NSW GOVERNMENT

NSW Resources Regulator

INVESTIGATION INFORMATION RELEASE

DATE: AUGUST 2019

Causal investigation initiated after worker injured by pin ejected under pressure

Incident date: 9 July 2019

Event: Potentially serious injury

Location: Ravensworth Open Cut Coal Mine, Singleton NSW

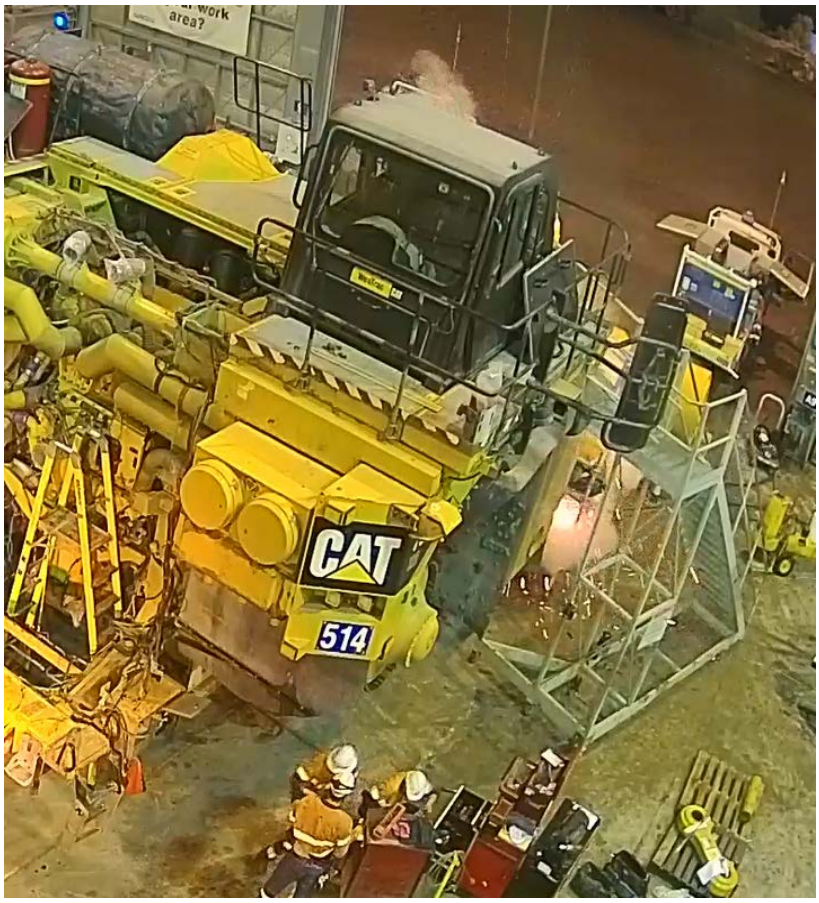
Overview

A worker was struck by a suspension link pin while conducting maintenance activities.

The incident occurred while quenching the pin with water shortly after making a hole through the centre of the pin with a thermal lance.

The worker was taken to Singleton Hospital and later transferred to the John Hunter Hospital in Newcastle.

Figure 1 Image from video footage of workshop at time of the incident



Causal investigation

In consideration of the potential severity, the frequency of lancing operations at mines and the unusual nature of the incident, the NSW Resources Regulator made the decision to initiate a causal investigation. A causal investigation team has been established consisting of representatives from the mine operator,

the contracting company of the injured worker, the haul truck supplier, Industry Health and Safety representatives from the Construction Forestry Maritime Mining Energy Union (CFMMEU) and the Regulator. The investigation has commenced and is ongoing.

The investigation is focussed on the likely cause or causes of the incident for the purpose of sharing learnings with industry.

The scope of the causal investigation includes, but is not limited to:

- the circumstances that caused the pin ejecting under pressure and controls to prevent similar reoccurrences
- the circumstances that caused the subsequent ejection of the suspension link pin and the controls to eliminate or minimise risk to workers
- the adequacy of training and competency of workers conducting thermal lancing work, particularly regarding identification of hazards
- the suitability of work instructions and supervision for workers undertaking thermal lancing, particularly regarding the removal of pins in mobile plant
- eliminating hazards associated with thermal lancing of pins, taking into account:
    - the use of appropriate tools and work methods, and
    - the design of pins to better facilitate removal by alternative mechanical means.

The mine has conducted an Incident Cause Analysis Method (ICAM) that will form the basis of the investigation. These include;

- the causal circumstances of the incident, including a timeline
- human and organisational factors
- recommendations for the mining industry to prevent a similar incident reoccurring
- recommendations for the Regulator to assist with better regulation.

