Fluidized Bed and Dissolved Oxygen Measurements

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Procedure

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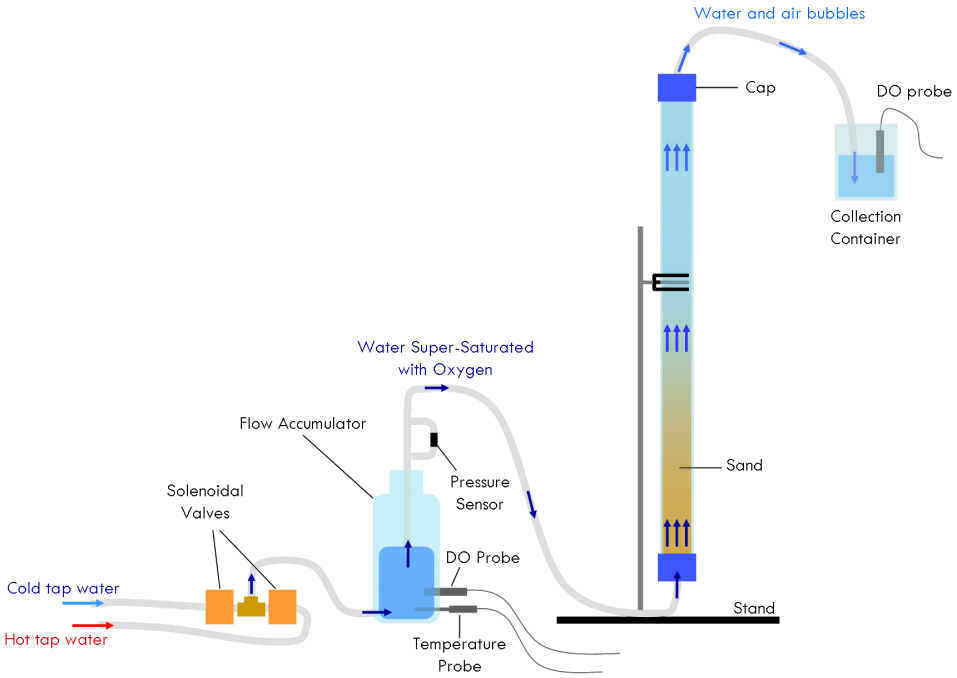

Initial sand filter experimental setup

These are the results of the first several experiments run, with the initial experimental setup. This setup consisted of the flow accumulator and vertical glass filter column. A dissolved oxygen (DO) probe in the flow accumulator recorded the dissolved oxygen concentration of the inflowing tap water. The flow rate and temperature of the water was monitored by a pressure sensor and temperature probe inside the flow accumulator and controlled by valves on the hot and cold water lines. These valves were opened and shut by the program ProCoDA Software. Once the water had run through the filter column, it was collected in a small beaker containing another DO probe, which recorded the dissolved oxygen concentration of the outflowing water.

Results

The first experimental run used glass beads as the filter media and a flow rate of 200 mL/min. The unsuspended filter depth was 32 cm, and the temperature was held at a constant 20 degrees Celsius. #Figure 1 illustrates the change in dissolved oxygen that occurred over time, measured by DO probes. The yellow line represents the DO concentration of the inflowing tap water, and the blue line represents the DO of the outflowing water.

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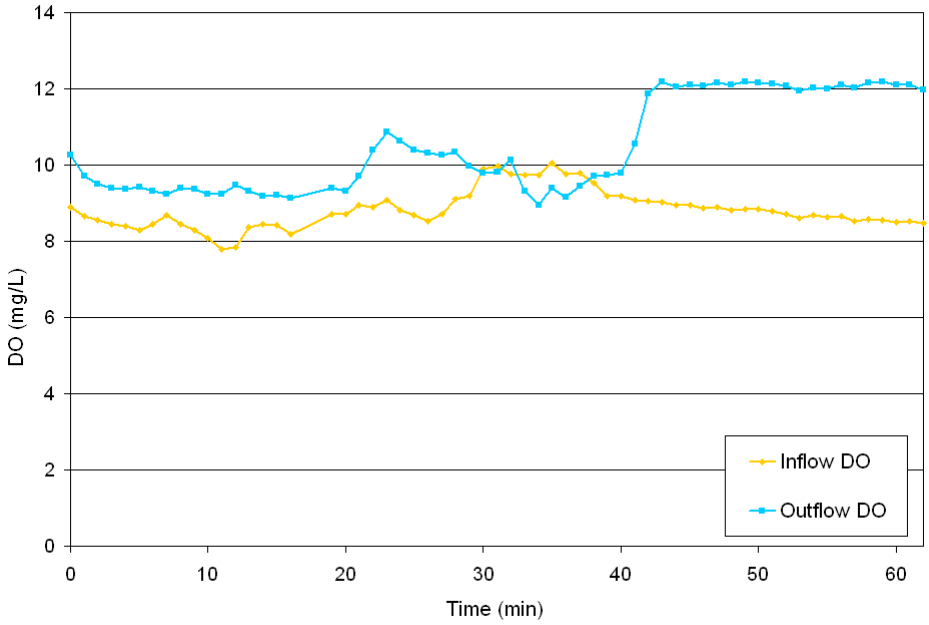

Figure 1: Initial results obtained using glass beads at a flow rate of 200 mL/min and a filter depth of 32 cm.

While the inflow DO concentration was about 9mg/L, the outflow was roughly 11 mg/L. Overall, #Figure 1 shows that the outflow DO concentration was measured as higher than the inflow concentration. This was inconsistent with what we predicted. Though it was possible that this setup would have no effect on the the DO of the water, the DO should not be able to increase inside the system. We found that this was most likely due to the error in the DO probes, which we found were not functioning properly. To download the data file for #Figure 1, click here

Conclusion

We concluded that we needed to purchase a new, more reliable DO probe to measure the oxygen concentration, or else we needed to find another method to measure the DO concentration. We decided to try out the sugar test in future experiments, which involves adding sugar to the outflowing water to see if bubbles form (if yes, then the water is still supersaturated). We also modified our setup to include a bubble collector in order to directly observe the amount of gas leaving the water. Together, the sugar tests and the new setup comprised the second phase of our experiments, which is completely described here.

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