Proceedings of the Institute of Acoustics

RISK RATING PROCEDURE FOR NOISE

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1. INTRODUCTION

The Microelectronic Semiconductor Manufacturers Joint Working Group consisting of members from the manufacturers, equipment suppliers ,trade unions and the HSE have for some time been developing a risk assessment rating procedure for their industry. Based on initially the hazards from general safety and chemicals (inhalation) .It was decided to try to extend the risks to those of noise and radiation by using the principles previously adopted Noise fell within the previous criteria but radiation did not and a different approach was eventually adopted for that subject.

The initial impression of the industry was to ask the question 'do they have a problem with noise?'. Clinically clean rooms , automation, space age technology etc. is what immediately comes to mind. After a visit to a plant I had to say yes they may have problem. Outside the clean environment are to be found water treatment plant including pumps, compressor houses, ventilating systems, exhaust systems all having the capacity to emit noise.

Also with workers being in the very special environment presents its own problems regarding noise. While not at a level which would be considered to be damaging to hearing, the background noise can cause considerable annoyance making it stressful to some of the more susceptible workers. Unfortunately the risk assessment procedure described here does not cover this annoyance factor, only the risk to hearing.

2. WHAT IS RISK ASSESSMENT?

Carrying out a risk assessment may sound awesome, particularly if you are not familiar with health and safety procedures. Usually it is applied common sense and observation.

A *Hazard* is anything that has the potential to cause harm. In this case noise can cause harm to hearing .

Risk is the chance, great or small, that someone will be harmed by the hazard . The risk arises from the activities carried out where the hazard exists. The extent of the risk should take account of the number of people who may be exposed and the consequences for them.

A *assessment of risk* is a careful examination of what in your work activities, could cause harm to people. A consequence of the assessment is to enable you to weigh up whether or not you have taken adequate precautions or should do more to prevent further harm.

There are four steps to risk assessment and management :

Step 1.	Finding out if there is a problem (and how bad is it?)
Step 2.	Decide what to do
Step 3.	Take actions
Step 4.	Review what has been done

The object of risk assessment is to identify the hazard, assess who may be affected, evaluate the risk and decide if the existing precautions are sufficient. The adoption of a Risk Rating Number (RRN) system should lessen discussion and arguments which could arise and it provides a convenient method for calculating the overall or combined risk due to many factors.

The system as described is based on a qualitative numerical system. It is designed to be more of a hands-on application to supplement existing techniques. It has been devised to avoid being over complicated and provide a simple ranking scheme where managers can identify and prioritise actions which need to be taken.

By using the system before and after controls have been introduced the effect of the controls can be readily seen.

This risk rating number system is a tool to be used by managers and supervisors in their decision making process. **It is not a substitution for an adequate noise assessment as is required by the Noise at Work Regulations 1989.**

3. THE RISK RATING NUMBER SYSTEM FOR NOISE

The general principle of the system is to obtain a numerical risk rating for an activity using a simple 'look see' assessment built up from a series of variable factors to be found in Appendix 1. The overall risk rating number is obtained by multiplying the numbers from the individual factors.

The equation for the Risk Rating Number for noise is :-

$$\mathbf{RRN(NOISE) = LN \times EX \times NC \times NP}$$

where: **LN** = Likelihood of Noise Exposure to any level of Noise

EX = The level of Noise Exposure without ear protection

NC = Control of the Noise

NP = Number of persons at risk of Noise exposure (above 80dB(A))

Table 1 *Likelihood of Noise Exposure (time of exposure)* - **(LN)**

The information to be obtained to use Table 1, indicating the length of a particular exposure, is usually relatively easy to obtain. However, cases of variable exposures to different noise sources during the same working day or shift may prove more complex and an overall exposure will need to be made.

Although Table 1 is based on an 8 hour working day there is provision to enable longer or shorter shifts to be assessed. An example is given in the Table for a 12 hour shift.

Table 2 *The Level of the Noise (without ear protection)* - **(EX)**

Table 2 gives some general indicators for noise levels to assist in determining likely rating (EX) levels.

