



EVALUATION OF THE BONA DUST FILTER

GREAT NOLIGWA MINE
7 March 2003



JJ Dekker
O-ESH Manager Occupational Hygiene
South African Region Central O-ESH Team

PURPOSE

To evaluate the dust filtering efficiency of the Bona Dust Filter. Both dust mass filtering efficiency and dust particle filtering efficiency was evaluated.

METHODOLOGY

Project was conducted at the Bona Dust Filter installation on Great Nologwa Mine. This unit is currently installed at the 76 Level station tips.

Two AEROCET 531 particle mass and count instruments were utilised to determine the filtering efficiency of the Bona Dust Filter.

Samples were collected at:

- The intake to the dust filter,
- The return of the dust filter, and
- The return of the side extraction bag.

Samples were collected during tipping and non-tipping activities.

The pressure over the filtration unit was also measured before the dust filtrating efficiency tests commenced and on completion of the dust filtrating efficiency tests.

FINDINGS

The detailed results of the tests are depicted in Appendix A.

Particle filtrating efficiency

The overall particle filtrating efficiency ranged from 14,4% to 53,4% (average of 36,8%) when there was no tipping being done. The highest efficiency occurred in the $\geq 5 \mu\text{m}$ category (19,7 to 56,1 % with an average of 25,3% filtrating efficiency). The filtrating efficiencies in the in the 0,5 to 5 μm category ranged from 10,1 to 50,7 %, with an average filtrating efficiency of 20,3%.

During tipping operations the particle filtrating efficiencies ranged from 66% (0,5 to 5 μm category) to 88% ($\geq 5\mu\text{m}$ category) with an overall particle efficiency of 69%.

The particle filtrating efficiencies for the side extraction bag ranged from 84% (0,5 to 5 μm category) to 93% ($\geq 5\mu\text{m}$ category) with an overall particle efficiency of 85%.

Dust mass filtrating efficiency

The overall dust mass filtrating efficiency ranged from 10% to 59% (average of 45%) when there was no tipping being done. The highest efficiency occurred in the PM1 category (10 to 90 % with an average of 78% filtrating efficiency).

During tipping operations the overall dust mass filtrating efficiencies ranged from 45% (PN2.5 category) to 74% (PM7 category) with an overall mass efficiency of 66%.

The mass filtrating efficiencies for the side extraction bag ranged from 50% (PM1 category) to 98% (PM7 and PM10 categories) with an overall mass efficiency of 98%.

Pressure

The pressure over the Bona Dust Filter reduced with 8,1% (from 740 Pa at start of tests to 680 Pa at end of tests).

Replacement period

The estimated replacement period for the secondary and tertiary filters could not be calculated at this stage. Test results on the primary filter filtrating efficiency and dust holding capacity is required, before the calculation can be done.

CONCLUSION

Although the Bona Dust Filter rendered relative good dust filtering efficiencies at the beginning of the tests (53% overall dust particle-filtering efficiency and 59% overall dust mass filtering efficiency) these efficiencies deteriorated as the tests progressed. Overall dust particle filtering efficiency decreased by 39% (from 53% to 14%) and overall dust mass filtering efficiency decreased by 49% (from 59% to 10%).

This decrease in efficiency is mainly due to the leakage's that occurs within the dust filter unit and were confirmed by the system pressure that also decreased by 8,1%.

During inspection (conducted directly after tests were completed) it was identified that the sealing material does not form a proper seal at all the identified areas and collapses due to vibrations from the fan and filter units inside the Bona Filter.

RECOMMENDATIONS

The sealing material must be replaced with a more robust material that could withstand the forces present inside the Bona Dust Filter.

Areas that are not properly sealed (as demonstrated to the Universal Engineering Representative who accompanied us during the visit) must be rectified.

The supplier must forward the dust filtrating efficiency and dust holding capacity tests results for the secondary filter to Great Noligwa Mine O-ESH Department.

The entire test must be repeated, once all the recommendations (as indicated above) have been completed.

APPENDIX A – Test Results

	BONA FILTER UNIT (Particle Count Evaluation)						
	INTAKE		RETURN		EFFICIENCY		
Location	0.5 u > /Litre	5.0 u > /Litre	0.5 u > /Litre	5.0 u > /Litre	0.5 u > /Litre	5.0 u > /Litre	Overall /Litre
No Tipping 1	468975	13902	231222	6105	50.7	56.1	53
No Tipping 2	346595	8807	311443	7072	10.1	19.7	14
Average	271857	7570	180888	4392	20	25	37
Tipping	434736	27066	147604	3373	66.0	87.5	69
Side Extraction Bag	271857	7570	42845	547	84.2	92.8	85

