

Dust in the Construction Industry

Recent legislation changes and efforts to promote education on the effects of dust by the TUC and HSE has led to many organisations implementing an Occupational Health and Safety Management System (OHSMS). However, despite some progress being made, the construction and demolition industry are not attributing the same level of importance to health as they do to safety. As a result, workforces are still at great risk from inhalable and respirable dust. It's vital for the industry to make a behavioural change to protect long-term health.

Dust: the silent killer

The Control of Substances Hazardous to Health Regulations (COSHH) set in place industry standards for exposure to hazardous substances, including dust. These regulations assign employers with the responsibility of preventing worker over-exposure to dust, however, workers are still suffering serious long-term health problems, and in some cases death. An estimated 3,500 cancer deaths were attributed to the construction and demolition industry in 2013, according to Mike Slater, President of the British Occupational Hygiene Society (BOHS), and yet these deaths are rarely deemed worthy of news coverage by mainstream media. As well as the impact on worker health, companies must also take into account the impact of insurance claims and higher premiums, sick pay from a higher number of sick days, and project delays and stoppages on project profitability. These unwanted consequences of poor hazardous substance control reduce the return of investment, so it is in the best interests of companies in the short-term, as well as employees in the long-term, to ensure occupational exposure to dusts are minimised.

Year on year, the majority of worker deaths are a result of ill-health, rather than accidents. Therefore, industry must increase efforts to defend against the avoidable inhalation of hazardous substances. To do so effectively, the industry needs to approach health with the same attitude as safety, by evaluating the many different types of risks and threats to health, and then introducing an effective strategy for protecting workers. Construction companies taking this pro-active attitude go beyond regulations by following risk reduction strategies that utilise personal and environmental dust monitoring and analysis to ensure workers are protected from over-exposure.

Different dusts, different threats

Although asbestos is the most widely publicised hazardous substance in the industry with strict guidelines on its safe removal, there are actually other components of construction and demolition dusts which are potentially as harmful: from brick dust, from stone cutting, wood dust and one particular example is crystalline silica, which can cause silicosis. This is inflammation and scarring of the lungs. It also increases the risk of lung cancer, chronic obstructive pulmonary disease and other respiratory diseases as well as kidney and auto-immune diseases. Like asbestos, the effects of exposure to silica are chronic due to the long latency period and it may take many years before symptoms present themselves.

The Health and Safety Executive (HSE) states that "in most cases it should be reasonably practicable to control exposure to 0.1 mg/m^3 (8-hour TWA) or less by engineering or process control. Employers should aim to ensure that workers are not exposed to respirable crystalline silica dust concentrations above this level". Over in the States, OSHA (Occupational Safety and Health Administration) have recognised that their existing PEL (Personal Exposure Limit) is not adequate to

protect workers and are proposing a new lower level of $50\mu\text{g}/\text{m}^3$ averaged over an 8 hour day. It hopes that once implemented this ruling would save nearly 700 lives and around 1600 new cases of silicosis per year, over 80% of these in the construction industry.

To ensure Companies are as informed as possible the HSE publishes the EH40 guidelines to Workplace Exposure Limits (WELs). It is, however, down to the Companies' themselves to look out for updates which are, frustratingly, often not well publicised. A useful, alternative source of information for personal monitoring and workplace exposure limits is the Air Sampling Solutions website (www.airsamplingsolutions.com), which features detailed information on methods of analysis and exposure limits for each type of hazardous substance.

Personal monitoring or environmental monitoring?

Once a construction company has acknowledged that dust monitoring is a necessity, the next step is to invest in effective monitoring equipment. In terms of environmental and boundary monitoring to protect the neighbouring community, construction companies can use remote site monitoring systems like the BOUNDARY Guardian to measure the dust output to the local environment. The BOUNDARY Guardian is a web based, real time, unattended data logging monitor with optional text alerts should pre-set limits be exceeded. This ensures companies remain compliant with regulatory limits and are not at risk of action from the local authorities. In densely populated cities site monitoring is of great benefit to the neighbourhood. For example in London construction and demolition activity is responsible for up to 15% of air pollution.

For surveys and risk assessments of levels of dust on site a Microdust Pro can be used which has real-time data and a graphical display to allow users to instantly view results and react accordingly.

However, although helping to comply with regulatory limits and conducting surveys, personal monitoring is required to calculate an individual worker's exposure to harmful dust and thus providing the means to safeguard their future health. In personal monitoring a pump and filter are used to accurately measure the amount of dust inhaled by the worker.

Personal Monitoring of Dust

Dust particles differ in size and for personal monitoring there are generally two fractions of interest, 'Total Inhalable Dust' and 'Respirable Dust'. Total Inhalable Dust is the total amount of airborne material which enters the respiratory system (up to 100micron). Larger particles do not penetrate into the deep lung and are caught in the respiratory tract being expelled by the body's own defences. The smaller particles (up to 10micron) are termed 'Respirable Dust' and this is the fraction that causes the most harm. These particles are capable of penetrating the deep lung where gas exchange takes place and get lodged there.

In general terms, the method for monitoring personal dust exposure consists of a known volume of air being drawn through a pre-weighed filter using a TUFF sampling pump. Post sampling, the filter is re-weighed and the difference in weights is used to calculate the worker's exposure.

In practical terms, the pump is calibrated to the desired flow rate (generally 2-2.2l/min) and attached to the worker, usually around the belt area. A suitable sampling head containing the filter is connected to the pump via a flexible plastic tube. The sampling head is mounted in the 'breathing

zone' (the area 30cm around the nose and mouth) usually on a jacket or lapel. The pump is then set to run for the duration of the shift or desired sample time, usually 8 hours.

It is possible to monitor for different fractions of dust (Total inhalable and Respirable) using different sampling heads. An inhalable sampling head is used for Total Inhalable Dusts which is all size fractions and a Cyclone Head for the respirable fraction, the smaller size fraction which is more hazardous and that is capable of penetrating into and getting lodged in the deep lung. For a simple gravimetric method, i.e. difference in weights of filter paper, generally glass fibre filters (GFA) filters are used. For further analysis on the type of dust collected other types of membrane filters may be needed, e.g. MCE or PTFE.

Analysing and Interpreting Data

The results of the monitoring exercise enable the site management to make informed decisions on whether the workforce is being exposed to harmful levels of dust. It is good practice to keep the exposure level as low as is practicable as exposure limits, which are based on current information, may change and generally they become more stringent, not less. It is accepted that there are no 'safe' levels, just levels of risk. Even if levels of dust are deemed to be acceptable it is advised to carry out regular monitoring to account for differing tasks, changes in routine, environment and differing staff with differing work practices to get a clear and ongoing picture of workers' exposure. If exposures are high then a plan to control the risk needs to be implemented utilising the hierarchy of control, i.e. looking at ways to eliminate, contain or manage exposure before resorting to PPE.

In conclusion

The construction and demolition industry have recently been moving in the right direction with regard to safety, with statistics displaying a positive trend towards fewer accidents in the workplace. Thanks to more innovative technology to make dust detection easier, employers and workforces have a greater opportunity than ever to work together to ensure short-term and long-term threats to well-being are minimised. With this in mind, it is time that greater efforts are made to make a behavioural change and implement improved health protection management systems that are in line with occupational safety and accident prevention management systems.