Report on Dust Generation and Effectiveness of Suppression Techniques used on Longwall BSL and Crushers

Proposal Summary:

The Joint Coal Board, now Coal Services, has been entrusted with the Underground Coal Health for many years, and this includes the monitoring of environmental factors, especially dust via the Standing Dust Committee.

Through this committee, longwall exposure is measured on a regular minimum six monthly basis and advice and assistance offered to the mines on dust control and mitigation.

One area of high dust make is the BSL and Crusher, where the resultant dust can severely contaminate intake ventilation and therefore expose greater numbers of operators to high dust exposures.

Research Question:

I propose to further investigate the dust problems associated with the BSL and crusher areas on longwall faces and identify the existing controls in the industry to assess the effectiveness of the control.

Method:

The method proposed, is to investigate the type of BSL and crusher used in the industry and then a selected number of BSL/crusher units (say 4) to identify:

- The current equipment configuration, age, type of crusher, length, sprays, dust extraction systems, etc.
- Existing dust suppression system
- Measure the roadway size, BSL area in roadway,
- Determine the ventilation flow internally when the crusher is operating without product (possibly done on OEM workshop floor)
- The ventilation internally when the crusher and BSL chain are operating without product (possibly done on OEM workshop floor)
- Changes to BSL internal ventilation with product volume, effectively the ventilation effects of the crusher and coal in BSL
- Estimate how product volume affects the dust make, does more coal than the crusher can handle cause a significant dust increase?
- Area of BSL verses the Volume of Coal
- Efficiency/effectiveness of dust suppression system and how product volume may affect effectiveness
- BSL discharge configuration onto belt, height of discharge, sprays, ventilation flows, etc.

Resources:

Requirements for research are:

- Minimum 4 sites willing to cooperate with the research
    - High volume
    - Medium volume
    - Low volume
    - Distinctive dust suppression system

- Instruments for measuring ventilation and air flow in the gate and around the BSL (Magnahelic gauge)
- Pitot static unit to measure pressure differences throughout the BSL
- Smoke tubes
- Instrument for measuring instantaneous dust counts
- Second person (provided at the mine) to allow measurements to be taken while logging coal volumes from the face

Expected Results:

The results will achieve:

- Understanding of the effect the crusher has on the ventilation around the BSL, especially the discharge
- Ventilation flow within the BSL
- Understanding of the current dust suppression systems and their effectiveness
- Indication of dust make from BSL and crusher

Discussion:

The results will benefit the coal industry by identifying the factors that cause the dust to escape into the ventilation stream from the BSL area and the most effective method of reducing the dust available to the market.

The information should reflect:

- the effectiveness of the dust suppression systems
- the different types of dust suppression available
- how combinations of suppression systems work
- how current systems are used and maintained

The results should be made available by report to Coal Services and then to longwall mines to allow them to review and reflect on the information, in respect of their local situation.

As the topic is specific to the longwall mines, the industry benefits will be limited, however some comparisons may be drawn in respect to the dust in ratio feeders and panel crushers that may be useful. Also there may be some parallels in regard to dust suppression on continuous miners and the effect the chain or on board crushers may have on dust.

Introduction:

Dust is a major issue on longwall mines. In recent times, as production increases, so has the dust make which is resulting in failure to meet dust regulation standards.

When longwalls were introduced to Australia, on the South Coast and Hunter regions, faces were 2.5 to 3.5 metres in height and produced 1.5 – 2 million tonnes per year.

This has now changed and faces are up to 4.8m high, and produce up to 7 million tonnes per year.

The question is how have dust suppression techniques progressed in line with the different environment, and are there any new ideas out there that need to be adopted on a broader basis?

Historically, the main dust suppression techniques depend on water knock-down of dust, hopefully at source. Understanding that wetting coal has its own problems, we need to know what sources of dust are currently causing problems at mines and may be contributing to failures.

My investigation looked at BSL and crusher dust make, and the current suppression techniques in place to reduce airborne dust migrating onto the face.

