SANAA Engineering Recomendations

Recommendations and Ideas from Ing. Pedro Ortiz and Ing. XXXX from SANAA

Sedimentation Tanks

- Said that sedimentation works better at lower temperatures, and that the shade provided by our roof will help with that. Their argument was that the density difference in cooler water makes sedimentation more effective. This doesn't work with my logic, since colder water should be denser, encouraging flocs to float more if they maintain their density. Or perhaps the density of flocs changes more quickly with temperature than the density of water?
- They use deeper tanks
- Their lamella are 1.22 m long instead of our 90 cm.
- They have more space below the entrance tubes, between the entrance tubes and the lamella, and above the lamella.
- Typical tanks tend to be more like 4 m deep.

Sludge Removal

- They think that purging the sludge as much as 1 to 2 times a day is good. Tanks should only have to been emptied and completely cleaned about once a month.
- They isolate the tank and purge it rapidly, dropping the level to the top of the lamella (I'm guessing about 40 cm). They thought they normally close the tank exit (to not drop the level of other tanks) but not the tank entrance.
- For larger tanks, they have a square canal at the bottom where we are going to have the sludge removal tube in a trench. The canal is then covered with cement lids that have orifices. Sludge drains into the canal and then is removed when a valve at the end of the canal is opened.
- They recommend slope toward the centerline and toward one end, much like we are doing. They said if the slope to the centerline is not steep enough (I think ours might not be) sludge can cake up on the bottom when the tank is not purged often enough.

Sludge Blanket

- They think it will be hard to develop a good sludge blanket with our tanks, because there is not enough vertical space below the lamella. The blanket could easily rise up into the lamella and be blown out the top (we think this might be happening sometimes).
- They think a sludge blanket is unnecessary with the upflow velocity that we have. They are used to much less tank area per flowrate. However, they are also used to using filtration after sedimentation. We need to get a lower effluent turbidity (they were talking about below 2 NTU ideally) then they do when they have filters.
- Sludge blanket is easier to achieve with cone-shaped sed tanks, since you get a diminishing velocity that way.
- They way our influent tubes are close to the bottom might be helping us develop a sludge blanket, since it blows sludge up off the bottom of the tank. However, the position of the tubes might also be keeping us from being able to purge sludge well since the influent is blowing sludge away from the sludge removal launderer.
- They thought Monroe's cone idea to keep a constant sludge blanket level might work.

Sed Tank Influent Tubes

- They recommend one large influent tube with orifices in the top (pretty much like our effluent launderer). They think our method works but is more complicated.
- They leave space below their influent tube for sludge to fall. Our influent is at the bottom of the tank. Advantages and disadvantages of this are discussed above in the section "Sludge Blanket".

Foam at Surface

- They say that foam in the floc tank is normal, but not in the sed tank.
- They top of the sed tank should be crystal clear, even if you are not using a skimmer to collect the effluent. This contradicts Chris Bordlemeyer's experience.
- They think the foam is likely due to overdosing with aluminum sulfate.
- They say that with grade A sulfate (fewer impurities) the foam will be white. With grade B sulfate the foam will be brown like we have. I'm not sure what we're using.

Lamella

- They have typically used 6cm lamella spacing, but say that prefab lamella systems often come with much smaller spacing. They thought our 4cm spacing is good.
- They recommended a plastic material called Lonas (used in car floors) for lamella, although they thought that our polycarbonate will work well too.
- Asbestos lamella were used previously until the stopped because of safety concerns.

Effluent launderers

- They recommend only having orifices in the top. This way the orifice is at a uniform level and the path from the top of the lamella to the orifice is larger so that the velocity gradients in the top of the tank are less severe.
- They say that if the effluent launderers are too close to the top of the lamella, there will be high velocity regions near the orifices and very little flow in the parts that are farther from the orifices.
- Moving our orifices to the top would increase the distance (currently rather small) from the top of the lamella to the orifices.

- They recommend a spacing of about 20 cm between orifices.

Chemical barrel feed

- They think there is no problem with using slightly dirty water (20 NTU) for sulfate stock
- Dirty water will not work for chlorine stock.
- They recommend a flexipump, the same think Antonio recommended and we tried in the Ojojona Junta. The one we tried in Ojojona did seem to work well.
- They think that if the barrels are filled with a bucket, the operator will get lazy and just use raw water.

Rapid mix

- They recommend an inline mixer.
- They think it is possible to rapid mix too much. They have seen evidence of this in jar tests.
- It is possible that with our 3 elbows method we are mixing too much. For instance we might get enough mixing in the first elbow and then the second and third add too much.

Chlorine testing

- The DPD sachets we use are expensive and not available here
- They use a chemical called Ortolidina. It comes in a salt form and must be mixed in solution with concentrated HCl in a lab.
- SANAA could likely supply us with prepared Ortolidina solution.
- 5 drops of solution are applied to a sample and then the sample is put in a comparer that can be purchased at swimming pool supply stores.
- The prepared solution lasts a long time if it is stored in a light proof bottle.

Filtration

- They suggest adding a filter after our plant and think it would be easy to do.
- They will send us a design of a German filter that backwashes with the same head that accumulated above the filter when it clogs. The backwash happens automatically when the head loss reaches a certain level.
- Traditional gravity powered rapid sand filters that backwash must be built in banks of four. The pressure from three filters is used to backwash the fourth.
- They say that upflow filters (cleaned with rapid downflow) work. The media gets cleaned well even though it is not suspended. They say the advantage is that the media is not mixed around when you wash it. You can layer the filter how you like, with large media at the bottom, and it stays that way. There is no need to use low density material like anthracite to keep large particles in the first part of the filter. Conversely, in a downflow rapid sand filter, the smallest media tends to end up on top when the media is not uniformly sized. This small media ends up clogging quickly.

Follow-up

- They would like to come and visit before we install the lamella and after they are installed.
- They will send us some of their design files (in Excel) and schematics they have for various filtration schemes.