Controlling exposure to chemicals:
a simple guide on how to do it

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Controlling exposure to chemicals in the workplace will be much easier in future as a result of a guide published recently by the UK Health and Safety Executive (HSE). Known as COSHH Essentials, the guide is a simple 5-step procedure which allows anyone using chemicals to devise an appropriate control strategy to reduce exposures. Instead of just setting desirable safety goals, as was done until recently, the guide is a very specific toolkit which will suit a wide range of users. Using information that is readily available the guide shows managers and safety representatives how to devise a control procedure. You do not need to be a trained occupational hygienist to use it.

Occupational Exposure Limits

For many years UK law has required the management of companies to have procedures in places of work to control exposure to chemicals. These 'in-house' procedures together with some 650 occupational exposure limits (OELs) for specific chemicals were meant to provide the necessary protection for UK workers. This was the theory. In practice it was not nearly as protective as it was designed to be.

Part of the problem was that the law required managers of companies of all sizes to carry out their own risk assessments. Larger organizations found it much easier to do this than smaller companies. Big companies could afford to employ hygienists to do the work and to devise controls. Small and medium sized enterprises (SMEs) have generally either been unclear about what to do or found risk assessment difficult and expensive.

This is not just guesswork. Several years ago the HSE carried out a survey of companies which used chemicals to find out how much managers knew about the limit–setting process. Telephone interviews were conducted with 1000 managers responsible for health and safety in SMEs and with 150 trade union safety representatives. Most of those interviewed claimed to know about OELs. On closer questioning however, it became clear that real knowledge about OELs was very limited. Only about 20% of those interviewed had a real knowledge of the limits and a similar percentage knew how to assess an OEL. Even fewer knew the difference between the two types of OELs in force in the UK. These are the health-based Occupational Exposure Standards (OESs) and the Maximum Exposure Limits (MELs) for substances like DNA-damaging carcinogens and chemicals which cause asthma. The survey also indicated that trade union safety representatives knew more about limits than managers.

It would be fair to say that the results of this survey were painful for the HSE. For the first time the organization had asked those whom it both advised and policed how they were coping. The answer was that they were doing rather badly. Help was needed. Those managers who were expected to use the OELs did not know what they meant. If they did not know this, how could they possibly implement the limits ?

A new approach

It was clear to everyone that a completely new approach was required, which would take account of the limited knowledge base about hygiene and the lack of understanding of risk assessment. It was no good complaining that managers ought to carry out proper risk assessments. UK law had required them to do precisely that for many years, but the telephone survey showed that most of those interviewed would be unable to perform them properly. What the survey did show, however, was that managers were concerned about their workforce and were likely to have some controls in place. Most of the guidance managers relied on for what was necessary would have come from information sent by the suppliers of chemicals. Thus, the controls

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would have been based either on what was printed on a label or the contents of a safety data sheet. It was also clear that the situation was unlikely to change much in years to come. So, what was to be done?

After considerable debate it was agreed that the primary objective had to be a procedure that allowed those who used chemicals to work out how to handle them safely. If such a procedure could be devised, then it would help to control exposure to most hazardous substances being used, and not just those for which there were exposure limits.

COSHH Essentials

A working group of hygienists, toxicologists, epidemiologists and others from industry, trade unions as well as independent scientists, was established by the HSE to work out a procedure. The group met many times over more than two years to shape and reshape a procedure which was both acceptable and easy to use. At particular stages of the work there was further consultation with both industrial users and TU safety reps to make sure that we had taken the right approach. Feedback from these consultation exercises was very positive and many good ideas for modifications came in through these routes. The end result of this work was the COSHH Essentials guide.