The BSL can be a major source of dust on longwall faces. Current coal volumes at peak can be 5500 tonnes per hour and this has major dust creation issues. Low volemes of coal are more easily wet and cause less problems, however high volumes, expecially in the BSL/crusher create large dust volumes that are not easily controlled.

There are two major suppliers of longwall equipment in Australia. These OEMs supply a standard design of dust control on the BSL and will only change if specifically requested to do so.

It appears that dust generation is not considered specifically at the time of purchase and problems are only detected after operations commence. Modifications are then difficult to make and redesign is expensive and sometimes ineffective and may take many changes to become effective.

Method of BSL Internal Pressure Observation:

The internal pressures in the BSL were monitored using a simple Magnahelix gauge and two lengths of hose. The hose was positioned internally at each end of the BSL and the gauge centrally located and read manually as the BSL was operated under coaling conditions.

It was intended to use the Hund instantaneous dust monitor to gauge different dust conditions with the extractors running and not running, however it proved difficult to guarantee the extractors would be operating and so this was not done.

Results of internal pressure observations at mines and the dust suppression equipment in use are tables in Appendix A and B.

Findings and Observations:

There were two major tests and examinations carried out at the mines to attempt to show problems with dust suppression techniques on the BSLs.

- Observation of current dust suppression equipment
- Pressure differences were measured across the length of the BSL to determine the internal BSL pressure and how this may affect dust migration into the ventilation air entering the face.

As observations and tests were all carried out during coaling operations, there were some difficulties determining the exact details of some of the dust suppression equipment, however this, I believe did not adversely affect the outcome of the investigation into:

- the effectiveness of the dust suppression systems
- the different types of dust suppression available
- how combinations of suppression systems work
- how current systems are used and maintained

It did highlight however the poor knowledge regarding the equipment, the effect on dust of the equipment and differences in operating effectiveness at different mines.

Basic BSL Design

1. The BSL design appears to be critical for reducing dust make. If the area within the BSL is too small for the volume of coal, then internal pressures up to (and possibly greater than) 120Pa are generated, which forces dust into the ventilation stream.

2. This design appears to be even more critical in blocky coal, where large lumps create large volumes of coal at short intervals.

3. Fine coal, does not appear to have the same problems and the coal flow is smoother, the internal volumes are more constant and surges in internal pressures do not appear to build up.

4. The height or cover design of the BSL is therefore important to ensure coal volumes do not fill the BSL. This is especially important at the exit to the crusher, and design work in this area should be looked at independently of the other areas of the BSL. This is because of the build up of coal at the exit to the crusher.

5. Internal baffles appear to have a beneficial effect on dust exiting the BSL, but these are now going out of favour due to the possible restriction of the coal flow, and the damage caused by the steel baffles becoming detached. Some mines stated that it was essential to have the baffle fitted or dust make increased. Others either had not thought about the issue or were

6. It is also unclear at present how internal baffles may affect the operation of a dust extractor. Further investigation will be needed in this area.

Hood Design

1. The hood or delivery cover of the BSL can have profound effects on dust and coal flow. For this reason, time and engineering expertise should go into this area, especially if a dust extractor is to be fitted.

2. Shrouding of the delivery area onto the belt is one of the most important areas as any ventilation currents in this area will pick up stray dust. The area should be enclosed on all sides (including the rear or inbye end) with curtains or sides that drop down to the belt. This can lead to problems with coal clearance and new designs may be needed to prevent blockages.

3. Shrouding should ideally prevent access of ventilation, unless pulled in by a dust extractor to prevent egress of dust.

4. The boot end design is also important as a narrow belt will cause poor clearance of coal leading to BSL stalling. The belt width should be maximised to ensure coal flow is maintained

BSL Delivery onto Belt

1. New designs should be engineered to produce an improved coal flow onto the belt. Current designs allow coal to strike the belt at right angles (almost) which causes the coal to stall while it is accelerated to belt speed. This can lead to dust issues at the head end. Chute designs are difficult to engineer in this type of situation, but should be investigated at time of overhaul or purchase.

