# "TOO MUCH OF A GOOD THING ISN'T ALWAYS A GOOD THING"

By Jacob Gardner

Despite what Alan Jackson said in his 2015 hit, too much of a good thing is not always a good thing. Aeration is critical in the activated sludge treatment process as it provides secondary treatment as well as nitrogen and phosphorus removal, but over-aeration may be costing you money and system performance.

Most wastewater treatment facilities operate their aeration and aerobic digesters between 1 and 3 mg/L of dissolved oxygen (DO). Operating below that level is not good for the health of your biomass and operating above that level will have a negative impact on your monthly electric bills. Over-aeration can also impact mixed liquor settling times and nutrient removal.

Microorganisms in aeration tanks will start to secrete a sticky film around themselves as their food supply is exhausted. The aeration in the basin mixes the liquid and keeps the bugs in suspension. As the suspended bugs collide, they stick together and form a floc. This floc then falls from suspension in the secondary clarifiers, but if the aeration basin is over aerated, the mixing action may cause the floc to break up before it reaches the clarifiers.

Over-aeration also causes problems in your anoxic zones. Anoxic zones used for denitrification can become somewhat oxic (aerobic) by cycling in water that has too high of a DO level. During nutrient removal, the bugs crave oxygen in their anoxic environment and are forced to pull chemically bound oxygen from nitrate ($NO_3$). If there is freely available and easy to consume oxygen in the water, the bugs will go after the easy-to-get oxygen and derail the desired biological process. In cases where excess oxygen is inhibiting denitrification, operators may be forced to add chemicals to keep the pH and alkalinity of the water in check.

Over-aerating won't just affect your settling and nutrient removal, it will also affect your bottom line. Excess oxygen is coming from blowers and operating these blowers beyond their need can be costly. In many of the activated sludge treatment facilities that I have assessed, blowers consume over 60% of all the electricity used by the treatment facility. Small changes to the aeration can have a large impact on your electric consumption and, in turn, the cost to operate your plant.

So, what should we be doing about over aeration? Each system is going to operate differently, but fine tuning your aeration system could lead to electric savings and process improvements. Aeration design and control changes can be a costly endeavor but monitoring your system's DO with a handheld meter is a great way to start identifying if your system is over aerating and is in need of adjustments. The data should be collected every half hour (a setting on many meters) for a week or so to provide an overview of the DO levels in your basins. Controls can then be adjusted incrementally to get your levels to the desired concentration. Be sure to involve your consulting engineer and regulatory agencies before you make any process changes and to collect data on DO, ORP, and alkalinity throughout any changes to make sure your system is functioning properly.

Works Cited:
"Too Much Air? Understanding the Critical Role of Aeration Systems". Walter Higgins and Jim Kern PE. Treatment Plant Operator Magazine, March 2016

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