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ACARP MATTERS

ACOUSTIC TECHNOLOGY REDUCES FINE DUST EMISSIONS FROM DRAGLINE MACHINE HOUSES

Fine dust particles from a dragline machine house have been reduced by more than 90 per cent in a test environment using acoustic agglomeration technology in conjunction with inertial separation.

Ingress of high dust loads has potential to limit a machine's performance and increase maintenance costs. In addition, there is a potential effect on operators and maintainers through increased exposure. Modern filtered air handling units are generally efficient at reducing the dust load in the machine house for larger particles (greater than 10 microns). However, smaller dust particles (less than 10 microns) pass through the air handling units and either remain airborne or are deposited on surfaces inside the machine house.

In order to access the parameters for acoustic agglomeration for dragline air handling units, researchers visited BMA Goonyella Riverside open cut coal mine to take detailed measurements of Dragline 4

The pilot plant used for evaluation of the Dynavane operational efficiency

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The principle of acoustic agglomeration of airborne particles has been known for the past 75 years when it was observed that small particles tend to 'stick' together in the presence of an intense acoustic field, resulting in the formation of larger particles. Acoustic agglomeration does not reduce respirable dust particulate mass in an airflow; it increases the size of particles to a range that can be extracted from air intake flows by other means, such as micro-cyclones or filters.

This research project was undertaken in a four stage program by CSIRO Earth Science and Resource Engineering in conjunction with Peak3, a Brisbane based company that specialises in diesel emissions management for the mining, heavy transportation and energy sectors. The researchers:

- Selected and evaluated particulate mass measurement and instrumentation;
- Setup and tested a dust loading rig;
- Built a miniature agglomerator and tested it against known operating conditions;
- Mounted an agglomerator on a test rig and tested operational parameters.

CSIRO research engineer David Hainsworth said the at the start of this project it wasn't clear whether acoustic agglomeration would work in the kind of dust environment that existed at large, open cut coal mines.

"The proof of concept has definitely been established in a laboratory-scale implementation," he said.

"We found that it is feasible to fit acoustic agglomeration to existing dragline machine room air handling units with very little modification to the inertial separation units. The additional electrical power required by the acoustic agglomerators is only a fraction of the power required by the existing air handling units and, overall, should not be difficult to supply from the existing motor control switchboards.

"We built a prototype acoustic agglomerator and fitted it to the test Dynavane inertial separator and tested thoroughly with dust sourced from a dragline machine room and

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coal dust. Results were in line with the outcome of the computer modelling at up to 90 per cent dust reduction from the Dynavane.

"The outcomes for the open cut coal mining industry are a dramatically improved understanding of the composition, size and the efficient removal of smaller dust particulates than is achieved with current filtration technologies; a greatly improved acoustic agglomerator; and increased efficiency from in line cyclones for dragline machine rooms."

Tony Egan, ACARP Project Monitor and Glencore Manager Project Governance, said now that the concept had been proven, a site based trial was needed to scale up the technology and test it on an operating dragline, which would require support from a dragline manufacturer and an open cut mine.