Kolomela Dust Suppression Test Report 11 December 2013

Introduction

Benmarc was asked to demonstrate a solution for the dust emission problem at the secondary crusher at Kumba Iron Ore, Kolomela Mine.

A demo unit was not available at the time, and Benmarc manufactured a suitable unit that was installed on Wednesday 4 December.

System Design

The system was designed to treat a maximum of 3600tph with one chemical only. It is capable of delivering 10500L/hr of water and 270L/hr chemical. Due to the dust retention benefit at the stockpile, BM525 was chosen as the best chemical for the application.

The system was built to be operated from the nearby 380vac welding plug, with a 220vac/380vac auto-start permissive.

It is important to note that the system is a bare-bone unit designed to only suppress dust in isolated areas – as opposed to permanent systems that would be capable of suppressing dust from tipping operation to stockpile. Permanent systems also add the benefit of pre-treated material when downstream positions such as screens and crushers are treated prior to stock-piling.

Installation:

The system was installed below the secondary crusher with power supply from the first floor 380vac welding plug at the same building.

Due to limiting site access procedures, Benmarc personnel could only start the installation after 11am on Wednesday when a 1-day permit was issued for the purpose. This resulted in a spill-over into the next day and necessitated the issuing of a 7-day permit.

The installation was completed on the Thursday with the exception of the permissive that was due to be provided by the mine.

During the weekend and Monday, all the installed nozzles had been damaged by production and Benmarc had to acquire new ones. Benmarc also had to acquire additional electrical equipment to interface with the existing 525vac “Dustcon” dust suppression system in order to obtain an auto-start signal. Unfortunately the Dustcon unit could not be completely disconnected although the feed valves were closed during parts of the testing.

For the re-installation of the nozzles, Benmarc was given limited time during production runs. The permissive signal was also only completed by mine electricians on Wednesday.

During initial testing, Benmarc recognised the need to adjust some equipment. For this the conveyor had to be locked out. Although technicians were at the mine at 6:30 to adjust the equipment during shift change, they were only escorted onto the mine at 7:30 – thereby missing the opportunity.

The equipment was adjusted during lunch hour and automatic testing was initiated. The final manifold configuration was as follows:

- 1 manifold with 2 nozzles at oversize discharge
- 2 manifolds with 2 nozzles each before crusher discharge
- 1 manifold with 6 nozzles after crusher discharge
- 1 manifold with 2 nozzles at scalping screen fines discharge

Note that this is not the optimum configuration. Pre-identified positions such as directly below the secondary crusher was disallowed by the mine. Furthermore, the manifolds were installed into existing holes in the chutes as Benmarc was not at liberty to cut new holes in the identified positions on the chutes.

An estimated 90% of the remaining dust would have been eliminated by installing manifolds in the designated positions, and optimising the system.

Results:

The system was started and stopped at intervals, and the effect was demonstrated with Mbuyi and Beatus present.

Although there was only a marginal decrease of emissions at the scalping screen, this was not our area of focus and a substantial visible reduction of dust at the secondary crusher and stockpile head chute was evident.

No verifiable dust emission readings were taken and the evaluation was purely visual. The pictures below show the secondary crusher and stockpile discharge with the dust suppression system either on or off:

Stockpile:

Dustcon System On (only this picture refer to the Duscon system – all other pictures refer to Benmarc System only)

System Off

System On + 15 Minutes

System On + 15 Minutes + 30 Seconds

System On + 25 Minutes

Secondary Crusher Building:

System Off

System On

Secondary Crusher Discharge:

The following sequence shows the reduction of visible dust from system off, through system on, to full effectiveness after approximately 20 seconds (excluding benefit from oversize belt).

System Off

System On

System On + 5 Seconds

System On + 8 Seconds

System On + 12 Seconds

System On + 17 Seconds

System On + 20 Seconds

System On + 30 Seconds

System on + 40 Seconds

Applied Dosing Rates:

Chemical was added to the water stream at a rate of 144L/hr and total moisture addition was 8900L/hr at an applied pressure of 5.5bar at pump discharge. Our target moisture addition is 0.5%, whereas in this case we were adding only 0.37%. This under-treatment was purely due to the fact that the treatment was concentrated in a small area that limited our options for manifold placement.

Conclusion:

The pictures show a clear reduction in visible emissions. Given the limited time available for fabrication, installation and optimisation, this is positive results.

A permanent system would eliminate 90% of the remaining dust and emissions would be comfortably within legal limits. However, this would have to include treatment with BM210 at the primary crusher and BM515 at the scalping screen – in addition to the treatment at the secondary crusher with BM515 as during the test.

Due to the limited time that was available for the testing, Benmarc recommends that the system be kept on site while more permanent site access can be arranged, and testing can commence in January 2014.

The above are preliminary observations and will be supplemented with additional information when the test continues in January. If anything in this report is unclear, please do not hesitate to contact me.

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