2. Height of the drop from BSL to belt is important if no chute/flow design can be installed. The trajectory onto the belt will determine the potential for bottlenecks and therefore the likelihood of dust issues.

3. Water quantity, direction and pressure at the delivery is also important and will be more effective if the coal stream is flowing rather than stalled. Water spray design should be investigated with the coal flow design.

Sealing of Covers

1. Covers should be sealed across the full length of the BSL, where practically possible. Problems for sealing may occur at the tensionable drive area, however engineering designs should be able to produce a reasonable sea.

2. Covers should be designed to be modular and removable so that damage can be repaired easily and quickly.

3. Cover designs are now being improved with polyurethane covers or plastic covers now being tested.

4. Overlap of covers should be designed to allow maximum sealing to occur.

5. Geogrid techniques, where the BSL is wrapped in a sheet of mesh and kept constantly wet should be further investigated and refined. It is important that these meshes are kept wet or they do produce more dust.

Internal Pressures

1. Internal Pressures in the BSL vary markedly with type of BSL and design.

2. The crusher exit area appears to be important for balancing load issues within the BSL as does the length of pan immediately outbye the crusher. A greater area, and longer pan, seems to allow the coal flow to settle lower on the BSL and not bulk up to the top, allowing flow of air over the coal instead of the coal pushing the air out of the BSL delivery.

3. Crusher design was initially thought to be important regarding the pressures building up inside the BSL. The high speed impact designs were thought to cause an air pressure increase, however the results show this not to be the case in general and only a small pressure increase was noted.

4. The crusher design (especially the impact unit) did seem to cause a large build up of coal on the discharge side of the crusher. If this build up was sudden and large, the coal volume was in excess of the BSL transport volume and the pressure internal to the BSL increased markedly (up to 120Pa peak and instantaneous).

5. Coal characteristics appear to play a role in dust make from BSLs. Fine coal appears to flow through the BSL and not cause problems, however large lumps, blocky coal and extreme peaks in production all caused massive volume increases in the BSL leading to increasing internal pressures and dust migrating into the intake air.

6. Baffles may or may not help keep dust internal to the BSL. This area needs more investigation. A baffle or several baffles, may restrict or may allow extractor to prevent dust egress at delivery. As most BSLs do not have baffles, it was difficult to obtain concrete evidence, however one mine (with an extractor fitted) stated categorically that the dust was impossible to manage without a baffle internally sited on the crusher exit.

7. The best dust extractor sampled gave a negative pressure of -150 Pa at inlet, however the extractor was not reliable and more work needs to be done to improve efficiency, reliability and ease of maintenance.

Spray Design

1. When a new longwall is designed, and built, there is a great variety in technical specifications. Some leave all details to the OEMs, whereas others specify to the last nut and bolt. In either case, it is often forgotten to specify spray design, position, water pressure and quantity, etc. This then leads to the OEM installing a standard dust suppression system that may not suit the mine conditions.

2. The tender process should be used to specify dust suppression requirements, or at least obtain the OEM reasoning as to why the sprays are installed in certain positions.

3. Cone sprays appear to be the standard unit, which basically drench the surface of the coal and hopefully prevent dust becoming airborne.

4. Just installing sprays does not prevent dust. It is important to look at what is happening to the coal at that point in the BSL.

5. The positioning of sprays, nozzle sizes, nozzle types, etc, all have a different effect on the coal wetting process depending on where they are installed.

6. Use of a flat spray may act as a curtain, venturis allow a positive or negative pressure to be established at key points along the BSL. What type is best for which area needs to be carefully considered and provisions made to change. This is one reason to have covers made as modular units so modifications can be made easily if problems occur.

7. With the high coal volumes produced today, it is unlikely that all the coal can be wet, and there are only certain areas that allow the coal and water to be effectively mixed, ie the crusher and BSL delivery. This may point to returning to water being introduced through the crusher shaft to actively introduce water at the impact area.

Crusher Design

1. Most crushers today are impact type, with high speed rotors breaking the coal rather than using the pick type unit that rotates more slowly and breaks the coal in a more dust efficient manner.