The causal investigation team may also consider:

- previous incidents of a similar nature
- examples of similar incidents from other industries
- reasonably practicable control measures
- what prevented the risk manifesting as a serious injury or fatality
- any other factors, where appropriate.

The Regulator will not be considering further enforcement action in relation to this incident, unless a significant breach of work health and safety legislation is observed, where:

- reckless conduct is observed or
- false or misleading information is provided about the incident.

An investigation report will be prepared at the completion of the investigation.

The mine

Ravensworth Open Cut Mine is in the NSW Hunter Valley, between Muswellbrook and Singleton. It incorporates the open cut mine and the coal handling and preparation plant. The mine is a joint venture between Itochu (10%) and Glencore (90%).

The mine operates more than 50 large haul trucks and about 100 items of heavy earth moving plant.

The incident

On July 4, 2019, the haul truck was brought in to the mine's workshop for a 40,000-hour programmed change out replacement (PCR).

On 8 July, fitters were working to remove the pins from the lower left-hand suspension link, known as a 'dogbone'. They had managed to partially withdraw both front and rear pins prior to handing over to night shift.

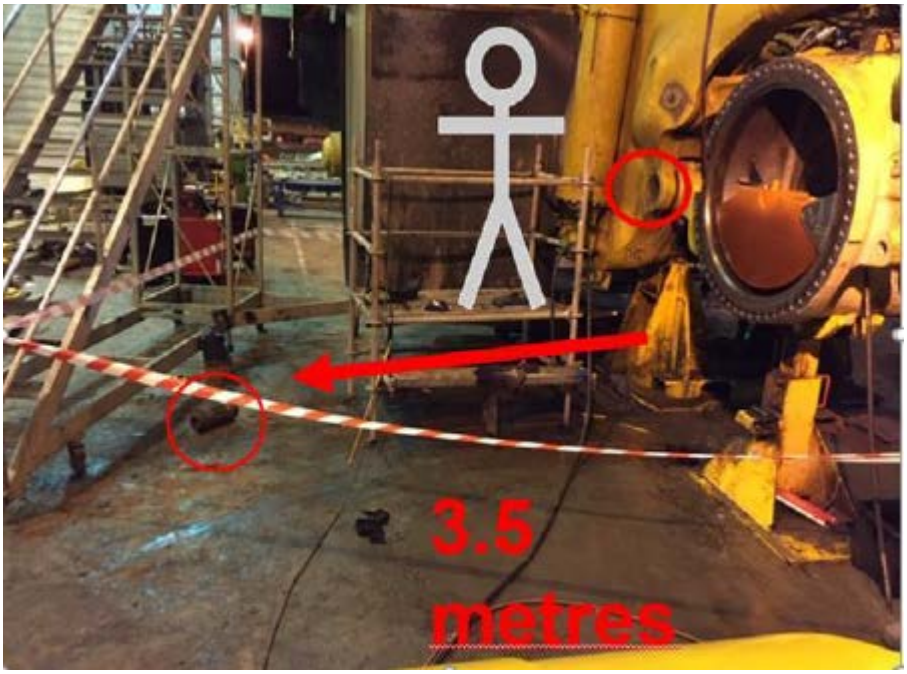
Night shift fitters then successfully removed the rear pin but realised after several hours the front pin appeared to be seized. The night shift fitters then requested a boilermaker to conduct thermal lancing of the pin, to remove it.

Figure 2 Lower Suspension Link (Dogbone) supported by crane as preserved following the incident

Thermal lancing is a process whereby a lance or rod is fed by pressurised oxygen to sustain a burning tip capable of cutting through material such as steel or concrete. The tip operates at temperatures upwards of 2000°C.

After an initial discussion with the fitters, the boilermaker and a spotter had the work area prepared and a scaffold in place to work from giving access to the pin.

Figure 3 Boilermaker work position when struck



The lancing process began, taking about 15 minutes, followed by water quenching for a further six minutes. The fitters inspected the pin but believed it was still seized, so asked for the process to be repeated. Lancing began for the second time for about six minutes to enlarge the hole through the pin. Standing on the scaffold, the boilermaker turned off the lance and began using a water hose, initially to cool the area behind the pin clevis, then the pin itself. The ejection occurred seconds after quenching the pin.

The pin was violently ejected, hitting the boilermaker on the left side of his body, resulting in a large hematoma to his left hip, a greenstick fractured left thumb and minor facial and eye injuries from the slag spray. The spotter, who was working with him, was propelled backwards from the force, but was not injured.

