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A monthly newsletter from the Maine Department of Environmental Protection for wastewater discharge licensees and treatment facility operators and employees.

February 2013

Adventures in Technical Assistance

Every wastewater facility in Maine measures the amount of flow going through the plant each day. Usually, there is a flume or a weir and upstream of that there is a device that measures the height of the water and, based on well-known principles, converts that height to a flow that is recorded on a chart and totaled for the day. The operator reads the totalizer, subtracts the number read yesterday from today's number, and records the flow on the 49 form. Some facilities record the flow coming into the plant and other record the flow leaving the plant. In the case of activated sludge, trickling filters and RBC plants, it usually doesn't matter where the measurement is made, but for lagoon facilities that have storage capabilities, the effluent flow reading is preferred for regulatory purposes.

The flow readings are used to determine detention times in various tanks, but, if you neglect internal recycle flows, you may be assuming that the detention time in certain tanks is longer than it really is. For example, if an operator is returning RAS from the clarifiers to the aeration tanks at a rate equivalent to 100 percent of influent flow, the total flow "seen" by the aeration tanks is twice the influent flow. If the tanks have a theoretical detention time of 6 hours, the actual detention time for water in the tanks May be a little as three hours. Short detention times in the activated sludge aeration tanks can cause poor BOD removal and filamentous bulking.

Another consideration is how the recycle rate affects the food to microorganism (F:M) ratio in your system. If you are returning sludge from your clarifiers at a fixed rate, you are moving a fixed amount of solids back to the aeration tanks every hour. For example, if the average daily flow to your facility is 1 MGD; your return rate is set to 750,000 gallons/day and the return sludge from you clarifiers contains 1 percent solids, you will move about 2,600 pounds of solids back to your aeration tanks every hour. During the day, when most of the food is coming into the plant, the F:M ratio may be 0.35, which is right in the middle of the recommended range for conventional activated sludge treatment. An F:M ration of 0.35 means that for every pound of BOD coming into you aeration tanks, there are about 2.6 pounds of "bugs" available to eat that food. If the return rate is constant, but the flow, and therefore, food coming into the plant drops off at night, the F:M ratio may change enough to cause problems with the process. This is the type of "mass balance" relationship that engineers love, but operators are often bored to tears by. But it's important to consider how the system performs all the time, not just when flow are "normal." I always recommend that the re

Technical assistance continued on back

For Practice:
Wastewater Operator Practice Exam Questions

1. The pressure gauge on the discharge side of a pump reads 23.2 psi. What is the discharge pressure head?
   a. 73.8 feet
   b. 53.6 feet
   c. 33.9 feet
   d. 22.1 feet
2. For the most accurate test results, the preferred number of colonies on the plate of a fecal coliform bacteria test is
   a. 200 - 500 colonies
   b. 100 - 200 colonies
   c. 20 - 60 colonies
   d. 10 - 20 colonies
3. The loading from your primary clarifiers to your aeration basin is fairly constant and your RAS concentration is also fairly constant. If you increase the RAS pumping rate, what will the effect be on the activated sludge process?
   a. The MLSS concentration in the aeration tank will increase.
   b. The F/M ratio will go up.
   c. The OUR rate will increase.
   d. The possibility of denitrification in the secondary clarifiers will be greater.
4. A rectangular channel is 24 inches across by 18 inches deep. If the water in the channel is 9 inches deep and moving at the rate of 6 feet per second, how much water will move through the channel in 2 hours?
   a. 64,800 gallons
   b. 191,000 gallons
   c. 486,000 gallons
   d. 540,400gallons

Answers on back

Wastewater Operator Certification News

Registrations for the Spring 2013 exam, which will be given on May 15, must be postmarked by March 27 or delivered to the JETCC office by March 29.

