BOD Pro System Maintenance Manual

Priming Reagent Lines – Beginning of the day

At the beginning of a day the system will be used, the lines will need to be filled with fresh reagent. This can either be performed via a shortcut button on the home screen, or performed quickly by turning each pump on manually. The following instructions below describe how to prime the lines.

1. Place the tubing into the reagent bottles below the liquid level in the bottle.
2. Place a large beaker/container under the tips of the level sensor to catch the waste. When priming the dilution pump line, it is best if the tips are in the beaker as the water will eject with some pressure once it reaches the tip. This can be done by moving the autosampler in manual control or by holding the beaker up around the tips.
3. Manually turn on the dilution pump(s) using the switch on the front of the module until the dilution water is ejecting from the tip and there are no bubbles in the lines. Ensure to turn the pump to the auto position to allow the software to control the pump during the run.
    a. Repeat for each of the remaining pumps and ensure to turn the pump back to auto once completed.
    b. This can also be done by turning on the pumps under the hardware tab.

Rinsing out Reagent Lines – End of the day

At the end of each day, it is important to empty the lines of all reagents to prevent growth. This is especially important for dilution and seed solutions since growth can occur very rapidly if left in the lines.

1. Lift the tubing in the reagent bottles above the liquid level in the bottle.
2. Place a large beaker/container under the tips of the level sensor to catch the waste. When priming the dilution pump line, it is best if the tips are in the beaker as the water will eject with some pressure once it reaches the tip. This can be done by moving the autosampler in manual control or by holding the beaker up around the tips.
3. Manually turn on the pumps using the switch on the front of each pump and let them run until the lines are empty. Turn the pumps off. This can also be done by turning on the pumps under the hardware tab.
4. Place the tubing from the reagent bottles into a beaker of DI water.
5. Manually turn on the pumps as above and let the lines fill with DI water.
6. Once sufficient water is present, remove the ends of the tubing from the DI water beaker and let the lines fill with air.
7. When complete, turn the pumps to the auto position.
8. Store the probe in a BOD bottle with 1 inch of water overnight. This can be done manually or by using the 'Park Probe' shortcut button on the home screen.

Changing the DO Probe Membrane – Once a month or as needed

It will be necessary during the operation of the BOD system to change the DO probe membrane and add electrolyte solution to the probe. A shortcut button can be created with a script that allows easy access to the probe without removing it from the system.

The membrane can last anywhere from a few hours to several weeks depending on the nature of the samples being analyzed and how the probe is cared for. Probe readings that are erratic or do not stabilize are the most common indicator that electrolyte needs to be added to the probe or that the membrane needs to be changed.

1. On the home screen, select the '**Change Membrane'** shortcut button.

2. The autosampler will move the probe to the front center of the rack to allow easy access to the membrane.
3. Unscrew the old membrane from the bottom of the DO probe. Fill the new membrane half way with electrolyte, screw it back into place and press '**OK**'.
4. The probe will need to sit for at least 30 minutes in a BOD bottle containing 1 inch of water before calibrating or running samples.

Checking the Flow Rate of a BOD Reagent Addition Pump – Monthly

The flow rate of a pump should be checked once a month or if issues arise with BOD results. Also if any of the tubing is changed on a pump, the flow rate will need to be verified. Flow rate calibration is performed under the Hardware/Pumps tab.

Pump Calibration

The following instructions can be used for any of the pumps present on the BOD Pro system but will be described using a seed pump.

The pump calibration can be done using de-ionized water or seed.

1. Place the end of the tubing in a bottle of seed or a beaker of water.
2. Place a large beaker/container under the level sensor tips.
3. Using the switch on the front of the module, manually turn on the pump until the line is fully primed. Discard any liquid obtained.
4. Place an appropriately sized graduated cylinder (see per chart below) under the level sensor tips
5. In Hardware/Pumps tab, select the pump desired to calibrate the flowrate. Ensure the correct tubing size is selected, and enter in the amount of time to run the pump for (i.e. 30s or 60s). Note: if performing a calibration on a high flow rate pump, such as the dilution pump, a time of 15 or 30 seconds can be used.

Pump	**Approximate Flow Rate (ml/min)**
Dilution	700-800
Seed	10-20
Inhibitor	10-20
Spike	10-20
Rinse	400

6. Record the volume pumped.
7. Repeat at least 2 more times and average the results. Enter the averaged value into the measured volume section.
8. Select the calculator button, then click Save.
9. Once this is complete the flow rate in the software will need to be changed using the instructions below.

