

Dust Control at Demolition Sites

Introduction

Demolition work involves hacking, crushing, and cutting, which can generate large amount of dust and debris. If poorly managed, the clouds of dust can contain particulate emissions that may be hazardous to human health. They can also reduce visibility, delay demolition activities and cause property damage.

Why is Dust a Problem?

Airborne dust at construction sites is a problem as it leads to health concerns and respiratory problems. (Refer to chart on the right delineating health and other problems attributed to excessive dust presence).

Besides health concerns, the dust affects environmental degradation, causes visibility problems, damages machinery/equipment and property, and creates unsafe conditions.

The main problems experienced were:

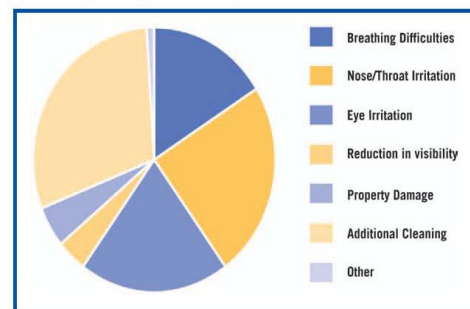


Fig.1 Problems associated with excessive dust presence (Source: *No Dust, No Fuss. Guidelines for Controlling Dust from Construction Sites.* By NSW EPS, NSW Government Program, Parramatta City Council)

Silica – It's not just Dust

Silica, the chemical compound silicon dioxide (SiO_2), is the most common mineral in the earth's crust. (<http://www.cdc.gov/niosh/topics/silica>). Silica is found naturally in almost all rocks, sand and soil. It is also found in concrete products and bricks, but is not considered a significant hazard. However, once the concrete, bricks or rocks are broken up, the dust given off may contain fine airborne crystalline silica (termed respirable crystalline silica (RCS)) and can be inhaled. Inhaled silica dust causes fibrosis or scar tissue formation in the lungs. It also affects the lung's ability to process oxygen. The lung disease silicosis can occur. The condition is irreversible, progressive and may prove to be fatal. (www.qpani.org/documents/craigchisholmjaneccallumpresentation.pdf).

Control Measures

Dust control is important in keeping workers safe and productive, addressing effective equipment maintenance, and managing nuisance complaints from users of adjacent spaces. Overexposure to respirable dust and silica can be controlled and reduced through a number of ways:

Enclose work areas - Enclosures can be provided to minimise or cut off flow of dust particles into adjacent occupied areas. In addition, dumping chutes should be enclosed with appropriate screens, debris should be bagged, and temporary dust control barriers and enclosures for dumping of sand, rocks, cement and dusty materials should be provided.

Workers training and Personal Protective Equipment (PPE) - Workers should be supplied with the appropriate PPE, and provided with training to enable them to recognise the dangers of dust, and to work safely in a dusty environment.

Use of ventilation and dust suppression systems - Contractors can also manage dust proliferation by using exhaust ventilation devices / system. They can suppress dust through the consistent and regular spraying of water at designated areas. A case study illustrating the implementation of a successful dust suppression system is described below.

Case Study - Use of the Mist Machine for Demolition Works

A contractor was able to effectively implement a dust suppression system through misting. The company is a bizSAFE Level 3 contractor that specialises in controlled demolition, grouting/repair and structure strengthening. The contractor was well aware of the need to keep dust under control when it began planning for the demolition of a number of different building elements (e.g. masonry wall panels, floor and wall tiles) of the existing Changi Airport Terminal 1. This was especially important as the Terminal building was in operation during the demolition works.



Fig.2 A mist fan

Development of Mist System

To effectively manage the dust level during demolition works, the contractor used a mist fan, similar to those used in food courts and pubs to freshen up the surrounding environment. At the pubs and food courts, the mist fans are generally used to dispel irritants (e.g. cigarette smoke and smell), and cool the environment.

The company adapted the mist fan for use in demolition works, by customising it to suit specialised requirements at demolition sites. This eventually evolved to become a mobile machine fitted with mist generation capability, which facilitated easy access to demolition areas. It was also effective in wet dust suppression.



Fig.3 Demolition work being carried out



How does it work?

The misting system works by forcing water through a specialised nozzle to produce ultra fine water droplets, which would in turn absorb the fine dust particles in the surrounding atmosphere.

Fig.4 A misting machine with specialised nozzles

The required components for a misting system include tubing, specialty misting system nozzles and water supply. Additional components may be required for a specific use of the misting system or to improve its performance, such as a pressure pump. Performance may also be enhanced by increasing the number of nozzles and adjusting the water pressure.



Effectiveness of Mist System

The use of the misting machine typically requires less water, and consequently less drying time compared to other techniques involving the active spraying of water. This reduces the need for the extensive clean-up of demolition residue, as well as the probability of slips and falls.

Fig.5 The misting machine (red machine on the right) being used in demolition works

The misting machine has been effective and useful in dust control for demolition works, as evident from the feedback received from clients and main contractors:

"Basically, this machine is very useful and has effective dust control. It also can save manpower. It will probably be much more convenient if a function to control the vapour level is introduced," *said Osada Naoya, Construction Manager, Takenaka Corporation.*

"This is our first time to use mist machine for demolition works. Due to the nature of A&A works, our T1 upgrading project has several different types of hacking / demolishing works inside the Airport Terminal building; which is quite a sensitive area where dust and water are concerned. Mist machine is one of the good solutions to mitigate the dust without too much water. Contractor is fully utilising the machine for their daily activities. We have obtained good evaluation of the work method from our client, CAAS" *said Hannya Masayuki, Project Manager, Takenaka Corporation*

Conclusion

While the use of a dust control system, such as misting, might not totally prevent dust emissions, a properly thought-out system can benefit the company and its workforce in the following ways:

- Lower maintenance and clean-up costs
- Minimal use of utilities, especially water
- Lower probability of accidents with better visibility
- Prolong usability/lifespan of equipment and its components as continuous exposure to fine dust may cause friction which increases wear and tear on machine parts.
- Ensure compliance with existing health regulations
- Improve working conditions and comfort level for workers
- Enhance company's reputation as a responsible contractor that recognises the need for proper planning, design, installation, operation and maintenance for an effective and cost efficient dust suppression set-up.

References

1. Guidelines for controlling dust from construction sites. By NSW EPS, NSW Government Program, Parramatta City Council
2. The control of dust and emissions from construction and demolition - Best Practice Guidance. By London Councils and the Greater London Authority

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