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Allen Harim Harbeson WWTP
Bio-Solids Management Plan

BACKGROUND

The Allen Harim Harbeson Wastewater Treatment Plant (WWTP) is an industrial WWTP that treats water from a large poultry operation. The permitted flow is 2.0 MGD with actual average flows at 1.5 MGD. The Harbeson WWTP produced two types of Bio-Solids that must be disposed of in accordance with Delaware and Maryland regulations. The first sludge is produced from the Dissolved Air Flotation Thickener (DAF) and the second is dewatered aerobically digested waste activated sludge. Process descriptions are as follows:

Dewatered Pressed Sludge with Sanitary Component

The Allen Harim Harbeson WWTP produced approximately 80 to 100 wet tons of dewatered sludge (bio-solids) per week. The dewatered sludge does have a small sanitary component which is less than 3%. The sanitary component will not be present after 2018. Separation of the sanitary waste system is underway and when complete the sanitary waste will be pumped to the Artesian Beaverdam Creek WWTP.

The dewatered sludge has a per cent solids of 20% making it disposable at the Delaware Solid Waste Authority (DSWA) Southern Solids Waste Management Center (SSWMC) in Georgetown, Delaware (see attached analytical (Appendix A), Permit Request (Appendix B) and permit (Appendix C). The dewatered solids is hauled to the DSWA landfill by Clean Delaware who has a current permit to haul the sludge for Allen Harim (Appendix D).

Waste Activated Sludge (WAS): As Return Activated Sludge (RAS) is pumped from Clarifier 1 and Clarifier 2, a portion of the return sludge, known as Waste Activated Sludge (WAS), is pumped to an aerobic digester; either Digester A or B. Aerobic Digestion is the process used to stabilize the solids received from the Clarifiers.

Sludge Digesters: While the WAS sludge fills the Digester, the sludge is continuously mixed by the use of a surface aerator. Once the Digester becomes full, the sludge must be thickened before any further processes. This can be accomplished by turning off the aeration system, which will allow the sludge to settle out while the clearer water (supernatant) is removed by the use of a decant system. The supernatant is returned to the head of the wastewater treatment process and the surface aerator is turned back on to continue sludge stabilization and mixing; followed by dewatering.

Screw Press: Digester sludge is dewatered by the use of a PW Tech Volute Dewatering Press (Screw Press), which can produce a 17-25% cake solid, a high solids recovery, and can dewater sludge up to 120-125 GPM.

The key components are the dewatering drums, which achieve both thickening and dewatering. Thickening occurs at the beginning of each drum and dewatering (pressing) occurs at the end.

Process Description: Aerobically digested sludge from the digesters is pumped into the mixing tank of the press. In this tank, polymer (FOC 64FS) is thoroughly mixed in. From there, the sludge enters the flocculation tank where gentle mixing and flocculation occurs. As the level in the flocculation tank rises, it overflows into the dewatering drums where it is then pressed. The dewatered cake then falls into the SPIRAC Conveyor System which dumps it into an open top trailer for disposal.

Dissolved Air Flotation Sludge (DAF)

The Allen Harim Harbeson WWTP treats poultry wastewater. This poultry wastewater has a high oil and grease content. It is necessary to remove as much of the oil and grease as possible. This poultry waste sludge that is produced does not have a sanitary component therefore it is land applied in Maryland by our sludge hauler Denali Water Solutions. During the winter months when land application is prohibited the DAF sludge is stored in an approved storage facility in Maryland. The Allen Harim Harbeson WWTP

produces approximate 500 wet tons of DAF sludge per week. The most recent analytical for the DAF sludge is attached (Appendix E) along with the Denali Sludge Haulers permit (Appendix F).

Dissolved Air Flotation is a water treatment process that clarifies wastewaters by the removal of suspended matter such as oils, grease, or solids. This removal is achieved by dissolving air into the wastewater under pressure and then releasing the air at atmospheric pressure into the DAF. The released air forms tiny bubbles which adhere to the suspended matter causing it to float to the surface of the water where it may be removed by a skimming device.