2. Speed of the crusher shaft and the nature of the crusher design will have a different dust resultant. It is important that dust is knocked down at the point of source and this is why crushers with internal water systems may have a better opportunity to knock down dust.

3. Getting the water to the right place is only one side of the story. Having the correct water pressure and quantity is just as important. In the past, shearer water pumps have been used to put water through the crusher shaft to effectively drench the coal at the source. This appears to have gone out of favour now and in all the mines observed, none had crushers with water through the shaft.

4. Ideally water volume, and pressure should be varied with coal volume and one mine did in fact monitor BSL load (motor current) and when it increased over a certain threshold (33%) opened a solenoid to increase water volume to match the coal volume more closely. In normal running only cooling sprays operated, when coal volume increased extra sprays at mine pressure came on line. This appears to have had an effect on dust, however it was said that the benefits were not as great as when the dust extractor was working well.

5. It may be possible to design a system (similar to the shearer drum system used at South Bulli on the Mitsui) to pulse the water through the shaft of the crusher so that the only sprays working were on the bottom half of the shaft, thereby reducing water usage and getting water to the correct point at high pressure.

6. Crusher inlet design must have a curtain to collect dust. The longer the inlet length to the crusher (ie length of covers along the Mini-pans) may also have an effect on dust and impact issues from the crusher. This should be investigated further.

7. In let area to the crusher should be maximised so that blockages do not occur as this causes build up of coal and excess friction, breakage and therefore dust make outside the BSL and not subject to dust suppression.

8. Crusher exit design (as I have said above) also appears to be important to internal pressure in the BSL. If the area is large, the coal volume appears to have less effect on internal pressures as you would expect.

9. The length of the pan on the exit side of the crusher also may play an important role in reducing pressure increases as the coal flow can be smoothed out in this area and regulated to ensure less volume is moved up the goose neck. Chains across the BSL can assist in this, similar to those used in the feeder breakers in panels.

10. Exit baffles on the crusher appear to be important to containing dust in the crusher area and allowing sprays to do their work. A steel baffle is now not as common as previously noted, however there appears to be a significant difference reported in dust from the BSL where fitted. At a mine where a baffle was fitted, no air flow was detected with all equipment stopped.

11. Baffles may allow the BSL to have two separate dust areas controlled by a single extractor. A split system for the delivery and another for the crusher appear to have benefits. One mine in fact had a separate system for each area and was looking at the possibility of separate extractors for each.

Water Circuit

1. Some mines used cooling water for dust suppression, whereas others used a separate system. In general, where dust was a problem, a separate system was installed. This points to the cooling system water being too low volume and pressure to be effective.

2. As a general rule, a separate system should be installed for cooling and dust suppression.

3. The pressures and volumes on the dust suppression should be monitored the same as for cooling water. This will allow water to be more effectively used and monitoried.

4. Spray design and nozzle orifice to be matched to water pressures and quantities. Each spray should be designed for the location in the BSL and for the coal flow profile at that point. It may also allow the number of sprays to be reduced and relocated to key areas.

5. Currently the OEM provides a standard unit. This unit may not be ideal for the location or pressures or quantities used at the mine. Each spray should be designed for a specific job and a different spray used in each specific location. Unfortunately no mine had optimised a complete system and in general looked at a specific area on the BSL rather than the whole. More work is needed in this area.

6. Should surfactants be used? (Citrus based additives have positive trials in Queensland). This is always the question. There were no trials currently in progress at the time of observation. It may be that dosing of a surfactant could be introduced at the point of use (eg at the crusher) to minimise costs and usage. This would need a dosing pump similar

to the greasing units currently in use. I think this may be a positive area to do further work.

Speed of BSL Chain

1. There was no evidence to support any different chain speeds at the mines observed.

Extractors Required

1. Internal pressures in BSLs varied greatly with size and design. No two units were alike. In the worst case, a positive pressure of 120Pa was recorded across the length of the BSL, which related to coal volume being in excess of the BSL volume. This could be evidenced by the top covers being lifted slightly by the coal on the chain.

