

Shuttle Car Cable Reel Interlock Valve Anglo American – Grosvenor Mine

The Problem

A known hazard for all underground coal mines operating shuttle cars in the development panel, is the possibility of the cable damage due to being run over by the car itself, which in turn results in cable failure with the potential of an arch flash occurring a flammable gas rich environment.



Image 1: Shuttle Car Cable

Shuttle Car cable damage has been experienced at Grosvenor in the past 12 months due to 2 root causes being,

1. Loss of Hydraulic pressure to the cable reel resulting in the cable not being reeled in when traveling towards the cable.
2. Cable reel failing to rotate due to coal build up, cable jam, component failure, etc.

Innovation

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

The innovation was to come up with an engineering control to prevent the cable damage occurring and removing the arch flash hazard.

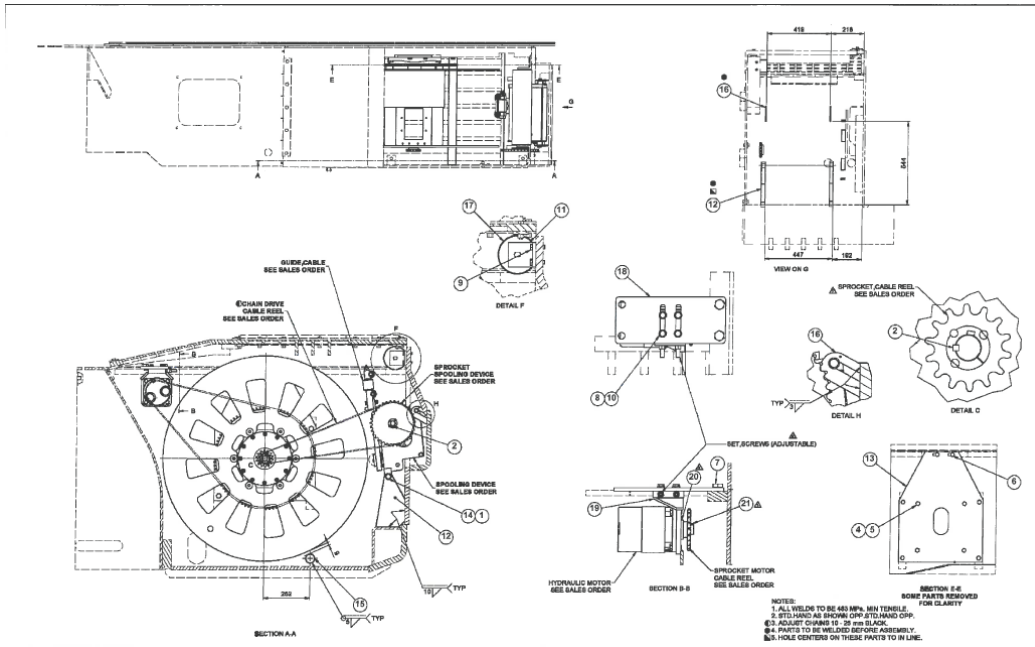


Image 2: Shuttle Car GA

The Solution

Due to experiencing this failure at Grosvenor engineering controls were investigated to better prevent the hazard occurring.

A control has now been implemented on site to one of the Shuttle cars as a trial to manage the hazard in the event of the shuttle car reel losing hydraulic pressure.

This is achieved by incorporating a hydraulic manifold which utilises the pressure from the cable reel to pilot a valve.

When the pressure is lost or reduces below 900psi the valve closes returning the service brake pressure pilot back to tank and in turn applying the park brake due to no signal to the service brake pilot switch.

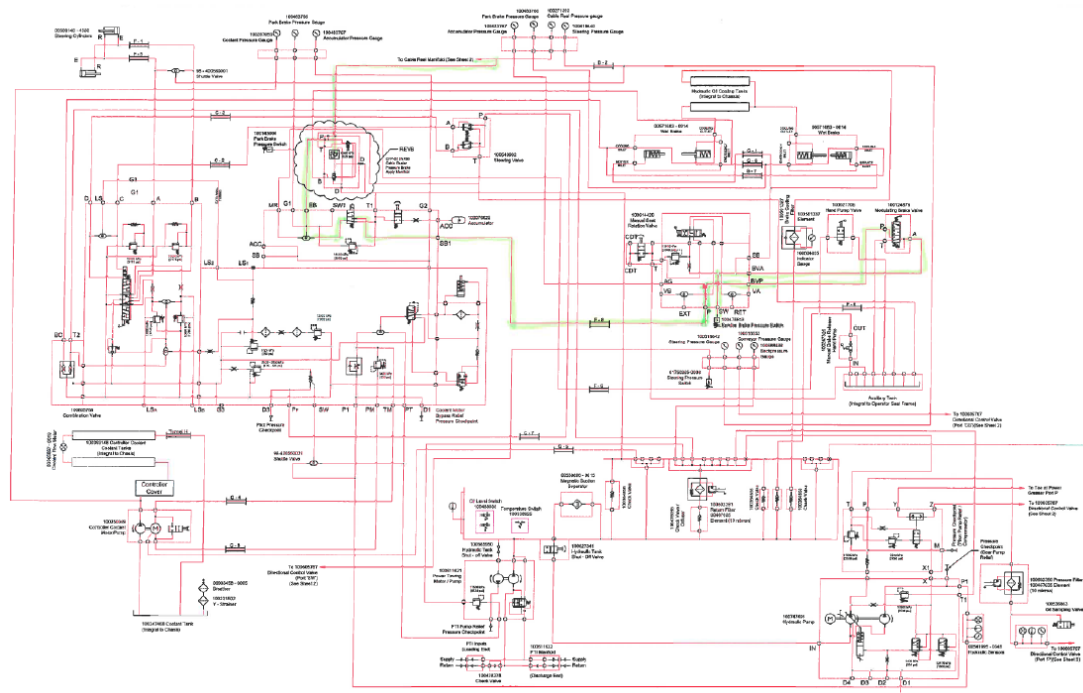


Image 3: Schematics

The hydraulic manifold also gives the ability to bypass the interlock to accommodate towing of the machine when there is no pressure applied to the cable reel and is locked during normal operation.



Image 4: Introduced Manifold

Benefits / Effects

This has been in operation for the last month with no impact to the operation of the machine and zero cable damages have occurred from the first root cause above.

Further Works

The next step is to have the modification fitted to the remaining fleet of shuttle cars on site.

Work has now commenced on implementing a control to manage the second failure mode.

We are investigating the use of an Austdac Trolex 9042 unit as a simple controller to take an external input from a sensor fitted to the cable reel sprocket which is capable of doing some simple logic in relation to the shuttle car tramming function being activated and rotations of the cable reel.

In the event of either of the above two root causes taking place the pump would be shut off to prevent cable damage occurring.

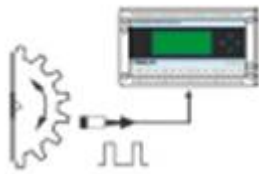


Image 5: Trolex Unit

There is still a lot of work to have this completed however we are planning on having a system to trial in Q3 this year.

Transferability

The Shuttle Car Cable Reel Interlock Valve can be installed on all models of shuttle cars throughout the industry, however the electronic controller may have some limitation depending on having the ability to utilise an input from the shuttle cars tram function.

Approximate Cost

Hydraulic Manifold \$5,000

Schematics \$3,000 (one off payment)