SURFACE TREATMENT FOR SAND REDUCES AIRBORNE DUST

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ABSTRACT

As of June 23, 2016, the Occupational Safety and Health Administration (OSHA) final rule on Occupational Exposure to Respirable Crystalline Silica took effect. This final rule establishes a new worker permissible exposure limit to airborne silica dust of 0.05 mg/m³ as an 8-hour time-weighted average. It also includes other provisions to protect employees, such as requirements for exposure assessment, hazard communication, engineering controls, respiratory protection, medical surveillance, and recordkeeping. The hydraulic fracturing industry must meet the new requirements by June 23, 2021 which gives an excellent opportunity for employers to develop and implement emerging technologies for crystalline silica control.

Herein, we report a newly developed cost-effective strategy for dust control, in which a chemical is easily sprayed onto fracturing sand. This coating will not only reduce the occurrence of airborne dust during fracturing operations, but will also improve other properties including the compressive strength of the sand and improve the proppant pack conductivity.

From sand mining, through processing up to the final delivery at the frac blender augers, numerous points of silica exposure have been identified. Several attempts have been made to implement engineering controls to limit silica exposure at the fracturing site, e.g. dust collection devices at fracturing sand units, where sand is pneumatically loaded from bulk trucks. However, it is reported that workplace concentration of airborne respirable silica exceeds the permissible exposure limit by 20 times or more.

This chemically inert technology can be applied by simply spraying the coating onto fracturing sand at concentrations as low as 0.05% by weight of proppant, with a reduction of 90% v/v of airborne dust observed through sand blast testing. Additionally crush resistance tests performed at multiple stresses have consistently shown that ~20 to 30% w/w less fines are generated when compared to un-treated sand.

A field trial of this sand coating technology will show significant reduction in airborne crystalline silica at multiple test locations on a fracturing site during normal operations. It will be shown that the treated sand is free to flow and easy to operate without the use of special equipment.

This new technology in combination with already implemented PPE best practices and engineering controls for dust mitigation, such as dust/vacuum collection devices, etc., will help to enable full compliance with the new set of safety requirements established by OSHA.

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