TIMMINS WEST MINE

LSG 4500, Atlas Copco ST14 8 yd Scoop Incident

16 December 2013
THE INCIDENT

At 03:00 hrs. on Dec 16, 2013, EE was remote mucking in the 730 TC level, #8 stope draw point.

The operator states that after taking a bucket, he curled the bucket back to shake the muck, then the scoop started to travel towards him in reverse. He immediately released the joy sticks and depressed the machine stop switch on the operator unit (OU). There was no response and the scoop continued to travel towards him. He attempted the machine stop again with no response.
The scoop continued to travel in reverse towards the remote stand, hitting it and knocking him to the ground where he landed on his right shoulder. There where no injuries to the operator. The scoop narrowly passed by him and kept travelling towards the ramp and level intersection without commands or control from the operator. It struck the corner of a safety bay, deflected off the pillar and continued towards the level access.
At the intersection to the main ramp, it rounded the corner and proceeded left up the ramp. There were indications that the scoop contacted the left wall in several places. It travelled up ramp for approx. 175m.
At the entrance to the 710 TC level the scoop struck the up ramp pillar and stopped. Concerned for anyone coming down ramp the operator followed the scoop on foot, leap frogging from cut out to cut out until stopped.

He used his cap lamp to signal an approaching 42 ton truck traveling down the ramp, the truck operator saw the scoop approaching with no back up lights and stopped on the ramp a short distance away above the 710 access.
When the operator reached the scoop it was still running and the tires where turning in place. He was unable to safely reach the master switch, so he entered the cab and switched off the unit from there. He put the wheel chocks in place and called his supervisor and a mechanic. The remote unit was disconnected from the machine and the scoop was brought to the shop for inspection.
THUNDER CREEK, MAIN RAMP, 710 TO 730 LEVELS

Total Distance Traveled = 230 m
IMMEDIATE RESPONSE

• The unit was secured and tagged out for the investigation.

• Management, JH&SC, Mechanical and Safety Dept. were notified & statements gathered.

• Notice sent to the Ministry of Labour. OH&S Act, Sec. 53

• The Investigation
**THE INVESTIGATION**

**OU:** Atlas Copco RRC **Operator Unit** that the operator would use to control the ST14 Scoop from the safety of a remote stand.

**MU:** Atlas Copco RRC **Machine Unit** that would be mounted in the cabin of the Scoop. The RRC MU receives the Bluetooth commands from the RRC OU and is the actuating unit in Scoop RRC.
THE INITIAL INVESTIGATION

- Atlas Copco Product Specialist arrives, Jan 16, 2014. Inspected the scoop and the components of the OU and MU.

- In a safe controlled location the scoop was linked in remote. The tech could not replicate the incident at that time. The scoop responded as designed.

- Further investigation found that there are two safety relays in the RRC MU that should have shut down the engine ignition circuit as well as apply the brakes in the event of a failure in the RCS can-bus communication or a fault on the machine. It was found that both circuits had been bypassed at the X115 connection of the A10 Main Dash panel.
By-passed RRC Safety Circuits at X115 connection in the A10 Main Dash Panel

Original wires were broken at X115 connection
• It is unknown when or why the relays were by passed, but it’s thought that a mechanic was trouble shooting a brake failure (not releasing) while in manual operation without the MU in place. Unknown to the mechanic the jumper would by-pass the safety relays in the MU when it is installed.

  **Note:** when not operating in remote the MU is removed and a plug is installed.

• The jumper was forgotten and the unit operated for some time until the incident occurred.

• When the incident occurred a data link between modules was lost, most likely caused by a wiring fault in the scoop through normal wear and tear.

• The cause of the original communication failure between modules has not been determined.
Ignition Circuit

Ignition circuit wires were joined together near X115 connection at A10 Main Dash

Park Brake Circuit

Park Brake circuit wires were joined together near X116 connection at A10 Main Dash
Scoop RRC Modules

ST 14 Operators Compartment

Safety Relays located in the MU
FURTHER ATLAS COPCO TESTING

• They were unable to re-create the failure by operating the machine on RRC, so they proceeded to simulate a loss of communication between the RCS modules by removing power from the individual modules while operating on RRC. They did this by wiring in a normally closed momentary push button into the power circuit of the modules.

• They found that by momentarily disrupting the communication to the D540 decoder module they were able to recreate the event where the rig continues tramming at a fixed RPM and direction. The test was repeated several times to ensure the result would always be the same.

• They proceeded by correcting the safety relay circuits wiring and repeating the same test multiple times.

• With the relays properly wired into the parking brake circuit and the engine ignition circuit, the ST14 Scoop shut down the engine and applied the parking brake automatically as it was designed to do, immediately after the communication error.
CORRECTIVE ACTIONS AND RECOMMENDATIONS

• The scoop involved in the incident has been taken out of service. The remaining unit has been inspected by Atlas Copco and found to be serviceable. We are replacing them in the near future, so they will no longer be used for remote mucking.

• If a temporary by-pass or jumper is required for maintenance or testing of equipment, the service personnel are to attach a Tag on the equipment indicating name, date and time, reason and what system has been by-passed or jumped. The jumper and tag will immediately be removed when the need for the tag no longer exist.
CORRECTIVE ACTIONS AND RECOMMENDATIONS

• A more detailed Pre-Shift Check List for remote units will be implemented.

• Atlas Copco Safety Bulletin was issued. Test RRC MU/STRAIF Safety Relay Circuit Verification.

• Atlas Copco, RCS Scooptram Radio Remote Control maintenance schedules provided
  – 250 hour
  – 1000 hour

* Previous to the incident there where no scheduled maintenance or tests for the remote safety relays in the MUs.
Thank You