

### **Investigation report**

Worker suffers serious burns while using an angle grinder to cut an intermediate bulk container (IBC)

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# Introduction

A subcontract worker suffered burns to his chest, arms and face when vapours escaped from an intermediate bulk container (IBC) he was cutting and ignited at Northparkes Mines on 4 April 2023. The worker was using an angle grinder to cut the IBC. He was unaware the IBC contained residue of a hazardous chemical (flammable liquid) that had a flash point below 18 degrees Celsius.

### The mine

Northparkes Mines is a copper and gold mine 27 kilometres north-west of Parkes in central west New South Wales. It consists of a block cave mine, a sub-level cave and an ore processing plant.

#### The contractor

The worker involved in the incident was employed by a subcontracting company engaged by a contractor to the mine operator to undertake mill reline works.

#### The incident

Work was being undertaken to reline a grinding mill in the ore processing plant at the mine on 4 April 2023.

A practice had developed at the mine in which the tops of used IBCs were removed to enable them to store and transport waste. A reciprocating saw was usually used to cut the IBCs but an angle grinder was sometimes used. Using an angle grinder created more heat and presented a greater likelihood of sparking than a reciprocating saw.

A forklift operator retrieved an IBC from a used IBC storage area and transported it to an open area of the processing plant. The IBC had not been washed. It contained a residual amount of a liquid substance (Fischerchem Collector C503) that was stored inside it. The substance was manufactured in China and was shipped to Sydney in IBCs. It was transported to the mine and used to process mined ore.

Due to its potential exposure-related health effects and hazardous physical properties, the substance was classified as a hazardous chemical in accordance with the Work Health and Safety Regulation 2017 (NSW) (WHS Regulation) and Globally Harmonised System of Classification and Labelling (GHS). Because of this, manufacturers, importers and suppliers of the substance had duties to ensure that the hazard-related information regarding its composition was accurate and communicated through product labelling and the provision of safety data sheets (SDS).

The substance's SDS and label affixed to the IBC correctly stated the substance was corrosive but did not identify it was also flammable. The SDS incorrectly stated the substance's flashpoint (lowest temperature that will cause liquid vapours to ignite when exposed to an ignition source) was 130.9 degrees Celsius when in fact it was less than 18 degrees Celsius.

Figure 1: The location of the incident



The forklift operator asked the injured worker to take an angle grinder to the location of the IBC so that he could cut the top off it. The forklift operator left the area temporarily and, during this time, the worker made the decision to remove the top of the IBC using an angle grinder.

The worker used the angle grinder to cut a strip along the top of the IBC as well as the 2 metal straps at the top of the IBC. He removed one of the straps and left one of the straps attached to the frame at one end.

Vapours from inside the IBC reacted violently with heat or sparks produced by the angle grinder.

The force and heat of the reaction caused the worker to move a short distance back from the IBC. He felt a burning sensation through his shirt in the region of his chest. He did not see a flame or smoke and did not hear any sounds created by the ignition. Investigation report: Worker suffers serious burns while using an angle grinder to cut an intermediate bulk container (IBC)

Figure 2: The cut that was made along the top of the IBC



The forklift operator and another worker were nearby. They immediately responded and removed the injured worker's shirt. The injured worker suffered full thickness burns to his right upper arm (total body surface area – 8%). The burn was determined to have been caused by a flame. The injured worker underwent various medical procedures including a skin graft. He also suffered less serious burns to his chest and face that required treatment.

#### **Investigation findings**

The Resource Regulator's Major Safety Investigation Unit investigated the incident to determine its cause and circumstances.

The investigation found several factors contributed to the worker being exposed to the risk of serious injury or death, including the following:

- 1. The substance was classified as a hazardous chemical in accordance with the WHS Regulations and GHS. As such, manufacturers, importers and suppliers had duties to ensure that testing and analysis of the substance was undertaken with accurate and up-to-date information regarding the substances hazardous properties (including its flammability and flash point) communicated through product labelling and its SDS.
- 2. The overseas manufacturer of the substance classified the substance as having a flashpoint of 250 degrees Celsius and made no reference to it being a flammable liquid.

- 3. Neither the importer or supplier of the substance nor the mine operator undertook any testing or analysis to validate information provided by the manufacturer about the substance's flash point and composition, nor did they require any other party to do so.
- 4. Post-incident analysis of the substance determined that its composition and flashpoint were markedly different to that stated by the manufacturer and information contained in the relevant SDS. In particular:
  - a. the manufacturer stated its flashpoint was 250 degrees Celsius and the SDS prepared by the supplier stated it was 130.9 degrees Celsius but post-incident analysis determined that it was less than 18 degrees Celsius (meeting the classification of a flammable liquid)
  - b. post-incident analysis also identified that:
  - the substance contained flammable ingredients that were not recorded in the SDS, including isobutanol (flashpoint 28 degrees Celsius), toluene (flashpoint 4.4 degrees Celsius) and isoamyl alcohol (flashpoint 43 degrees Celsius)
  - active ingredients claimed by the manufacturer to be in the substance were not present.
- 5. The hazard information detailed in the substance's SDS was based on the incorrect composition information provided by the manufacturer. The SDS did not state that the substance was flammable (i.e. flammable range being below 93 degrees Celcius). The SDS largely referenced the combustible and corrosive properties of the substance. The handling instructions were largely focused on these hazards.
- 6. However, the substance's SDS did include the following information:
  - a. Store the product in cool and dry conditions
  - b. Heating the product could cause decomposition
  - c. Decomposition of the product may produce flammable vapours which may ignite when exposed to an ignition source
  - d. There is a slight fire risk when exposed to heat.

