

# Protecting Employee Health During Fracking

There is evidence from the USA, where fracking has been underway for some time, that show there are considerable health hazards to workers within the fracking industry; most notably exposure to crystalline silica. 'Safe' exposure limits have frequently been exceeded and if fracking becomes a fact of life in the UK, comprehensive air and dust monitoring programmes to protect workers should be high on the UK Occupational Hygiene agenda, says Neal Hill, Product Line Manager, Casella.

*Respirable silica has recently been recognised as a hazard in fracking operations, which can use between several tons to two million pounds of industrial sand per well site. Last year, NIOSH and OSHA issued a hazard alert for silica after a NIOSH field study conducted in 2010 and 2011, and released in 2012, found excessive exposure to silica at 11 sites in 5 states.*



Hydraulic fracturing or 'fracking' is the process to obtain gas and oil from shale rock. The rock is drilled horizontally and a high pressure water, sand and chemical additives mixture is injected into the rock to 'fracture' it. This releases the gas which flows out to the head of the well.

Most recently, fracking has come under international scrutiny. Whilst being common in the USA, many countries suspended or banned the process. Some of those countries, including the UK and members of the European Union are now lifting the bans and choosing to focus on regulation instead of prohibition.

Indeed, the UK Chancellor, George Osborne, shocked many in 2013 by announcing new tax breaks for shale gas exploration and plans for building up to 30 new gas-burning power stations. The announcement appeared to be at odds with previous proposals that focused on investing in carbon neutral energy projects in order to reach the 15% renewable energy production target by 2020. The Chancellor's argument was that gas powered energy is, and will continue to be, one of the most cost effective energy sources available, allowing us to replace ageing coal, nuclear and gas power stations and increasing our energy capacity by around 5GW. In addition extracting shale gas would boost tax receipts and aid the UK economy. However,

he recognises that it is unlikely to lead to big reductions in household bills as experienced in the States because of the UK's reliance on pipelines from other countries. It is not a closed energy economy like the USA.

Although the UK government has shown much support for fracking, many others have campaigned against it due to the environmental risks including contamination of ground water, air pollution and some evidence of localised earthquakes. It was also reported in *Noise Bulletin* (May 2014) that exploration will be exempted from the need to obtain IPPC permits and it is feared that drilling, flaring and transportation activities will have a noise impact. As well as the effects on the community, employee health concerns, principally exposure to respirable silica dust are becoming a very hot topic. In the US where OSHA (Occupational Safety & Health Administration – part of the US Dept of Labour) and NIOSH (National Institute for Occupational Safety & Health – a federal agency and part of the Center for Disease Control and Prevention) have been reporting on the dangerous levels of exposure.

The potential health risks from silica to workers on site arise from the fact that the fracking process requires a large amount of sand which is 99% silica. Workers are exposed to fugitive silica

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dust released during transportation and transfer of the sand from vehicles, to sand movers, to hoppers and blenders.

These workers are at risk from developing silicosis which causes inflammation and scarring in the lungs and also increased risk of developing lung cancer, chronic obstructive pulmonary disease and other respiratory diseases as well as kidney and auto-immune diseases. The effects of exposure to silica are chronic due to the long latency period. It may take many years before symptoms present themselves.

NIOSH estimate that 1.7million US workers across several industrial sectors are exposed to crystalline silica each year and that figure may not even paint the full picture stating that "The true extent of the problem is probably greater than indicated by available data." The CDC has also written that there is no surveillance data in the US that enables an accurate estimation of the number of individuals with silicosis.

According to *The Pump Handle*, a US science blog focussing on public health issues, "Respirable silica has recently been recognised as a hazard in fracking operations, which can use between several tons to two million pounds of industrial sand per well site. Last year, NIOSH and OSHA issued a hazard alert for silica after a NIOSH field study conducted in 2010 and 2011, and released in 2012, found excessive exposure to silica at 11 sites in 5 states. These findings were summarised by the researchers

in a recent article in *Well Servicing* magazine where they explain that the majority of exposures for employees involved working around sand movers (74%), sand transfer belts (83%) and what are called blenders (50%) were above the 40 year old OSHA exposure limits. They also explained that excessive exposures were also documented for employees working upwind but not in the immediate area of sand moving equipment as well as for employees inside truck cabs that did not have fine articulate filters or tight-sealing doors. Not included in this documentation is the number of workers at these 11 worksites affected by these exposures."