COSHH Essentials is what might be called a generic risk assessment guide. In other words it is a general, but all-embracing approach to risk assessment which will cover many situations. The foundation for the scheme was based on well recognized principles. These were that risk was the combination of hazard and exposure. No matter how hazardous a substance is, if there is no exposure, there is no risk. So the procedure we adopted was based on the following flow diagram :

As most of those interviewed said that they used information from suppliers to help devise controls, we decided to construct a guide which used this source of information. Details about the hazard of chemicals can be found in safety data sheets. Hazardous chemicals that are sold in the EU are given risk phrases (R phrases) depending on their particular properties. In COSHH Essentials these R phrases are allocated to one of five hazard bands, band A being the least hazardous and band E the most. Band E is for substances which damage DNA , and can cause cancer; it also includes substances which can cause asthma.
To help inform the discussions about which R phrase should be in which hazard band, the working group used data from over 100 substances which had well-validated occupational exposure limits in the UK regulatory system. In the end, the scheme is slightly precautionary in that it allocates some substances to hazard bands which provide more control than the occupational exposure limits require. We see this as a necessary precaution.

For the next step - that of exposure - we adopted a simple approach. It was the possibility of exposure that we were concerned about. In the case of solids, this would be determined by how much is used and how dusty they are. For liquids, it is both the volume used and their volatility.

To make it simple, but also to reflect how hygienists consider exposures, we used 3 measures of quantity. For solids, the amount used is either grams, kilos or tonnes. With liquids, it is millilitres, litres or cubic metres.

There are also 3 categories of dustiness for solids: very dusty (e.g., talcum powder); medium dusty (e.g., soap powder) or low dustiness (e.g., waxed flakes). The volatility of liquids is determined by reference to a simple graph. A knowledge of both the boiling point of the solvent and the process operating temperature enables you to work out whether it is a low, medium or high volatile solvent that is being processed.

Although the length of time for which someone is exposed is also important, we did not include this in the scheme because it does not change the air concentration caused by a particular process.

The next step was to consider what exposures would be generated by combining physical properties with amounts used, e.g., gram quantities of medium dusty material, etc. In the end, occupational hygienists on the working group agreed that 4 exposure bands could be predicted.

The control options available to hygienists include general ventilation; engineering control; containment; or special facilities where expert advice is needed. Using these four options, the hygienists considered how each control measure would alter airborne concentrations in each of the 4 exposure predictor bands. Through this approach, it was possible to see how tighter controls would be able to push concentrations down to a particular range.

Our final step was to match the predicted exposure ranges and control options with the various hazard bands. This allowed us to determine the exposure ranges appropriate for particular hazards and to apply further refinements. This last step closed the loop. It meant that in future, by using a combination of hazard band, quantity used, degree of dustiness or volatility, and control approach we could predict what airborne concentrations were likely to occur. All of the options have been thoroughly reviewed by a number of occupational hygiene society working groups and they agree with what we have done.

Using COSHH Essentials

So those who use the scheme will need safety data sheets to locate R phrases. This will allow them to determine the appropriate hazard band. Combining this information with the quantity to be used and an assessment of how dusty or volatile the substance is, users of COSHH Essentials will be guided to a particular control approach. The guide also has a number of detailed diagrams and information to show how these controls work in practice. Feedback from industry and TU safety reps has been very positive. Many are saying that they wished they had had this guide years ago, as it would have made their work so much easier.

COSHH Essentials will also help industry consider how to reduce costs. At each step, those using the guide are asked to consider substituting a particular substance for something less hazardous, or less volatile, or in a less dusty formulation, i.e., using waxy pellets instead of fine powders. These strategies will reduce both the level of control needed, and also costs.

The way forward

We believe that COSHH Essentials is only the start of a much longer process. The approach taken in the guide can be adapted to deal with more complex tasks where a range of substances are used in a variety of operations. In the UK, this is now being done for the printing industry. Other industry groups are likely to follow.

It is also clear that COSHH Essentials could be exactly what is needed for the Chemical Agents Directive. The Directive is due to come into force in May 2001. However, before it can become law, it will require an agreed procedure for determining, assessing, preventing and controlling risks. If the experience of SMEs in Europe is the same as that in the UK, it is clear that they will also need help to do what the Directive requires. COSHH Essentials, suitably adapted to the needs of other European states would provide that help. ■