QUEENSLAND MINING INDUSTRY
HEALTH & SAFETY CONFERENCE
2015

Shuttle Car Cable Reel Interlock Valve

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Anglo American - Grosvenor Mine

Introduction - The Challenge

Prevention of 1000 Volt shuttle car cable damage

- Classified as an industry high potential incident due to;
  - It having the potential of resulting in an arc flash within an explosive environment
    - Methane Explosion
    - Coal dust Explosion

Explosion risk

  - Along with the potential exposure to electric shock

2015 Events

- The number of Cable damage events this year caused by the shuttle cars running over the cable within Anglo Australia
- Grosvenor Mine – 3
- Grasstree Mine – 1
- Moranbah North Mine – 4

The number of shuttle car cables repairs this year by Queensland power in the Moranbah region is 102 cables

Cost Impact

- Shuttle car cable cost $14k new
- Cable repair can cost up to $10k
- Downtime to investigate and repair – 3.5 hours
- Not to mention the cost to individuals and the business if a major event was to occur

A Shuttle car is used within the development panels to transport coal from the continuous miner to the conveyor

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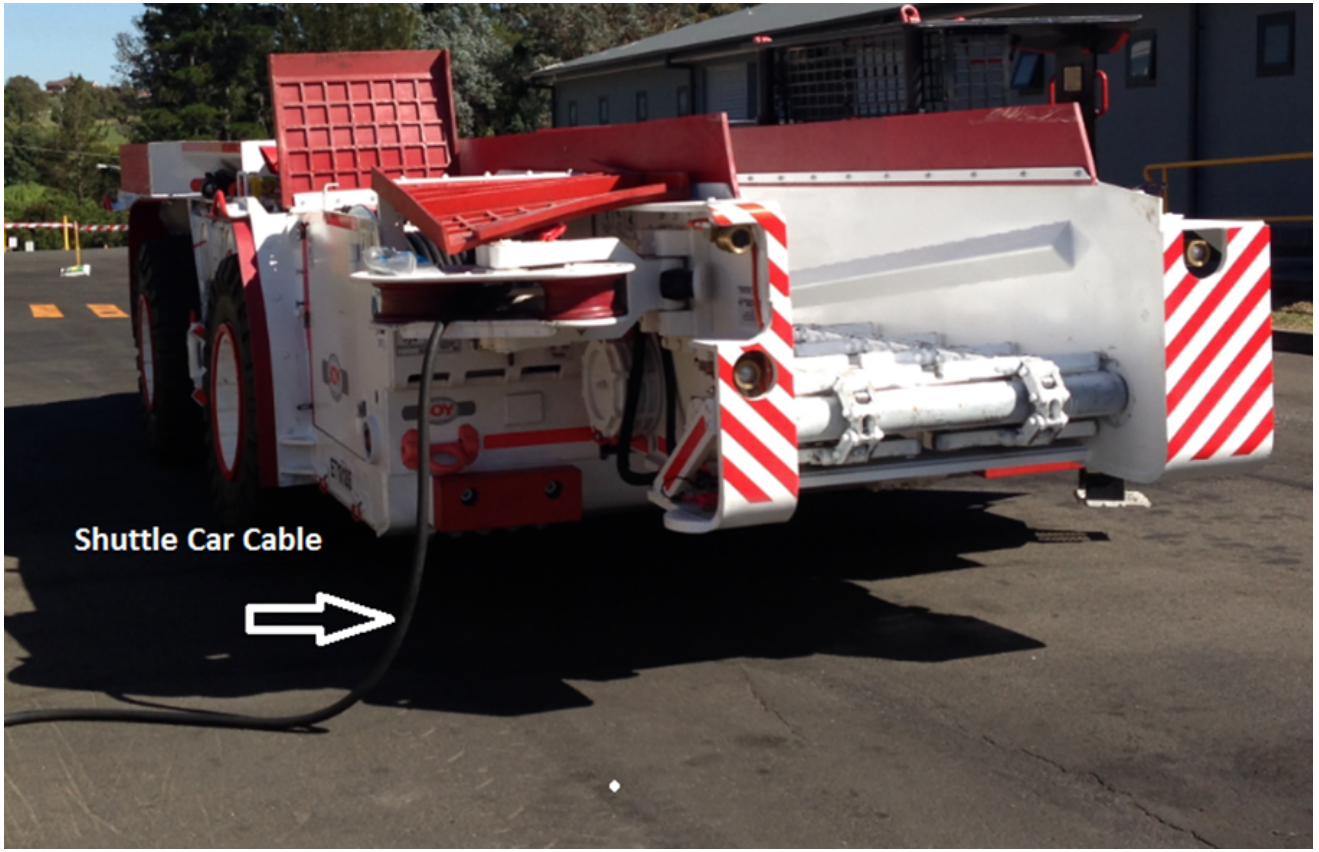

