Certification Boulevard

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Test Your Knowledge of Wastewater Disposal

1. What typically happens to the ORP of final effluent when the ammonia concentration in the effluent increases?
   a. The ORP value increases.
   b. The ORP value decreases.
   c. The ORP value remains the same.
   d. Ammonia concentration has nothing to do with ORP values.

2. What term is typically used to identify toxicity on wastewater effluent discharged to an open body of water?
   a. $CBOD_5$
   b. TOC
   c. TTHM
   d. WET

3. Which chemical is typically used to adjust effluent pH (between 6.0 to 8.5) before being discharged to a surface-water outfall?
   a. Lime
   b. Polymer
   c. Sodium Hydroxide
   d. Alum

4. What typically happens to the chlorine demand of reclaimed water when the nitrate concentration is elevated from 4 mg/L to 8 mg/L?
   a. The chlorine demand doubles
   b. The chlorine demand is cut in half
   c. The chlorine demand is fairly unaffected by nitrate concentrations
   d. The chlorine demand is tripled

5. What may be typical permit values for nitrogen and phosphorus in effluent being discharged to open bodies of water in Florida?
   a. TN greater than 5 mg/l … TP less than 2.0 mg/l
   b. TN less than 0.1 mg/l … TP greater than 1.5 mg/l
   c. TN about 3.0 mg/l … TP about 3.0 mg/l
   d. TN less than 3.0 mg/l … TP less than 1.0 mg/l

6. Given the following data, what is the annual budget for chlorination of reclaimed water at this plant?
   • Plant flow is 7.5 mgd.
   • Chlorine residual is 2.4 mg/L.
   • Chlorine demand is 6.9 mg/L.
   • Cost of chlorine is $0.24 per pound.
   a. $50,958 per year
   b. $13,150 per year
   c. $37,808 per year
   d. $24,657 per year

7. What is the flow entering a reclaimed-water storage tank if the tank volume is 0.14 mg and the detention time is 3.5 hours?
   a. 583,000 gals per day
   b. 1.2 mgd
   c. 0.96 mgd
   d. 312,500 gals per day

8. What is considered to be a neutral pH?
   a. 6.5
   b. 14.0
   c. 10.0
   d. 7.0

9. What is the equivalent in gpm of a pipe that has 1 mgd flowing through it?
   a. 694 gpm
   b. 1,440 gpm
   c. 133,690 gpm
   d. 11.6 gpm

10. What is the demand for chlorine if the residual is 1.1 mg/l and the amount of chlorine applied is 7.4 mg/l?
    a. 7.3 mg/l
    b. 6.5 mg/l
    c. 8.5 mg/l
    d. 6.3 mg/l

ANSWERS ON PAGE 58

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Do you have a question or an exercise you would like to feature in "Certification Boulevard?" We'll be glad to publish it. Just send your question (with the answer) or your exercise (with the solution) to:

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There is no limit to the number of questions or exercises you may submit. Please include your name, city, and organization or company so we can give you credit.

Certification Boulevard Answer Key

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1. **b. The ORP value decreases**
   Ammonia and ORP values are typically inversely proportional to each other … when one goes up, the other goes down.

2. **d. WET**
   WET stands for Whole Effluent Toxicity

3. **c. Sodium Hydroxide**
   Water that is disinfected with chlorine and then dechlorinated with sulfur dioxide may require a chemical to stabilize the pH within the required 6.0-to-8.5 range. A common chemical used for this application is sodium hydroxide … caustic soda.

4. **c. The chlorine demand is fairly unaffected by nitrate concentrations**
   Nitrate (NO_3) values have little to no affect on demand for chlorine in the disinfection process. However, nitrites (NO_2) will consume about five times their weight in chlorine before a residual is detected.

5. **d. TN less than 3.0 mg/l … TP less than 1.0 mg/l**
   Typical AWT standards in Florida, especially for effluents discharged to open water bodies, are something no greater than 3.0 mg/l for Total Nitrogen (TN) and no greater than 1.0 mg/l for Total Phosphorus (TP).

6. **a. $50,958 per year**
   Lbs/day of chlorine used
   = flow, mgd x (residual, mg/L + demand, mg/L) x 8.34 lbs/gal
   = 7.5 mgd x (2.4 mg/L + 6.9 mg/L) x 8.34 lbs/gal
   = 581.7 lbs/day

   Cost per day
   = lbs/day chlorine x cost per pound
   = 581.7 lbs/day x $0.24 per lb
   = $139.61 per day

   Cost per year
   = cost per day x 365 days/year
   = $139.61 per day x 365 days/year
   = $50,957.65 per year

7. **c. 0.96 mgd**
   Flow in gpd
   = Tank Volume, gals x 24 hrs/day ÷ Detention Time, hrs
   = 140,000 gals x 24 hrs/day ÷ 3.5 hours
   = 960,000 gallons per day

8. **d. 7.0**
   The pH scale is 0 to 14; 0 to 6.9 is acidic, 7.0 is neutral, 7.1 to 14 is basic (alkaline)

9. **a. 694 gpm**
   1,000,000 gals per day ÷ 1,440 mins per day
   = 694 gals per min per mgd

10. **d. 6.3 mg/l**
    The formula for chlorine demand is: chlorine supply minus chlorine residual

    Demand = Supply - Residual
    = 7.4 mg/l - 1.1 mg/l
    = 6.3 mg/l demand