Upcoming Training

*February 14 in Fairfield- Use of Polymers in the WW Process - Sponsored by JETCC – Approved for 3 hours

*February 14 in Fairfield- Flocking & Coagulation - Sponsored by JETCC – Approved for 3 hours

*February 26 in Portland- From Source Water to the Estuary - Sponsored by JETCC and Co-Sponsored by MWUA – Approved for 6 hours

*February 27 in Waterville– Hand-on Laboratory Analyses - Sponsored by MRWA – Approved for 6 hours

*March 5 in Orono - Trustees Training (5:30 – 8:30) - Sponsored by JETCC – Approved for 3 hours

*March 7 in Kennebunkport - Overview of Pump Stations - Sponsored by JETCC – Approved for 6 hours

*March 12 in Portland - Mechanical Power Transmission Basics - Sponsored by JETCC – Approved for 6 hours

*March 14 in Rockland - Creating an Replacement & Repair schedule - Sponsored by JETCC – Approved for 6 hours

*March 21 in Augusta - Regulatory Briefing, DOL Expectations and Intro to Maine WARN - Sponsored by JETCC – Approved for 6 hours

*March 26 in Kittery - Care of Emergency Generators - Sponsored by JETCC – Approved for 6 hours

*March 27 in Scarborough - Social Media & on the job Use of I-pads, tablets & Androids - Sponsored by JETCC – Approved for 6 hours

*March 28 in Bangor - Pumps 101 - Sponsored by JETCC – Approved for 6 hours

*April 2 in Saco - Energy Workshop - Sponsored by JETCC – Approved for 6 hours

*April 2 in Mars Hill - Trustees Training (5:30 – 8:30) - Sponsored by JETCC – Approved for 3 hours - Sponsored by JETCC – Approved for 6 hours

*April 3 & 4 in Presque Isle – North Country Convention - Sponsored by JETCC – Approved for up to 12 hours

*April 11 in Fairfield - Process Control - Sponsored by JETCC – Approved for 6 hours

*April 23 in Topsham - GIS, Data Collection & CCTV to Manage Assets - Sponsored by JETCC – Approved for 6 hours

*April 24 in Lewiston - Intro to Composting (for Solids Management) - Sponsored by JETCC – Approved for 6 hours

*April 30 & May 7 in Yarmouth - Math Review - Sponsored by JETCC – Approved for 6 hours

*May 21 in Portland - Settleability Problems & Loss of Solids with Michael Gerardi - Sponsored by JETCC – Approved for 6 hours

*May 22 in Southern Maine - Hands-On Microscopy with Michael Gerardi - Sponsored by JETCC – Approved for 6 hours

Note: JETCC stands for Joint Environmental Training Coordinating Committee - P.O. Box 487, Scarborough, ME 04070-0487, Tel: 207-253-8020 – www.jetcc.org

MWUA stands for Maine Water Utilities Association - 150 Capitol Street, Suite 5, Augusta, ME 04330, Tel: 207-623-9511 www.mwua.org

MRWA stands for Maine Rural Water Association – 254 Alexander Reed Rd, Richmond, Maine 04357, Tel: 207-737-4092 – www.mainerwa.org

Technical assistance from front

turn rate be paced to the influent flow whenever possible. That give a better chance to maintain a constant F:M ratio and keep the bugs happy.

Please look at the flows inside your plant as well as the flow coming in the door. The better you understand how flow affect loadings and detention times, the better chance you have to maintain a good quality sludge that removes BOD efficiently and settles well in your clarifiers leaving high quality effluent to discharge to the environment.

Dick Darling, Maine DEP Senior Environmental Engineer

For Practice Answers

1. a 1 psi = 2.31 feet of water 23.2 * 2.31 = 53.59 which rounds up to 53.6 feet of water
2. c According to *Standard Methods*, the preferred number of colonies is 20-60 on a plate for the fecal coliform membrane filtration test. This number is enough to assure that the count is reasonable and yet no too many to chance many multiple bacteria growing together to form a single colony.
3. a The Concentration of mixed liquor (MLSS) in the aeration tank will increase because more sludge will be returned to the aeration tank. The F/M ratio will decrease because the food (loading from the primary clarifiers) remains constant. The OUR rate will go down because there are more bugs to use the oxygen. The possibility of denitrification in the secondary clarifiers will decrease because more sludge is being withdrawn, giving a shorter detention time in the clarifiers.
4. d 24 in X 9 in = 216 sq. in = 1.5 sq.ft X 6 ft./sec. = 9 cu. ft./sec.

   9 cu. ft./sec. X 2 hr. X 60 min./hr. X 60 sec./min. = 64,800 cu. ft.. X 7.5 gal./cu.ft. = 486,000 gal.

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