

Dust suppression

Wet Earth an Australian company says it “can provide the solutions to a large range of dust problems.” Certainly, its website (www.wetearth.com.au) provides a good review of many of the mining industry’s dust issues, and the solutions. Some of the most common dust issues are:

- Haul road dust suppression
- Dust generated during above ground mining and blasting
- Stockpile dust suppression
- Dust generated during and transferring, discharging, crushing and processing
- Dust generated during dumping
- Conveyor belt and transfer points
- Open area dust control

- Underground traffic generated dust control
- Underground airborne dust suppression

Haul road dust suppression

Traditional haul road dust suppression has been to use water carts – these are available from companies like the truck manufacturers and specialists like Philippi-Hagenbuch (PHIL). As an alternative Wet Earth and other companies offer an automated sprinkler solution using high quality sprinklers, valves and an automated control system.

PHIL builds its Big Shot Water Tanks from 6,000 to 60,000-plus gallons

for all articulated and rigid frame off-highway trucks. The interior of a Big Shot Water Tank is engineered to minimise confined space issues. The patented external/internal access door system incorporates front and rear bulkhead access man doors, top of tank access points, and built-in interior access baffle doors. This allows safe, easy internal access so anyone who has to enter can move easily throughout the tank interior with unrestricted passage from front-to-rear.

The tank’s external construction includes a unique flat top tank. Sloped at only 1.5°, this basically flat top minimises the chances of losing one’s

footing. In addition, PHIL's exclusive lifting eye design provides precise placement for perfect balance when raising the tank.

The patented fluid tank baffling system ensures solid vehicle control in any application. This exclusive anti-surge stabilising system provides front-to-back baffling and a full-height/full-length centre Backbone™ structure. Internal baffling, in conjunction with the internal fluid surge stabilisers, minimises side-to-side fluid movement for maximum vehicle stability at all normal haul road speeds.

The Big Shot comes equipped with an in-cab controlled water cannon that allows the dispersment of water from 50 to 60 m with absolute control and accuracy. Long-wearing, specialised spray heads are rear-mounted and operate independently. The entire tank plumbing system utilises off-the-shelf Victaulic/Gruvolk style fittings throughout for easy maintenance.

The water pump system employs an exclusive 'Soft-Start/Soft-Stop' single combination hydraulic valve that allows the operator to safely start and stop the water pump at any engine RPM. If it is necessary to suddenly turn the water on at full throttle, this system makes it possible to do so without causing damage to the pump.

The tank's exclusive 'Variable Volume' adjustment allows simple adjustment of the water volume of the tank. On days when less water is required for controlling dust, etc., the water tank can be downsized to a lesser, pre-adjusted volume. Switching from full volume to a lesser volume is easily accomplished in less than five minutes.

The addition of wetting agents and polymer binders to the water used for haul road dust suppression can decrease both the application frequency and the amount of water required. The wetting agents improve the performance of the water in wetting the surface material thoroughly. The polymer binders cause the surface particles to hold together reducing their likelihood of becoming airborne (dust). It also makes the haul roads more compacted with less loose surface material. Dust suppression chemicals can be used with both water carts and sprinkler based solutions.

For example, Dust-A-Side (DAS) is a South African ISO 14001, 9001 compliant company operating in the global mining industry. DAS provides a continuous dust control management system and has

channelled more than 30 years' experience into developing a best practice system to control dust.

Its Dust Control Management System consists of a range of environmentally friendly dust binding products, with a comprehensive stabilisation and continuous maintenance programme. It is successfully used throughout the world in underground and surface mining operations at coal mines. The system comprises three elements: planning, application and monitoring of the dust control system using products, equipment and skilled operators. DAS can either provide the necessary equipment or enter into a supply agreement with the client.

Dust from surface mining and blasting

Pre-watering can reduce the dust generated by mining activities, including blasting, by increasing the moisture level of material. Again, sprinklers are one of the ways in which this can be achieved.

Ecology S.r.l.'s Fog Cannon® is another solution – a high volume mist generating machine with throw distances of up to 250 m which blankets the area in a fine mist that suppresses airborne dust. The Fog Cannon is one of the most important new devices in dust suppression and is available in a range of different sizes. The average throw is from 30 metres up to 250 m with an inclination between 42° minimum, up to 45° maximum on the horizontal. The arc of coverage is normally around 270°.

Stockpiles

Stockpile dust suppression is usually a simple case of stabilising the surface of the material. This is usually done with regular watering, which can also, of course, help combat spontaneous combustion. Long throw, high angle sprinklers are the most suitable for stockpile dust suppression. Again, the Fog Cannon is another very good solution. Adding a polymer based crusting agent to the water used can dramatically reduce the frequency of application and also improve the dust suppression performance in high wind conditions.

