Synergist® Solutions: Silica

Silica Hazards: New Concerns and Sampling Options

By Debbie Dietrich

Occupational exposure to silica surfaced as a priority issue for OSHA in the American Industrial Hygiene Association’s 2013–2014 biennial survey of its members on the top public policy issues of concern for occupational health and safety (OHS) professionals. In February 2013, U.S. congressional committee leaders echoed AIHA members’ concern in a letter requesting action from the White House on OSHA’s proposal to update the agency’s crystalline silica exposure standard. The letter notes that the review of the proposed silica standard has been delayed at the Office of Information and Regulatory Affairs for over two years while government data has shown an increase in the number of reported illnesses and deaths related to silica exposure.

So what’s making news in regard to silica problems and solutions today?

New Focus on Exposures

Both OSHA and NIOSH have been focusing on worker hazards in the oil and gas extraction industry, particularly in hydraulic fracturing operations. Hydraulic fracturing, or “fracking,” involves injecting large quantities of sand, water, and chemicals into the ground at high pressure. This process fractures shale, allowing oil and gas to flow more freely into a well. There are many sources of silica dust exposure for workers in the oil and gas industry, including transporting, moving, and refilling silica sand during fracking operations. In a recent NIOSH study of 11 fracking operations in the U.S., researchers found that 8-hour time-weighted average (TWA) exposures to silica consistently exceeded the relevant OSHA, NIOSH, and ACGIH occupational exposure levels at each of the 11 sites. More information about this study is available on the NIOSH Science Blog.

In response to the findings of NIOSH’s recent field study, OSHA issued a hazard alert to educate employers on the hazards of silica during fracking operations and work practices to reduce exposures. In addition, several OSHA regions have enhanced inspections of targeted oil and gas operations through special emphasis programs.

As an extension of its efforts to protect workers from silica hazards, NIOSH has developed a cooperative program with the oil and gas industry that is focused on field research to characterize exposures to silica and to develop controls to minimize these exposures. The agency has also published an online list of work practices and other control measures that can reduce silica exposures in the oil and gas industry. Further, NIOSH professionals have designed new engineering controls to minimize exposures to silica and are currently looking for industry partners to test these devices. To learn more about the NIOSH Oil and Gas Extraction Safety and Health program, contact Eric Esswein at the NIOSH Denver office.
New Focus on Sampling

In recent years, SKC has seen an increased focus on silica sampling that has been driven by more than just silica exposures in fracking operations. For example, in 2006, the threshold limit value (TLV) for respirable crystalline silica was reduced from 0.05 to 0.025 mg/m³, a significant development that spurred this heightened interest in silica sampling.

This lower TLV led industrial hygienists to perform more silica sampling and contributed to the demand for new and better ways to collect this contaminant. In a 2010 *Annals of Occupational Hygiene* article, NIOSH researchers noted that when sampling with traditional respirable dust samplers at standard flow rates, it is difficult to obtain enough silica to perform a quantitative analysis in working environments near TLV levels. Specifically, the authors predicted an unacceptable level of variation in results due to low contaminant loadings.

Most traditional respirable dust samplers require flow rates near 2 L/min. Higher flow respirable dust samplers are now available from SKC and other suppliers. These new higher flow samplers collect more contaminant mass to achieve the limit of quantitation for full-shift or short-term task monitoring. Disposable versions of the SKC samplers are also available to enhance user convenience.

Higher Flow Respirable Dust Samplers: New Options

Historically, cyclones have been used for respirable dust sampling in the workplace. SKC scientists have developed and patented a unique impactor-based sampler to better match the new global sampling criteria for respirable dust. This personal sampler is called the Parallel Particle Impactor, or PPI. The PPI design allows for precise particle size selection and adherence to global sampling criteria at designated flows. The high-flow respirable PPI is designed for use at 8 L/min and can be partnered with a pump, such as the SKC Leland Legacy, to provide the contaminant mass needed for quantitative analysis in working environments near TLV levels. A preassembled, disposable version of the PPI Sampler is available to avoid the hassles of sampler assembly, disassembly, and cleaning.

Other high-flow respirable dust samplers that are now available commercially include:

- CIP10 polyurethane foam cup sampler, designed for use at 10 L/min (Tecora, France)
- FSP10 cyclone sampler, designed for use at 10 L/min (GSA Messgerätebau GmbH, Germany)
- GK 2.69 cyclone sampler, designed for use at 4.2 L/min (BGI Inc., Waltham, Mass.)
- GK 4.162 Rascal cyclone sampler, designed for use at 8.5 to 9.5 L/min (BGI Inc., Waltham, Mass.)

As occupational health and safety professionals await action from OSHA on a new silica standard, SKC hopes that any new regulation will have a performance-based requirement for respirable dust samplers so that OHS professionals can adapt to new requirements in exposure monitoring.

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