Significant Incident Report No. 219

Subject: Delayed detonation of explosives in a blast hole during post-blast inspection by shotfirers

Date: 05 June 2015

Summary of incident

One hundred and ninety-four blast holes had been loaded with a decked charge comprising two column charges separated by a deck of stemming material, and pyrotechnic or non-electric detonators.

During the post-blast inspection of the open pit shot, about 10 minutes after the shot was fired and soon after the shotfirer had given the “all clear” for the shot, explosives in one blast hole detonated close to two blast crew personnel performing the inspection.

Fly rock from the unexpected detonation landed close to the shotfirer, who was 15 metres from the blast location, and close to the shotfirer’s assistant, who was recovering the spent firing line about 30 metres from the blast.

Fortunately, no-one was injured.

Direct causes

- The pocket (top) charge misfired during the initial firing of the blast.
- It appears that hot gases from detonation of the bottom charge heated the ANFO in the pocket charge to the point at which the remaining explosives detonated.

Contributory causes

Misfire and post-blast detonation

The factors that lead to the misfire are uncertain. However, the following observations were made and appear to have contributed to the post-blast detonation.

- The blast design process, including approval process, did not identify the shortcomings of the design parameters associated with the deck charge. The deck charge blast design was implemented without formal change management processes, including risk assessment.
- The site risk assessment had not identified the risk of post-blast detonation associated with deck charges.
- The length of stemming material between the pocket and bottom charges was insufficient and allowed hot gases to penetrate through to the pocket charge after detonation of the bottom charge.

- The stemming material used between the charges was drill cuttings, which is not as effective as crushed aggregate.
- Cavities were detected in several holes in the blast but not in the hole that detonated post-blast.

Entry into blast area

- The blasting procedure allowed the shotfirer to re-enter the blast exclusion zone 5 minutes after the shot had been fired. The procedure did not specify modified re-entry times based on risk assessment (e.g. deck charges, time for dust or fumes to clear).

Actions required

Mine operators are reminded of the importance of developing safe systems of work that identify hazards and manage risks associated with blasting operations on mine sites.

- Competent personnel need to design the blast parameters by considering site-specific conditions, sound blasting practices and advice, and input from appropriate technical experts, including explosives suppliers and manufacturers.
- Apply rigorous change management and risk assessment processes to any changes to blast design parameters. Also examine operational procedures associated with blasting (e.g. impact on exclusion zones and re-entry periods).
- Implement quality control processes at both the design stage (e.g. blast design approval and sign-off) and tie-in stage (e.g. blast hole tie-in checks).
- Engage competent persons for all activities associated with drilling and blasting operations. Where less experienced personnel are used, increase the supervision, monitoring and checking of work performance.
- Shotfirers need to be vigilant when approaching blast holes and after blasting when inspecting for signs of misfires, signs of heating (e.g. smoke), presence of hazardous substances (e.g. dust, noxious gases) and potential for other hazards (e.g. voids).

Further information

- State Law Publisher, www.slp.wa.gov.au

  Dangerous Goods Safety (Explosives) Regulations 2007

- Australian Standards, www.standards.org.au

  AS 2187.2 *Use of explosives*

This Significant Incident Report was approved for release by the State Mining Engineer on 05 June 2015