WA0023370 Twisp POTW TA Visit of 05-23-2012

From: Fleischman, Darrel (ECY) **Report Date: 05-24-2012**

To: Marcley, Richard (ECY)

CC: Smith, Donna (ECY); Huwe, Cynthia (ECY); Barik, Sanjay (ECY); Washington, Diana (ECY)

Re: Technical Assistance

Date(s) contacted: Wednesday, 05-23-2012

Contact venue(s): onsite visit, preplanned

Contacted: Howard Moss (Public Works Director), David Hunter (Operator), K.C. Moriarty (Operator)

Arrived: 0955
Left: 1405
Total Time on site: 4 hr., 10 min.

Narrative:

Recent history:
A summary of violations in the current calendar year, if any, at the subject facility, are identified below. These are obtained from PARIS (Permit and Reporting Information System) records.

David called me on 5-16-12 to make arrangements for me to visit and help them with their settleability problems. It turns out that the process conditions were more convoluted than that.

Violations:
PARIS shows no violations since 2003. The first time I checked PARIS for Twisp violations, it showed one, but today (as of this writing), there are none—perhaps a PARIS hiccup (?). However, a few submittals are due in 2013, and I discussed those with Howard while I was there. I offered to send them the I&I and Wasteload Assessment Excel© templates.

to the Submittals report. This link will add an additional filter for this submittal type, you may need to uncheck other filters to see all versions of this submit

Submittal	Submittal Name	Status	Report Date	Due Date	Received	A
Signatory Requirements	Signatory Requirements - G1	-	-	-	-	-
Infiltration And Inflow Evaluation	INFILTRATION AND INFLOW EVALUATION	-	-	08/31/2013	-	-
Wasteload Assessment	WASTELOAD ASSESSMENT	-	-	08/31/2013	-	-
Application For Permit Renewal	APPLICATION FOR PERMIT RENEWAL	-	-	08/31/2013	-	-
Other	EFFLUENT STUDY OF TEMP RESULTS	Received	-	12/31/2011	12/20/2011	Y
Other	EXFILTRATION TEST REPORT - COLLECTION SYSTEM	Received	-	10/01/2011	02/02/2012	Y
Other	EXFILTRATION TESTING - COLLECTION SYSTEM	Received	12/01/2011	08/01/2011	12/20/2011	Y

This visit:
I met David in the plant lab. He showed me some recently gram-stained slides of the mixed liquor. What he thought were *Nocardi*a sp., are not *Nocardia*, but some other settleability interfering filaments, and they're overrun with them.

We toured the plant while he explained their predicament.

Summary of issues:

1. Solids inventory is high.
2. F/M ratio is low (0.03 by our calculation at the time of my visit).
3. Clarifier sludge blanket level is within 2 feet of the surface during morning peak hydraulic loading.
4. SVI of the undiluted mixed liquor was 188 mL/L; but a mixed liquor sample diluted to 25% with non-disinfected effluent had an SVI of 441 mL/L (poor).
5. Staff was using gallons wasted to gauge their progress trying to decrease the solids inventory; I informed them that they need to keep track of pounds of solids wasted to compare with the active system pounds of solids.
6. They've tried controlling the filaments with chlorine and hydrochloric acid—no good.
7. They hired Otis Hampton as a private consultant, but there was little improvement.
8. They have 5 feet of foam in the aerobic digesters, and the decant pipes (actually telescoping valves) don't have adequate elevation range to be effective. Little digester space remains at present.
9. There's one old clarifier which is hydraulically isolated from the active system which can be used for sludge storage, and temporary storage of drum thickener filtrate.
10. An onsite SOUR test of the mixed liquor showed a value of 7.9 mg O_2/L/g MLVSS/hr. This indicates old sludge, which we already knew.

Troubleshooting activities:

After the plant tour, we discussed the issues with Howard Moss, K.C. Moriarty and David Hunter. I had brought a 15 minute video along about clarifier operations and state point analysis, which I played for the men. I'd also brought along 2 settleometers for settling curve studies on the mixed liquor, along with 2 spreadsheets obtained from an environmental engineer, Dick Darling, in the State of Maine. The spreadsheets are for secondary state point analysis, and are already proving to be handy tools for process control.

Before we got into the actual settling study, Howard had some notes he wanted to ask me about.

Chlorination for filamentous organisms:

I said the chlorination (they used 5 drums of sodium hypochlorite) failed because there is too much chlorine demand with the solids inventory as high as it is. In my (and other operators' experience), the chlorine works better with a lower inventory, and lowering the inventory should be their first priority.

Freezing in the oxidation ditch:

Howard is thinking about adding planks across the top of the ditch to keep it warmer in the ditch; otherwise they get an ice sheet on the surface which thickens with each snowfall. I told him it's worth a try. I'll follow up with an email to him: for super cold days and nights, they could warm the air under the planks with a space heater.

Additives:

A vendor was giving Howard the hard sell about some products to reduce the sludge production and foaming. I told him my opinion is to exhaust the natural and scientific means to control the process, only resorting to expensive chemicals as a last resort, and then only if he consults legitimate references. We discussed hydrogen peroxide, which they tried, to no avail, to reduce the ditch foaming. Also polymer addition, to which I remarked that it provides a very short-lived solution, like overnight, as the charges holding the floc together, dissipate.

Clarifier rake speed:

On my previous visit to Twisp, I remarked about how fast the rake arm in the clarifier was travelling. Howard did some research and from what he read, it should only travel about 2 feet per minute—their clarifier rake is moving at more like a rate of 22 feet per minute. He wanted to know how important it is. I told him that if the rake is moving too fast, they'd already be bulking sludge from the clarifier, and that decreasing the solids

inventory in a calculated manner had higher priority. I offered that for the cost of a new gearbox, they can get the process under control more easily.

