

# **M501: MEASUREMENT OF HAZARDOUS SUBSTANCES INCLUDING RISK ASSESSMENT**

## **CASE STUDY 1 - PAINT MANUFACTURING - SUPPLEMENTARY INFORMATION FOR LECTURER**

### **PURPOSE**

- To provide delegates with an opportunity to work together as a group to gather sufficient information to enable a chemical agent risk assessment to be completed. This is an information gathering exercise designed to help delegates develop practical risk assessment skills.

### **METHOD**

- Show the Paint manufacture and vessel cleaning case study video clip and explain what is happening.
- Ask delegates to comment on what they see, that is, make critical observations that they would need to include into a chemical agent risk assessment. Delegates should also be encouraged to ask for any other information that they think they might need to enable them to complete a risk assessment.
- Ask delegates to have a go at documenting a risk assessment for the vessel cleaning process.
- Review how well they have done, indicating strengths and weaknesses in the information gathered, observations and conclusions made.
- Stress that risk assessment is very much a practical exercise - one that must be undertaken at the workplace. A team approach, particularly one that includes employee participation, is advocated.
- Work through the answer for this activity using the paint company's risk assessment proforma. Discuss whether the proforma could be improved or if all the information is present.

## RESOURCES PROVIDED

- Case study, comprising of:
  - Supplementary information for trainer
  - Video clips
- 'Model' answer

## RESOURCES REQUIRED

- Copies of the 'model' answer
- Flip chart paper and projector

## DETAILS OF CASE STUDY

1. Four operators have been trained to manufacture paints in this factory. They work a single day shift, 0800 – 1600 hours with a 30-minute break for lunch. Paints are produced on a batch basis. Once the paint has been colour matched it is poured into tins. The empty vessel is returned for cleaning. Each operator cleans 4 vessels per day. Each vessel takes approximately 15 minutes to clean. Operators wear recycled cotton overalls, safety glasses, PVC elbow length chemically resistant gloves and safety boots. (*Information provided in Student notes*)
2. To remove residual paint from the interior of the batch vessel approximately 10 litres of Butan-2-one (Methyl Ethyl Ketone) is added. Butan-2-one is a narcotic in high concentrations. Brushes and spatulas are then used to ensure that the vessel is thoroughly cleaned. The residual paint contains 2-methoxyethanol, which can be absorbed across the skin and is also known to affect the male reproductive system and bone marrow. (*Information provided in Student notes*)

3. Personal monitoring has been performed and analysis of the samples obtained gave Butan-2-one 8-hour time-weighted average concentrations in the range 100 – 300 ppm. 2-methoxyethanol 8-hour TWA concentrations were all less than 1 ppm (Occupational Hygiene Report, 'Assessment of exposure to vapour and noise', Ref: KJ0087K, 01/09/05). The operators performing this task commented that they often experienced light-headedness, headache and nausea at the end of the working day. *(Information provided in Student notes)*
4. Procedures describing how this task should be performed are not available. However, local exhaust ventilation units are uniquely identified, maintained at regular interval and are subject to a thorough examination and test every 14 months. The maintenance department undertakes weekly visual inspections of these units. Confined space entries are controlled through a permit to work system. Regular safety walkthroughs involving safety discussions with staff are carried out. *(Information provided in Student notes)*
5. Process operators have received training on the harmful effects of the materials used and on the correct application of the control measures that have been provided. *(Information provided in Student notes)*
6. The paint manufacturing company subsequently engineered out this problem. They built a large automatic cleaning unit. Vessels could be wheeled in and then automatically solvent cleaned with butan-2-one. On completion of the cleaning cycle the unit is force ventilated and the solvent recovered via a distillation unit. The unit can then be opened and the cleaned vessel recovered and reused.
7. Occupational exposure limits, risk phrases and boiling points for butan-2-one and 2-methoxyethanol are as follows:
  - Butan-2-one (methyl ethyl ketone) – 200 ppm 8 hour TWA and 300ppm 15 minute STEL, Narcotic in high concentrations. Absorbs through skin. Risk phrases: 11, 36, 66, 67, Boiling point: 80°C.

- Paint (2-methoxy ethanol) – 5 ppm 8 hour STEL, Long-term effects on male reproductive organs. Absorbs through skin, Risk phrases: 60, 61, 10, 20/21/22, Boiling point: 125°C. *(Information provided in Student notes)*
8. Emergency response, in this case loss of containment and subsequent spillage, has been well addressed by the company. Detailed emergency procedures are available and an emergency exercise conducted annually. Spill kits and personal protective equipment (including breathing apparatus) are available together with a separate first aid room. *(Information provided in Student notes)*

### ***Video Clip – Full Case Study Description***

#### **Paint Manufacture Process**

An operator is standing on a pallet supported from the arms of a fork lift truck and is loading pigments, resins and extenders into a batching vessel. Each bag is lifted up to the 'filling' point, opened using a knife and the contents poured into the vessel. The top section of the mixing unit is equipped with local exhaust ventilation and a mixing arm that can be raised and lowered. Solvents are metered directly into the batching vessel from bulk storage. General ventilation is achieved by both natural (doors and windows) and mechanical means (roof and wall mounted axial fans)

A picture of a vessel full of paint is shown. We then see an occupational hygienist using a direct reading solvent monitor to measure solvent vapours present in the workplace.

An area containing a large number of batching vessels full of paint is shown and these are waiting for the paint to be colour matched (a check that the correct colour has been achieved).

The vessels are then transferred to the filling hall where they are hoisted up into the air. A valve at the bottom of the vessel is opened and the paint allowed to pass through two vibrating sieves and then into an empty 5-litre tin situated on the floor. Successive tins are filled and sealed one at a time until the batching vessel is emptied.

The empty vessel is then cleaned prior to re-use.

### ***Tank Cleaning Process***

It is on this section of the video clip that delegates develop their practical risk assessment skills. The video clip repeats several times to facilitate this process.

There are several points to note:

1. Poor ergonomics – operator has to lean into vessel whilst balanced on a pair of steps.
2. Operator breaths in air deeply as he moves away from top of vessel. Complaints of headache, nausea, etc, received.
3. Contaminated PVC elbow length chemically resistant gloves/ cotton overalls. The overalls are obtained from a recycling company and are discarded when they become too dirty.
4. Local exhaust ventilation installed is unsuitable for this task – the operators' head is below the intake of this unit and consequently solvent vapour laden air would be drawn past the operators breathing zone.
5. Wiping face with hand.
6. Gap between glove / overalls – paint marks can be observed on the forearms of the operator.
7. Eye protection not splash resistant – glasses rather than goggles worn.
8. Exposure of others in area – several people walk past the vessel being cleaned.
9. Electric / safety problems.