2. Extractors must provide a negative suction at the inlet to the extractor tubing of -120Pa or greater to be effective. In some cases, the extractor generated a higher negative pressure but due to blocked suction tubing or other inefficiencies the effective negative pressure at the BSL end of the ducting was half this.

3. On average, the maximum pressures internally were in the range of 10-25Pa under good coaling volumes. This varied with direction of cut and therefore volume of coal cut. Higher pressure were recorded with higher volumes of coal. (See Test procedures and results earlier). Higher seams with greater volumes and bigger BSL were worst than low seams. This is most probably due to high short term peak loads instead of consistent cutting.

4. The position of the extractor was important, and initially I believed that the crusher was the key area, however it appeared that more dust was caused by coal movement through the BSL and causing dust to exit at the delivery.

5. In all the cases observed, most dust was evident at the BSL delivery onto the belt. In one case, it was thought that there would be additional benefits to have a separate line extracting from the crusher, either to the same extractor or to a separate extractor.

6. If internal baffles are fitted, a split system may be more effective, however this needs to be further investigated.

7. Extractors must run before the BSL and crusher start. This requires the extractors to be linked into the start sequence for the longwall.

8. Some extractors recycled the air from the BSL back into the crusher, others used scrubbers and discharged the air back into the intake ventilation. One discharged into the return (however this was relatively easy as the belt ran on homotropal ventilation).

9. In general it was difficult to decide if one system worked better than the other, however in all cases the extractor system had been shut off, was only working intermittently, was operated as part of the research or simply had been removed. This indicates that many operators did not seriously become involved with dust issues unless forced to do so by internal regulation or external pressures from regulatory authorities.

10. Recirculating the air did not cause large volumes of dust to appear, however measurements were not conducted internally on the BSL involved so pressures could not be compared.

11. New designs of extractors have internal baffles that can be removed to give varying extraction from different sides of the BSL delivery. This is not a quick process and new designs should be made to make the process easier. Currently the set up is generally left as delivered.

12. Extractor fans were operated by air, from support hydraulics (not successful), separate hydraulic motors, and electrics. Each had its problems.

Maintenance Scheme

1. In only two instances from the 8 mines observed were the sprays maintained on a work order system. Most cases if a spray was blocked, and was noticed, it was repaired.

2. There was no external method of checking if sprays were operating where the sprays were on a separate system from cooling water. No flow was monitored. Repairs in these cases were intermittent or non existent.

3. Design of the sprays means there is no physical evidence of operation and this should be investigated.

4. Extractor maintenance must be done every shift. To effectively ensure the dust extractor is working correctly, the inspections should be part of the mine inspection scheme.

5. Dust extractor design needs to be investigated to allow easier maintenance and observation and should be fully monitored on the longwall monitoring screens.

6. Extractors should operate whenever the longwall is running.

7. Spray volumes if practical should be labelled and displayed for easier control and monitoring.

8. BSL should be washed down regularly to prevent build up of fines where the air velocity is highest.

Conclusions:

Dust problems are not the most pressing issues at mine sites today. Only when multiple failures occur, do people react.

The BSL is only one area where the problems occur, however this can be significant as all the air passing over the BSL ends up on the face, increasing the threshold levels in the ventilation.

Longwall engineers and managers must look at BSL designs and attempt to anticipate the position as the longwall advances. It would be a benefit to be able to change or redesign dust suppression equipment inherent in the original design by designing covers to be modular and easily removable, while being easily sealed.

Internal pressures in the BSL appear to be a function of coal volume, BSL design characteristics, and coal characteristics. Pressures can only be reduced by fitting a dust extractor, at the delivery in the first instance, and possibly a second unit or branch at the crusher exit. BSL design should be revisited with dust suppression in mind.

Dust extractors must be designed to create a negative pressure at the intake to the extractor tubing of -150Pa.

The research was not conclusive, however does point to the need to install dust extractors on most longwall where coal volumes peak at the BSL volume.