Notwithstanding the information contained within the SDS, used IBCs containing residue of the substance were stored in uncovered areas of the mine where they were exposed to direct sunlight and ambient temperatures.

7. There were no warnings on the labell afixed to the IBC about the substance's flammable properties. The only safety-related GHS hazard pictogram on the IBC related to its corrosive properties.

#### Figure 3: GHS Corrosive hazard pictogram



- 8. The mine operator based its risk assessments concerning use of the substance on its combustible and corrosive properties. These risk assessments focused upon the storage and use of the product in the production process and did not adequately consider the potential reuse of the containers at the mine.
- 9. The substance's SDS was not provided to the injured worker or his employer, nor a contracting company who had been engaged to undertake the mill reline. The injured worker assessed the risks associated with cutting the IBC in terms of the substance's corrosive properties (rather than its flammable properties).
- 10. The mine operator and the contracting company did not undertake risk assessments or develop documented procedures in relation to cutting and repurposing IBCs at the mine.
- 11. The substance's SDS stated that IBCs should not be reused unless thoroughly cleaned or used to store the same substance and Australian Standard AS3780:2008 The storage and handling of corrosive substances prohibited reuse of IBC's other than to store the same substance. The IBCs that were repurposed to store waste at the mine were not routinely washed.
- 12. The practice of cutting the tops from IBCs occurred regularly at the mine. However, the task was ordinarily performed using a reciprocating saw that did not produce as much heat as an angle grinder.
- 13. The mine operator's hot work procedures were not followed at the time of the incident. The procedures required a hot work permit to be issued for using the angle grinder, which involved assessments of relevant hazards and risks to be undertaken. The injured worker did not believe that the hot work permit system applied to the work that he was undertaking.

The Regulator published an <u>investigation information release</u> regarding the incident on 21 April 2023.

## Recommendations

NOTE: The following recommendations are general in nature and not directed to any specific supplier, PCBU or worker.

Importers and suppliers of hazardous chemicals must:

- 1. ensure, as far as reasonably practicable, that a hazarous chemical is without risk to the health and safety to people who may use, handle or store it, or carry out any reasonably foreseeable activity in relation to its use, handling or disposal
- 2. not rely on general information provided by manufacturers about the hazardous chemcials composition and flammability in the absence of verifiable evidence of testing and analysis to determine its constituents, hazardous classification, hazardous properties and flash point
- 3. carry out, or arrange the carrying out of, any calculations, analysis, testing or examination that may be necessary to comply with the above duty (point 1)
- 4. provide adequate information to people who are exposed to the hazardous chemical about:
  - a. the purpose for which it was manufactured
  - b. the results of any testing conducted

c. any conditions necessary to ensure that the hazardous chemical and the container it is housed in are used without risk.

PCBUs must:

- 1. ensure the storage, use and disposal of hazardous chemicals (including the containers within which they are housed) are the subject of an adequate risk assessment that:
  - a. is directed to identification of:
    - i. reasonably foreseeable hazards including those that extend beyond the primary intended use
    - ii. risks arising from reasonably foreseeable hazards,
    - iii. measures to control the identified risks in accordance with the hierarchy of controls.

refer to the code of practice - Managing risks of chemicals in the workplace

- b. considers:
  - i. information provided by manufacturers, importers and suppliers, including all information contained in the SDS
  - ii. regulatory requirements concerning using hazardous chemicals
  - iii. published authoritative guidance material such as, in the case of hazardous chemicals, AS1940:2017 The storage and handling of flammable and combustible liquids and Safe Work Australia code of practice – managing risks of hazardous chemicals in the workplace.
- 2. provide contractors and workers with adequate information, instruction and training relating to undertaking risk assessments concerning potential exposure to hazardous chemicals before the commencement of work
- 3. ensure that containers that may contain residual combustible and/or flammable substances are rendered safe by cleaning, and then punctured or crushed.

Refer: AS1940:2017 The storage and handling of flammable and combustible liquids

Workers must:

- 1. conduct risk assessments directed to the matters set out above at 'PCBUs must'
- 2. comply with the PCBU's safe work procedures, including those relating to hot works and handling, using and disposing of containers that were used to store hazardous chemicals
- 3. refer to, and consider, product SDSs and relevant standards when undertaking tasks involving using, handling or storing hazardous chemicals (including residues and the containers the substances are housed in)
- 4. be aware that hazardous chemicals and related vapours that are not classified as flammable, may ignite upon contact with a heat source due to the degradation of the substance.

#### **Further information**

Please refer to the following guidance materials:

- AS 3780-2008 Storage and handling of corrosive substances
- AS 1940-2017 The storage and handling of flammable and combustible liquids
- Understanding safety data sheets for hazardous chemicals, fact sheet (Safe Work Australia)
- <u>Storage of flammable liquids</u>, guidance material (Safe Work Australia)
- Managing risks of storing chemicals in the workplace, guidance material (Safe Work Australia)
- Managing risks of hazardous chemicals in the workplace, code of practice (Safe Work Australia)
- Learning from investigations: Worker suffers serious burns using an angle grinder to cut an IBC