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Water Consumption in Wet Dust Mitigation Applications

Dust particles from mining operations remain a sellable product albeit in a different form. Therefore, you wouldn't want it to be carried away on the wind to settle outside of the area that you control. For this reason, wet dust suppression has become best practice in most mining operations where finer particles are prevented from escaping the main ore body as it is being conveyed throughout the plant.

Wet suppression refers to wetting the dust particles or wetting the ore body to reduce or prevent emissions of dust. Unfortunately, this requires a lot of water that influences the effectiveness of your operation.

The primary mechanism of wet dust suppression is gravity that should prevent dust from becoming airborne. Small dust particles are too light to be influenced by this force, and the addition of weight in the form of water is the only viable solution.

Laboratory testing on iron ore revealed that, to reduce the "Dust Number" to 10 (*Dust Extinction Number or DEN*), at least 8.3% (by weight) of moisture was required for the graded sample of fines used during the test (*Australian Standard AS 4156.6-2000*).

Theoretically, if extrapolated to a reasonable production rate of 150Kt/month with one suppression point, the weight of water added could be as high or higher than the weight of one entire month's worth of production per year (in this case 149 400L). This puts a huge strain on essential natural resources and is accompanied by high cost and possible penalties for the consumer.

Furthermore, for every liter of water added to the ore body, one kilogram of weight is added. A conveyor system is designed with three primary considerations – weight, volume, and delivery speed. Due to conventional wet suppression of dust, many conveyor systems will run at peak weight but under volume capacity. In the example above, 149.4 ton of water must be conveyed every year, reducing production capacity from 1.8Mt/year to 1.65Mt/year.

Let's assume for this exercise that optimum moisture addition of 5% is possible. For the same production rate of 150Kt/month, production would only be curbed by 90t/year (as opposed to 150t/year).

Therefore, it makes sense to want to reduce the water addition to the ore while still maintaining effective suppression. Part of the solution lies in the preparation of water before it is applied to the ore body or material stream. Although one will never be able to reduce dust without the addition of water, the same study has proven that it is indeed possible to reduce moisture addition with prepared water. However, in real-life situations this will not be enough due to high conveyor speeds that impedes penetration of the material stream and spreading of the moisture throughout the ore body.

The correct water droplet size, application force, manifold placement, discharge pressure, spray patterns and dynamic control must work in harmony with chemical additives to create the optimum conditions for wet suppression with lower moisture addition.

With Benmarc's proprietary chemicals and advanced application technology it is achievable. The technology has been applied at mining operations throughout SA since 1997 and has consistently proved that significant reduction of water is possible.

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