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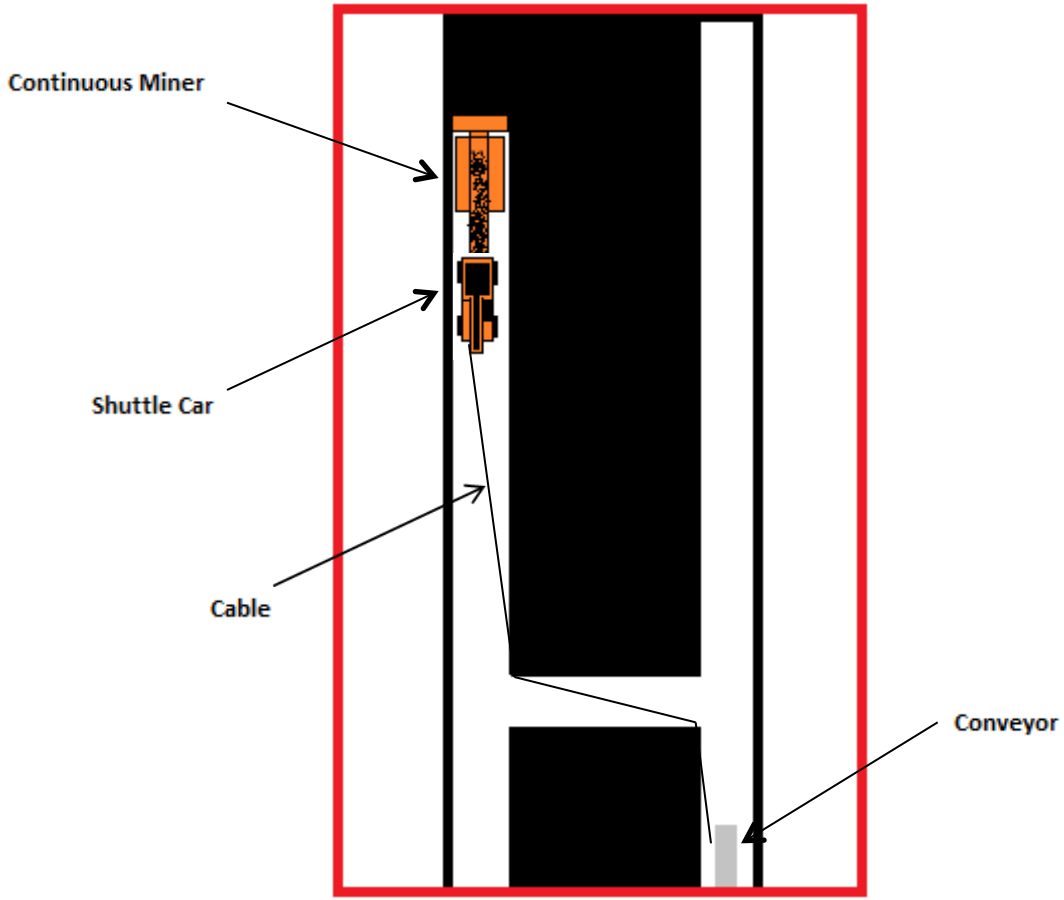