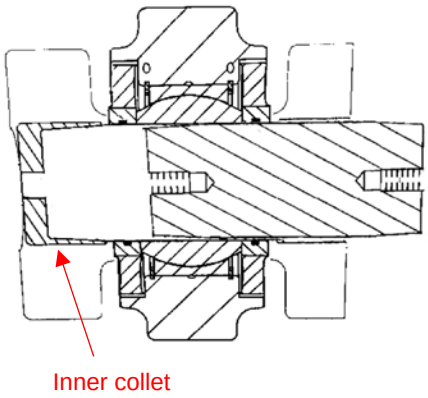
The investigation

Investigations so far have identified the following points about the circumstances of the incident:

- The outer pin retaining collet had been removed by hot work gouging. The inner collet remained in position.

- The pin – weighing 46.7kg – was withdrawn by mechanical means about 70 millimetres from its installed position before starting lancing, forming a pocket or void behind the pin.

Figure 4 - CAT 797F Pin Assembly



- At some time before the haul truck was brought to the workshop, the seals of the spherical bearing had failed. This meant lubricating oil was lost and the cavity was subsequently filled with grease, under a manufacturer's recommended interim control action (ICA).
- The boilermaker was wearing full personal protective equipment (PPE) including a leather jacket and forced ventilation welding helmet.
- Lancing and quenching initially occurred without incident. While successful in producing a hole through the back of the pin, it was unable to be withdrawn mechanically.
- A second lancing operation took about five minutes to further open up the hole through the pin, also without incident.
- Post-incident evidence found slag build-up in the void between the rear of the pin and inner collet, with the slag blocking one of four holes in the collet.
- The ejection occurred about 15 seconds after signs of steam were visible on video footage where it's understood (from interviews and statements) that cooling of areas protected by heat blankets in the vicinity behind the pin, were cooled just before quenching the pin from the lancing entry point.

Causation

Initial investigations and testing suggest the primary cause of the incident was most likely due to the rapid expansion of steam from the quenching water being applied to the hot pin and slag. The team is also considering other factors such as the presence of grease and other hydrocarbons. The final report will provide details of other factors at the completion of the investigation.

Recommendations

Mines must manage risk in accordance with the hierarchy of controls.

It is important to note these recommendations have been developed in consideration of the outcomes of initial investigations.

Mine operators should review their safety management systems, focusing on:

Pin removal by mechanical means

- Mine operators should review procedures for removal of pins with prioritisation of mechanical means of removal over thermal removal (lancing). The review should consider original equipment manufacturer (OEM) procedures, as well as what to do when those procedures are unsuccessful.
- Mine operators should consider the availability and suitability of tools and equipment used for the mechanical removal of pins. Mines should consider OEM recommended tooling, as well as tooling for alternate methods developed when other methods fail.
- Mine operators must ensure the provision of training in the safe use of tools and equipment. Tools and equipment must be used for their intended purpose and within design limits, in accordance with the procedures, unless a suitable change management process is followed.

Thermal lancing

- Mine operators should review risk assessments, and as necessary, revise control measures for undertaking thermal lancing, considering the potential for a steam or hydrocarbon explosion event, confinement and safe standing zones and PPE for protection against being struck by projectile pins and slag spray.
- Mine operators and service providers, must consult workers and people who are, or are likely to be affected (such as spotters) by lancing and quenching activities with regard to the management of risk.
- Mine operators should review their hot work management plans, hot work permit systems and procedures to ensure the hazard of steam expansion events and combustion of residual hydrocarbons when undertaking thermal cutting, gouging and lancing has been identified and controlled.
- Mine operators must provide adequate information and instructions to protect workers from the hazards of steam expansion and combustion of hydrocarbons. Mine operators should provide hazard awareness training for workers undertaking thermal lancing, to identify circumstances that could result in a steam or hydrocarbon explosion and particularly, confinement of that explosion.
- Mine operators should review the competency of persons authorised to perform hot work, to demonstrate they have obtained the necessary training, skills and experience to be deemed competent to carry out thermal lancing safely. In the absence of recognised national competency units, mines and service providers should consider the development and implementation of their own training packages for this type of work.

NSW Resources Regulator

About this information release

The NSW Resources Regulator has issued this information to draw attention to the occurrence of a serious incident in the mining industry, and to advise a causal investigation is underway.

A final report on the outcomes of the causal investigation will be published.

Visit our website to:

- learn more about our work on causal investigations and emergency response
- view our publications on other causal investigations

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DOCUMENT CONTROL	
CM9 reference	DOC19/642024
Mine safety reference	IIR19-09
Date published	7 August 2019
Authorised by	Chief Inspector Office of the Chief Inspector