Maintenance schemes are not being used to ensure the dust suppression system is operational and this should be encouraged.

In conclusion, I would like to thank Coal Services for the opportunity of conducting this research, which I believe has identified the areas for further research, design changes and maintenance.

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Appendix A

Tests were carried out on various BSL units to determine the internal pressures in various states of operation.

Test 1		**No Extractor**	**Extractor Operating**
Measurement across full length of BSL			
Internal Press. No movement		3-4 Pa	
Crusher Only		8-10 Pa	
BSL & Crusher		14-15 Pa	
Small Coal volume		40 Pa	
Peak Loads		60 Pa	
Very Large Surge		Dropped to <30Pa then up to 60Pa	
Test 2			
Measurement across full length of BSL			
Internal Press. No movement		0	
Crusher Only		0	
BSL & Crusher		0	
Small Coal volume		2-5Pa	
Peak Loads		12-15 Pa	0Pa
More coal		23-+36 Pa	Surging 2-5 Pa but no dust from Delivery
Inlet pressure to crusher from outside		-10Pa	
Test 3			
Measurement across full length of BSL			
Internal Press. No movement			Inlet pressure to dust extractor -150 Pa
Crusher Only			
BSL & Crusher		-3Pa	-9 to -12 Pa
Crusher Inlet to external		-20 Pa	
BSL delivery to external		+20 Pa	
Peak Loads		As bigger volume of coal enters crusher peak pressures to -50 Pa	Pressures balanced with little external dust visible +/-1 Pa
Very Large Surge		Suction in at crusher at -50 Pa and blown out at BSL delivery in clouds	

Test 4			
Measurement across full length of BSL			No extractor fitted
Internal Press. No movement		0 Pa	
Crusher Only			
BSL & Crusher			
BSL very low flow on flit to TG		0 Pa	
Peak Loads		Run to MG Near TG 0-5 Pa Mid face 10-20 Pa Near MG 10-15 Pa	
Very Large Surge		Greater Pa	
Test 5			
Measurement across full length of BSL			Extractor fitted but not used
Internal Press. No movement		1 Pa	
Crusher Only			
BSL & Crusher			
BSL very low flow on cut to TG or MG		1-2 Pa (Low volume of coal)	
Peak Loads		No peak loads as shearer restricted speed	
Test 6			
Measurement across full length of BSL			No Extractor fitted
Internal Press. No movement			
Crusher Only			
BSL & Crusher		-1 to -2 Pa	
BSL very low flow on cut to TG or MG			
Peak Loads		As soon as the crusher touches coal the pressure goes to +20 Pa	
Very Large Surge		Under high loads up to 71 Pa recorded.	

Appendix B

Details								
Ventilation			Good		66		55	55m3/s
Roadway Dimensions			5 x 4		5x3		5.5x3.2	5.5 x 3
Air Velocity at BSL			High		High +4m/s	High		
Homotropal/Antitropal	Anti	Anti	Anti	Anti	Anti	Anti	Anti & Homo	Anti
MG Brattice Wing	No	Yes	Yes	No	Yes	Yes	No	Yes
BSL hosed often	No	No	No	No	No	No	Yes	Clean
Water Press. to LW	15 bar	14-17bar	16 bar		6"range, 1200KPa		55bar	
Shearer Water Pump Pressure	50 bar				100 bar			
Shearer Water used for water on BSL	No	No	No	No	Some	No	No	No
Cooling Water used for Dust	+8 bar	Yes	No	Yes	Yes	No	Yes	Yes
Other								
Boot End								
Return Belt Sprays		None	None	None	None			
Number	Dripper bar					1		5 on bar
Type						Rose onto bottom belt		Dripper
Make								
Quantity								
Water from Cooling	No					No		Hose connected via manual valve
Side/Top Sprays			On top of belt. Fine mist too light to reach belt in high air volume	None	None	None		
Number	1		3					None
Type	Venturi		Venturi					
Make	?							
Quantity			Manual					
Water from Cooling	No		No					
Maintenance System								
Shift	Not in scheme			N/A		Planned each shift/code A		
Day								
Weekly								
None			Not in scheme					
BSL Delivery								
Dust Head Cover	Yes	Yes	Yes		Yes	Yes	Yes	
Number	3 bars at front, 1 bar on top,	3 on bar	2 external onto belt, 2 x 2 internal to cover and bar over sprocket (not connected	4 sprays, 2 on top and 2 on side	4 each side some plugged	5	Extractor fitted but not operating	None external, 2 x internal
Type	Cone	Cone	Cone	Cone	Cone	3 cone on bar and 2 cone on side		Cone
Make		OEM	OEM	OEM	OEM	OEM		

