HEARING PROTECTORS

11th October, 1971.

Some practical problems on the introduction of hearing protection in industry.

R.M. Taylor
Rupert Taylor & Partners Limited

Hearing protection is quite obviously not the answer to problems of noise nuisance; the nuisance of wearing ear plugs or muffs would far outweigh the advantage gained. Only to prevent hearing loss can reduction of noise at the ear be considered, and even then, there are very strong arguments against using them.

If all the possible solutions to different types of noise problem are tabulated and evaluated in terms of cost and suitability, hearing protection comes out on top only in cases where it is machine operators that are affected, largely because of the advantage of low cost. If cost is disregarded (which it seldom can be) then this method of dealing with a problem looks far less favourable. The advantages of hearing protection of any kind are:-

Low cost
No design work
No installation problems
'Instant universal remedy'
Mobility
Effectiveness

The disadvantages are:-

Discomfort
Wearer resistance
Hygiene problems
Danger from reduced hearing threshold
Difficulty in ensuring that the devices are worn
Difficulty of wearing some types with safety helmets.

The relative advantages and disadvantages of different types can also be tabulated:-

PRO	EXTERNAL EAR MUFF	EAR PLUGS	GLASS DOWN	WAX
	Durable	Durable	-	-
	-	-	Disposable	Disposable
	Hygienic	-	Hygienic	-
	Not easy to lose	-	Cannot be lost if dispenser used	-
	-	Low cost	-	-

	EXTERNAL EAR MUFF	EAR PLUGS	GLASS DOWN	WAX
PRO	-	Spectacles & helmets no problem	Spectacles & helmets no problem	Spectacles & helmets no problem
	Conspicuous	-	-	-
CON	-	Some types Uncomfortable	-	-
	Some are heavy	-	-	-
	-	Easily lost	-	Easily lost
	Expensive	-	Recurring expense	Recurring expense
	Difficulties for spectacle wearers & with helmets	-	-	-
	Unsuitable in hot, humid or dusty conditions	-	-	-
	Messy if fluid seal breaks	Hygiene depends on user	-	Messy

The first problem to be overcome in trying to bring about the introduction of hearing conservation in industry is management apathy or resistance. Ignorance of the hazards of high noise levels is frighteningly widespread still. For example, the medical officer of a large company of confectionery manufacturers cannot be swayed from holding a theory that 'thickened eardrums' are the cause of noise-induced threshold shift. Tradition dies very hard indeed, and so many adult males have sustained hearing damage either from gunfire in the services or from a noisy job in their younger days that they pay little attention to the dangers. On top of this, deterioration of hearing for most people does not carry anything like the importance that loss of sight would (not that eye protection is easy to enforce). Many happily boast about the acoustical feats they have performed, and loss of hearing from a noisy occupation carries some sort of aura of heroism.

It is nevertheless usually possible, and will eventually be mandatory, for management to appreciate the hazards and to be goaded into taking preventative action. There can be no doubt that if it is economically or practically feasible, reduction of noise at source, or protection of personnel from hazardous noise by other means is infinitely preferable to providing ear defenders. There is considerable danger in high noise levels other than the danger to the hearing. The loss of communication which is barely restored by the wearing of ear protectors can be extremely dangerous; warning shouts and signals go unheeded. Some people certainly find conversation easier in the presence of a high background noise level when wearing ear defenders even though both the signal and the noise are equally reduced, but this effect is by no means universal. Human responses have been shown to be

impaired in the presence of high noise levels, the percentages of errors commited increases and consequently so does the accident rate.

Although not yet satisfactorily proven and quantified, noise has in some cases been shown to have physiological effects on the body other than on the ears. Aparts from the fact that high intensity noise can reach the inner ear by paths other than the middle and outer ear which are the only parts protected by ear protectors, the presence of noise can affect the functioning of the nervous and circulatory systems. The effects are very similar to those of other forms of stress. The normal reactions to sensation of danger can be brought about; capillary blood vessels can contract, and changes in muscular activity occur. Thyroid disorders and other effects of prolonged stress can occur.

All that ear protectors will do is to reduce the effects of noise-induced hearing loss as long as they are worn. In order to ensure this, user resistance has often to be broken down. The prejudices about hearing loss sometimes found in management are usually found to a much greater extent in the users. The problem is not made easier by the fact that no type of ear protector can really be considered completely free from discomfort of any kind. After prolonged use, external ear muffs can become extremely irksome, and although well fitting ear plugs are not really noticed, constant insertion and removal can cause inflammation of the ear canal; glass down or individually moulded plugs are best from this point of view. Another important point is that certain types of ear plug contain a valve which closes only when the noise level exceeds an approximately predetermined level. Apart from the advantage that in fluctuating noise levels it is easier to converse during quieter intervals, there is the added advantage that the need for removal and re-insertion is reduced, consequently reducing the likelihood of inflammation.

User resistance is often due simply to feelings of self consciousness and cissiness. This problem is not so great if the wearing of ear protection is compulsory, so that there is no odd man out, but in some cases there are anyway only one or two people who need to wear muffs. In this respect there is an advantage in external muffs in that they are so large and unusual looking that they are quite clearly there for a very important purpose. There is the converse argument that because internal ear plugs are inconspicuous they make the wearer less self conscious, and this question can best be resolved by giving the user a choice.

The biggest problem of all is enforcement. If there is an enforcement problem, particularly when the noise levels are only just over the danger limit, then internal ear plugs are inadvisable because it is not possible simply to glance along a shop floor to see that everyone is wearing them. Ear muffs of course being easily visible make non-use quickly identifiable.

In amny industries, the head has to be protected in other ways as well as from noise. Perhaps the most common safety device is the helmet. If helmets have to be worn, the addition of ear defenders not only presents difficulties because special types are necessary either with the head band at the back or with the cups attached to the helmet, but also because of the clutter of paraphernalia on the head. Add a dust mask and goggles as well, and the complaint of one man of feeling like a Christmas tree seems well justified.

However, many will have noticed the wide acceptance of safety helmets. Admittedly, once you have walked into a low beam in a factory you soon realise the value of a helmet quite apart from the danger of falling objects; however, advantage can surely be made of the acceptance of helmets as industrial apparel by promoting the use of ear defender/helmet combinations. There are a few designs of this type, and some incorporate a means of moving back the ear defenders when not needed. On balance, this is probably a good thing.

In industries where helmets for safety purposes are completely unnecessary, there would be some advantage in a design of ear defender which was in the form of a reasonably presentable looking cap or hat. If the design were suitable, user resistance could be greatly reduced.

There are clearly enough difficulties in the introduction of any kind of hearing protection scheme for it to be utterly inadequate simply to purchase a supply of ear defenders and hand them out. The ear defenders themselves must be only a part of an integrated programme of hearing conservation.

First priority in an ideal hearing conservation programme must be education. All concerned must be made aware of the nature of the problem and the reality of the dangers. Secondly, monitoring of the hearing levels of the affected personnel must be instituted in the form of an audiometry programme. This is important both to safeguard the employer and to ensure that the hearing conservation programme is effective. Only third in the list comes the provision of the hardware itself.

In conclusion, it must be said that ear protection of any kind is a last resort for economical or practical reasons, or a temporary measure pending machine modifications or acoustic treatment. The only end which is achieved is the avoidance of hearing damage, and any increase in efficiency obtained from the reduction of noise at the ear is offset by either discomfort, or communication difficulties.

It is most important to offer the user a choice of types of protector. It may not be possible to allow a choice between external or internal protectors, but there is a wide range of different external ear defenders and a wider range of internal plugs and other methods. Acceptability to the user is the most important factor of all.