These should only be taken as a guide. They are not substitutes for actual measurements The noise level used should not take into account the use of ear protection. The factor used should reflect the noise level produced, with or without any other noise control measures in place.

Provision has also been made in Table 2 for any exposure to very high short duration impulses of noise above the Peak Action level of the Noise at Work Regulations i.e. a peak sound pressure of 200 pascals (140dB). Exposure to such high impulse noise adds to the overall value of noise exposure level derived from Table 2. Account is taken of this by multiplying the noise level rating figure obtained for normal exposure by a factor of 1.5.

Table 3 *Control of the Noise* - **(NC)**

If control measures to reduce personal exposure are implemented this should be reflected by a lower overall risk rating figure. However, the figure should also reflect the suitability and effectiveness of the control measures used. So, for example, if an employer simply chooses ear protection without any control of the noise at source e.g. by suitable noise reduction or enclosure a higher overall risk rating number will result.

If no assessment of exposure has been made under the Noise at Work Regulations 1989, (quite apart from the general exposure assessment made by calculating the product of LN x EX), this is again taken into account in determining the overall risk rating number. A proper noise assessment under the Regulations is critical for determining risk and appropriate control measures. If this has not been done a suitable increased risk factor needs to be added. This increased risk factor for not carrying out a noise assessment should also spur employers into taking appropriate action before proceeding further.

Taking all these factors into consideration an appropriate rating number should be selected from Table 3 so as to allow calculation of the overall risk rating number for noise.

Table 4 *Number of People at Risk* - **(NP)**

The overall risk rating number for noise exposure should , in addition to the factors already taken into consideration, also reflect the number of people put at risk. The rating number is therefore duly increased in relation to the numbers at risk.

Where the public are put at risk a high risk factor is given too since they are unlikely to be in a position to properly protect themselves from the consequences. If the public are at risk it is also likely that significant numbers of employees will be as well.

Using the Rating Number ***LN x EX*** *(derived from Tables 1 and 2)*

By determining (LN x EX) you have assessed the noise exposure in a given situation without the use of ear protection. This will now give an indication of action to be taken to comply with the Noise at Work Regulations. If the product (LN x EX) is equal to or exceeds the following figures then the action levels in the regulations have been exceeded:-

> If LN x EX is equal to or greater than 12 the first action level of the regulations has been exceeded and appropriated action should be taken.
>
> If LN x EX is equal to or greater than 24 the second action level of the regulations has been exceeded and appropriate actions should be taken.

Using the overall Risk Rating Number for Noise - RRN(Noise)

To derive the overall risk rating number simply take the appropriate rating values for each of LN, EX, NC and NP and multiply them together.

RRN(NOISE) = LN x EX x NC x NP

For example an maintenance employee may work near an air compressor at a noise level of 96dB(A) for 4 hours where no control measures have been provided. In this case the risk rating will be **120.** (4 x 6 x 5 x1).

Giving the man ear protection will give a risk figure (RRN) of **96** (4 x 6 x 4 x 1)

From the rating figures it maybe decided to enclose the compressor which will reduce the risk rating dramatically

When the compressor is then enclosed the noise level is reduced to 88dB(A). As a result the RRN(Noise) is now **6** (4 x 1.5 x 1 x 1).

If a programme of effective control at source is carried out which will significantly reduce the noise exposure, the risk rating number will fall drastically to reflect both the degree and suitability of the control provided.

Appendix 1.-RISK RATING NUMBER- NOISE

Risk Rating Number - RRN(Noise) = LN x EX x NC x NP

Table 1:Likelihood of Noise Exposure to any level of Noise (LN)

0	None at all	Will not be working in any area where noise exists (below 75 dB(A))
1	Very occasionally	Once a week/ Four times a month
2	25% of the working day	Two hours in an eight hour shift
4	50% of the working day	Four hours in an eight hour shift
6	75% of the working day	Six hours in an eight hour shift
8	All the working day	An eight hour shift

For other exposure times see the text (LN) eg. If the shift length is 12 hours the LN factor is equal to 12.

