Track Press Cylinder Failure

Mines safety alert no. 371

Mine Type: Coal Mine - Surface

What happened?

A serious accident occurred whilst coal mine workers (CMWs) were undertaking track repairs on a Hitachi EX1900 excavator at a mine site (refer Figure 1). The workers were preparing to use a 360 tonne track press. Whilst aligning the track press in preparation to press out a track pin the pressurised cylinder head plate failed catastrophically.

The failed component struck a worker causing serious arm injuries. He was airlifted to a Brisbane hospital and has required multiple operations and ongoing rehabilitation.

The injured CMW was working alongside two other CMWs at the time of the incident. Neither of whom sustained injuries.

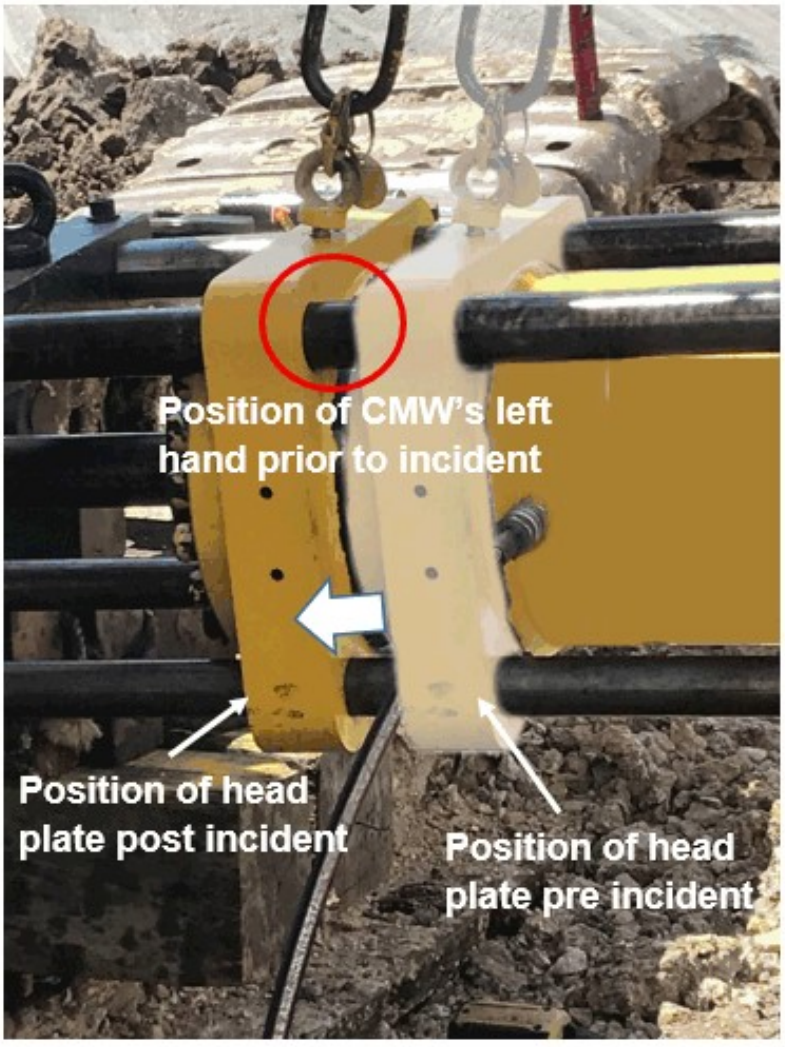
Figure 1: Incident Scene

Equipment: 360t Track Press

Hazard: Mechanical / Struck by projectile

Cause:
The investigation into the incident identified multiple engineering failures that contributed to the incident including:

- Evidence of historic repeated occurrences of cylinder hydraulic pressure intensification.
- The head plate separated from the cylinder at the head plate weld. Repeated occurrences of pressure intensification in the rod end chamber i.e. overloading, initially caused cylinder distortion and ultimately head plate weld separation (refer Figure 2).
- Restricted oil flow from the rod end chamber, during normal pressing operations, created pressure intensification in a portion of the cylinder that is not supposed to experience high pressure.
- Poor internal engineering design of the cylinder resulted in pressure intensification.
- Poorly functioning hydraulic fittings (quick connect couplings) on the return hose restricted the oil flow, creating the high pressure condition in the rod end chamber.
- Inadequate deactivation of the quick connect check valves during operation resulted in a blocked hydraulic return line.
- Lack of appropriate pressure controls to prevent over-pressure events.



Comments:
No pressure control system was present in the piston or rod end chamber to control pressure intensification. Such a device could have reduced the rod end chamber pressure from the pump unit, and eliminated the intensification.

Recommendations:

Mine sites should have a robust system for inspection of equipment used for maintaining plant as per S79 of the CMSHR.

79 Equipment used for maintaining plant

I. A coal mine must have a standard operating procedure for electrical and mechanical equipment used for inspecting, testing, and maintaining the safe operation of plant at the mine.

II. The procedure must provide for the following—

III. selecting equipment that is fit for its intended purpose;

IV. using the equipment safely;

V. maintaining the equipment in accordance with its specification;

VI. testing the equipment at appropriate intervals and labelling the equipment to show when the equipment was last tested.

Mine sites must have:

- An inspection process for equipment used for maintaining plant to ensure the equipment meets site requirements and standards. This should include all tooling used by contractors that bring Electrical, Hydraulic and Pneumatic tooling to site.
- An effective Contractor Management System that includes ensuring Supervisors understand their responsibilities.
- A robust Risk Assessment (RA) process restricting the use of pre-populated and ranked Job Safe Analysis (JSA) or similar documents.

Suppliers

- Suppliers of equipment and services to the mining industry must review and ensure all similar track press units and associated pumps, hosing and fittings are operational and not compromised.
- Suppliers of equipment and services to the mining industry must ensure they have a robust testing and maintenance program to ensure all defects are identified and rectified prior to supplying equipment.

Creswick Bulger Regional Inspector of Mines

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