

## Noise control at the workplace starts with measurements.

We often automatically turn to personal protective equipment in order to restrict noise. Yet there are other solutions. NoiseAtWork software enables us to map the situation quickly.

Text by Jos Bosman

It has been scientifically proven that exposure to noise which exceeds 80 dB(A) causes hearing loss, but lower levels can also cause physical and mental complaints. Noise also has a disruptive effect on communication and concentration in the workplace. It can affect the productivity of employees. Discomfort and nuisance caused by noise can therefore cost companies money. Employers are responsible for working conditions, and therefore for any exposure of their employees to noise in working environments. The risks run by employees need to be surveyed when drawing up the Risk Inventory & Evaluation (RI&E). They can also be identified from employees' complaints.



Figure 1: Noise measurement at the workplace  
(Photography: Thea van den Heuvel, The Netherlands)

### Gradual process

An estimated 900,000 employees experience hearing loss as a result of long-term exposure to noise. About 200,000 even experience deafness due to excessive noise. Industrial activities in the metalworking sector, construction and food industries are examples of environments involving many noisy tasks. Hearing loss is a gradual process: you don't initially notice that you are becoming deafer, and you therefore don't feel the need to restrict your exposure to noise. Your hearing gradually deteriorates without you noticing, and in the long term this can lead to performance problems and in some professions even to being classed as unfit to work.

The problem is exacerbated by exposure to noise outside work. A new threat is posed by loud music from mp3 players and phones, via ear buds and

headphones. Teenagers who continually expose themselves to high (or excessive) noise levels will probably only notice that their hearing has deteriorated later in life (age 30-40). A complaint that used to be associated with the elderly has developed into a problem for a much larger group of people. Many more people than before could end up becoming socially isolated. Hearing loss can also indirectly contribute to other physical problems. Communication requires us to get signals across, but this is becoming increasingly difficult due to excessive environmental noise. This increases the risk of stress and therefore the risk of cardiovascular diseases. In short, there are many good reasons to control noise.

### *Hearing loss can indirectly contribute to other physical problems*

#### Legal framework

The Inspection Service of the Ministry of Social Affairs and Employment in The Netherlands checks whether target provisions are being met. It bases its checks on the applicable laws and legislation and compliance with them by both employers and employees. The Working Conditions Decree describes two action levels and a limit level:

##### First action level

- » Daily exposure (equivalent noise level over the entire working day) of 80 dB(A)
- » Instantaneous peak sound pressure level of 112 Pascal

##### Second action level

- » Daily exposure (equivalent noise level over the entire working day) of 85 dB(A)
- » Instantaneous peak sound pressure level of 140 Pascal

Limit level (including reducing effect of hearing protection, i.e. in the auditory canal)

- » Daily exposure (equivalent noise level over the entire working day) of 87 dB(A)
- » Instantaneous peak sound pressure level of 200 Pascal

## Measures

The occupational hygiene strategy must be adopted when mapping and restricting noise risk: it must first be tackled at the source and only in extreme cases should hearing protection be used.

Providing personal protective equipment (PPE) is just one of the employer's obligations. A ruling by the European Court on 19 May 2011 stresses this: noise control is more than simply providing hearing protection. The ruling states that: Noise nuisance for employees must be reduced by the implementation of measures. The use of hearing protection alone is not enough. The Court's explanation of Directive 2003/10/EEC is that the measures are not confined to simply providing hearing protection, as that is not what is meant by the 'programme of technical or organisational measures' stipulated by the directive.

Tackling the problem at the source, eliminating as far as possible the direct cause of the noise, starts with conducting measurements. This enables an objective analysis of noise levels. NEN-EN-ISO 9612 forms the basis for measuring and assessing noise levels in the workplace. This standard stipulates which variables need to be measured and how measurements must be conducted. The standard describes three methods for conducting a noise level inventory. All three focus on employees:

1. Task-based method
2. Job-based method
3. Full-day method

### 1. Task-based method

- » Employees are divided into groups, known as Homogeneous Exposure Groups (HEG), comprising similar tasks, such as logistics or manufacturing tasks.
- » Noise measurements are conducted for all relevant and applicable machines and tasks within each HEG.

