CLEARING THE AIR

How dust exposure is impacting health, safety and productivity

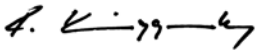
FOREWORD

Foreword

Dust is a serious threat to the construction industry and to human health. In construction, there are many applications that generate significant amounts of dust unless managed well.

We need to act on dust with the seriousness it deserves and requires, to protect workers and businesses from the detrimental effects it can have on health and productivity.

I hope you find this following eBook useful in learning more about the issues surrounding dust in construction, the impacts and what we can do to manage it.



Rainer Ringgenberg
Head of Market Region E1

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WHAT IS DUST?

Introduction

Dust is one of the biggest health and safety concerns the construction industry is facing. It poses a significant risk to workers and employers.

However, there is still a lack of understanding around the detrimental impacts it has on the health and safety of those working in dust heavy environments. Early 2020 saw authorities reclassify Respirable Crystalline Silica dust (RCS) as a carcinogen in a watershed moment for the industry. We're now witnessing a growing momentum in the conversation around dust exposure. It is going to be an industry-wide collaborative effort to tackle construction dust.

Depending on the processed base material, size of the dust particles, concentration in the air and the duration workers are exposed, dust can lead to severe health issues as well as loss of productivity and working comfort. In addition, dust does not just stay at the construction site. It can spread easily to other areas impacting people, nature and the surrounding environment.

What is dust?

Dust consists of tiny solid particles, is highly dispersed, and easily circulated in the air. Inhalable dust, which can be trapped in the mouth or nose, is less than 100 microns in size and is such as wood dust. Whereas respirable dust penetrates deep into the lungs, is **less than 10 microns**, an example here is silica dust. Then we have thoracic dust which gets trapped in the upper part of the airway such as cotton fibres.

Let's put that into perspective: the average human hair is about **60 microns** thick!

Fine dust is invisible to the human eye and can only be seen if there is a lot of it in the air - clouds of dust as we say. Because of its small particle size, it can stay in the air for up to 12 days. Sometimes, when we don't see dust, we might still smell it e.g. if a room smells "like concrete", cement dust can be circulating in the air.

Fine dust particles are the most dangerous because they are small enough to get into the far reaches of the respiratory system, typically the alveoli where they interfere with oxygen, and cause long-term damage. Over-exposure to respirable dust that contains silica can even cause silicosis, chronic obstructive pulmonary disease (COPD), and cancer.

HOW IS DUST GENERATED?

Different types of dust occur depending on the type of material used and the type of construction process.

Silica dust

Silica is a naturally occurring mineral that is found in materials such as concrete, mortar, brick, sandstone and granite amongst others. When undergoing abrasive treatment like drilling, cutting or grinding, in the construction process, very fine dust (Respirable Crystalline Silica dust, or RCS dust) is created. Respirable dust is very fine and penetrates alveoli causing severe long-term damage.

Wood dust

Wood-based products are common in construction, the dust generated when working with wood materials creates inhalable dust, these particles are trapped in the mouth and nose creating great discomfort for workers.

Thoracic dust

Thoracic dust gets trapped in the upper part of the airway.

There are multiple touch points in the construction process that generate RCS dust and it's found on almost all jobsites. It's important to note here that dust isn't only a high-risk factor while actively carrying out these tasks. Dust is also released into the air from fabrics and clothing after carrying out tasks like these, further disturbance is created through cleaning, or via the transportation of materials (such as moving or emptying bags of cement). It can also circulate further when it is disturbed by wind, like during transportation of dusty materials or while mixing powdery material, for example, when preparing cement.

The very nature of fine RCS dust means these particles can travel deep into your lungs and cause a variety of serious health problems for workers who are regularly exposed to it over time.

HEALTH AND SAFETY

Dust exposure is one of the biggest threats the construction industry is facing due to the hazardous impact it has on Health and Safety.

The well-being of workers is the most significant issue faced when considering dust exposure on construction sites and regular inhalation of fine dust particles can lead to serious, long-term health implications and fatalities.

Inhaling dust makes for uncomfortable working conditions, irritating the eyes, nose, throat and skin which can lead to on-going problems with health. However, it is the regular inhalation of fine dust particles that can lead to long-term health problems like asthma, lung cancer, Chronic obstructive pulmonary disease (COPD) and silicosis. The dust particles are so small, they build up in the lungs over time and the more severe effects are not always immediate. By the time symptoms present themselves, the damage is already irreversible.

Because of the regular interaction with processes that produce dust, construction workers have a higher risk of developing these diseases. Some of the workers who suffer from dust-related diseases, like asthma or COPD, find they can no longer work.

PRODUCTIVITY

As well as improving health and safety, using dust extraction systems also increases productivity. Dust clogs up tools, affects workers comfort, and can cause damage to surrounding fittings and fixtures.

