Longwall Dust Gutter System

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Introduction

- Anglo American - Moranbah North Mine
- Underground Coal Mine – Longwall Operation
- Bowen Basin, Central Queensland
- Longwall Dust Gutter System

The Issue

- The articulation point in the Powered Roof Support (PRS) canopy allows coal and fine dust particles to fall into the main air ventilation path creating a dusty working environment for coal mine workers.
- Maintain compliance within the Longwall Face SEG for respirable and inhalable dust levels on the Longwall face.
- Design a system to ensure effective dust management when a PRS lowers, advances and sets to the roof during normal Longwall operation.
- Reduce and remove dust and fine coal particles to ensure greater visibility.
- Design a system to cater for different cut heights on the Longwall face which may effect walkway height in the rear walkway of the PRS.

The Solution

The Design Journey

There are several factors that needed to be considered within the design:

- Version 1 was a piece of vinyl suspended between the side shield and the canopy with magnets. This designed promptly filled up and separated from the side shield introducing a large amount of fine dust into the air way causing a hazard to coal mine workers.

- Version 2 was a piece of stainless steel tube cut in half, this was then riveted onto the poly sail track with rubber stitched onto the vinyl attached to the PRS using 4 x magnets. The design was too large in many ways and awkward to handle. Additionally the vinyl would bunched together preventing an effective seal.

- Versions 3 to 6, over an 8 month period saw multiple design change made. Tube was replaced for folded plate, sail track, rubber and stitching were all removed and replaced with stainless bar, and vinyl welded into the sides. Bunching of the vinyl was resolved through the introduction of folded flat bar, correct positioning of gutter was established, upgrading of the water circuit to incorporate a dedicated spray allowing the gutters to move freely with the PRS while being durable enough to last through adverse mining conditions.

- Version 7 is the current version, incorporates an elbow to increase fall angle of the gutter that reduced maintenance requirements while still providing a noticeable dust reduction, and does not hindering or interfere with the coal mine workers in the rear walk ways in adverse mining conditions (low roof heights).

Safety and Design Requirements

- To be an effective engineering control in dust reduction for all longwall mining conditions.
- Low maintenance and easy to install.
- Multiply attachment points to adequately manage dust payload to ensure retention of the gutter system.
- The addition of water flushing minimises maintenance of the system and reduces fugitive dust emissions.
- Ensure walkway height was not compromised with the installation of the gutter system.

