Significant Incident Report No. 264

Subject: Solvent vapour explosion during engine maintenance task

Date: 06 July 2018

Summary of incident

In October 2017, a maintenance technician escaped serious injury when an explosion happened while he was performing a valve adjustment on a dump truck.

A 12 volt LED lamp with a magnetic base was used to illuminate the work area. The technician used a brake cleaning solvent to clean up the task area, and the solvent vapours (heavier than air) built up within the confines of the engine and accumulated in the sump. The lamp was accidentally dislodged and fell, causing a spark that ignited the vapours and resulted in an explosion.

The cast iron sump disintegrated as a result of the explosion and the technician received burns to his face.

Direct causes

- Flammable solvent vapours built up in the engine and were ignited by a 12 volt LED lamp connected directly to the truck battery.

Left: Sump damage, showing the failed sump (A) and the sump remnant (B) that had fallen down into the sump cover (C). Right: LED lamp used to illuminate the work area.

Contributory causes

- Inadequately identifying the hazards associated with the use of the particular cleaning product in the site's risk assessment:
  - flammable properties of the vapours released by the brake cleaner solvent were not identified

- the solvent was branded as a brake and parts cleaner and degreaser, and was considered by the site as a general use item
- the application of cleaning solvents with this task had not been identified in the site's safe work instructions or in the original equipment manufacturer's (OEM's) maintenance specifications.

- Failure to follow safety instructions provided by the solvent manufacturer on the SDS.
- Failure to ensure adequate ventilation of the work area.
- Failure to use electrical equipment suitable for a flammable environment.

Actions required

The following actions are recommended.

Risk assessment

- Carry out an appropriate risk assessment when products are introduced on site to ensure the products are fit for purpose. The risk assessment should:
  - refer to the manufacturer's safety information (SDS and recommended controls and safe use guidance)
  - be detailed and completed by a competent person, with a safe system for work developed and approved
  - involve site Safety and Health representatives in the assessment.

  Note: Refer to the Mines Safety and Inspection Regulations 1995, Part 7 Division 3 for requirements on the introduction of potentially hazardous substances.

- Where possible, eliminate the use of flammable cleaning agents.

Safe systems of work

- Use only products and equipment that are fit for purpose (e.g. lighting, cleaning products).
- Routine tasks should be undertaken using an approved safe work instruction (SWI).
- Before using chemical products, refer to safety data sheets and other safety information in the site's hazardous substances register.
- Ensure restricted areas, where required, are adequately ventilated.

Further information

- Department of Mines, Industry Regulation and Safety, Mining safety publications, www.dmp.wa.gov.au/ResourcesSafety

  Mines Safety Bulletin No. 94 *Use of contact cleaning agents*

This Significant Incident Report was approved for release by the State Mining Engineer on 06 July 2018