Polluted Waters

The sewer science lab that we completed in class was used as a tool to raise awareness and enlighten us about all of the pollution that is plaguing our local water supply and how to properly filter it out. In this lab, we were trying to learn about and employ the various processes and procedures used in real life sanitation facilities in order to sanitize a sample of water that we polluted intentionally for testing purposes.

Over the four days of testing, the lab consisted of each group taking a turn carrying out each of the measurement procedures. On the first day of testing, my group did the ammonia test, which required us to put 2.5 milliliters of waste water into a 25 milliliter vial, dilute it by a factor of ten using de-ionized water, put 5 milliliters of the waste water into a test tube, then add sodium salicylate, sodium hydroxide, and sodium hypochlorite into the test tube. Next, we then had to shake the test tube and wait 5 minutes. After that time had elapsed, we compared the color to the chart and multiplied the number by a factor of ten. On the second day of testing, my group did the turbidity test, which consisted of filling a sample cell with 10 milliliters of deionized water, then putting the cell into the cell holder. After that, we set the FAU to 0, we filled another cell with 10 milliliters of waste water, replaced the old cell with the new one, and pressed READ to get the turbidity measurement to find the turbidity value. On the third day, we measured the COD levels. We did this by collecting 0.5 milliliters of waste water with a calibrated pipette, and then, using gloves and protective eye wear, we carefully pipetted the water into the COD vial and screwed the lid on tightly. We then heated the vial in an incubator for one hour at 150 C. At this point, we made a new COD vial with 0.5 milliliters of distilled water and put that in the incubator for one hour. When the colorimeter said program 18, we put the COD vial with distilled water into the colorimeter and pressed the button that said zero. After that, we removed that vial, inserted the one with waste water in it, pressed the “read” button, and recorded our results. On the fourth day of testing, we did the pH test. First we obtained a 10 milliliter sample of waste water, put the colored strip of the pH paper into the sample, and then we compared the color of the paper to the chart to find the pH value.

During our lab in class, we recreated many of the procedures used in wastewater treatment plants. We started this lab with primary sedimentation where we let the water sit, which caused the solids to settle at the bottom or float to the top. In our procedure, we just simply put the water in a slanted tank so when we opened a release valve only the liquid would flow out. In treatment plants, they use a similar process except giant paddles push the floating solids into a separate area so they can be processed, whereas we just threw them out. During our testing, we didn’t have the ability to run our water over fixed film reactors, but in waste water plants they run the waste water through them to consume the majority of the organic material in the waste water. Another similarity between the processes we followed in class and those followed in commercial processing centers had to do with the activated sludge, a mass of biodegradable matter and organisms that consumes the rest of the waste water’s biodegradable matter. After we put the activated sludge in the tank, we aerated it so the organisms could survive and grow. We then let the waste water sit and, after a designated time, removed the activated sludge, which was then sent back to be reused. Processing plants also use this process except on a much larger scale with much more water. The same is true of the final part of the filtrating process. In class, we ran the waste water through a dual layer media filter with one layer of sand and one of anthracite coal; waste water treatment plants use this same process.

Despite our best efforts at treating our waste water in this lab, we did not purify the water to a point where it would be safe to release into the bay for numerous reasons. On the one hand, our pH level was 6.5, which is the minimum for discharge into the bay (the range is between 6.5 and 8.5). However, on the other hand, our Ammonia level was 7.5mg/L, which is 4.5mg/L bigger than the 3mg/L maximum limit for discharge into the bay. In addition, the turbidity level of our water was 27.5 FAU, which is 7.5 FAU larger than the 20 FAU limit for discharge into the bay. Lastly, the COD level of our water was an astonishingly high: 134.5mg/L. This is 94.5mg/L higher than the 40mg/L limit for discharge into the bay. Since the waste water does not meet three of the requirements for discharge into the bay, we were unsuccessful in our attempts to purify it.

While the majority of our tests were done correctly, there where ways in which we could improve the purification and measurement of our waste water. The first would be to eliminate human error. For instance, we relied heavily on human sense with the pH test, requiring people to judge how alike two colors look and that might be too subjective. In addition, many of the tests required us to pour precise amounts of water into test tubes, a process that could be messed up by a person misreading the markings on the tube. Another way that we could improve this lab would be to give us a stronger sense of the real world implications and context for what we were doing. One idea is that instead of doing this lab every day in class, we could have a grade wide field trip to a sedimentation plant and follow one batch of waste water as it moves through the various processes. Then when we perform our own tests back in class, we would have a better understanding of what’s going on.