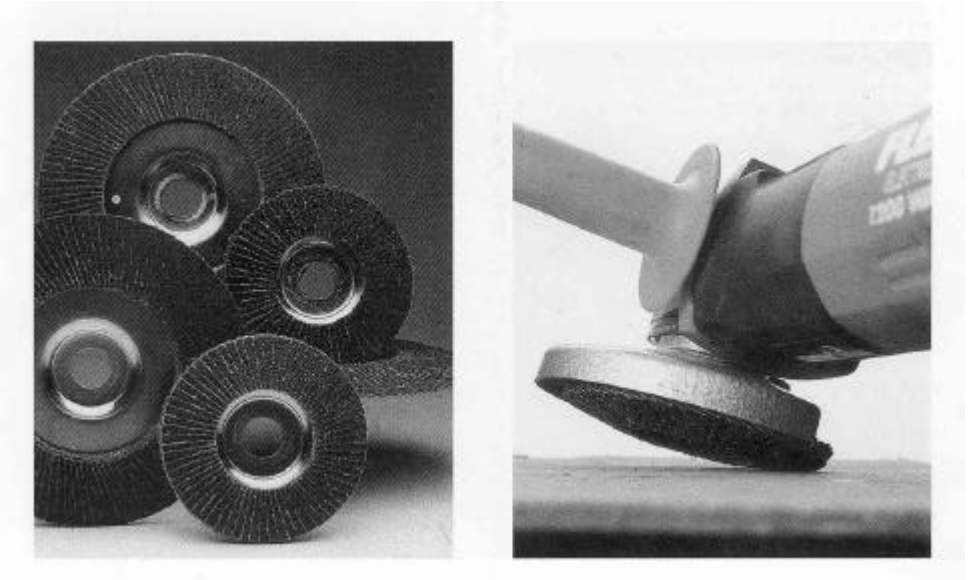

Figure 2: Flap grinding disc

The data in table 1 show that the noise limit of 85 dB(A), as obliged by Dutch law, is exceeded in almost all companies in this branch.

From the noise levels and the exposure times the following contributions to the daily dose of the workers due to their own activities can be derived (average values):

- Sheet metal works : 88 to 91 dB(A)
- Pretreatment : 84 to 85 dB(A)
- Assembly/disassembly : about 78 dB(A)
- Paint spraying : 80 to 81 dB(A)

As a consequence of the activities of colleagues in the same working room the real daily doses of workers shall increase approximately by:

- 1 to 2 dB(A) for workers in the sheet metal works department;
- 2 to 4 dB(A) for workers in the pretreatment department;
- 4 to 8 dB(A) for workers in the assembly/disassembly department.

This increase depends strongly on the specific situation, especially the layout and the acoustical finishing of the working room (sound absorbing ceiling and/or walls).
In the paint spraying department the daily dose is not significantly influenced by the contribution of other departments, because this department is separated from the other departments (paint spraying cabin).

Regardless of this uncertainty it can be concluded that in the present situation the daily dose is higher than 80 dB(A). It is generally accepted that noise induced hearing loss can be expected if workers are exposed during longer periods of time to daily doses above 80 dB(A). This conclusion is valid for each department except the paint spraying department.
The daily doses of the workers in the assembly/disassembly department are mainly caused by the activities in the sheet metal works department and the pretreatment department.

In the sheet metal works department the following activities/noise sources are especially responsible for these values (with the mentioned contribution to the daily dose):

- grinding : 87 dB(A);
- cutting with pneumatic chisel : 84 dB(A);
- hammering : 83 dB(A);
- cutting with pneumatic saw : 84 dB(A).

In the pretreatment department these activities/noise sources are (with the mentioned contribution to the daily dose):
- sanding : 83 dB(A);
- cleaning with compressed air : 80 dB(A).

NOISE REDUCING MEASURES

Noise reducing measures according to the state of the art are listed using the questionnaires and the visits to companies.
Regarding to noise abatement the so called "labour hygienic strategy" is obligatory. This consists of an obliged order of measures:
1. provisions to the noise source;
2. provisions in the transmission path of the sound;
3. reduction of number of noise exposed workers and/or exposure time;
4. application of personal hearing protection devices.

The following measures appeared to be most effective in order to reduce occupational noise exposure, and should therefore be stimulated:
Grinding:
- if possible: application of flap grinding discs (reduction 7 to 15 dB, purchase costs 20 to 25% higher than conventional grinding discs;
- application of flexible grinding discs (reduction 5 to 13 dB, costs due to extra wear approximately 50% higher than for conventional polishing discs);
- application of magnetic damping foils (see figure 3; reduction 2 to 3 dB, costs approximately € 100.- per m^2);

Figure 3: Application of magnetic damping foils

- application of plastic brushes and discs (see figure 4; reduction 5 to 15 dB, no extra costs);
- application of grinding machine with low noise driving unit (reduction 0 to 10 dB, purchase costs approximately 50% higher than standard tools).

Figure 4: Application of plastic brushes and discs

Cutting:
- application of magnetic damping foils (reduction 2 to 3 dB, costs approximately € 100.- per m^2)

Hammering:
- replacement of damaged parts instead of repairing (extra costs depend on the specific damage);
- application of magnetic damping foils (reduction 3 to 5 dB, costs approximately € 100.- per m^2)

Sawing:
- application of magnetic damping foils (reduction about 3 dB, costs approximately € 100.- per m^2)
- application of sawing machine with low noise driving unit (reduction 0 to 15 dB, purchase costs approximately 50% higher than standard tools).

Sanding:
- application of sanding machine with low noise driving unit (reduction of 0 to 10 dB, purchase costs approximately 50% higher than standard tools;
- application of a silencer on the air-exhaust of pneumatic tools (reduction up to 10 dB, costs € 15.- to € 30.- a piece).

Blowing with compressed air:
- application of low noise nozzles (reduction 5 to 10 dB, additional costs € 5.- to € 6.- per blow pistol).

Noise transmission:
- sound insulating enclosure around stationary equipment, such as compressor units;
- application of sound absorbing ceiling and/or walls.

It is highly recommendable to apply an acoustical favourable lay out in case of a new building or renovation of an existing building. In that case the sheet metal works department should preferably be separated from the other departments.

EXPECTED EFFECT OF NOISE REDUCING MEASURES

By application of the combination of the measures as mentioned above reduction of daily doses can be expected as follows:

- sheet metal works department : 4 to 5 dB(A);
- pretreatment department : 3 to 4 dB(A);
- paint spraying department : about 1 dB(A).

For workers in the assembly/disassembly department the daily dose will decrease significantly by this combination of measures, mainly due to the fact that the noise contribution of their own activities is relatively low.

CONCLUSION

An extensive survey regarding occupational noise levels in car damage repair companies has been carried out. Most workers are exposed to noise levels that can cause noise induced hearing loss.
Different noise reducing measures appeared to be feasible. By application of a combination of measures reduction of daily doses of 3 to 5 dB(A) can be obtained.
Lack of knowledge about noise reducing measures appeared evident. It is therefore highly recommendable to provide adequate and specific information about actual and practicable provisions regarding noise reduction.

REFERENCES

1. **Periodicals:** A. Boasson, R.A. Metkemeijer and J.H. Granneman, “Sound exposure of musicians in a pit orchestra”, Inter Noise 2002.