Quantity								15l/min
Water from Cooling	No	Yes 20l/min	No separate. Not measured. All in parallel	Yes, 25l/min from BSL		No		From BSL cooling water
Skirting on Dust Cover								
Sides	Yes	None	Yes	Yes	Yes	Yes	Yes	Yes, but flap ripped
Rear	Yes but cut clear of belt	None	No	No	Yes but not onto belt	Yes but short of belt	No but sprays instead	Yes but short of belt
Front Flap	Yes but not to belt		Yes		Yes	Yes but gaps to the dust cover	Yes	Yes, profiles for coal on belt
Deflector Plates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dust Extractor								
Type	None	None	Yes	OEM	OEM	None	?	None
Water Discharge			To floor		Floor, belt or BSL, gravity		Into BSL	
Water from Cooling	Separate		No	No, separate	No from Hyd hose. Regulated to 4 bar		No	
Sprays					End x 2, Side x 4. Difficult to access. Fitter did not know type so inspections questionable			
Details			Not operating due to problems. Operated for testing only	Hydraulicall driven from pumps. Not working at time of visit				
Maintenance System								
Shift							Yes	
Day								
Weekly			Planned		Weeky			
None	None	None	Not at time of test	None, if blocked then repair required		None		None
				If blocked, remove and may not be replaced				Inspection door on discharge flap open
Goose Neck								
Baffles	None	None	None	None	No	None		
			Tried and taken out	Baffles considered a restriction to coal flow				

Sprays on Convex			N/A						
Number	None	3 on bar		None		3 on bar	Bar not connected	None
Type		Cone				Cone		
Make		OEM				OEM		
Quantity								
Water from Cooling		No, Separate				No		
Mid Section								
Number	None	None	4 bars with 3 sprays. 1 bar not connected	5 on bar		None	BSL covered with Geogrid and soaker hose used to wet	
Type			Cone	Cone			3 x Soaker hose	
Make			OEM	OEM				
Quantity			Separate system not measured				BSL discharge into BSL separately	
Water from Cooling			No	Yes, from crusher at 35l/m			No	
Concave								
Number	None	3 on bar	1 x 3 spray bar	None	3 on bar	3 on bar		
Type		Cone on o/b end	Cone		Cone on o/b end	Cone on o/b end		
Make		OEM	OEM		OEM	OEM		
Quantity								
Water from Cooling		No	Not connected			No		
Sealed Joints	Yes, sealed with Mastik	No sealing seen	No	No badly damaged, open hole/pipe on top of BSL		Yes	No covered by mesh grid	Bad gap in top cover at BSL tensioning area. Needs repair. Covers well bolted
Maintenance System		No	No					
Shift	As required	As required		As required		Planned to be done shiftly		
Day								
Weekly								
None								
Straight Pan								
Number	Not applicable	3 on single bar		None	None	None		N/A
Type		Cone						
Make		OEM						
Quantity								
Water from Cooling		Not connected						
Sealed Joints		No	No	No	No	Yes where possible		