Whitewater System: The Whitewater System is located behind Polymer Tank 3 and its purpose is to provide the dissolved air into the DAF. The main components of the Whitewater System are a pump, a stainless steel aeration tube, and an air compressor. The whitewater pump draws clarified water from the bottom end of the DAF and pumps it into the aeration tube which provides additional hydraulic retention time under pressure. Once the water is forced from the aeration tube, it's pumped to the front of the DAF and enters at the bottom of the tank. The control system (HMI) for the Whitewater System is located in the MCC Room. Training on the HMI will be provided.

Our DAF is the long, blue, rectangular shaped basin located inside the WW Main Building. The Raw Water from the Flow Equalization Basin (FEB) is pumped to here. Remember: PAC and Polymer are injected into the water before it reaches the DAF. The water enters at the front of the DAF, which is at the end of the catwalk; or yet the back end of the WW Main Building. The water is pumped through a 10 inch grey PVC pipe and forced downward into the tank. As the water comes up, the WW operator should see a separation of the solids in the water. These solids will float to the surface of the DAF, creating a brown colored blanket. This blanket, known as DAF Sludge, will then be skimmed off into a hopper and pumped to a frac tank; which is then hauled off site by tankers.

Operating the DAF: In order to become a good DAF Operator, you must be persistent. The quality of the DAF Effluent and DAF Sludge will change at times and will require immediate action. It is <u>NOT</u> recommended to make a change to chemical settings and then walk away; expecting your adjustments to work out. A poor quality effluent can have negative effects on downstream treatment processes. The best practice is to make an adjustment, which is

mainly the PAC pump settings, and then watch the incoming water entering the front of the DAF. There you will see the reactions taking place and you will immediately know whether to adjust the chemicals again.

Wastewater enters the DAF at a rapid pace, normally around 1300 GPM. Close observation is needed to see the solids separation (floc). With the perfect chemical feed rate settings, the floc will be about the size of a grain of rice or smaller. And the floc will quickly cover the surface of the DAF. If the floc is large, most likely it's caused by overfeeding the PAC, therefore, the pump settings must be lowered a little at a time.

Checking the pH levels on the DAF Influent and DAF Effluent is a good way to put you in range of your required PAC feed. An excessive PAC feed will lower the pH and therefore you must back off the pump speed. If the pH is too high, then you will need to increase the PAC pump speed. Sanitation shift usually has higher pH levels due to their caustic based cleaners and will require the WW Operator to increase PAC pump settings to lower pH of DAF Influent.

Operator Responsibilities: Operating the DAF can be complicated, therefore, it requires lots of attention from the operators to ensure the DAF system is producing good sludge and a high quality effluent. All WW operators are required to perform frequent turbidity and pH testing on the DAF Effluent (see DAF Effluent Turbidity and pH testing procedures). Operators are expected to be able to perform chemical feed adjustments to both the PAC and Polymer pumps in order to achieve and meet our turbidity and pH goals. Those goals are listed below:

- DAF Effluent Turbidity: 50 FAU or less
- DAF Effluent pH: 5.9 - 6.3
- DAF Influent pH: 6.7 - 6.9
- DAF Polymer Feed Rate: 12,000 – 13,000 mL/min

Sludge will accumulate on the surface of the DAF and will become thicker as the DAF treats the incoming wastewater. A skimmer will push the sludge into a hopper at the end of the DAF and the operators will need to monitor the level in the hopper; as well as the sludge on the surface. Once the level in the hopper reaches near to full, the sludge must be pumped to the Frac Tank by

the use of the DAF Sludge Pump. This pump should not be run dry, therefore, operators should stay close by to ensure it doesn't. It is also required for all operators to monitor the Frac Tank level throughout their shifts. Sludge overflows are not wanted..... At about 2 feet from being full, the sludge hauler, Denali, should be notified if no tankers have been in to haul sludge.