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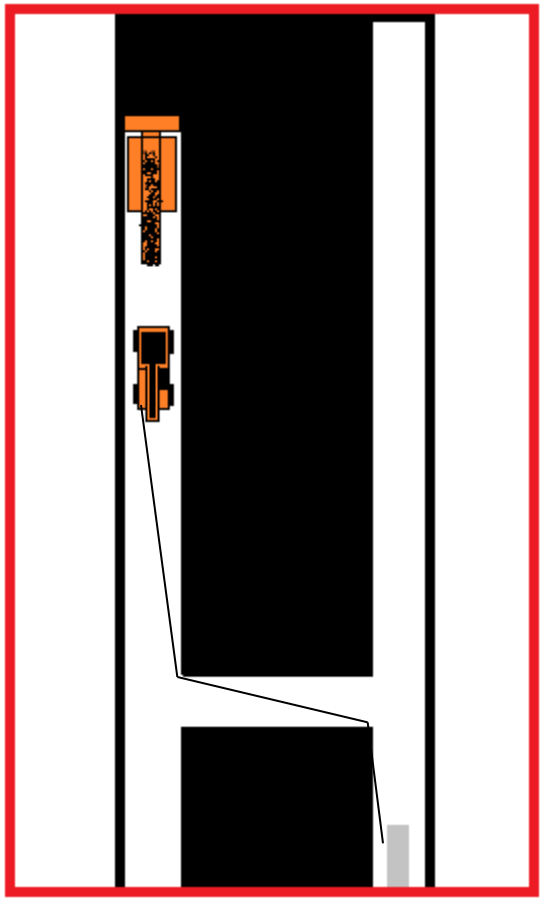

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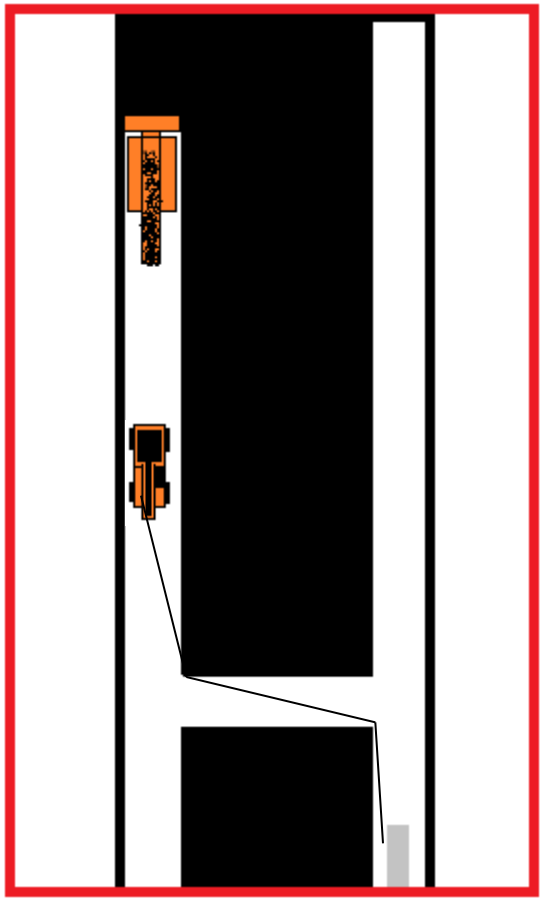

