



## Significant Incident Report No. 233

**Subject:** Worker seriously injured by hot caustic solution while cleaning an inline strainer

**Date:** 01 December 2015

### Summary of incident

During routine maintenance, a process operator was cleaning a screen box (inline filter) connected to pipework below a thickener tank. He opened the drain valve to verify isolation before undoing four bolts to open the screen box door. On opening the screen box door, the operator found the screen full of material. As he pulled the screen out of its housing, a blockage upstream of the screen box dislodged. The operator was engulfed in 95°C caustic solution, receiving thermal and caustic burns to his body and face.

An emergency responder found the main isolation valve open.

### Direct causes

- The main isolation valve was open, so the screen box and associated valves were not isolated.
- The process operator was in front of the screen box when the blockage dislodged.

### Contributory causes

- The isolation of valves was not verified through either a second and independent method of ensuring all valves were closed, or checking the effectiveness of each isolation point by separately observing a “change of state”.
- The operator mistakenly thought he had closed the main isolation valve but its function was actually being performed by a blocked pipe.
- Excessive scale had built up inside the vessel after scheduled maintenance was delayed.
- It was difficult to determine the position of the main isolation valve (i.e. open versus closed).
- Operators were not required to lock or tag isolation points for routine work.

### Actions required

The following actions are recommended for work involving hazardous substances.

#### Plant design and modifications

- Consider plant design that enables positive and proven isolation methods such as physical disconnection, single block and bleed and spade, and double block and bleed.

- Consider modifying the plant to include facilities for proving an isolation point. Where drain lines are used, they need to be as close as possible to the isolation to prevent a false verification due to a line blockage.
- Isolations should be as close as possible to the piece of plant being isolated.
- Consider installing flushing systems to verify pipework and plant are free of blockages.

### Safe systems of work

Implement safe systems of work such that:

- safe work procedures are provided for isolations, including the basic principles of **lock, tag, try test** and finally **test for dead**
- safe work procedures are updated to capture operational experience to ensure known risks have adequate controls
- vessels are maintained to reduce material or scale build-up inside pipelines, drain lines or valves, as blockages may falsely indicate isolation
- plant and equipment are clearly identifiable to prevent incorrect isolation
- gases and liquids are not trapped in sections of plant that do not have adequate pressure or vacuum protection or thermal relief.

### Verifying isolation

An isolation valve may leak and fail to isolate. If the isolation is not verified appropriately, the leak or failure may not be recognised until the job starts.

- When conducting an isolation, prove all isolation points before proceeding with intrusive work. Each isolation valve should be proved separately by observing a “change of state” between **close-open-close** positions after the system has been fully drained. Valves need to experience full system pressure to ensure they hold.
- A “try test” needs to be completed to verify all electrical, hydraulic and instrument air circuits have been isolated.
- The “test for dead” needs to consider all potential hazards, such as residual amounts of corrosive, toxic or flammable substances, retained pressure, hot condensate and steam. Do not rely on an unproven or inconclusive isolation. Consider:
  - extending the isolation boundary
  - implementing additional controls
  - deferring the work until a shutdown.

### Further information

- [www.dmp.wa.gov.au/ResourcesSafety](http://www.dmp.wa.gov.au/ResourcesSafety)

Mines Safety Bulletin No. 118 *Working alone with corrosive substances – potential loss of communications*

*Isolation of hazardous energies associated with plant in Western Australian mining operations – guideline*

This Significant Incident Report was approved for release by the State Mining Engineer on 01 December 2015