Frac Sand Fever, Flocculents and Public Health Fears

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Originally published on Law360, New York (December 12, 2013, 7:01 PM ET)

The "frac sand rush" is well under way in the United States, particularly in the Midwest, where the high-purity silica sand — branded "northern white" — has the ideal size, roundness and hardness for propping open fissures created by hydraulic fracking. And there appears to be no end to the continuing demand for frac sand and the growth of the multibillion-dollar silica industry. In 2013 alone, 56.3 billion pounds of sand are expected to be used by energy companies in their fracking operations.

This unprecedented expansion of frac sand mining, however, has been matched by unprecedented concerns over the long-term health risks posed by frac sand mining operations to local residents. Such concerns, in some Midwest communities, have led to local moratoria that have halted the permitting of additional frac sand facilities until the public health risks of current operations can be further assessed. For instance, Wisconsin's Trempealeau County Board, which issued more frac sand mining permits than any other county in Minnesota or Wisconsin over the past three years, voted overwhelmingly in August to enact a one-year moratorium on the permitting of new sand facilities or allowing
existing sites to expand.

To date, public health fears have primarily focused on respirable crystalline silica, which can be kicked up by silica mining and processing operations and which can, under certain circumstances, lead to silicosis or lung cancer if exposure is not mitigated. But there are growing public fears that the silica industry's use of settling agents or flocculent — "floc" — may also pose serious health risks to nearby residents.

Flocculents

Flocculents are commonly used to remove mud, silt and other impurities while the frac sand is being washed. This improves water recycling and reduces the substantial water demands silica facilities place on local water resources. Flocculents also reduce the acreage required by silica processing sites by eliminating the need for large settling ponds.

One of the most common flocculents used by the industry is polyacrylamide. Although polyacrylamide is believed to be toxic to some aquatic organisms if directly discharged into surface waters, it is not considered harmful to humans. Polyacrylamide has long been used by municipal and industrial water treatment plants to assist the removal solids from

the water. However, polyacrylimade feedstock contains small levels of acrylamide, the monomer from which polyacrylamide is constituted, and research indicates that polyacrylamide can also break down into acrylamide under certain environmental conditions.

This poses a serious public health concern to residents living near silica processing facilities because acrylamide is classified as neurotoxin and probable carcinogen by the U.S. Environmental Protection Agency.

Pursuant to the Safe Drinking Water Act, the EPA has set a maximum contaminant level goal ("MCLG") for acrylamide, which specifies the concentration at which acrylamide is expected to cause health problems. The current MCLG for acrylamide is zero because, among other things, the EPA has found that exposure to acrylamide above the MCLG for relatively short periods of time can damage the nervous system, with effects such as numbness and weakness in the hands and legs.

The EPA has found that chronic exposure to acrylamide at levels above the MCLG may even result in paralysis and cancer. Unfortunately, assays to identify exposure to acrylamide are not readily available to clinicians.

Although acrylamide is known to be biodegradable, it does not bind to soil and will thus move rapidly through the soil column, potentially resulting in an increased risk of surface or groundwater contamination. Because acrylamide has a higher mobility and lower rate of biodegradation in sandy soils than in clay soils, the World Health Organization reports that acrylamide may more easily contaminate groundwater when those soil conditions are present. Such sandy soils are obviously commonplace where the frac sand mining operations are located. Cooler temperatures — like those experienced in the Midwest for much of the year — can also lower the rate of biodegradation.

Although the EPA has set a national primary drinking water regulation for acrylamide at 0.5 parts per billion, there are currently no acceptable means of detecting acrylamide in drinking water. Nor can acrylamide be removed by conventional water treatment processes. For this reason, the EPA has traditionally regulated water treatment operations that use polyacrylamides through a "treatment technique requirement" that limits the allowable residual acrylamide in the polymeric coagulant aids to 0.05 percent by weight and the dosage of polymeric coagulant aid which can be added to raw water to remove particulates, to 1 part per million (ppm).

This essentially means that water treatment plants that use polyacrylamide are required to maintain detailed records of what polyacrylamide flocculent has been used to treat the

water, and to certify that its application has been limited to the regulatory limit on the front end, as there are no satisfactory means of testing the water itself for operator compliance. States may set a more stringent treatment technique level for acrylamide in drinking water than the EPA.