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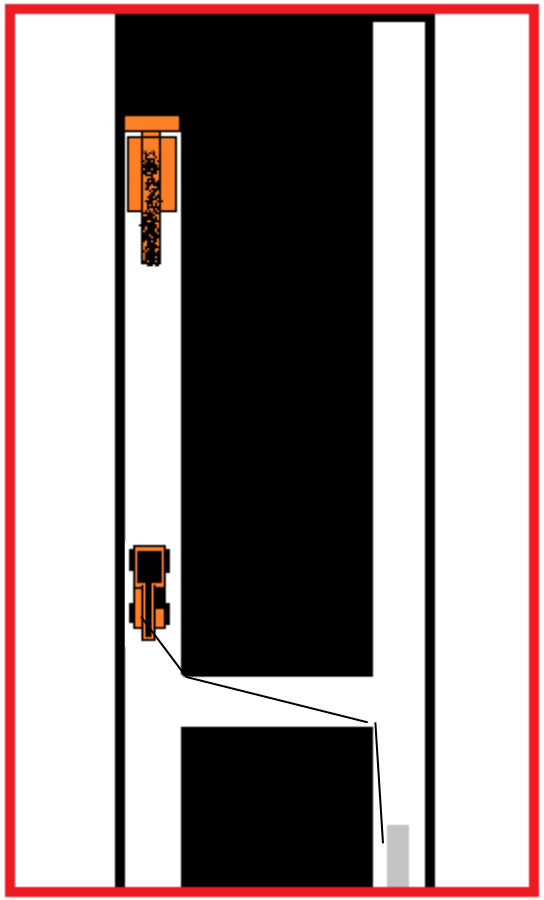

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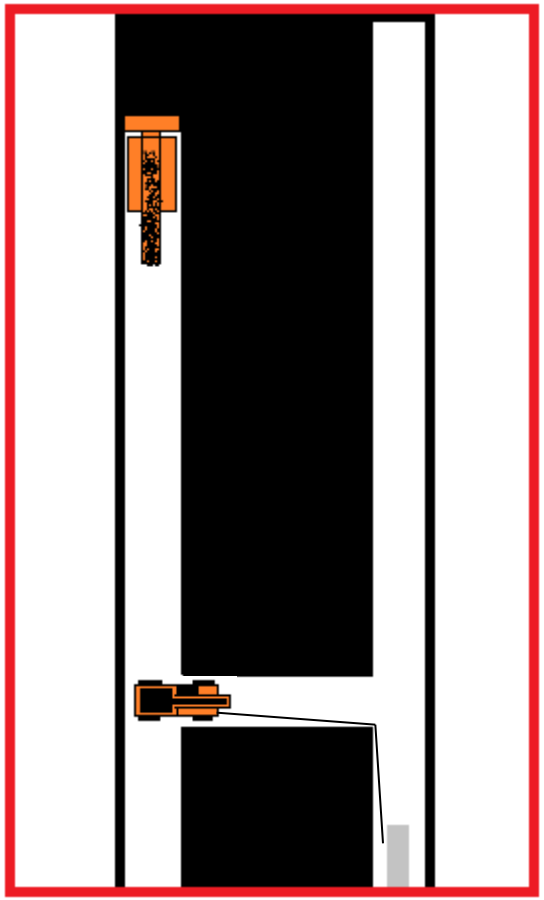

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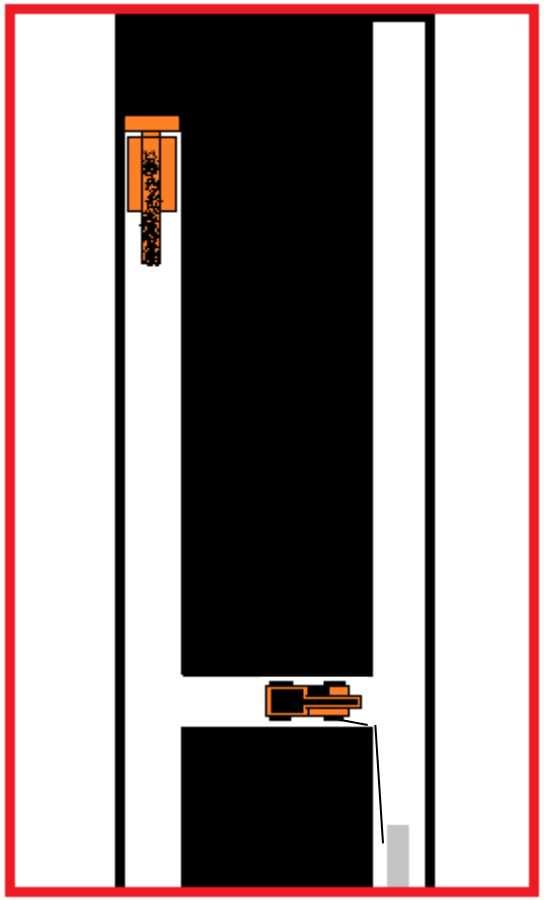

