

# Operator Quiz Test No. 113 – Nutrient Removal

The following questions are designed for trainees as they prepare to take the ABC wastewater operator test. It is also designed for existing operators to test their knowledge. Each issue of *Clear Waters* will have more questions from a different section of wastewater treatment. Good luck!

- Denitrification is accomplished by:
    - Converting ammonia to nitrite
    - Converting ammonium to nitrate
    - Converting nitrate and nitrite to nitrogen gas
    - Converting nitrate to nitrite
  - Denitrifying bacteria need which of the following conditions to denitrify:
    - Aerobic
    - Anoxic
    - Anaerobic
    - Acidic
  - Nitrogen can be removed from wastewater biologically by which of the following methods:
    - Gas Stripping
    - Activated Sludge
    - Breakpoint Chlorination
    - Ion Exchange
  - Kjeldahl nitrogen consists of:
    - Organic nitrogen and ammonia nitrogen
    - Inorganic nitrogen and ammonia nitrogen
    - Inorganic nitrogen and nitrite
    - Inorganic nitrogen and nitrate
  - In order to denitrify dissolved oxygen concentration should be:
    - 0.3 – 1.0 mg/l
    - Greater than 1.0 mg/l
    - Less than 0.3 mg/l
    - 0.0 mg/l
  - When ammonia stripping is used to remove nitrogen, the pH should be:
    - Less than 7.0
    - Between 7.5 and 8.5
    - Between 9.0 and 10.0
    - Between 10.5 and 11.5
  - Which of the following is least likely considered when applying chemical for phosphorus removal?:
    - Mixing zone
    - Flocculation zone
    - Injection point
    - Ambient air temperature
  - A stable inorganic form of phosphorus found in waste streams is called:
    - Orthophosphate
    - Polyphosphate
    - Organic phosphate
    - Paraphosphate
  - Which of the following is not commonly applied to wastewater for phosphorus removal?:
    - Ferrous Chloride
    - Ferric Chloride
    - Sodium Hypochlorite
    - Aluminum Sulfate
  - Which application is not typically considered when trying to remove phosphorus from wastewater?:
    - Tertiary filtration aided by the addition of chemicals
    - Enhanced biological nutrient removal
    - Chemical addition of aluminum or iron salts
    - Incineration of settled sludges
- Use the information below to answer the following questions.**
- Plant Flow: 4.5 MGD  
Influent P concentration: 1.5 mg/l  
Aeration tank volume: 2000 cu.ft.  
Effluent P concentration: 0.5 mg/l
- What is the influent plant loading of phosphorus?:
    - 56 mg/l
    - 56 lbs/d
    - 5.6 mg/l
    - 5.6 lbs/d
  - What is the phosphorus removal efficiency?:
    - 34 percent
    - 66 percent
    - 1.0 percent
    - 10 percent

Answers from page 61: 1 C, 2 B, 3 B, 4 A, 5 C, 6 D, 7 D, 8 A, 9 C, 10 D, 11 B, 12 B

For those who have questions concerning operator certification requirements and scheduling, please contact Tanya May Jennings at 315-422-7811 ext. 4, [tmj@nywea.org](mailto:tmj@nywea.org), or visit [www.nywea.org/OpCert](http://www.nywea.org/OpCert).