ORP control:

Howard told me that they have an ORP probe in place and were semi-practicing anoxic treatment at times of the day. The ORP data is going to their SCADA system (to my knowledge), but it's not associated with any control software (which they can't afford at this time anyway, he said). He wanted to know my opinion about using ORP to control the brush rotors. I said that other plants have feedback loops from DO probes which control rotor speed with variable frequency drives, also expensive. I noted that energy costs for aeration in typical activated sludge plants accounts for 40% of the total energy costs. They could realize buy-back in energy savings from installation of VFDs on their rotors and blowers in about 5 years if they went that route, based on other plants I've visited.

I asked them if they had an effluent nitrogen limit, and they said yes, for ammonia. Their ammonia discharges are very low right now (<0.1 mg/L), so I said unless and until they had a TIN (total inorganic nitrogen) limit, there is no reason to spend the money to implement denitrification unless they wanted to do it for energy savings.

Outdoors:

We continued to discuss control of the solids inventory. David said that when they use the drum thickener too much when they're thickening solids from the aerobic digesters, the filtrate overwhelms the clarifier and they have to quit before the sludge blanket level gets too high. I asked where the filtrate enters the ditch. They showed me a pipe with a tee. I said they could store solids from the active system and filtrate from the drum thickener on alternating days. Then they could pump the filtrate slowly to the ditch during low flow periods (overnight, for example). They liked that idea and were planning to swivel the filtrate discharge tee around so they could attach pipe or hose to it for dealing with the filtrate, that day.

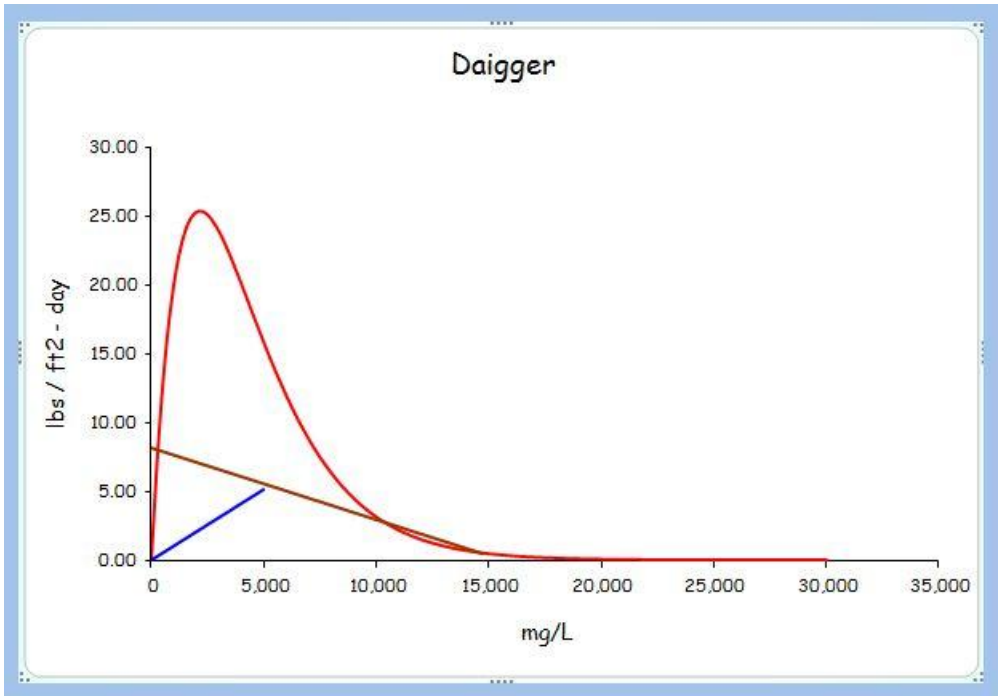
I noticed that the influent screen brushes were worn down flush with the helical metal. I pointed out to them that their screen was mounted so that it could be rotated up to horizontal so they could do maintenance on the lower end of it without entering the influent channel. I suggested they look at the manufacturer's information for the screen to see what it takes to replace the brushes. The brushes help remove grease balls from the influent (a main attractant for *Nocardia* filaments).

Process control tests:

Samples of non-disinfected effluent, mixed liquor and RAS were collected for settling tests and suspended solids. We spent about two hours monitoring settling of various concentrations of the solids samples. We also ran the mixed liquor SOUR (specific oxygen uptake rate) test. Then we fed the results into the SVI-based State Point Analysis models spreadsheet I brought.

This is a screen shot of the resultant chart, based on Glen T. Daigger's model developed in 1995. Without getting into too much detail, the point where the blue line and the brown line would cross is the "state point" for the secondary clarifier. The brown line represents the underflow rate (or thickening). The blue line represents the surface overflow rate. As long as the state point occurs under the area defined by the model settling curve, the clarifier is in good shape, and is able to handle the loading based on the current conditions.

However, the appearance of the brown line outside the settleability curve on the right side indicates that there's a thickening problem. It basically means that if the mixed liquor concentration continues to increase along with the filamentous bloom, under higher than usual influent flows, solids will be lost over the clarifier weir.



David and K.C. found this very interesting. I was going to copy the spreadsheets to their SCADA computer, but they couldn't have used them because that computer doesn't have MS Excel® installed. So I offered to send said spreadsheets via email, along with other process control tools. In passing, they asked if I could improve the function of their Excel® DMR. I said I would request permission to do so.

They thanked me for visiting and sharing my knowledge with them.

End of report