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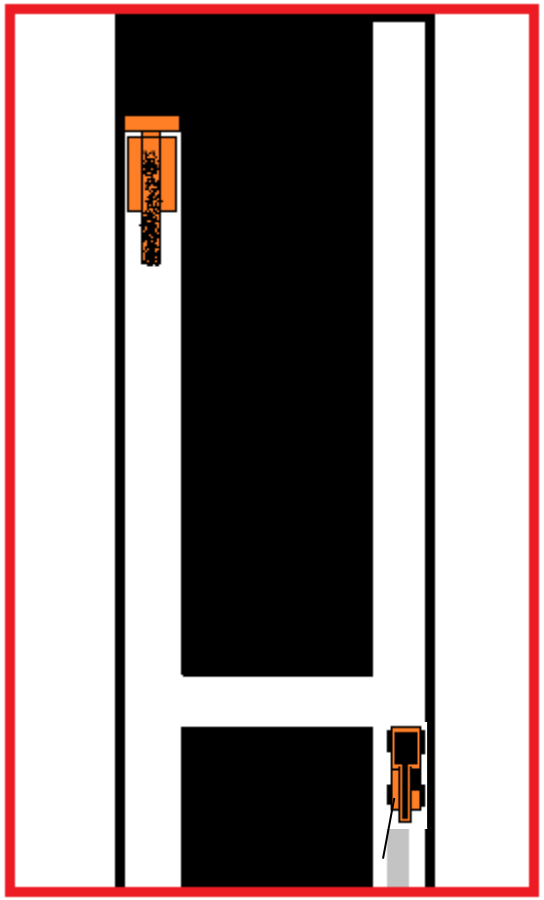

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Cable Reel Arrangement

Modes Of Failure

1.Loss of or no hydraulic pressure to the cable reel resulting in the cable not being reeled in when traveling towards the cable resulting in the car running over the cable

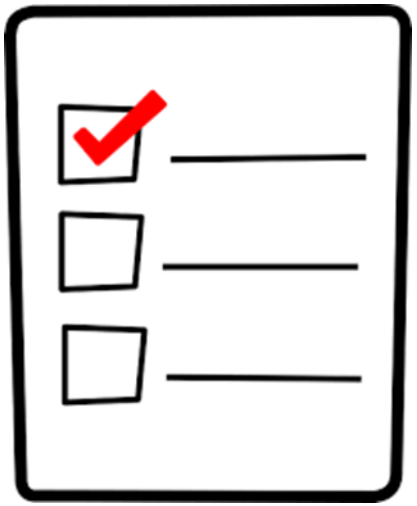
- Solution Developed

2.Cable reel failing to rotate due to coal build up, cable jam, component failure, etc. again resulting in the car running over the cable

- Concept Developed

Previous Controls

The control to manage this hazard is cable awareness of the operator and daily inspections of the equipment.



Solution – Loss of Hydraulic Pressure

- Introducing a hydraulic manifold which interlocks the cable reel pressure to the park brake circuit

Solution – Loss of Hydraulic Pressure

- In the event of the cable reel pressure dropping below 800psi (Set to 1000psi) the park brake is activated
- The manifold incorporates a bypass to accommodate towing or other situations when pressure is not required on the cable reel

Schematic

Service Brake (Pressure applied/spring release)
Park Brake (Pressure release/spring applied)
Brake Pedal
Bypass
Interlock Valve
Pressure from park valve to release park brake

Play Video

Benefits / Effects of solution 1 ✓

- This has been fitted to all of the Shuttle Cars in operation at the mine
- No cable damage has occurred due to loss of hydraulic pressure loss since the manifolds have been fitted
- There has been 2 events where this control has prevented cable damage due to loss or no hydraulic pressure

