Respiratory Protection Guidance for the Fracking Industry

Background
From OSHA's Hazard Alert: http://www.osha.gov/dts/hazardalerts/hydraulic_frac_hazard_alert.html
Hydraulic fracturing or "fracking" is a process used to "stimulate" well production in the oil and gas industry. It is not a new process, but its use has increased significantly in the last 10 years because of new horizontal drilling and multi-stage fracking (or "completions") technologies that improve access to natural gas and oil deposits. It involves pumping large volumes of water and sand into a well at high pressure to fracture shale and other tight formations, allowing oil and gas to flow into the well.

Large quantities of silica sand are used during hydraulic fracturing. Sand is delivered via truck and then loaded into sand movers, where it is subsequently transferred via conveyer belt and blended with other hydraulic fracturing fluids prior to high-pressure injection into the drilling hole. Transporting, moving, and refilling silica sand into and through sand movers, along transfer belts, and into blender hoppers can release dusts containing silica into the air. Workers can be exposed if they breathe the dust into their lungs.

Crystalline silica is a common mineral found in the earth's crust. It occurs primarily as quartz and is a major component of the sand, clay, and stone materials used to make every day products such as concrete, brick, and glass.

The need for Respiratory Protection
Hydraulic fracturing sand contains up to 99% silica. Breathing silica can cause silicosis. Silicosis is a lung disease where lung tissue around trapped silica particles reacts, causing inflammation and scarring and reducing the lungs' ability to take in oxygen. Workers who breathe silica day after day are at greater risk of developing silicosis. Silica can also cause lung cancer and has been linked to other diseases, such as tuberculosis, chronic obstructive pulmonary disease, and kidney and autoimmune disease.

Evidence of Exposure
In a recent NIOSH study, 47% of air samples taken at 11 hydraulic fracturing sites in five states showed concentrations of silica exposures greater than the OSHA Permissible Exposure Level (PEL) and 31% with concentrations of silica equal to or greater than 10 times the Recommended Exposure Limit (REL).

Providing Respiratory Protection
When engineering and work practices controls are not feasible, while they are being implemented, or when they do not reduce silica exposures below OSHA PELs, employers must provide workers with respirators. Whenever respirators are used, the employer must have a respiratory protection program that meets the requirements of OSHA's Respiratory Protection Standard (29 CFR 1910.134). This program must include proper respirator selection, fit testing, medical evaluations, and training.

At less than 10 times the PEL, a half-mask respirator (APF=10) may be worn for compliance. Many companies, however, have adopted the REL over the PEL as the best practice standard since the majority of OSHA PELs are based on recommendations that were made almost 30 years ago (i.e., 1968 Threshold Limit Values of the American Conference of Governmental Industrial Hygienists). Applying this thinking, 31% of the workers in the NIOSH air sample study would need the protection of at least a full-face APR. APRs place a burden on the heart and lungs to draw the air in through the purifying mechanism. A Powered Air-Purifying Respirator (PAPR) provides higher protection (1000 APF for a PAPR with a full-face mask) than a half-mask PAPR and takes the burden off the heart and lungs to draw the air in through the purifying filter since that work is performed by the battery operated fan. Additional benefits of a PAPR include increased comfort and productivity.

Determining the working environment concentrations
The most accurate method is to have an air sample taken and tested by a laboratory. One of the most popular resources for this is www.airtesting.com but a list of consultants is available at www.consultantslisting.org.

Determining the necessary Assigned Protection Factor (APF)?
To calculate the APF required, divide the hazard concentration by the PEL. APF = Hazard Concentration / PEL.

Resources:
OSHA Fracking Hazard Alert http://www.osha.gov/dts/hazardalerts/hydraulic_frac_hazard_alert.html

NIOSH Silica Topics Page http://www.cdc.gov/niosh/topics/silica/

Sample OSHA Respiratory Protection Program (See Appendix IV) http://www.osha.gov/Publications/SECG_RPS/secgrev-current.pdf

NIOSH Respirator-Trusted Source Information Page http://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/RespSource.html

AIHA Whitepaper on PELs http://www.aiha.org/news-pubs/govtaffairs/Documents/whitepaper02_PELs.pdf

RESPIRATORY RESOURCE

Example of Respiratory Protection for the Fracking Industry

Powered Air-Purifying Respirator with Full-Face Mask (APF =1000)



Supplied Air Respirator Options

Half-Mask
(APF = 50)

Full-Face Mask
(APF = 1,000)

Tychem Hood
(APF = 1,000)

3-Stage Filtration
with CO Monitor

7-Stage Filtration
with CO Monitor and
Remote Alarm

Ambient Air Pump Air Source:
Advantages: Portability, no CO monitoring required, high APF, more comfortable than APR.
***Note:** The air inlet must be in a known clean air location.

Compressed Air Source:
Advantages: High APF, can be configured with vortex-action tubes for cooling of up to 45 degrees, can be used with existing rig compressors.

Other Fracking Hazards
Silica is not the only hazard on a fracking site. Care should be taken to prevent harm or injury from all hazards.

Warnings:
This document is not a substitute for a proper hazard assessment by a trained health and safety professional. According to OSHA regulations, the employer is responsible for the health safety of the worker. Oil-lubricated compressors require a high temperature alarm or CO monitor.

Do not use after-market parts. Use ONLY Bullard replacement parts for Bullard respirators. A respirator that includes any replacement or spare part that has not been inspected as part of the respirator manufacturer's quality control plan is in a configuration not evaluated by NIOSH and therefore is not NIOSH-approved. Please consult the respirator manufacturer before purchasing and installing replacement or spare parts to ensure the NIOSH-approved configuration is maintained. Respirators which have been modified by the interchanging of subassemblies or other deviations using parts not produced and distributed under the respirator manufacturer's controlled system no longer meet the definition of being approved as a NIOSH certified respirator, and the use of the NIOSH approval label is not authorized for that unit.
http://www.cdc.gov/niosh/npptl/usernotices/pdfs/UsersNotice05042007.pdf

***Note:** Ambient Air Pumps are not a part of the NIOSH-approval, so a pump from one manufacturer may be used with a respirator from another.

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