Design Specifics

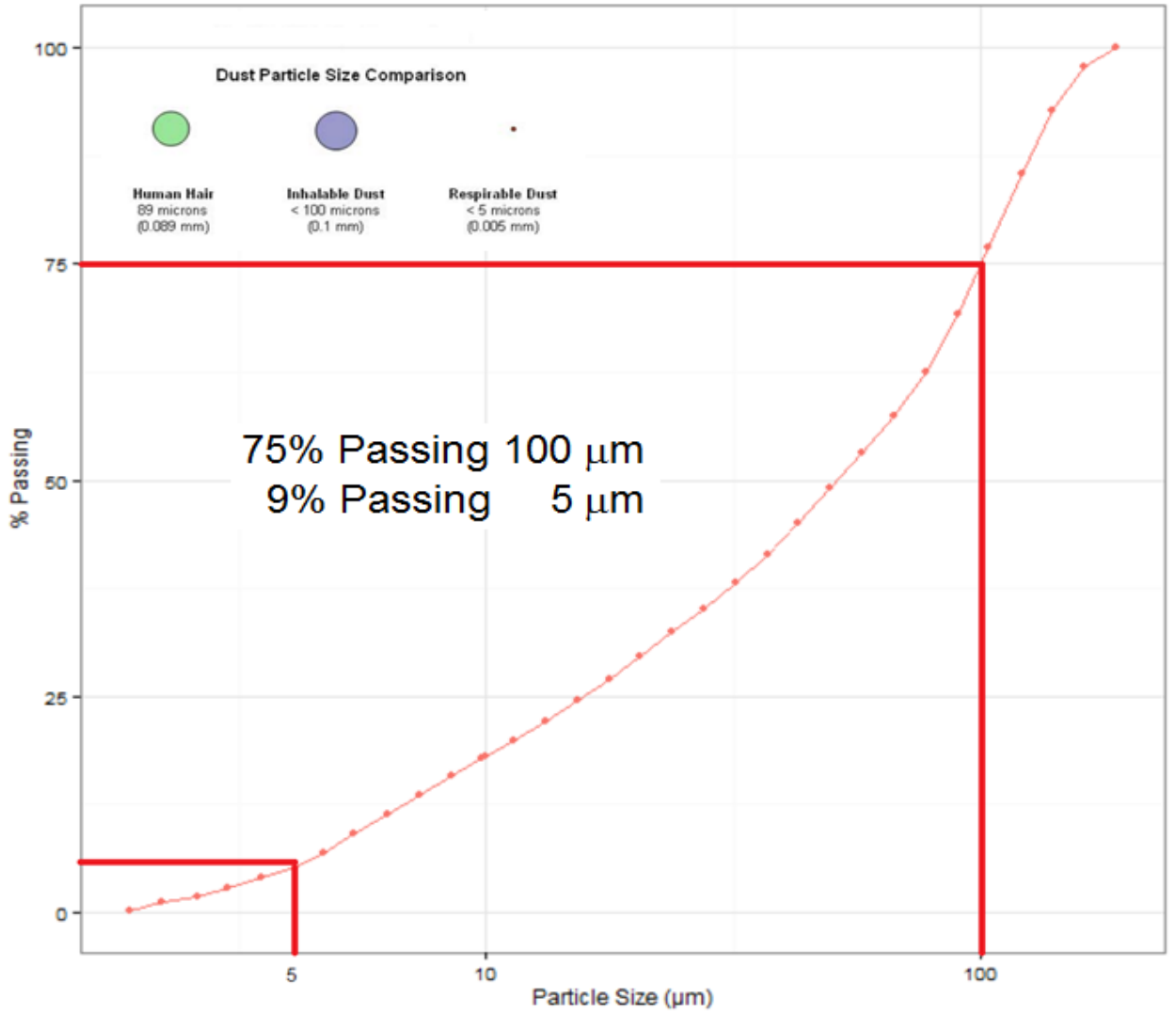
- Stainless steel 314 1.6mm, angled gutter for self cleaning inline with PRS design.
- PVC coated polyester vinyl 1100 dtex welded to avoid stitching that would deteriorate over time.
- Stainless flat bar 25mm x 3mm is inserted into the welded vinyl section and riveted to join the vinyl to the stainless gutter.
- Angled flat bar to suit the PRS with 4 x Magnets provides an effective seal against side shield directing all falling dust into gutter system.
- In total 8 x 92kg pull strength magnets giving 736kg total hold strength of the gutter system.
- All materials MDG 3608 Compliant.

Benefits and Results

- Significant reduction in dust particles present in the longwall ventilation system.
- Captures and diverts all dust and coal particles generated from the articulation point of the Powered Roof Support (PRS) and directs it away into the goaf away from the walkway of the coal mine workers.
- Minimizes the potential for coal build up on the PRS walkways and rear linkages to reducing airborne dust to reduce cleaning activities of the walkways.
- Creates a safe work environment for coal all mine workers.
- No Longwall Respirable Dust Sampling failures JAN – JULY 2017

Dust Particle Size Distribution

- Grab sample from PRS 36 gutter
- 1 kg dust collected per shear
- 45 mins/shear (1.3 kg/hr dust)
- 75% inhalable dust >100 μm
- 9% respirable dust >5 μm
- 298 dust gutters total across longwall
- 35 kg/hr, 290 kg/hr respirable and inhalable dust collected respectively



Transferability

Potential for wide-spread use across the underground longwall mining industry.

Entire installation has been completed during a scheduled maintenance window, resulting in no disruption to operational time.

Expense

The design is very cost effective to procure and install to existing underground installations. Purchase price $1,252 per PRS.

Summary

Moranbah North Mine has recognised through real time dust monitoring that there has been a significant reduction in airborne dust post the implementation of the Dust Gutter System. The mine has completed a full installation of the entire 149 (PRS) with water flushing on each of the 298 Dust Gutters.

Questions?

A clean face is a safe face