With the right preventative measures in place and the correct tools for the job, such as on-tool dust extraction systems, you can protect workers, increase productivity, lengthen product life spans and protect the surrounding environment.

Working in clouds of dust is an uncomfortable environment to carry out jobs effectively in. Dust reduces visibility, which can increase the risk of injury. Not only this, but dusty workspaces can be distracting for workers dealing with eye irritation, sneezing, coughing or nose blowing. Interruptions like these are not only discomforting for the employee but can lead to significant lags in projects and higher costs for businesses.

There are several ways you can tackle dust on your jobsite and protect workers against dust. By taking the appropriate measures, you can significantly increase productivity and lower maintenance costs.

By limiting dust exposure on your jobsite, you can:

- Reduce preparation time: no or minimal time sealing off the area required before work starts
- Reduce cleaning: depending on the application you can save up to 99% of cleaning time
- Reduce damage of fixtures and fittings: like carpets, furniture and other furnishings.

DUST AND TOOL EFFICIENCY

Did you know that working in dust saturated environments also impacts your tools?

Carrying out jobs that emit large amounts of dust in the air also effects your how your tools perform over time. Whilst less noticeable, the fine dust particles can clog up tools by getting into motors and other working parts. Dust particles also collect on sharp elements of inserts - such as chisel tips, drill bit edges and grinding disc surfaces - making them blunt and shortening their life span. This leads to high repair costs, unplanned tool maintenance, and leads to frustrating downtime of projects.

You can protect your tools by using the right on-tool dust extraction and increase the longevity of a tool's lifespan less dust clogging up the mechanisms and accessories. By protecting tools from dust exposure, work can be carried out with less costly interruptions and downtime for repairs and maintenance.

By reducing dust on your jobsite and protecting your tools, you can:

Increase lifetime of tools:
by up to 60% and of inserts by up to 20%

Increase application speed:
up to 20% with cleaner and sharper tools

MANAGING DUST ON YOUR JOBSITE

Health and Safety bodies across Europe recommend a Hierarchy of Control to help reduce risks to the lowest reasonably practicable level.

This hierarchy looks at the effectiveness and business value of five different approaches, with the top classed as ‘best’ practice followed by the ongoing steps to mitigate risk. You can use the STOP principle as an effective and memorable guide to control dust on your jobsite which defines the sequence of controlling risk, S-T-O-P.

Substitution

S

Eliminate the risk through using safer alternatives to avoid hazard where possible. Designing out dust generating work, for instance prefabrication, and better design practices leading to less corrective work being required on the job site.

Technical measures

T

Using machinery, tools or technologies to reduce dust in the air, to minimize the dangerous effects of dust for people such as Hilti Dust Removal Systems (DRS). Choose applications that generate less dust, for instance, wet diamond sawing instead of breaking concrete or direct fastening nails instead of drilling and screwing.

Organisational measures

O

Implementing alternative methods of working to support training and knowledge sharing. For example using Hilti ON!Track software to manage employee certifications and access Health & Safety information for employees.

Personal protective measures

P

PPE such as dust masks, for example, should be the final line of defence and are needed where risks remain present even after the other steps have been followed.

HILTI SOLUTIONS

Research

Hilti have worked together with the GB regulatory body (Health and Safety Executive) to try and find ways to address the dust problem. A specific area of collaboration is the testing of dust generated by power tools and the effectiveness of dust removal systems.

Hilti partnered with HSE to test power tools and their dust removal capabilities leading to the research into the HSE independent report, “Assessment of dust extraction system solutions on hand-held electric diamond cutters to BS EN 50632”. They independently tested Dust extraction solutions for hand-held electric diamond cutters to test how effective on-tool dust removal systems are at reducing dust in the air.

This research has led to very important findings,

1. On tool extraction can be very effective in removing dust at source before it goes into the air 99.8% of dust removed as the cut is being made.
2. All dust removal systems are not equal and there is a bigger difference in the effectiveness of those tested than initially anticipated. (see table of three systems).

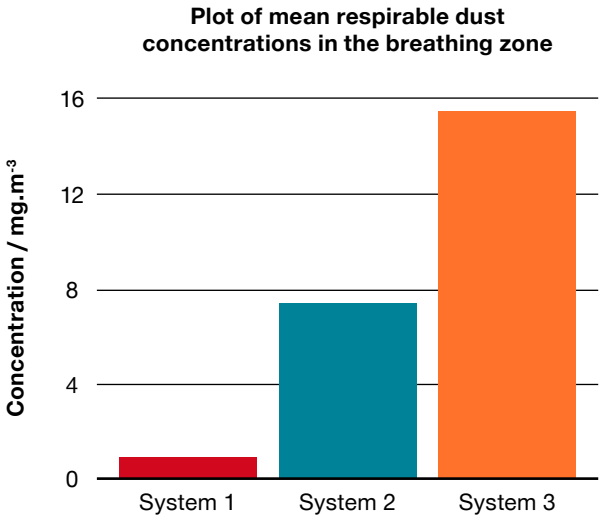

Figure 1: The HSE report showed a huge disparity into the effectiveness of three manufacturers’ dust removal systems.