Crusher and other dust sources

Farr Air Pollution Control lists the following dust collection applications for its products:

- Excavation sites
- Hammer mills
- Rock crushing
- Ball mills



Before and after Dust-A-Side dust management.
(Photos courtesy of Dust-A-Side)



Above and opposite: The range of Ecology S.r.l.'s Fog Cannon in different applications.
(Photos courtesy of www.fogcannon.com)



An example of a Weba chute in an iron ore application.



The Weba Chute System is a completely different and unique approach for the control and handling of bulk materials. (Photos courtesy of M & J Engineering)

of each transfer point. Product from the sink screens will be conveyed on a 900 mm wide conveyor while that from the float screens will move on a 600 mm wide belt. Each Weba Chute System is custom designed for the individual application taking into account factors such as belt width, belt speed, material sizes and shape and throughput.

The benefits of the systems include an up to 80% reduction in material degradation, greatly reduced levels of dust and noise, reduced production losses due to fewer blockages, significantly reduced spillage and vastly improved levels of safety. Easy access is provided for inspection and maintenance purposes, and the system does not require ongoing supervision, again representing a saving in manpower and related costs.

The Weba Chute System uses a 'supertube' with a cascade scenario where 95% of the material runs on material at the same time. Seen in slow motion, the bottom layer of particles appears to move in a tumbling motion down the chute. This results in significantly reduced wear, and in many cases the lip remains completely covered by material and never needs replacement.

This manner of optimum material control is taken a step further by designing the internal angle of the transfer chute to match the product with the belt speed, allowing the dramatically reduced spillage.

CAPOTEX 2000 says it is "the only company on a world level that exclusively specialises in covering conveyor belts. Our experience enables us to provide the market with a wide series of standard solutions, together with tailor-made customised designs. In a completely closed conveyor belt system, it is possible to reduce or eliminate exposure to the dust of the transported material, which could cause professional illnesses or lesser troubles of a temporary nature."

Where physical containment is not possible then reducing the materials likelihood to generate dust is a preferred first option. This can be done by increasing moisture level or by putting foam on the top of the material. Increasing the moisture level can be simply done by an array of nozzles or cluster nozzles over the conveyor applying an appropriate amount of water to increase its moisture level so that it is less likely to generate dust. The addition of wetting agents to the water can be used to improve the thoroughness

Mill conveyor transfer points
Underground mining
Coal dust processing

Its Gold Series GS dust collector has been stack tested at 0.0003 gr/dscf emissions on heavy duty rock crushing. As well as use in crushing installations it is very suitable for conveyor transfer points.

Dust from dumping

The action of dumping, whether it is overburden onto waste piles or material into a crusher, can generate a large velocity of air that can result large amounts of airborne dust. The use of nozzles spraying water opposing the exiting air/dust can reduce the amount of dust.

Where spray nozzles are not practical or do not adequately

suppress the dust then a misting solution is needed to address the airborne dust.

The most efficient approach for dust suppression on conveyor belt systems and their transfer points is to build a structure to physically contain the dust. For example, iron ore, like coal, generates a lot of dust and Weba Chute Systems are currently enjoying considerable success. Eight are being installed and commissioned at Mount Whaleback mine in Australia; the largest single pit, open-pit iron ore mine in the world.

Tonnage throughput for the chutes is 600 t/h with a particle size varying from plus 8 mm to minus 200 mm. The material has a high moisture content and this factor had to be taken into account during the design

of wetting. Applying a foam coating to the material can also reduce dust creation. The application of foam requires specialist nozzles spraying water with a foaming agent additive.

Underground dust control

The control of underground dust generated by the movement of trackless machines or other coal mining equipment is usually based on wetting the surface to minimise the dust. Many machines of course feature their own dust suppression sprays. For large areas then high volume sprinklers can be used. For

smaller areas and underground haul roads then either roof mounted sprinklers (such as Senninger's mini-Wobblers) or wall mounted sprays are appropriate solutions.

In many cases it is not possible to prevent dust in underground mining. If there is a point source of dust it may be possible to suppress it using the misting options like those that can be used during and transferring, discharging, crushing and processing.

If dust is being carried by the airflow through the mine then it may be possible to use an array of mist arrays to settle the dust as it passes

through. Mist arrays can be created by installing misting nozzles along the roof and down the walls so they create a full wall of mist the dust must pass through.

For details, please visit:
www.capotex.com
www.dustaside.com
www.fogcannon.com
www.farrapc.com
www.mjeng.co.za
www.philsystems.com

Coal International would like to thank the above companies and Mr John Chadwick for assistance with this article.



Our covers can be adapted to any kind of dust suppression system.



Project in Czech Republic for dust suppression.



Project in Spain for dust suppression. (Photos courtesy of Capotex.)