Table 2 : The level of the Noise (without ear protection) (EX)

0	A busy office environment	less than 75dB(A)
0.25	Inside a car at 50 mph	75dB(A) - 80dB(A)
0.5	Can just hold a normal conversation	80dB(A) - 84dB(A)
1.5	Have to raise your voice to converse	85dB(A) - 89dB(A)
3	Have to shout to a person 2 metres away	90dB(A) - 94dB(A)
6	At the limit of shouting	95dB(A) - 99dB(A)
12	Impossible to hear shouts and other warnings	100dB(A) - 105dB(A)
24	Impossible to hear shouts and other warnings	105dB(A) - 109dB(A)

N.B. the risk rating figure should be doubled hereafter for every 3dB(A) rise in noise level.
Also, if a levelexceeds the Peak Action level for impulse noise (140dB)multiply the normal noise rating figure by 1.5 i.e. (12 x 1.5 = 18)

Table 3 : Control of the Noise (NC)

0.5	The noise is controlled so that the operations are below 85dB(A)
1	Noise control used but level still 85dB(A) or above
4	Ear protection is in use without other noise control
5	Noise control not used at all
10	No assessment has been made of noise exposure under Noise at Work Regs.

Table 4 : Number of persons at risk of Noise exposure (above 80dB(A)) (NP)

1	1 - 2 persons
2	3-7 persons
4	8-15 persons
8	16 - 50 persons
12	More than 50 persons **or** the general public

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Revision of Noise Guides 1 &2 and 3 to 8 that support the Noise at Work Regulations 1989

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It is eight years since the Noise at Work Regulations came into force in the UK, these regulations were introduced to implement the European Noise at Work Directive 86/188/EEC The noise guides, issued alongside the regulations were in two volumes, the first volume contained Guide 1 which dealt with the Legal duties of Employers and the 2nd dealt with the Legal duties of designers, manufacturers, importers and suppliers. Both these guides dealt with the requirements to prevent hearing damage.

In the second volume Noise guides 3 to 8, dealt with Noise Assessment, Information and Control.
Both these documents issued in 1989/90 were being prepared during 1985,86 and were completed in 1987 i.e. 10 years ago.

It is true to say that in almost all aspects, covered by these guides, many changes have taken place during the last 10years.

HSE does not make changes just for the sake of change, because of the various implications there needs to be a system of collaboration, contact and the involvement of many departments. Effectively what this means is that a business case has to be prepared and accepted before any work is carried out.
This business case also needs to spell out the time scale for the revision and the projected completion date, this is required by the department who will prepare and print the revised documents.
This presentation will highlight the major changes and discuss in some detail why the changes were required and why they were thought to be necessary.

The first stage was to decide what needed to be changed and why; if a change was necessary what should be incorporated in the change.
Initially an internal questionnaire was sent out to all interested departments who were asked to indicate where they thought revision should take place and why.
The responses were analysed and a first revised draft was prepared.

This draft was then circulated and comments were requested; it is worth indicating here that HSE has many interested departments such as :-
-Policy (this covers many divisions)
-Enforcement-this covers many Inspectorates
-Legal
-Technology

Revision of Noise Guides supporting the Noise at Work regulations 1989

From the comments received, from the internal circulation, the first major change requested was that the noise guides should be in one document and not two as is the case now.
This comment has been taken on board and the revised guides will be in one document.

The revision was necessary because of a government initiative and because changes in many areas over the last 10 years.

The areas of major change are as follows:-

-Government requirement to review all legislation and guidance pre 1994 (previous)

-Legal duties of designers/suppliers

-New Legislation affecting employers

-Changes in European Directives

-Progress/changes in measurement

-Changes in Instrumentation requirements

-Changes in production and testing of Ear Protection (new standards)

-Progress in noise control information (Case studies)

-Changes in application of the Noise at Work Regulations

-The need to firm up certain requirements as a result of non-conformity

The presentation will discuss in some detail the changes made and pose some questions to the delegates with a view to obtaining more feed back for inclusion/assistance in the revision.