	BONA FILTER UNIT (Particle Mass Evaluation)														
	INTAKE					RETURN					EFFICIENCY				
Location	PM 1.0 mg/m3	PM 2.5 mg/m3	PM 7.0 mg/m3	PM 10.0 mg/m3	TSP mg/m3	PM 1.0 mg/m3	PM 2.5 mg/m3	PM 7.0 mg/m3	PM 10.0 mg/m3	TSP mg/m3	PM 1.0 mg/m3	PM 2.5 mg/m3	PM 7.0 mg/m3	PM 10.0 mg/m3	TSP mg/m3
No Tipping 1	0.01	1.01	7.906	9.017	10.502	0.009	0.464	2.468	3.099	3.664	10	54	69	61	59
No Tipping 2	0.059	0.8	3.24	3.652	4.279	0.006	0.159	2.594	3.002	3.304	90	80	20	7	10
Average	0.035	0.905	5.573	6.335	7.391	0.008	0.312	2.531	3.051	3.484	78	66	55	45	45
Tipping	0.029	0.629	4.246	4.973	5.626	0.015	0.347	1.087	1.314	1.685	48	45	74	69	66
Side Extraction Bag	0.008	1.189	8.349	9.889	10.4	0.004	0.038	0.151	0.197	0.229	50	97	98	98	98

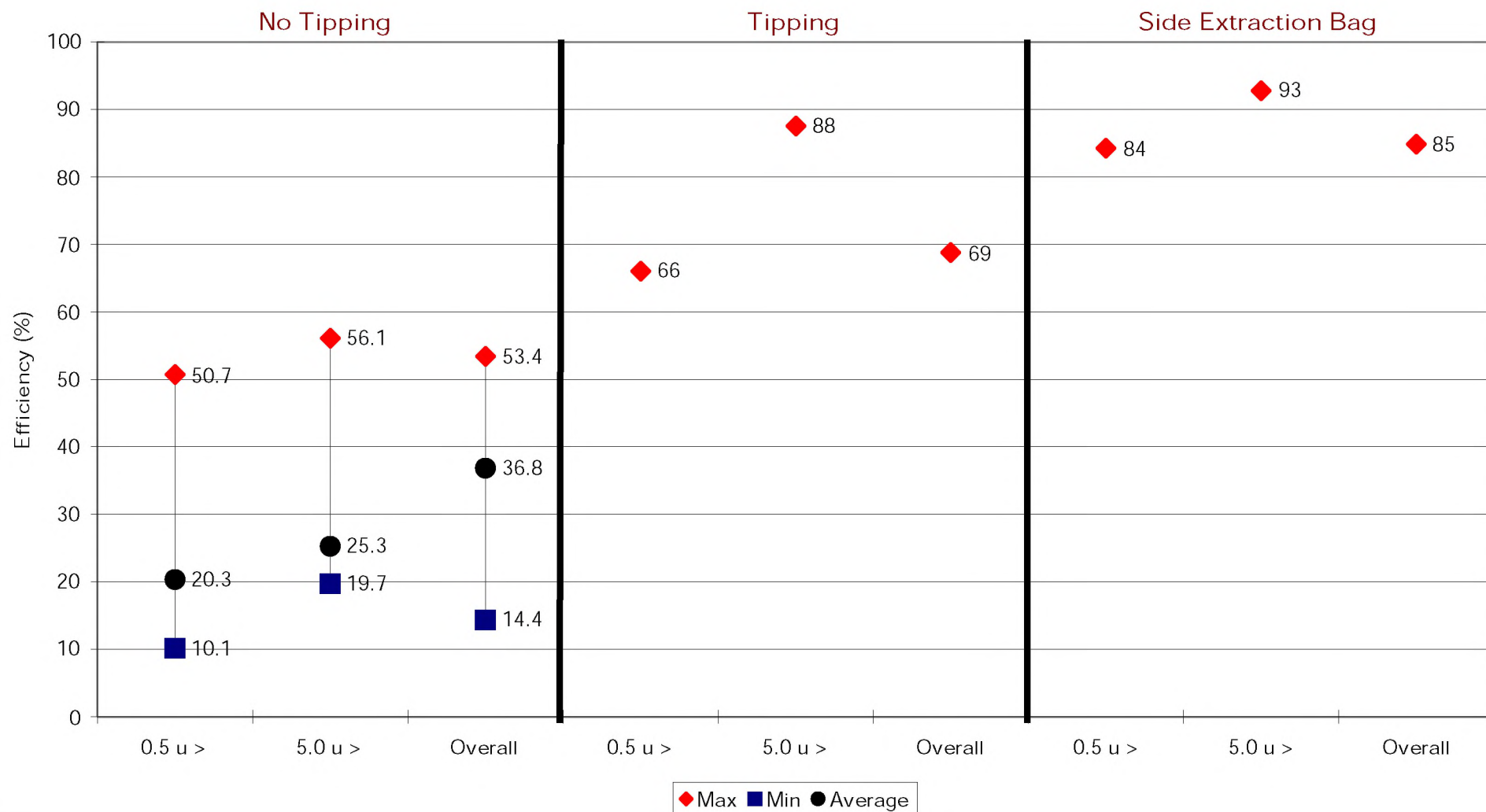
Pressure over Bona Dust Filter Unit:

	Start of tests = 740 Pa
	End of tests = 680 Pa

Ventilating air quantity through Bona Dust Filter Unit = 4,0 m³/s

Number of filtration units inside Bona dust Filter = 8 units

BONA DUST FILTER EVALUATION (Particle Filtrating Efficiency)



BONA DUST FILTER EVALUATION (Mass Filtrating Efficiency)

