The Fundamentals of Aeration: Narrowing it Down to the Basics

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Summary: As more advances are made in aeration technology, water treatment dealers have another viable option at their disposal. Before choosing aeration, however, professionals should consider the water problems and make certain the technology is applicable to deliver a practical solution.

Most of us are able to picture clean, clear water bubbling over rocks in a brook. Splashing water into the air repeatedly over rocks serves to aerate water and expose it to ultraviolet sunrays that help purify the water. This is one of nature's ways of cleaning water. Aeration, for instance, is the oldest method known for eliminating unpleasant "rotten egg" odor arising from hydrogen sulfide (H_2S) in water. The modern day practice of mixing air and water uses principles found in nature to separate unwanted contaminants from clean water through a similar process. A variation of spraying water into air is pumping air into water, or air spraying. Either method may effectively mix air and water, although the transfer mechanisms may differ. Unwanted contaminants or impurities be-come aerated and some of these oxidized impurities may now be readily separated from water by a process called filtration.

Different processes

Aeration can be a physical process, chemical process, or both. When water containing H_2S, radon, carbon dioxide (CO_2) and methane is physically sprayed into the atmosphere, it may be partially or totally evaporated into the air. When an abundant amount of air is blown into the water, the high concentration of air carries the volatile contaminants away, even when the contaminants may be a little heavier than air. With air given the specific gravity of 1, examples of vapors heavier than air are oxygen, hydrogen sulfide and carbon dioxide.[1] When water is aerated in an enclosed container—that is, under pressure—gassing off these impurities will be less successful than when the aeration occurs in an open container of low pressure.

Methane, $C0_2$ and radon aren't likely to be totally removed in the aeration process in a closed container under pressure. Aeration will gas off these contaminants when the container is de-pressurized to allow venting of unwanted gases and then re-pressurized as desired. Conversely, low levels of hydrogen sulfide—less than 5 parts per million (ppm)—may be fully gassed off under pressure. High levels of H_2S, in excess of 5 ppm, are removed by utilizing a combination of aeration followed by a carbon filter. This gas is colorless, corrosive, flammable and may be poisonous at high levels, especially in wastewater applications. H_2S that's not fully gassed off will be oxidized. Oxidation of H_2S involves a chemical process that converts it to a sulfate precipitate, which may be removed in a carbon filter bed.

Figure 1. The shallow tray process