FracCure
Turbine Aeration

INTRODUCING THE AERATOR THAT WILL SLASH YOUR BIOCIDE COSTS

Frac operators today find themselves being circled by (oftentimes hostile) wagons consisting of the EPA, the Media, environmentalist groups, and a concerned public. The issue is centered mostly on harsh chemical biocides in frac fluids and the use of scarce fresh water.

Both biocides and water are central to reservoir fracturing. Without biocides, bacteria will produce slime, scale, corrosion, hydrogen sulfide gas, and a host of other challenges. Scarce water points to the need for recycling, yet recycling can present its own concerns which also include bacteria. FracCure's revolutionary new turbine aerator can address all of these challenges.

Biocides can be classified as either non-oxidizing or oxidizing. Non-oxidizing biocides have been the industry standard, but they can contribute to corrosion, souring, and a reduced flow rate.

Oxidizing biocides can be effective, fast acting agents for microbial control. Yet, due to their very nature, they can be consumed as oxidizers when they come into contact with organic debris or other contaminants in the water. When the water is loaded with contaminants, these high-dollar biocides are needlessly consumed as oxidizers and are thus lost as disinfectants.

Aeration relieves the oxidative demand placed on biocides by oxidizing the reduced organic, mineral, and sulfur compounds in recycled water. This action reduces the amount, and hence the cost, of biocides needed.

FracCure's turbine aerator works in other ways to reduce biocide levels and to remediate flowback water destined for recycling. By introducing huge amounts of dissolved oxygen into the frac pit, the FracCure turbine aerators stimulate the growth of aerobic bacteria. These

bacteria will "feed" off the nutrients needed by sulfate reducing bacteria (SRB's) and acid forming bacteria (AFB's). Among these nutrients are friction reducers, polymers, and gels contained in frac fluids as well as hydrocarbon and organic residues. With access to these nutrients, SRB and AFB populations can explode downhole and near the wellbore. The result often is biogenic sulfide production leading to souring. Other issues are black water (iron sulfide) production and corrosion issues in flow lines, tanks, and equipment. As the aerobes consume these nutrients, the level of SRB's and AFB's will begin to drop.

SRB's in particular are known for causing corrosion and other problems. Besides reducing the level of SRB's, the dissolved oxygen will oxidize the H_2S they produce.

Other benefits of FracCure's turbine aerator include a reduction in the level of iron, manganese, and organics which are converted to higher insoluble oxides that are easily removed by sedimentation. In addition, the levels of turbidity, suspended solids, and CO_2 are lowered significantly.

Recycling flowback water makes economic sense when the cost for recycling drops below the cost of fresh water acquisition or wastewater disposal. With growing concerns over the use of fresh water, and with more and more public wastewater treatment plants no longer accepting flowback water, the economic shift points directly toward recycling.

Experts cannot agree on the extent to which flowback water must be treated to render it suitable for reuse. Some operators say that fresh water is not mandatory for fracturing. Others say that, at a minimum, efforts should be made to reduce barium, strontium, iron, and sulfates to reduce the risk of scaling. These contaminants are among the host of constituents found in flowback water.

The challenge of recycling is compounded when flowback water sits in a pit, particularly during hot weather. Such water becomes conducive to the formation of

emulsions and sulfidic sludges. These solids must be reduced or removed. Otherwise, they render the water useless for recycling.

SRB's are the culprits again. They use sulfate to complete their metabolic cycle leading to emulsions and sludges as unwanted byproducts. The dissolved oxygen injected by FracCure's turbine aerator can oxidize the reduced organic, mineral, and sulfur compounds in recycled water BEFORE the SRB's can form the emulsions and sludges. If they have already formed, then the aerobes whose growth has been ramped up by the dissolved oxygen will "consume" these emulsions and sludges. The net effect is a separation of the flowback water from solids, entrained hydrocarbons, and frac fluid chemicals.

Once the aerobes consume the nutrients needed by SRB's and AFB's, these anaerobic populations begin to decline. Eventually, the aerobes themselves, being deprived of nutrients, will begin to die off. The result is that the amount of biocides needed for the final "kill" are greatly reduced.

Many service contractors provide onsite remediation of flowback water using technology ranging from filtration to electro-coagulation. Even here, FracCure's turbine aerators can be useful. Pre-treating the water in the pit with dissolved oxygen can remove many of the contaminants that can interfere with the efficient operation of these treatment processes.

Onsite remediation as above requires that frac water be removed, treated, and then returned to the pit. Yet, for many frac operators the frac pit itself, being a controlled lagoon, provides the best environment for flowback water remediation. For these operators the frac pit can and should be at the heart of the treatment process for the recycling of frac water. By installing FracCure's efficient, durable, state-of-the-art aerators in the frac pit, the flowback water can be treated to the point that treatment chemicals and biocides can be more effective. Of importance, and unlike other remediation options, a one-time purchase of a FracCure aerator can provide years of service with no additional purchases necessary.