Hazardous Substances:

Protecting Your Workplace from the Dangers of Solvent Exposure

It’s been said that solvents are the asbestos of the future. If that is true, then we have a problem on our hands. A serious problem.

By one estimate, up to 25,000 New Zealand workers are currently exposed to potentially harmful organic solvents. That’s 25,000 people who could be suffering from a huge range of solvent-induced symptoms - minor skin irritation, central nervous system depression, systemic poisoning, even death.

Organic solvents are used for extracting, dissolving or suspending water-insoluble materials such as fats, waxes, and resins. These chemicals are commonly used in the workplace to produce paints, adhesives, glues, coatings, and degreasing/cleaning agents, as well as the production of dyes, polymers, plastics, textiles, printing inks, agricultural products, and pharmaceuticals. Just to name a few.

Classified as aliphatic hydrocarbons, cyclic hydrocarbons, aromatic hydrocarbons, halogenated hydrocarbons, ketones, amines, esters, alcohols, aldehydes, and ethers, solvents can exist as a single chemical or as a mixture of different compounds.

To protect the estimated 25,000 people currently working with these hazardous substances, you need to take action for yourself and your workmates. Now.

Workplace Exposure Standards (WES) have already been established for many solvents. This is a start, but because so many of the substances used in the workplace are mixtures of chemicals, it’s important to know that the toxic effects of the substances that make up the mixture are additive. Overall, the sum total of the WES values for the components of the solvent needs to be less than 1.

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\text{C}_1 + \text{C}_2 + \text{C}_3 + \ldots + \text{C}_n \text{ should be less than } 1
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To find out how to minimize worker exposure to solvents and prevent the hazardous effects described above, read on.

Monitoring Exposures

Employers should carry out an initial analysis of workplace solvent exposures, and with periodic surveys of worker exposure thereafter. These surveys are necessary to find out the extent of worker exposure as well as to determine whether controls already in place are working.

For most applications, the use of a simple monitoring badge such as the
3M 3500 can be effective. Using a technique called “worst case scenario monitoring”, the individual who is most exposed to the solvent wears a monitoring badge on at least three non-consecutive days, using a new badge each time. These badges are then sent to a laboratory such as AgriQuality for analysis. If the results show exposures above 50% of the WES, then it is best to assume the conditions of exposure are excessive.

**Control Measures**

The best way to minimize workplace solvent exposure is through good education. People handling solvents need to know as much as possible about the materials to which they are exposed, the hazards posed by those substances, and how to control the effects. It is not enough to provide the MSDS and hope that people understand it. In smaller companies, the employer may need analyse the information provided and ensure it is clearly understood by all.

There are three basic methods for limiting worker exposures to organic solvents: the use of contaminant controls, worker isolation, and personal protective equipment. But before diving straight into these, it’s best to plan your approach. Think carefully about exactly how you will implement these methods in order to make them most effective.

**Contaminant Controls**

As far as possible, engineering controls should be the primary means of preventing exposures. Consider closed-system controls for manufacturing processes and provide local exhaust ventilation where possible to direct harmful vapours away from exposed workers.

The closer to the work the better when locating the extraction intake. Ideally, the distance from the work activity should not exceed the diameter of the intake. Adding a flange to the intake opening will increase extraction effectiveness.

Ventilation equipment should be checked at regular intervals. System effectiveness should also be checked whenever there are any changes in production, process or controls that might result in increased exposure to airborne organic solvents.

**Worker Isolation**

Isolate workers from direct contact with solvents in the work environment by using automated equipment operated from a closed control booth or room. The control room should be maintained at air pressure greater than that surrounding the process equipment so air flows out of the room rather than into it.

Whilst this method will isolate and protect the worker, it will not protect people required to perform process checks, adjustments, maintenance and related operations. These people require the use of personal protective equipment in order to eliminate exposures altogether.
Personal Protective Equipment

While most people acknowledge the need to prevent inhalation of solvent vapours, direct skin contact should also be prevented. Through proper use of solvent-resistant gloves, aprons, boots, or entire work suits (depending on the hazard), the harmful effects of solvent exposure can be avoided almost entirely.

While “PVC” gloves are suggested by a number of MSDS, glove manufacturers do not recommend this material for handling solvents. Neoprene or nitrile gloves offer an economical answer, although PVA is a better option where extensive hand contact is expected. Face shields or chemical safety goggles should be used wherever there is potential for splashing.

Any clothing that becomes contaminated with organic solvents should be immediately removed, and discarded or cleaned before reuse. Using soap and water, thoroughly wash any areas of skin that have been in contact with solvents. It is important to provide appropriate facilities for general hygiene, such as washrooms and showers.

Respirators are the least preferred method of controlling airborne contaminants. But in small businesses, where engineering controls aren’t practical, or during short-term maintenance, we must recognise that respirators are likely to be used for protection.

There are four simple rules for the use of respirators in the workplace. These are:
1. Selection: choose according to the contaminant, the task and the people.
2. Fit: compatible facial fit, fit testing and the consideration of facial hair.
3. Respirator maintenance: regular maintenance is vital.
4. Storage: Always store respirators in sealed containers or well away from the work area.

OSH has provided guidelines for the use of respirators, recommended well worth reading. These are available free of charge on the Internet from the OSH website:
www.osh.govt.nz

When choosing a respirator, bear in mind solvent concentration, any special use conditions, and make sure the worker has been appropriately trained and properly fitted for the respirator. Note that air-purifying cartridge respirators cannot be used for solvent concentrations exceeding 1,000 ppm full-face pieces; helmets or hoods are recommended when vapours are likely to cause eye irritation.

Where workers need to wear a respirator for the duration of the shift, Powered Air Purifying respirators or Supplied Air respirators are recommended. These products improve wearer comfort as well as offering the protection factor. It’s no good providing a top-performance respirator if workers find it so uncomfortable that they have to take it off.
Reducing Exposure Times

Employers can reduce potential exposure to individuals by regularly rotating personnel.

Preventing the serious problems that can occur in a solvent-contaminated work environment is no easy task for an employer. Workers are renowned for ignoring protective measures employers try to give them, taking shortcuts, using things incorrectly, and being poorly informed. MSDS can sometimes provide incomplete or even inaccurate information, making things even more difficult.

But the consequences of solvent exposure can be extremely dangerous, even fatal. To manage the problem and avoid solvents becoming the asbestos of the future, employers need to adopt the techniques suggested here, and stick to them.

*For further assistance with solvent exposure management or other chemical handling issues, contact Safeline on 0800 100 014.*