Maintenance System								
Shift								
Day								
Weekly								
None		None	No					
Crusher Discharge								
Steel Baffle	Yes, chains hanging down		Removed	No, Steel plate dropped off	Yes - Important. Has dropped off in past	No, stated that not required	No	None now. Was installed originally
Sprays								
Number	3 bars with 5 sprays	3 on bar	No	None	5	None		Yes. Not connected
Type	Cone	Cone			Scrubber box, with volume controlled with BSL load			
Make	OEM	OEM						
Quantity	All in parallel	35l/min						
Water from Cooling	No	Yes						
Sealed Joints	Yes		No	No	Yes			
Maintenance System								
Shift	No							
Day								
Weekly					Weekly			
None		None		None				
Crusher								
Inlet								
Number	None	None	None	2 units x 5 sprays	3 on bar	6 on two bars	No	Spray bar with 4 sprays + venturi
Type				Cone	Cone	Cone		
Make				OEM	OEM	OEM		Cone & Venturi
Quantity				70l/m				13l/m cone and separate feed to venturi but manually operated
Water from Cooling				MG motor/gearbox to separate sprays. Total Q=70l/m		No		Yes as per below
Return								
Number	Inbye 1 bar with 4 and 2 bars with 3 sprays, outbye with flat spray	None		5	3 on bar	None		4 spray bar in top of crusher 13l/min from crusher. Others available but blanked off

Type	Cones			Cone	Cone			
Make	OEM			OEM	OEM			
Quantity	In parallel							13l/m
Water from Cooling				MG motor 60l/m				Yes from crusher in parallel with inlet water spray
Shaft Water Sprays	No	No	No	No	No	No		No
Maintenance System					N/A			
Shift	As required			As required		Planned for future		
Day								
Weekly								
None								None
Crusher Inlet & Mini-pans								
Number	4	3 on bar		No	3 on bar	6 on two bars	2	4 on bar
Type	Propeller type to prevent misting	Cone			Cone	Cones	Venturi	Cone
Make	?	OEM			OEM	OEM		
Quantity	In parallel	30l/min	Not monitored					
Water from Cooling	Yes, MG drive	Yes MG drive	Not monitored			No	No	Part of crusher above details
Armadillo Plate	No		Yes	Yes	Yes	Yes	Yes	
Chains	Yes							
Belt Curtain	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Dribble sprays
Inlet Water Curtain	No	1, rose spray, from crusher in paralled to rose spray	2 x Venturi	No	No	No		
Maintenance System								
Shift				As reqd			Yes	
Day						Planned		
Weekly					Weekly checks			
None								
Maingate Drive								
Number	1	None		None	2 x cone, 2 x rose. From each drive	3 cones onto small plate to reduce dispersal		2 units not used for dust. Just discharge onto Chain
Type	Venturi					Cone		
Make								
Quantity	Separate hose with tap							

Water from Cooling	No	Cooling to MG, then up face to TG and then discharge in MG at rose spray			2 MG drive	MG motor 50l/m, G/box is 30 l/m		
Maintenance System								
Shift						Planned		
Day								
Weekly					Scheme			
None								
Future Developments					Ongoing	More work to do		
Automation used on Face	Yes				Yes but sequence not available in PM4	Yes but not fully operational. Problem with bankpush as support advance		
Has BSL Dust suppression changed	Yes				Yes, modifications to MG sprays and dust extractor	Yes		
General Observations				Pipe in top of BSL for pump. Open if dusty. Automation is not working well	High use of rose sprays. All OEM sprays are cone type.	Water sprays on #'s modified and on shearer. Work will be ongoing		
Filtration					All water is filtered with backflushes			
Drums diameter					2.6 in 3m seam			
Cutting speed to MG				7.5m/m	9 m/m	11-15m/m		
Cutting speed to TG					22 m/min			
Observations on Dust Monitoring				Dust extractor was not working due to motor issues.		BSL Pressure Max 71, Min-1to-2		
				Sprays are taken out if blocked. Usually 2-3 operating in a 6 spray bar		Large volume of coal gives the increase above normal base load		
				BSL empty = 1Pa Shearer to TG 1Pa Coal quantity was low		As soon as crusher touches coal - +20Pa		

						Problem will not occur unless sustained high tonnages, ie from blockage			
Items to request				BSL internal baffles		Height of crusher			
				cooling water for sprays					
				water Q to sprays					