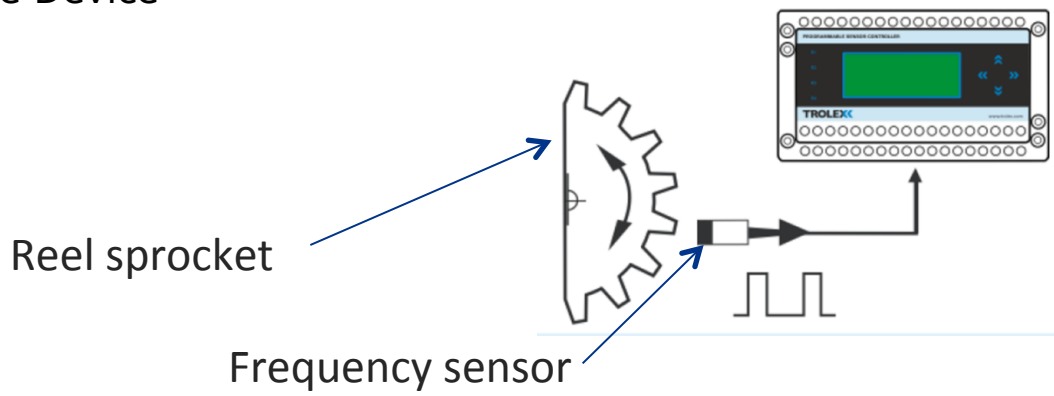
Disadvantages ✗

- Does not eliminate the second failure mode

Concept for the second mode of failure

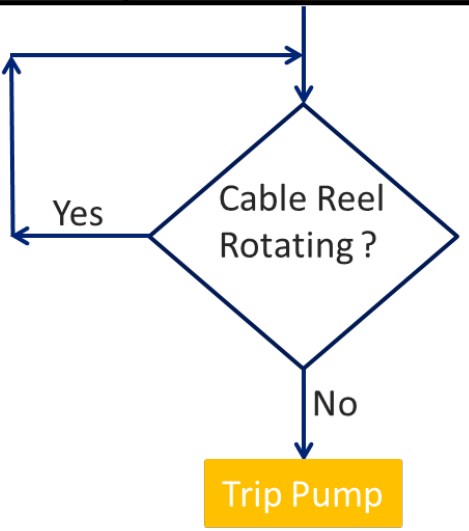
Cable Reel Frequency Sensor

- A frequency sensor mounted to sense the movement of the cable reel sprocket and this data can be read and processed by the Trolex 9042 to determine if the cable reel is rotating
- Trolex 9042 is already used on site for other applications
- Intrinsically Safe Device



How do we Know the Car is Moving?

Inputs	Machine Moving	Machine Stopped						
Park brake Released	Y	N	Y	N	Y	N	Y	N
Footswitch in neutral	N	Y	Y	Y	Y	N	N	N
Pump on	Y	Y	Y	N	N	N	N	Y



What is the control?

There are a number of option we are investigating

- Trip the Pump which stops the shuttle car

OR

- Linking the output to a strobe light to the operates cabin as a warning signal

Next steps

- Conducting bench testing to investigate the capability of the Trolex unit
- Conduct a change management to assess the introduction of risk
- Manufacture bracketing
- Fit to a shuttle car for trial starting with a warning light arrangement
- Trial with pump trip function enabled

Benefits / Effects of Solution 2

- Prevents all modes of failures
- This will potentially remove the requirement for the hydraulic interlock

Disadvantages

- Nuisance trips may occur if wheels are spinning in boggy conditions

Transferability

- The Shuttle Car Cable Reel Interlock Valve can be installed on all models of shuttle cars throughout the industry

- Frequency sensor may have some limitation on different shuttle car types and generations depending on having the ability to utilise an output from the shuttle cars tram function.

Approximate Cost

Interlock Valve Manifold

- Hydraulic Manifold $5,000

Frequency Sensor

- Trolex Unit $4,500
- Bracketry $500
- Strobe light $350

Total

- $10,350

QUESTIONS