In light of this, OSHA has proposed a new rule to address the hazard by updating the permissible exposure limits (PEL) for respirable crystalline silica. This has not been updated since 1971 and was based on research from the 1960s. The new standard, which drives down the PEL to 50 micrograms of respirable silica per cubic meter of air (50 µg/m<sup>3</sup>), is hoped to, "save nearly 700 lives and prevent 1,600 new cases of silicosis per year once the full effects of the rule are realised." Dr David Michaels, Assistant Secretary of Labour for Occupational Safety and Health is quoted as saying; "Exposure to silica can be deadly, and limiting that exposure is essential. Every year, many exposed workers not only lose their ability to work, but also to breathe. This proposal is expected to prevent thousands of deaths from silicosis – an incurable and progressive disease – as well as lung cancer, other respiratory diseases, and kidney disease. Workers affected by silica are fathers, mothers, sisters and brothers lost to entirely preventable illnesses."

In answer, the oil and gas industry in the US has established a focus group whose goal is to "expand the information on workplace exposures to respirable crystalline silica from hydraulic fracturing by collecting data within the industry" and "to further characterise the factors affecting exposures during hydraulic fracturing." Meanwhile NIOSH has recommended actions that will reduce harmful exposure and developed a list of best management practices. NIOSH is also working with the industry to design engineering controls to minimise exposure having an active 'Prevention through Design' program. Both OSHA and NIOSH provide many resources for fracking companies to help ensure the future health of their workers.

In the UK, the recently published report by the Intergovernmental Panel on Climate Change (IPCC) has urged governments to curb the use of "dirty" fuels like coal and cited natural gas as a key bridge to move away from fossil fuels. This only raised the prospect of fracking becoming commonplace across the UK and

wider world. It is a very hot topic and at their conference in Nottingham in April, The British Occupational Hygiene Society (BOHS), who work to promote better health and wellbeing in the work place discussed these potential health issues. They became, rather ironically, the 'victim' of anti-fracking protesters who had clearly missed the point!

It is imperative that effective air and dust monitoring is undertaken to protect those who will be manning the wells. As a consequence of this, business profitability is also safeguarded not only against lost man hours in the short term but also minimising the risk of compensation claims from serious illnesses in the long term. Companies can take advantage of the latest instrumentation available from Casella to action a comprehensive air and dust monitoring programme to protect the workers and the business from the negative effects of exposure.

Casella developed the very first commercially viable personal sampling pumps over 60 years ago and although Casella's Tuff range of pumps have dramatically moved on technologically since then; a pump with an appropriate sampling head and filter medium remains the accepted gravimetric method for personal exposure assessment.

But modern hand-held data logging instruments can also be used in real-time to detect harmful contaminants such as airborne dusts, fumes and aerosols. The Casella Microdust Pro for example is a rugged data logging device which may be used for spot checks and walk-through surveys that instantly provide data where excessive dust levels are occurring. Easy to use and built to withstand harsh environments, the multi-language instrument can also be used as part of the BOUNDARY Guardian.

The BOUNDARY Guardian is a fixed system which not only monitors dust but can also monitor noise and windspeed and direction. Simply specify the appropriate instruments from the BOUNDARY Guardian portfolio for what you need to measure. These systems are typically used for monitoring, as the name suggests, at the site boundary. It is an invaluable tool for checking environmental impact and can be reviewed remotely via the web. Should intervention be needed, a text alert will be sent. Clearly maintaining good relations with neighbours would be a distinct advantage!

With the help of the technology above and an effective air monitoring regime, site managers will be able to gather valuable data and make informed decisions regarding workforce exposure, training and working protocols. If fracking does indeed begin in earnest, let's be ready for it.

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The new CO<sub>2</sub> transmitter series EE850 and EE820 from **E+E Elektronik** (Austria) allows highly accurate and reliable measurements of CO<sub>2</sub> concentrations up to 10,000 ppm. The applied infrared measurement principle (dual wavelength NDIR\* procedure) is particularly insensitive to pollution. The transmitter's autocalibration function automatically compensates for aging effects.

The multi-point CO<sub>2</sub> and temperature factory adjustment procedure leads to excellent CO<sub>2</sub> measurement accuracy over the entire working temperature range. The measured values are available as either analogue current or voltage outputs. An optional kit facilitates easy configuration and adjustment of the transmitters.

The EE850 CO<sub>2</sub> and temperature transmitter for duct mounting is ideal for applications in building management or process control. A mounting flange enables easy installation of the sensing probe directly into the ventilation duct. The CO<sub>2</sub> sensing cell is well protected inside the transmitter. For CO<sub>2</sub> measurement, a small amount of air flows through the divided probe, into the transmitter housing, and back into the duct. The temperature sensor is located inside the probe. The EE850 offers an additional option for a passive temperature sensor output with a 2-wire connection.

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\* non-dispersive infrared technology

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