	Dust concentration / mg.m^{-3}	
System 1	Repirable	0.85
	Inhalable	2.45
System 2	Repirable	7.65
	Inhalable	16.55
System 3	Repirable	15.65
	Inhalable	38.90

Figure 2: Systems two and three were found to be far less effective in removing RCS than system one.

Source: https://www.hilti.co.uk/content/dam/documents/e1/health-and-safety/HSE_abridged_testing_report_final.pdf

Tools

Following the advice proposed by the S-T-O-P method, by first substituting traditional methods with alternatives designed to minimise, and in some cases even eliminate dust exposure, the root cause of dust hazards can be avoided.

Alternative methods to reduce the impact of harmful RCS dust onsite include:

Wet diamond drilling

Keep construction sites cleaner by collecting slurry created during wet diamond drilling. Units such as the DD-WMS water management system supply, filter and collect slurry for easy disposal while recycling the water in the process, to deliver a constant water supply. Rig-mounted diamond coring also carries very low Hand Arm Vibration Syndrome (HAVS) values, further reducing risk of injury.

Find out more >

Direct fastening

Make the switch to the BX 3 battery-powered nailer, designed to be a cleaner, quieter and virtually dust and vibration-free alternative to drilling.

Find out more >

Designing out concrete dust

Choose low-dust base materials or place our HAC cast-in anchor channels around the rebar before the concrete is poured, meaning little to no drilling, and therefore no exposure to concrete dust.

Find out more >

Not all dust removal systems are created equal

As the research with the HSE shows, not all dust removal systems are as effective as others. By using harmonised Dust Removal Systems (DRS) such as on-tool extraction and high-performance vacuum cleaners, you can maximise the amount of harmful dust removed at source and collect it efficiently.

95%

of Hilti power tools can contribute to virtually dust-free, and therefore, healthier construction sites.

Dust classification and Vacuum cleaners

To reduce dust exposure, vacuum cleaners are an essential part of the dust removal process. Ensuring they are effective; you need to make sure the vacuum cleaner you're using matches the application. To help with selecting the right vacuum cleaner for your job, they are categorised into three different levels of dust extraction class as defined by the occupational exposure limit and the level of risk to the user.

L Class (low risk)

L Class dust includes house dust, soft woods, and solid surface material.

The maximum allowable concentration of L class dust is **> 1 mg/m³**, this means the vacuum cleaner has to extract 99% of the dust.

M Class (medium risk)

Dust from hard woods, cement, concrete and tile cement as well as paints belong to the M class.

The maximum allowable concentration of M class dust is **≥ 0.1 mg/m³**, this means 99.9% of the dust has to be extracted.

H Class (high risk)

Typical H Class dust can be found in asbestos, mineral fibres, bitumen and artificial fibres such as glass wool.

The maximum allowable concentration of H class dust is **< 0.1 mg/m³**, this means 99.995% of the dust has to be extracted.

INNOVATION SPOTLIGHT

Complete your dust control strategy with Hilti VC-X vacuums and new AIC air cleaners

With the latest VC 20-X and VC 40-X vacuums you can capture a large amount of dust at source. Both models come with an upgraded interface that tells you the live status of the filter and container capacity, as well as a hose diameter selector to suit different tools. AirBoost adaptive automatic filter cleaning only cleans the filter when it needs to - maximising its lifetime and keeping you safe while you work.

Remove any excess dust particles from the air with the latest Air Cleaners from Hilti, the AIC 1000 and AIC 2000. Pair with your vacuum for additional safety to ensure the reduced risk of dust-related health issues for workers. Even with the best dust removal system, there is always a chance for dust to escape into the air. Using an Air Cleaner ensures that even this dust is captured and you always work within the safe limits for silica dust exposure - saving not only clean up time but also significantly less risk of fines and jobsite closures!

FIND OUT MORE

CONCLUSION

Whether you approach the issue of dust control in construction from the perspective of health and safety, worker well-being, productivity, cost-efficiency or tool maintenance, it's clear that dust is one of the biggest concerns for the construction industry. The broad spectrum of effects dust exposure has within the industry is extremely concerning and the time for us to act of dust is now.

DISCOVER THE BEST DUST CONTROL SOLUTION FOR YOU

FIND OUT MORE

References

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