## Dichloromethane (DCM) Case study

The facts of this case relate directly to the death of a worker caused by exposure to Dichloromethane (DCM)-based paint stripper. As a result of this fatality, young children no longer have a father, and the company that employed him has been heavily fined and is struggling to remain in business putting the jobs of others at risk.

1. Ben (not his real name) was killed after using a DCM-based paint stripper in a bath room with a small window. He was using the DCM-based product to strip lead paint from skirting boards. Ben had worked with solvents before, but no-one had told him that DCM could be particularly hazardous, and no risk assessment had been done for this specific task to identify what control measures were required.

   A risk assessment would have shown that the bathroom was a confined space (CS) and that he should not have been working with DCM in this space unless he had had CS training. CS training includes the need to:
   - use extraction to remove the contaminated air and a supply of clean air to replace it
   - use breathing apparatus (BA);
   - have a real time personal monitor to alert the wearer if the DCM level exceeds the workplace exposure limit; and
   - have a buddy system i.e. a trained person with BA to be outside the CS to rescue the worker if required.

   If you are not trained and competent to work in a CS training then the paint would need to be removed by a DCM-free paint stripper (which is less hazardous), or by a different method or by using a specialist company who are competent to work in a CS.

**If asked to work with DCM:**

- **consider alternative methods of removing paint that are less hazardous**
- **make sure the task has been risk assessed and do not work in a CS unless you have had CS training and are competent to do so**
- **you should be aware of the hazards, and symptoms, from exposure to DCM**

2. Ben applied 200 ml of DCM-based paint stripper (less than 2/3 of a can of soft drink) to the skirting boards, which had a total area of 1.2$m^2$, using a paint brush. He stayed in the bathroom doing other work when the paint was softening and was overcome by DCM

vapour and passed out. Once Ben had passed out he continued to breathe in high concentrations of DCM vapour that ultimately led to his death.

The evaporation of very small amounts of DCM can lead to very high, fatal, levels of DCM in the air. When exposed to DCM, workers can develop headaches, become drowsy and disorientated and then lose consciousness.

**If working with DCM-based paint stripper (in a non-confined space)**

- **use the minimum product required for the smallest area that needs stripping**
- **use a long-handled brush to apply the product where practicable (worker further from the product. Avoid spraying as it increases DCM in the air**
- **keeps containers closed when not in use**
- **leave the work area whilst the DCM-based stripper is softening the paint**
- **be aware DCM causes drowsiness - if you feel unwell leave the area immediately**

3. Ben did not use any mechanical ventilation i.e. extraction (also called local exhaust ventilation, LEV) to extract the contaminated air from the bathroom, nor any forced ventilation to help supply clean air into the bathroom and move the contaminated air towards the extraction.

   The use of extraction and mechanical ventilation to control the level of DCM in the air is need to create a good flow of air through the work area, and should be set up before work with DCM commences. It may also be needed for external work if that area is partially enclosed eg under sheeted scaffolding, in a pit.

   **It is important to adequately control the level of DCM in the air you inhale:**

   - **use effective extraction to remove DCM from the work area air**
   - **ensure contaminated air is discharged to a safe place away from the work area**
   - **have an adequate supply of replacement clean air e.g. by use of a fan and ducting**

4. The bathroom had a small window, which was open; however, Ben kept the door to the bathroom shut, in line with company policy, to limit the nuisance smell of DCM for the householder who was in the flat. The natural dilution of DCM with air was therefore minimal.

Even if both the bathroom door and the external door to the property had been open the natural ventilation would not have been adequate to reduce the DCM vapour levels below the short term exposure limit (STEL) of 200 ppm. The levels would still have been 4 times the STEL.

**When using DCM-based paint strippers:**

- **limit access to the work area so others workers and customers do not enter it**
- **ensure the property is unoccupied by residents and others during paint removal and remains so until all the vapour has been removed**
- **use natural ventilation, but do not rely on it alone, to adequately control the level of DCM in the air**

5. Ben did wear a respirator (mask) with the correct vapour filter (i.e. AX filter) to prevent inhalation of the DCM vapour. However, he was unaware that he should have been clean shaven and face fit tested for the respirator and that the filter had a very short life-time.

An AX filter has a maximum life-time of 40 minutes if the concentration of DCM in the air does not exceed 100 ppm, and less if the DCM concentration is higher and / or respirator is powered. After the incident expert tests proved that the high levels of DCM vapour in the bathroom (over 4000 ppm) would have 'broken through' the correct vapour filter in less than a minute, even assuming the respirator was correctly selected and worn. It was therefore concluded that a suitably fitted face mask with the correct vapour filter would not have prevented Ben's death.

**The use of an AX filter to prevent inhalation of DCM**

- **is only suitable for very short tasks, in well-ventilated areas where the DCM air levels are relatively low**
- **is dependent on the respirator being face fit tested and the worker being clean shaven**