### 2. Job-based method

This method is applicable if it is difficult to allocate tasks to a specific job or if the duration of the tasks varies greatly. This method is based on the principle of random measurements throughout the working day. A task analysis demonstrates which people come within which HEG. Depending on the size of the group, the minimum measurement time is divided randomly over the HEG. This method requires a detailed knowledge of the company's modus operandi in order to estimate daily exposure accurately. This method may be used if tasks vary widely and if their duration, or the tasks themselves, are unknown. In

such cases, an option is to equip a number of people in the HEG with a dosimeter.

### 3. Full-day method

- » The employer selects a number of employees per HEG who wear a dosimeter during several working days. The employees start their working days with a dosimeter and hand it back in at the end of each working day.
- » A minimum of three working days is required in order to obtain an accurate picture of day-to-day variations.
- » During or at the end of each working day, each selected employee must complete a form to indicate the extent to which the day corresponded to a normal working day.
- » The data on the dosimeters is easy to read out and input using a docking station.

## *Tackling the problem at the source starts with conducting noise measurements*

### Location method

The above three methods focus on employees. However, there is another method which works on the basis of location. This location method can quickly provide insight into overall noise levels. Companies have therefore often already conducted indicative measurements. When complemented by a number of measurements on a regular grid in the factory, this can be sufficient to map the noise contours.

It is a good idea to tell management which locations have high noise levels and the extent to which these cause a nuisance and/or are harmful. In some cases, this location method could even be conclusive, enabling the more time-consuming employee approach to be omitted.

The location method is excellently suited to stationary noise sources (fixed machines). The method lends itself well to a visual representation of those locations with high noise levels. The measurement results are used to visualise the different noise sources.

Noise-reducing measures can then be mapped for the different noise sources and ranked according to priority. NoiseAtWork software can support this modus operandi. The software identifies the noise contours based on the measured noise levels. The noise doses for each employee can also be determined based on their working hours.

The measurements can be used to create an overview of the departments and factory sections which are important to establishing employee exposure.

Individual environmental factors can be used to create computational models for internal noise in these departments. Measurements are conducted in the departments in order to map the sound pressure levels and validate these models. More detailed versions of these computational models for internal noise complete the basis for the survey. The models enable a forecast to be made of future scenarios and the effect of measures taken at the source.

*The location method is excellently suited to stationary noise sources*

**Case study**

A client in the industrial sector wanted to analyse the noise levels at workstations. Previous measurements had demonstrated the extent to which this company caused nuisance to the immediate surroundings. This case involved not just analysing the acoustic situation, but also all environmental hygiene aspects. The company's desire for optimum sustainability led to a wish to obtain insight into noise levels in the internal environment and into employee welfare. In conjunction with the company, this wish was translated into the question of how the company could ensure that noise levels at workstations did not exceed 80 dB(A). Three major decisions were taken:

- » Measures were taken at the source at so-called hotspots, following visualisation of the noise contours on the different shop floors
- » Noise criteria were laid down in the purchasing terms and conditions for suppliers when purchasing new equipment or replacement parts
- » Advice on orders, more specific criteria, more reduced-noise solutions and checks on project completion

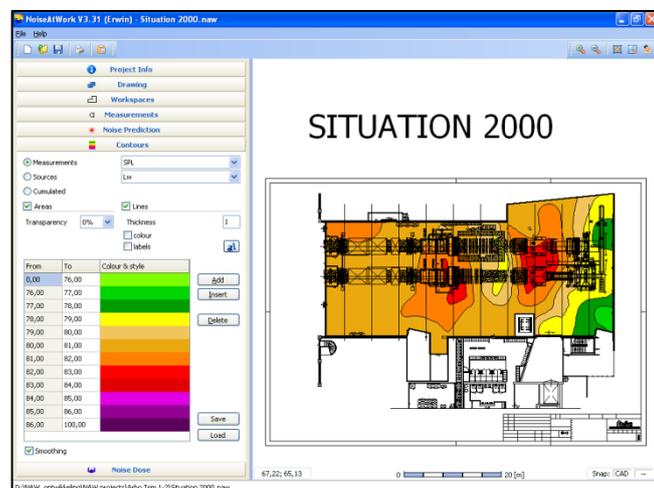


Figure 2: Situation before measures (NoiseAtWork)



Figure 3: Situation after measures (NoiseAtWork)

The maps above show the results before and after the introduction of noise-reducing measures on a production line. They indicate how daily exposure has decreased in this department thanks to measures taken near or at the source of the noise and to the replacement of machine parts with reduced-noise versions. Employee complaints have consequently decreased.



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NoiseAtWork is developed by DGMR and is distributed by selected resellers worldwide.