Dangerous Goods Safety
Significant Incident Report No. 01-14

Sulphuric acid leak damages storage facility

Summary of incident

A mine site in care and maintenance for several years had an onsite tank farm comprising four 2 million litre tanks containing 98% sulphuric acid.

Over time, a slight weep of acid from a tank's nozzle flange leaked about 250 L of sulphuric acid into the concrete secondary containment bund. The bund sump dissolved, leaking acid into the underlying soil. The soil reacted with the acid and expanded, with an increase in the ground level of up to 500 mm, severely damaging parts of the bund and its walls, and the pipework foundations.

The bund wall was repaired, and damaged areas of the bund floor sealed with limestone. The pipework between tanks was interconnected to allow acid to be diverted between tanks in an emergency. The frequency of facility inspections was increased.

However, hidden damage to the storage tank was revealed about 11 months later when the tank floor apparently split from the wall and there were leaks from the structure's ring beam. About 3,000 L of sulphuric acid was released in the second spill and contained in the bund. The spill was neutralised using limestone, and the reaction product (gypsum) removed and disposed of.

Limestone (piles of pale material) was used to neutralise the second acid spill and support the bund walls

About four weeks later, corrosion and the physical stress from the heaving of the foundations and supports appears to have caused a valve linking the four tanks in the farm to fracture. Between 250,000 and 500,000 L of sulphuric acid escaped into the secondary containment. Again, the acid spill was neutralised and the reaction product removed and disposed of.

Valve damaged during third acid spill

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A sulphuric acid loading gantry was installed at the facility and the remaining sulphuric acid removed from site. The facility was decontaminated, and significant remediation is now required.

As well as the environmental impact, this series of incidents had the potential to cause serious harm to anyone in the vicinity if they inadvertently came into contact with spilled acid or there had been a catastrophic failure of tank components.

Direct causes

- Sulphuric acid was kept in long-term storage when not required for on-site use.
- The integrity of the storage facility was compromised.

Contributory causes

- The tank and valve design lives were exceeded, and the inspection, testing and maintenance regimes were inadequate to manage the asset's integrity.
- The material used to construct the secondary containment bund was not fit-for-purpose.
- There was no system to detect leaks.

Recommendations

The risks associated with the potential failure of storage facilities for dangerous goods should be assessed on site and addressed by applying the hierarchy of control. For mines sites under care and maintenance, consider the following actions.

Eliminate the hazard

- Remove or dispose of excess or unnecessary inventory of dangerous goods.

Isolate the hazard

- Ensure construction materials used in infrastructure to contain dangerous goods are compatible and resistant to the intrinsic hazards posed by the substance.

  Note: Concrete without an acid-proof coating is not sufficient to contain acids. Some bitumen products are effective, and there are propriety products designed for the same purpose.

Use engineering controls

- Implement a risk-based inspection, testing and maintenance regime to ensure infrastructure containing dangerous goods is fully operational at all times.
- Install means to monitor for leaks (e.g. undertank monitoring, measure liquid levels in tanks).

Further information

Visit Resources Safety's website at www.dmp.wa.gov.au/ResourcesSafety for a guide to evaluating asset integrity management systems (AIMSs) that may be useful, as well as information on the reporting of dangerous goods incidents.

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