Safer Products, Environment with Wastewater Treatments

By: Bruce T. Ketrick

Wastewater operators face exposure to a variety of hazardous conditions every day. Depending on the effluent treatment program, the products that condition the wastewater – corrosives, poisons, volatile compounds, solvents, and irritants – can be more hazardous to the operator than the wastewater itself. In the area of odor control alone, a wastewater operator can encounter the toxic and corrosive gas hydrogen sulfide; corrosive gas solvent-based odor-masking agents that irritate skin, eyes, and nose; or pathogenic bacteria formed from the anaerobic activity of solids settling in the waste stream.

The most common odor problem in wastewater is the generation of sulfur compounds. Not only do these compounds have objectionable odors, but they can also be corrosive to the metals they contact and raise a serious health risk to waste treatment operators. They can generate as a by-product of anaerobic bacteria growth (low oxygen levels in the waste) and can form from the sulfur found in the waste product being treated, as well as where a biological digester reduces the organic level of sludge production.

Wastewater facilities use odor-masking agents, oxidizers, essential oils, and mechanical aeration to try to control these odors. The problem is that none of these materials actually absorbs the sulfur compound. This means the sulfur compound is still present as a corrosive and toxic material.

In all cases, the sulfur molecules are still present in the waste stream. So the way to make wastewater safer for the operator is to remove the sulfur compounds. Absorption of the sulfur molecule removes the sulfur molecule from the waste stream. Because the oxidation of sulfur into hydrogen sulfide (H_2S) or sulfuric acid (H_2SO_4) causes the problem – followed by the release of these compounds as an aromatic – absorption of the sulfur molecule removes the sulfur compound odor from the waste stream.

Carbon scrubbing of the air containing the sulfur compound is an effective method for absorbing sulfur compounds aromatically released into the air. However, this practice is costly and requires all waste treatment process air to pass through the carbon scrubber to be absorbed. In most systems, there is an open pond system – a tank or a clarifier – making carbon scrubbing impractical. Yet we know that carbon can absorb sulfur compounds, environmentally safer and not an operator hazard. So how do we take the ability of carbon to absorb a sulfur molecule and extend it to waste streams?

CARBON-BASED PRODUCTS

We look to carbon-based products – in particular, high-reactivity humic acid materials such as lignins. These naturally occurring large carbon-based molecules are comprised of carbon, oxygen, and hydrogen.

The concept of using a material that is formed in nature to improve the conditions in a waste treatment facility is just taking hold in the industry. However, we must look at using more natural methods if we want to ensure a healthier work place and an improved environment. High-reactivity humic-based products are safer to use, allow safer working conditions, and are safer for the environment.

Each lignin molecule contains seven to nine carbon-oxygen and oxygen-hydrogen open bonding sites. This allows lignin to act as an absorbent sponge for odor-producing molecules. Once the sulfur binds onto the high-reactivity humic acid material, the molecule absorbs it. Then the compound binds and locks itself in this molecule and is not available to form an odor-bearing sulfur compound. The extreme size of the high-reactivity humic acid molecule allows it to absorb large quantities of odor-causing compounds.

From an environmental point of view, high-reactivity humic acids or lignin molecules are completely nontoxic and nonhazardous and consist of all natural components. There is no handling problem, no spill problem, and no health risk. By removing the sulfur from the waste stream, you can reduce or eliminate the ability of the sulfur compounds to cause metal corrosion.

Adding a high-reactivity humic acid-based absorbent product to the waste stream as far upstream as possible allows the material as much contact time as possible to absorb sulfur. High-reactivity humic absorbent materials can also be added before primary or secondary clarifiers and before or after a sludge press. Because this product is a solution, you can make additions to the waste stream with a peristaltic pump.

Where odor is present due to waste spills on the ground, operators can spray a solution of humic-based absorbent material with a simple backpack sprayer. As the humic penetrates the soil, it will combine with sulfur compounds, binding them in the humic molecule.

Adding humic-based absorbent products to a waste system lift station will dramatically reduce the hydrogen sulfide in the lift station. Absorption of hydrogen sulfide reduces odor while reducing the corrosive atmosphere in the lift station. Improvement in both of these conditions yields improvement in operations' working conditions.

Combining humic-based absorbent materials with aerobic bacterial will help control odor. Using the proper bacteria package will allow the facility to absorb the sulfur and then consume the material with the aerobic bacteria. This prevents sulfur compounds from forming and becoming a noxious odor.

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