# Operator Quiz Test No. 113 – Potpourri

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- Which of the following digester conditions would have the most potential to result in low quality supernatant?:
  - Feed sludge point is too close to the supernatant draw-off point
  - Regular sludge withdrawal
  - Digester gas monometer readings equaling the digester gas compressor controller set point
  - Maintaining digester temperature of 98°F
- Sludge conditioning in a centrifuge is regulated by all of the following except:
  - Sludge feed rate
  - Bowl speed
  - Polymer dosing rate
  - Conveyor belt speed
- Step-Feed aeration is most accurately described as:
  - A process using digested sludge to maintain nutrient balances
  - A process that uses one tank for reaeration and for treating primary effluent
  - A process that allows a slug of primary effluent to pass through a tank without mixing with other primary effluent entering the tank
  - A process that adds primary effluent at several locations along the length of an aeration tank
- Calculate the food to mass ratio with the following data:  
Aeration tank influent flow 2.0 MGD  
Aeration tank influent BOD 100 mg/l  
Aeration tank size 15'x30'x100'  
MLVSS 2,000 mg/l
  - 0.3
  - 0.6
  - 0.15
  - 0.08
- A bar screen exhibits a large difference in upstream and downstream channel levels. This is most likely attributed to:
  - High grit levels in the channel
  - Blinding
  - Lower than average water flows
  - Higher than average water flows
- Given the following information, calculate the total flow in gallons after 1-minute of flowing through this channel. Assume the channel is rectangular and full.  
Channel Width: 5.0'  
Channel Depth: 2.0'  
Velocity: 3.5 ft/sec
  - 2,100 gal
  - 292 gal
  - 15,700 gal
  - 17,520 gal
- Detritus in wastewater can best be described as:
  - Sludge
  - Grit
  - F.O.G
  - Struvite
- Which of the following statements is correct?:
  - 1 HP-hour is equal to 0.746 kW-hour
  - 1 cubic foot is equal to 8.34 gallons
  - 100 ml is equal to 1 liter
  - 1400 minutes is equal to 1 day
- What is the detention time of a round secondary clarifier with a depth of 12 feet, a diameter of 130 feet and an influent flow of 11.25 MGD?:
  - 1.5 hours
  - 0.3 hours
  - 2.5 hours
  - 0.7 hours
- The logarithm of the reciprocal of hydrogen ion activity can best be represented by:
  - pH
  - H<sup>-</sup>
  - H°
  - PSI

Answers from page 61: 1 A, 2 D, 3 D, 4 A, 5 B, 6 C, 7 B, 8 A, 9 C, 10 A

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# Operator Quiz Test No. 114 – Activated Sludge, Etc.

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- Which of the following is not used to monitor and adjust the return activated sludge flow rate in a conventional activated sludge system?:
  - MCRT
  - SVI approach
  - Settleability test
  - Clarifier sludge blanket indication
- Clouds of billowing sludge that occur throughout secondary clarifiers and sludge thickeners when the sludge does not settle properly are called:
  - Floater
  - Bulking
  - Blinding
  - Floc
- A good activated sludge composition will contain which of the following abundant protozoa:
  - Thiothrix and actinomycetes
  - Worms and nematodes
  - Rotifers and stalked ciliates
  - Filamentous bacteria and fecal coliform
- The term OUR can best be described as:
  - The amount of oxygen activated sludge uptakes at a specific rate
  - The amount of oxygen dissolved in wastewater
  - The amount of oxygen contained in an anaerobic digester
  - The amount of ozone needed to disinfect secondary effluent
- An aeration system is experiencing an increase in DO and an increase in floc over the secondary clarifier weirs resulting in higher than normal TSS in the effluent. The operator notices the blower output has remained constant. What can be the cause of this?:
  - An organic waste load
  - A toxic waste load
  - An inorganic waste load
  - A polymer leak making its way into the waste stream
- Of the following, the most precise piece of lab equipment for measuring liquid would be:
  - Beaker
  - Graduated cylinder
  - Erlenmeyer flask
  - Pipette
- How many gallons of a 15% sodium hypochlorite solution would be required to make up 115 gallons of 9% solution?:
  - 69 gallons
  - 192 gallons
  - 34 gallons
  - 155 gallons
- An anionic polymer will have:
  - A positive charge
  - A negative charge
  - A neutral charge
  - No charge
- Determine the hydraulic loading rate of a trickling filter using the following specifications:  
6250 gpm flow rate  
140' diameter  
11.25 MGD  
6' deep
  - 1585 MGD/ft<sup>2</sup>
  - 585 GPD/ft<sup>2</sup>
  - 975 GPM/ft<sup>2</sup>
  - 115 GPH/ft<sup>2</sup>
- What is the chemical formula for sulfuric acid?:
  - HCL
  - H<sub>2</sub>SO<sub>4</sub>
  - NaOH
  - HNO<sub>3</sub>

Answers from page 61: 1.A, 2.B, 3.C, 4.A, 5.B, 6.D, 7.A, 8.B, 9.B, 10.B

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