# Tools Minimize Silica Dust Exposure

On June 23, the U.S. Occupational Safety and Health Administration began enforcing a tighter standard for exposure to respirable crystalline silica (RCS) as a precaution against debilitating and often fatal lung and kidney diseases. Detailed in 29 CFR 1910.1053, the new standard applies to hydraulic fracturing operations and limits workers' exposure to an eight hour time-weighted average of 50 micrograms per cubic meter (μg/m$^3$).

The standard requires employees to measure silica dust exposure in areas where it is likely, says Joseph Kraham, director of industrial hygiene for AIRIS Wellsite Services, an industrial hygiene consultant and dust control equipment provider. Unless silica dust exposure consistently falls below the action level of 25 μg/m$^3$, he says employers must:

- Write an exposure control plan;
- Demarcate and regulate areas where silica exposure may occur;
- Post compliant signage nearby to warn employees about silica dust;
- Establish effective engineering controls and work practices to minimize exposure;
- Assess exposure at work sites and continue monitoring it until it stays below the action level;
- Put employees in medical surveillance programs; and
- Keep records of test results.

Even on sites where boxes or silos rather than "sand king" systems handle sand transportation, Kraham warns that it is easy to exceed the 50 μg/m$^3$ permissible exposure limit (PEL) when evaluating representative personal samples. He estimates that 74 percent of sites have at least one employee exceed the PEL and 88 percent have at least one employee exceed the action level.

Sites that meet the limit may neglect other components of the rule, such as the warning sign requirements, Kraham says.

"The standard mandates proper housekeeping procedures," he adds. "To collect spilled silica sand, employers must use a HEPA vacuum or wet methods. Sweeping or shoveling the sand or using compressed air can create dust that workers might breathe in."

While the standard's engineering control requirement does not take effect until 2021, Kraham encourages employers to implement controls as soon as possible rather than trying to meet the exposure limit through workplace practices alone.

"Workplace practices can be difficult to enforce," he observes. "For example, when we go on sites that mandate respirators, we often see employees wearing them inconsistently or improperly." He points out that respirators only work for people who are clean-shaven.

### A High Bar

Ideally, Kraham says employers should try to get exposure below the action level of 25 μg/m$^3$. "If the employer can demonstrate that its procedures and processes will effectively keep silica dust below the action level, the standard no longer applies. That means the employer can stop monitoring exposure levels and putting employees under medical surveillance, which is a huge cost-savings," he explains.

To prove the standard should not apply, Kraham says employers must test below the action level twice in a row on occasions at least seven days apart. He cautions that exposure must stay below the level under any foreseeable circumstances.

"That is a high bar to meet, but is a challenge worth tackling," he argues. "In theory, the permissible exposure limit of 50 μg/m$^3$ represents the maximum an employee can be exposed to every day without suffering permanent harm. But as more data become available, we may discover that the limit should be lower. Today's limit for RCS is half what it used to be, and the limit for asbestos has changed multiple times since its introduction."

Kraham says employers who go the extra mile not only will do right by their employees but also protect themselves from future liabilities. He predicts that managing silica dust exposure will become more important as proppant intensities increase and operators experiment with progressively smaller meshes, trends that may increase total silica dust generation exponentially.

One of the most effective ways to reduce RCS is to minimize the number of times sand moves from one device to another, says Katie Sallee, AIRIS Wellsite Services' vice president and controller. She explains that each transfer point gives the proppant an opportunity to generate RCS.

"Modern sand handling systems have cut the number of transfers, but they still have areas where RCS forms," she says. "The industrial hygiene assessments we have performed suggest that even the newest and most modern proppant handling systems still need to be augmented with an effective engineering control to stay under the action level consistently."

In most applications, Sallee recommends as an effective engineering control vacuums that are installed around transfer points to collect RCS before it enters the work environment. "These vacuums have a small footprint, a minimal effect on operations and the flexibility to work with almost


**To meet the Occupational Safety and Health Administration's limit on employees' exposure to respirable crystalline silica, AIRIS Wellsite Services generally recommends installing vacuums around sand transfer points to capture dust before it can reach employees. The company cites years of data showing that vacuums work well and have a minimal effect on operations.**

any site or equipment configuration," she says. "We have years of data showing that they are reliable and effective."

**Treated Sand**

Silica that has been treated to reduce dust formation can give operators and service companies an effective and convenient way to minimize employees' exposure, says Natalie Eglinton, a technical sales manager at Covia, the company formed when Unimin and Fairmount Santrol merged in early June.

"Field tests in the Permian Basin and Marcellus Shale show that our treatment keeps dust below the action level, even for the highest-risk employees who work next to the sand throughout their shifts," Eglinton reports. She mentions that the company replicated OSHA's testing protocols, meaning that in addition to measuring dust in the air, it sampled employees' individual exposure to prove that the treatment is effective.

"Because the treatment is applied at an extremely low dosage–less than 0.1 percent by weight–it does not increase the proppant's thickness; change its conductivity, crush strength or turbidity; or affect how quickly it can be loaded, unloaded, moved and pumped," she says. "Nor does it affect chemical compatibility."

**By replacing traditional silica sand (left) with sand that has been treated to minimize dust formation (right), employers can reduce their workers' exposure to respirable crystalline silica below the triggering point for burdensome regulations, Covia reports. The company describes the treated sand as affordable and effective.**

With a cost between $2 and $3 a ton, Eglington says the sand will have a minimal impact on delivered sand prices. "This puts the cost below alternatives, and we are looking at ways to get it even lower," she reports.

As Covia has started to equip its mines with sprayers to apply the treatment, Eglinton predicts wide adoption. "Our newest mine in Crane, West Texas (was to begin) applying the treatment by the end of July, and we have two additional mines that should be ready by the end of the third quarter," she reports. ❐