Top 10 Causes of Dust in Underground Mining Operations... and how to keep it down.

For further information, expert advice or a quotation, call Dust-A-Side Australia today on CALL 1800 662 387
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THE PURPOSE OF THIS CHECKLIST

...is to increase awareness of the numerous problems arising from fugitive dust emissions at underground mines – including surface activities – and to help you alleviate these problems.

Foreword: Shedding light on a potentially dangerous problem.

According to SafeWork Australia, mining is traditionally the 4th most dangerous industry in the country, accounting for 6.74% of all workplace deaths in 2015.

Working in a mine is already fraught with the dangers associated with manual handling of heavy loads, the risk of strain and sprain, working at heights, and working with suspended loads; the last thing you need are problems stemming from fugitive dust.

Fine dust particles can affect miners’ health (the resurgence of black lung disease and other respiratory diseases is well documented) while dust can also affect safety, by reducing vision and impairing vehicular traction.

Regardless of the size of your mine or its location, the problems caused by errant dust are universal.

Furthermore, it doesn’t matter from which part of the site the fugitive dust emanated, or during which activity – be it processing, transporting or storing – once this potentially dangerous dust is generated and airborne, it becomes a whole-of-site problem that must be dealt with, quickly and cost-effectively.

This Checklist has been produced by Dust-A-Side Australia in the interests of educating, enlightening and ensuring that underground mines remain as safe and productive as possible.
Wheel-generated dust created by both heavy and light vehicles travelling on unpaved roads is often the number 1 source of dust on any mine-site. It is therefore important to balance productivity with ensuring the health and safety of the workforce. Key considerations to minimise this dust:

- quality of the material and general construction quality of the roads
- on-going maintenance practices
- presence of moisture (both naturally occurring and added to the roads for dust control)
- stabilisation of the running surface, and
- use of surface treatments to bind and suppress dust.

Dust emanating from underground walls and roofs is particularly prevalent on major roadways when vehicles travel along them, disturbing the fine loose particles that are present. These sources of dust can be better managed through:

- ventilation airflow
- washing of the walls, and
- sealing of the walls/roofs with chemical additives, in certain cases.
CAUSE 3
INDUSTRIAL/ LAYDOWN AREAS

Heavy vehicle movements are a common occurrence in and around workshops, fuel storage areas, hardstands, and the like – either at the surface or underground facilities.

The high frequency and often sharp turning motion of the vehicles creates extreme forces in the ground that can cause the material to break-up and become fine dust particles. These challenges can be somewhat alleviated through the use of ground stabilisation and surface treatment technologies.

CAUSE 4
DRILLING/CHARGING/ BLASTING

Drilling, charging and blasting are all hazardous activities carried out in controlled and isolated workspaces. Whilst dust is naturally generated from these processes, it can be better controlled through the use of spray systems and sometimes the use of chemical additives such as surfactants or foaming agents. Ensuring areas around blasts are washed down prior to re-entry will also help to alleviate dust spreading through underground workings once operations resume.
CAUSE 5
WASTE DUMPING

The dust generated through the physical tipping or depositing of waste material in a pre-defined area can be controlled through the use of spray systems, fog cannons and sometimes the earlier addition of moisture to the material.

Depending upon the exposure of the discarded material to the likes of wind and moisture, it may also become an ongoing source of dust generation on the site. In these instances, the use of binder products (such as polymers) can be used to veneer and seal the material so that fine dust particles do not become airborne.

CAUSE 6
STOCKPILES

Stockpiles can become major sources of dust depending upon the material/ore type, exposure to the elements (wind & rain) and moisture content. A key consideration to managing the dust emissions from stockpiles is the longevity of their existence.

This will dictate the most practical and cost effective method of successfully suppressing the dust generated. Common strategies include the use of fog cannons/mist systems, as well as the addition of a temporary or semi-permanent binder product to hold the fine particles together.
CAUSE 7
HOPPER BINS

The physical tipping action of material into a hopper bin, or similar, will lead to generation of dust unless the material has a sufficient moisture content to prevent it. The process of adding moisture to a material in advance is not always feasible, and therefore best practice involves a misting/fogging system triggered by automatic sensors.

A well-designed high-pressure system will effectively eliminate airborne dust problems, by atomizing low volumes of water under high pressure to create a fine mist directed at the specific source of the problem. The addition of surfactant technologies can further improve the effectiveness of such a system by helping to break down the surface tension of water particles and reduce water droplet size. This enhances the attraction of the water droplets’ performance as a wetting agent.

CAUSE 8
CONVEYORS

As material is transported along a conveyor, the motion, coupled with potential exposure to the natural elements, can cause the generation of airborne dust. This is particularly prevalent at material transfer points (at the start and end of each conveyor section) if the material does not have sufficient moisture content to hold the fine particles together. Whilst conveyors are often housed wherever possible (to shield them from workers/equipment, and to help contain noise and dust) the incorporation of a well-designed dust suppression system will also help to prevent and/or suppress dust.

Depending upon the site’s specific material transfer configuration, the use of both low-pressure systems to add moisture and/or binder products (dust prevention) to the material, as well as high-pressure systems to suppress any dust generated, may be considered.
CAUSE 9  
PROCESSING PLANTS

The overall design, maintenance and management of processing plants plays an important role in minimising dust emissions. The incorporation of dust extraction systems or more cost effective dust suppression systems should form a key component of the processing plant design when it comes to minimising dust.

As with conveyors above, the specific layout and process flow of every processing plant is unique, with best-practice often being achieved through a combination of high-pressure misting and fogging systems, custom designed and tailored for each precise operation. Particular focus is placed on the likes of material transfer points, crushers, screens, chutes and stackers.

CAUSE 10  
TRANSPORTATION (RAIL/TRUCK)

The vibration and exposure to moving air experienced by material in transit is often sufficient to generate a trail of fine dust particles. Other factors that will affect the amount of airborne dust include:
> the type of material
> particle size
> moisture content
> speed of travel, and
> load profile.

Whilst the best-practice control technique is to cover the load either with a solid lid or fabric material, this is not always economically viable, or feasible from an operational viewpoint. Alternative techniques to better manage dust during transportation can therefore include one or a combination of the following;
> the addition of moisture and/or binder products to sufficiently hold the material particles together prior to load-out,
> veneering and sealing of the material to prevent fine dust particles becoming airborne.

The implementation of dust suppression systems should be utilised to accomplish these techniques; providing an automated solution customised for each specific application.
For assistance with or advice about dust problems at your mine, simply call 1800 662 387 and have an obligation-free chat with a member of the engineering team at Dust-A-Side Australia.

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