Department of Consumer and Employment Protection
Government of Western Australia

Resources Safety

Mines Safety
Significant Incident Report No. 138

Paste fill wall failure

Incidents

Two mines in the Goldfields have recently had paste fill barricade failures.

The first case was a paste fill barricade that failed during the flushing stage of tight filling a drive underground. An employee parked in a vehicle close by observed the wall bulging and took steps to evacuate the area. A substantial quantity of fill material mobilised out onto the level over a bund wall and down into a sump. Had the employee not taken evasive action, the incident may have resulted in a more serious event. It would appear that the wall was poorly located and not designed for the dynamic loading during flushing to achieve tight filling.

In the second case, a stope was to be filled in two stages — firstly, to fill the stope to a height slightly above the initial drive and the barricade wall and secondly, once the fill had set, to continue filling to the full stope height. During the second stage of filling, the fill wall failed and a substantial flow of paste fill surged down the drive, past the exclusion zone, to where two electricians were working. One of the employees was in a ute. The other took evasive action by scrambling onto the back of the ute. Paste fill travelled past the vehicle at a height of about one metre. The employees were lucky to escape without injury. The paste fill flowed for about 250 m from the wall failure. It would appear that the stage one filling had only partly covered the barricade wall, leaving it vulnerable to hydraulic loading during stage two.

Discussion

- These incidents highlight the potential hazards associated with mining systems that use paste fill. Managers are reminded of their responsibility to provide a safe system of work for employees under section 9 of the *Mines Safety and Inspection Act 1994*.
- The design of mining systems requires consideration of the worst case scenario, using appropriate risk management techniques. The amount of stored energy behind paste barricades is commonly disguised and/or not well understood, with the general perception of paste fill being that it is like thick, coagulated concrete or plasticine and incidents such as those above will never happen.

Recommendations

When incorporating paste fill into mining systems, the following should be considered:

- The design of fill barricades or bulkheads must be capable of withholding the hydraulic head that may be placed on them, taking into account general groundwater and other seepage into the stope or drive and anomalies in the water content of the fill. Appropriate structural design must be undertaken and the wall must be constructed in accordance with the design requirements, using appropriate construction materials.
- Quality control systems must be put in place to ensure consistent delivery of the desired paste quality and appropriate placement of fill.

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- If necessary, adequate drainage time (dependent on fill quality and water content) must be allowed between fill runs.
- Fill barricades must be appropriately positioned within the access drive (i.e. constructed against rock faces free of geological defects and built at right angles to the direction of the access drive).
- For tight filling, adequate dimension breather outlet pipes need to be located sufficiently far away from the wall, and only a short distance from paste inlet lines to minimise the potential for pressure build-up on the wall.
- Appropriately designed and located containment bunds should be incorporated downstream of the stope or access drive to minimise the effects of an unforeseen failure on other work areas. Design should take into account escape ways and ore passes. Safe personnel exclusion zones should be established outside the containment area.
- The use of cameras and other remote monitoring devices should be considered to monitor the integrity of fill barricades, breather pipes and the paste fill inlet pipe.
- When placing fill in a void that extends above the vertical height of a barricade and may require more than one fill-run, an appropriate monitoring system must be in place to ensure that the vertical height of the fill is above the top elevation of the barricade at the end of the initial fill run to:
  - ensure a solid base for the subsequent filling and
  - reduce the potential for barricade failure.

  It is also essential to ensure that the fill is adequately consolidated and is of suitable and even quality, without encapsulated water, to avoid unwanted hydraulic loading of the barricade.

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