But what the public clamors for as frac sand mining expands — and which does not appear readily accessible — are studies on the concentration of acrylamide in frac sand wastewaters and how those waters may potentially affect surrounding groundwater resources if not properly disposed. And the volume of water at issue is potentially vast: closed-loop processing systems can use between 700 to 1,380 gallons per minute ("gpm"), while open-loop systems that do not recycle process water can use between 2,000 to 3,700 gallons per minute.

The washed sand itself may pose a risk because, once washing is complete, the sand is commonly sent to a surge pile where much of the water adhering to the sand particles infiltrates back into the ground. In addition, because many different mining operations may be located in close proximity to the same populated area, public fears of long-term cumulative exposure from multiple acrylamide sources may also need to be addressed if the frac sand rush is to continue unhindered by unaddressed public health fears and potential litigation.

Prior Acrylamide Litigation

To date, it does not appear that any litigation has arisen regarding the use of polyacrylamide flocculent in frac sand operations. But considering the recent, dramatic upturn in public opposition to the expansion of frac sand operations in some regions, especially in the Midwest, such litigation can be reasonably expected in the future. Even if local residents do not start attributing diffuse nervous system ailments to acrylamide exposure, they may still come to believe that medical monitoring is necessary to protect their health, when faced with the prospect that frac sand mining near their communities may continue for decades.

Demands for medical monitoring, based on alleged acrylamide exposure, was at the heart of a class action — Stern v. Chemtall Inc. — that numerous polyacrylamide manufacturers and distributors chose to settle this past year. Filed 10 years ago in the Circuit Court of Marshall County, W.Va., the complaint alleged that coal preparation plant workers, as well as their offspring, were exposed to acrylamide when the workers added polyacrylamide flocculent to the water needed to process coal.

The class was certified and was headed to trial until the parties reached a $13.95 million settlement agreement at the end of 2012, which was approved by the court this past

August. Under this settlement agreement, a medical monitoring program is being established that will provide free medical examinations to class members who have claimed exposure to acrylamide.

Acrylamide-based litigation in federal court, though apparently infrequent, also demonstrates that acrylamide-exposure suits may not be easy to dismiss on Daubert grounds. In Soutiere v. Betzdearborn Inc., two individuals claimed neurological injuries allegedly sustained as a result of exposure to acrylamide — by their handling of polyacrylamide flocculents — while working at an International Business Machines industrial wastewater treatment plant. The U.S. District Court for the District of Vermont ruled that the plaintiffs' expert opinion that the plaintiffs' peripheral neuropathy was caused by acrylamide exposure was admissible under Daubert.

Although both Stern and Soutiere involved occupational exposure to acrylamide by different routes — inhalation — than the exposure routes potentially facing residents surrounding frac sand facilities, the risk of future litigation over acrylamide contamination of groundwater remains quite real unless risk-management steps are taken and maintained.

Best Practices

Because opposition to frac sand mining tends to be most intense at the local level, frac sand operators are best advised to provide timely information to concerned residents regarding the impact of their operations on local water quality, if not required by permit or ordinance. Town hall meetings are a simple and useful platform to address public health concerns and to drive off unfounded fears at the outset of operations. Because frac sand mining is a new phenomenon in many areas of the Midwest, such educational efforts will go a long way to conquer a general "fear of the unknown" — the root of much litigation.

Frac sand operators should also strictly comply with all federal, state and local regulations and permits regarding their operations. Some states, like Wisconsin, require permitted facilities to record all water treatment additives used in nonmetallic mining operations on a monthly basis. Such records are subject to inspection to confirm that additive usage remains within safe levels. Noncompliance or violation notices from regulatory bodies regarding such additives — especially polyacrylamide flocculent — are a sure-fire way to attract potential litigants.

Non-polyacrylamide flocculents are available for use in the silica industry. but those too may prove controversial because their effects on the human health have not been extensively studied. For instance, diallyldimethylammonium chloride in the presence of

water disinfectants, may lead to formation of N-nitrosodimethylamine, which the EPA has just begun to evaluate as a possible drinking water contaminate. But, to the extent reasonable, if ecologically friendly flocculent alternatives are available, their use should be considered.

Maintaining industry standards regarding polyacrylamide use and the dissemination of those standards will help establish uniformity of usage among industry members. As the frac sand rush continues, inexperienced operators new to the industry will need guidance. If not received, the failure to mitigate potential health risks may be attributed to the entire industry. The result is greater opposition that, inevitably, will force the frac sand rush to a crawl.

—By Joseph M. Russell, von Briesen & Roper, s.c.

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