



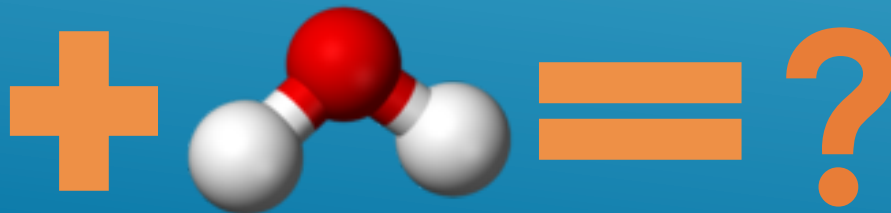
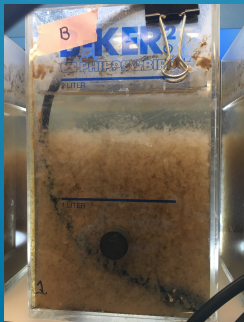
# Effect of a Nitrification Inhibition Compound on Biological Wastewater Treatment

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## Background:

- Sequencing batch membrane bioreactor (SB-MBR) at Mines Park in Golden, CO has potential to treat wastewater and tailor water for immediate reuse
- Nitrification inhibition compounds (i.e. Sodium Azide or NaAz) has potential to induce system failures
- Can effects of inhibitor be quantified to develop fault detection program to allow SB-MBR to run at optimal conditions continuously?



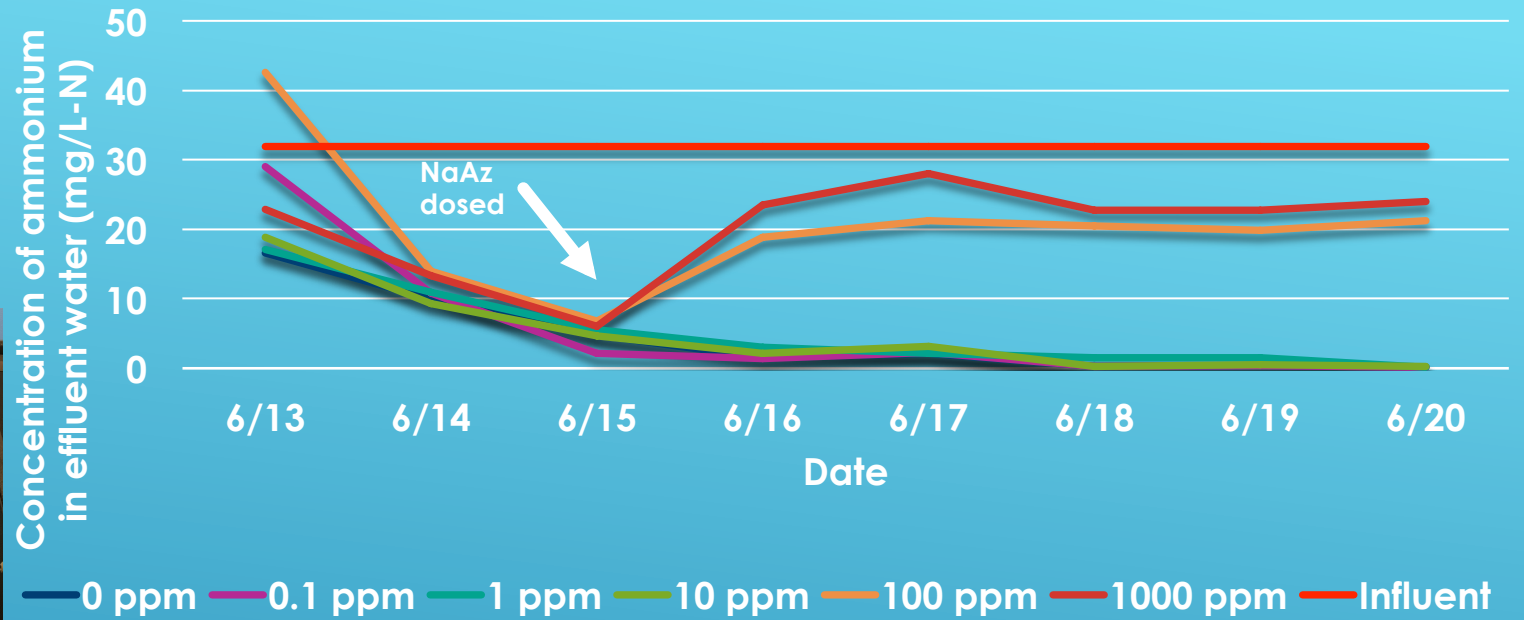
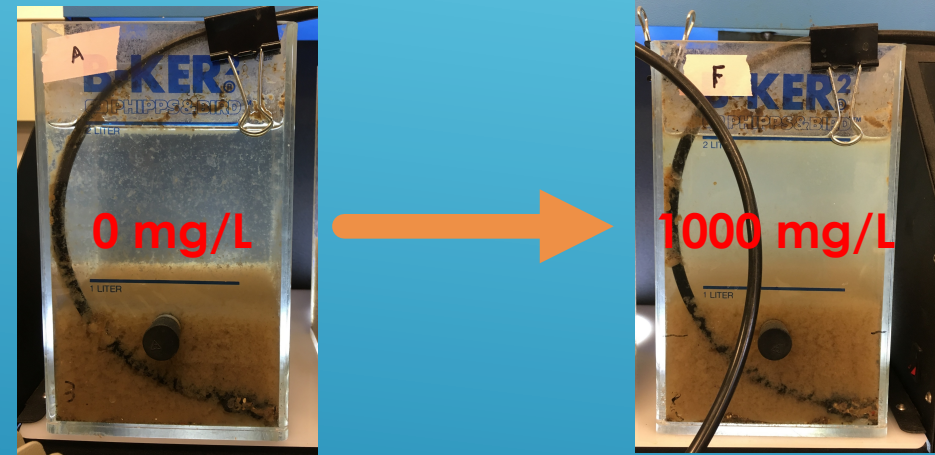
- **Above:** SB-MBR located at Mines Park in Golden, CO
- **Left:** A bioreactor with the addition of an inhibition compound will induce a system failure that we will track under varying conditions

## Experimental Overview:

- **Hypothesis 1:** Herbicides will inhibit biological wastewater treatment from converting  $\text{NH}_4^+$  to  $\text{NO}_3^-$
- **Hypothesis 2:** Degree of sensitivity depends on concentration and duration of perturbation event
- **Hypothesis 3:** Biological system failure can be predicted in comparing online measurements of  $\text{NH}_4^+$  and  $\text{NO}_3^-$  during perturbation and normal conditions

## Results and Conclusions:

- NaAz completely inhibits nitrification at concentrations above 100 mg/L
- NaAz and other related agricultural products have the potential to seriously harm the microbial ecology of biological wastewater treatment systems



- A sensor network can be used to detect perturbation events before the reactor's microbial community is permanently changed
- COD, pH, alkalinity, and conductivity are not as beneficial to detect perturbation events because of their ability to recover to steady state values, compared to nitrate and ammonium levels, which are permanently changed

**Left:** Qualitative differences in floc properties between 0 mg/L and 1000 mg/L in pulse disturbance  
**Above:** Ammonium concentration in effluent water as a function of time during a pulse disturbance showing the accumulation of ammonium at 100 and 1000 ppm suggesting inhibition of nitrification  
**Below:** SB-MBR located at Mines Park in Golden, CO



### Future Work:

- Applying an inhibition compound to SB-MBR
- Examining the effects of a commercial grade herbicide/fertilizer as a nitrification inhibitor
- Further development and implementation of the fault detection program and sensor network