With an accurate flow rate, the software will be able to accurately deliver the volumes specified on the run screen.

Replacing Pump Tubing – Once every 3 months

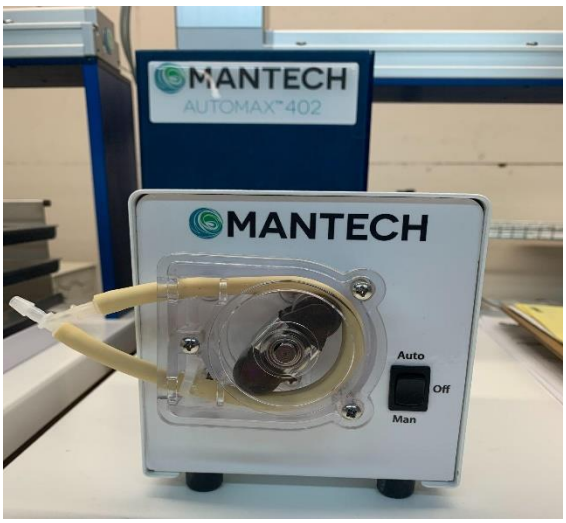
To keep the system running optimally, pump tubing should be replaced every 3 months or when any algae is present in the lines.

Complete tubing kits for each pump can be purchased from MANTECH INC or your local distributor to ensure correct tubing sizes and fittings are used.

1. Remove the rack from the first rack position of the autosampler bed.

2. In BOD Pro, navigate to Hardware/Robot menu. Connect and Home the autosampler. Move to Rack 1 Position 5 in XYZ to lower the probe holder.
   a. Note to adjust the Z height, use the jog feature to go higher or lower.
3. Lift the tubing in the reagent bottles above the liquid level in the bottle.
4. Place a large beaker/container under the tips of the level sensor to catch the waste. When priming the dilution pump line, it is best if the tips are in the beaker as the water will eject with some pressure once it reaches the tip. This can be done by moving the autosampler in manual control or by holding the beaker up around the tips.
5. Manually turn on the pumps using the switch on the front of the module and let them run until the lines are empty. Turn off the pumps.
6. Place the tubing from the reagent bottles into a beaker of DI water.
7. Manually turn on the pumps and let the lines fill with DI water.
8. Once sufficient water is present, remove the ends of the tubing from the DI water beaker and let the lines fill with air. Turn off the pumps and place them in the auto position.
9. Remove the yellow tubing that goes into the pumps.
10. Undo the spiral wrap from around the tubing going to the autosampler arm and detach the tubing from the probe holder by pulling straight up.
11. All tubing should now be free to remove from the system. Note you may want to keep the old lines so that they can be used to measure the new lengths of tubing.
12. To change the inner pump tubing, the faceplate on the pump will need to be removed. Using a Philips screwdriver, undo the four screws holding the faceplate in place.

1/4” Diameter Tubing



1/8” Diameter Tubing

13. Gently pull out the yellow tubing from around the rollers by pulling it towards yourself.

14. Replace with 

the new tubing. In order to get the tubing back around the rollers it is often helpful to manually turn on the pump. This is more easily accomplished with slow speed pumps so be careful if using this technique with the rinse pump or dilution pump as they rotate quickly.
15. Once the tubing is in the place, replace the faceplate and secure it with the 4 screws.
16. Measure out the new tubing and attach it back to the pumps using the fittings included in the tubing kits. Note: the input tubing which comes from the reagent bottle should be attached to the bottom of the pump and the outlet to the probe holder attached to the top.
17. Once all tubing is connected, use the spiral wrap to hold the tubing going to the sampler arm neatly together.
18. Home the autosampler and ensure that there is enough slack in the Z, Y, and X-axes.
19. Perform a flow rate check on the pumps as described above.
20. Rinse the new lines with DI water and then with reagent prior to sample analysis.

Additional Notes

- Clear Tygon tubing can be cleaned out a light bleach solution, followed by a flush with DI water.
- **DO NOT** use bleach for the silver antimicrobial tubing as this will deteriorate the coating inside the tubing.
    - Replace with fresh antimicrobial tubing.

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