Hysham Notes for 2/10/2023

To Do:

- Main Goal #1: Understand what permanganate is doing to clearwell effluent turbidity
  - Were the following improved readings when the high service pumps were on or off?
    - 0.817 Friday 2/3/23 at 11:06 am (On 9 times for about 10 minutes each 8:00 – 4:30). We need to understand why the high service pumps are cycling on an off so frequently. This doesn't seem right and frequent starts cause wear-and-tear on pumps.
    - 0.769 Friday 2/3/23 at 11:29 am
    - 0.624 Friday 2/3/23 at 1:10 pm
    - 0.513 Saturday 2/4/23 at 8:31 am (going to town)
    - 0.284 Monday 2/6/23 at 8:51 am (done going to town)
    - The conclusion from the above is that the low turbidity readings were from the clearwell and not an artifact of water returning back from the distribution system that may have cleared due to extra settling time in the system.
    - The values have since returned to prior levels in the 0.9 range.
    - A check of permanganate flows on Tuesday showed 250 ml/min (3.0 ppm)
  - Troubleshoot why the permanganate pump is pumping 250 ml/min at 60% vs. 165 ml/min expected based on pump capacity.
    We double-checked the permanganate down-gauge at 215 ml/min (2.6 ppm) compared to 165 ml/min (2.0 ppm) expected based on pump capacity. The permanganate pump in Forsyth also pumps more than expected. I will update the pump curve to reflect actuals.
  - Check feed and effluent manganese and iron
    Raw feed iron was 0.41 ppm.
    We need order Sodium Periodate reagent to run the manganese test. The instrument is a Hach Pocket Colorimeter II Manganese HR. Looking online I found a very similar model with part number 5870015, but the Hysham unit has part number 5953015 listed under the battery cover. I think we probably want Hach Manganese Reagent Set, High Range, 0.1 to 20.0 mg/L, 100 Tests. Hach part number 2430000, USA Blue Book part number 32525, but there is another option I can't rule out yet. I have an email into Davontay at USA Blue Book for some guidance.
  - Install repaired LMI permanganate pump
    We installed the repaired 20 GPH pump. The inlet check valve was non-functional. Forsyth had some spare parts for LMI pumps from before we switched brands. The inlet check is now a double check variety, but is a size down from what is normally on the pump. I tested it in the sink and with worked well and on the pump curve. We tested the flow at varying settings using the down-gauge. We experienced some variability that we will have to watch.
  - Test impact of varying permanganate flow:
    - 3.5 ppm, 4.0 ppm, and 4.2 ppm (target dosage from manual)
      - Bill was running about 250 ml/min (3.0 ppm) from 2/1 to 2/10/23. Clearwell effluent turbidity decreased from the 1.0 NTU range to 0.3, but then returned to the 1.0 range again. Low permanganate flow was suspected, but the 3.0 ppm flow was verified on 2/7/23. We theorized that more permanganate may help, so we dialed the pump to 290

ml/min (3.5 ppm) but were unable to maintain this flow because the filter effluent started to turn pink. We worked the flow back to 250 ml/min (3.0 ppm) and the filter effluent cleared. The following day the flow had to be reduced again when the filter effluent turned pink. The pump was left at 28% which is 233 ml/min or 2.8 ppm permanganate.
    - We were not able to get the clearwell effluent turbidity to drop again. We need to explore this with some experts in manganese and iron removal. I wonder if residence time is too low in the system to achieve precipitation before the filters. To test this, we plan to perform jar testing during the week of 2/13 to test residence time impacts for permanganate and chlorine treatment.
    - We observed that the water leaving the bead chamber was very dark after the air scour and flush cycle was complete as shown in Figure 1. We decided it might be necessary to run the air-scour and flush cycle twice per day (every 3 hours) to prevent excessive buildup. The system appeared better after a second flush cycle as shown in Figure 2.
- Main Goal #2: Understand why automatic valves are unreliable
    - Deep dive on why instruments are sticking
    - Is the issue the valve, air solenoid, or the actuator?
    - The scour air valve to the west unit was open and decommissioned due to past trouble with the valve failing to actuate. It was being run manually when needed. We confirmed that we could operate the valve from the PLC without starting the blower, turned on control air to the actuator, and tested the valve. It stroked forcefully and quickly several times open and closed with no signs of sticking. This indicates there is no issue with this valve sticking or the actuator being under-powered. It is possible that the issues with this valve were related to the plugged air dryer causing low air flows and unreliable actuation. Now that the dryer has been bypassed, this valve seems to be working better.
    - I had questions on which port opens the actuators. From the Bray Series 92 Double Acting Actuator Manual, pressure introduced through Port A (the left port when facing the ports) forces the pistons away from each other and causes the pinion to rotate in a counter-clockwise direction opening the valve.
    - There is an issue with the 5-way solenoid valves used to actuate the valves with many failed parts. We took 3 failed solenoids back to Forsyth for testing. The parts were labeled well with the failure symptoms which will be helpful for troubleshooting. It is possible that moisture or debris is plugging small passages in the valves. The new air dryer with a new filter will help resolve this potential.
    - The Bray Series 6P valve positioners are also experiencing a high failure rate. A follow-up is to investigate what is causing such low reliability. Valve positioners, actuators, and solenoids are normally highly reliable in my experience even with wet air (as long as it is above freezing).
    - Roy identified and repaired an air leak that was causing inadequate air supplies to the level controllers on the west unit. We agreed on a temporary bypass to address a crack on a complex glued together manifold. Level control appeared to work well after the bypass. Follow-up is to repair the manifold which predominantly serves the off-line unit.

- Other Priorities:
  - Troubleshoot ALUM pump slow pumping about 25% of pump curve. Not Started.
  - Discuss new pump curves for flow vs ppm dosage. Complete. I need to update the curves.
  - Share preliminary timeline. Complete.
  - Prepare Diagram with parts list for chlorine system repairs.
  - Check chlorine eductor spare parts status. Hysham has extra eductor heads, a spare #12 eductor tube, and a rebuild kit. We may only need PVC parts for the revamp.
  - Get started with moving turbidity meter. Not Started.

Figure 1 – Water leaving the bead chamber after air-scour and flushing.

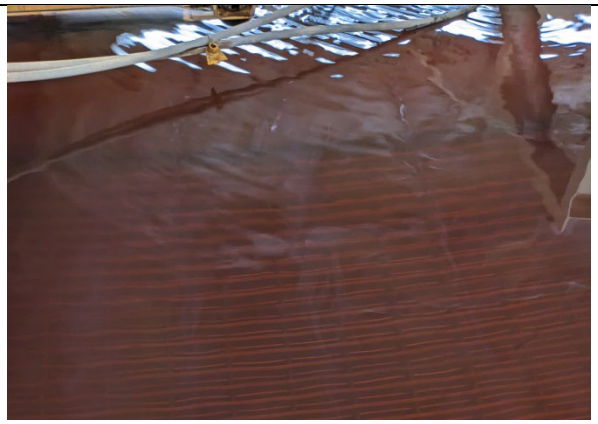

Figure 2 – Top of bead chamber after second flush.