ABC Wastewater Collection Level 2 Practice Exam (Sample)

Study Guide

BY EXAMZIFY

Everything you need from our exam experts!

Questions

1. **The surface overflow rate for a settling tank is calculated from which formula?**
    - A. Volumetric flow divided by the tank volume
    - B. Volumetric flow divided by the tank surface area
    - C. Product of the volumetric flow and tank surface area
    - D. Sum of the volumetric flow and tank surface area

2. **What is the equivalent of 1 cu ft/sec in mgd?**
    - A. 30,024 gph
    - B. 500 gpm
    - C. 0.72 mgd
    - D. 0.65 mgd

3. **What is the required MLSS concentration if the desired solids loading rate is 40 lbs/day/sq ft for a clarifier with a flow of 6.5 MGD?**
    - A. 4615 mg/L
    - B. 3707 mg/L
    - C. 3517 mg/L
    - D. 3920 mg/L

4. **The optimum growth of nitrifying bacteria is typically in a pH range of ____________**
    - A. 6.5 to 7.5
    - B. 7.5 to 8.5
    - C. 5.5 to 6.5
    - D. 8.5 to 9.5

5. **If adding sodium bicarbonate to an anaerobic digester for pH control, care should be taken not to overdose because ____________**
    - A. CO2 will be consumed and can result in a vacuum in the tank
    - B. Sodium toxicity can result
    - C. Calcium carbonate can precipitate and cause problems
    - D. pH may spike above 12.0

6. **If a digester reduces volatile solids by 55%, how many lbs/day of volatile solids are destroyed per cubic foot of digester capacity?**

   A. 0.06 lbs VS destroyed/cu ft.

   B. 0.1 lbs VS destroyed/cu ft.

   C. 0.02 lbs VS destroyed/cu ft.

   D. 0.04 lbs VS destroyed/cu ft.

7. **What factor can influence the operational conditions of a digester?**

   A. Influent chemical composition

   B. Biological activity rates

   C. Temperature changes

   D. All of the above

8. **When chlorine is introduced to hydrogen sulfide gas, the hydrogen sulfide is ______________?**

   A. Oxidized and made odorless

   B. Diluted to a weaker concentration

   C. Not affected

   D. Concentrated

9. **What is a common operational challenge associated with anaerobic digesters?**

   A. Excessive oxygen supply

   B. Maintaining temperature

   C. High nutrient removal

   D. Low sludge volume

10. **Potassium permanganate is used for ______________**

    A. Stabilization

    B. Disinfection

    C. Coagulation

    D. Odor control

Answers

1. B
2. D
3. B
4. B
5. B
6. C
7. D
8. A
9. B
10. D

Explanations

1. The surface overflow rate for a settling tank is calculated from which formula?

A. Volumetric flow divided by the tank volume

B. Volumetric flow divided by the tank surface area

C. Product of the volumetric flow and tank surface area

D. Sum of the volumetric flow and tank surface area

The surface overflow rate (SOR) is an important parameter used to evaluate the performance of a settling tank. It is specifically defined as the volumetric flow rate of wastewater entering the tank divided by the surface area of the tank. The rationale behind this calculation is that it helps determine how effectively the tank can separate solids from liquids based on the flow rate across its surface area. By dividing the volumetric flow by the surface area, one obtains a flow rate that indicates how much liquid is passing over each unit area of the tank's surface over a specified timeframe. This information is crucial because it can impact the tank's ability to allow solids to settle due to the residence time and the dynamics of the flow. A higher surface overflow rate suggests a greater likelihood that particles may be carried over with the flow rather than allowing them to settle, which can lead to inefficiencies in treating wastewater. Understanding the correct calculation of surface overflow rate is vital for designing and operating wastewater treatment facilities effectively, ensuring they can meet regulatory requirements for effluent quality.

2. What is the equivalent of 1 cu ft/sec in mgd?

A. 30,024 gph

B. 500 gpm

C. 0.72 mgd

D. 0.65 mgd

To convert cubic feet per second (cu ft/sec) to million gallons per day (mgd), it's important to understand the relationships between these units of measurement. 1 cubic foot is equivalent to approximately 7.48 gallons. Therefore, to convert 1 cubic foot per second to gallons, you multiply by 7.48. First, calculating for 1 cu ft/sec to gallons per day involves the following steps: 1. **Convert cu ft to gallons: \(1 \text{ cu ft} \times 7.48 \text{ gallons/cu ft} = 7.48 \text{ gallons}\). 2. **Convert gallons per second to gallons per day**: There are 86,400 seconds in a day. Therefore, you multiply the gallons per second by the number of seconds in a day: \(7.48 \text{ gallons} \times 86,400 \text{ seconds/day} \approx 645,120 \text{ gallons/day}\). 3. **Convert gallons to million gallons**: Since 1 million gallons is 1,000,000 gallons, you divide by 1,000,000: \(645,120 **

3. What is the required MLSS concentration if the desired solids loading rate is 40 lbs/day/sq ft for a clarifier with a flow of 6.5 MGD?

A. 4615 mg/L

B. 3707 mg/L

C. 3517 mg/L

D. 3920 mg/L

To determine the required Mixed Liquor Suspended Solids (MLSS) concentration based on a solids loading rate and flow rate, you need to understand the relationship between these variables. The solids loading rate provides a means to calculate the necessary solids concentration to achieve the desired treatment performance in a clarifier. In this scenario, the desired solids loading rate is 40 lbs/day/sq ft, and the flow rate is 6.5 million gallons per day (MGD). The first step is to convert the flow rate from MGD to cubic feet per day, as the solids loading rate is given in pounds per square foot per day. 1 MGD is equivalent to approximately 7.48 cubic feet, which means: \[6.5 \text{ MGD} \times 7.48 \text{ cf/MG} = 48.62 \text{ cubic feet/day} \] Next, to find the area of the clarifier, which is necessary for calculating the actual solids loading in terms of lbs/day, we would divide the total flow by the loading rate: \[Solids \, Loading \, Rate = \frac{Total \, Solids \, Load}{Area} \] Rearranging

4. The optimum growth of nitrifying bacteria is typically in a pH range of ____________

A. 6.5 to 7.5

B. 7.5 to 8.5

C. 5.5 to 6.5

D. 8.5 to 9.5

The optimum growth of nitrifying bacteria occurs in a pH range of 7.5 to 8.5. This range is slightly alkaline, which is conducive to the metabolic processes of nitrifying organisms. Nitrifying bacteria, such as nitrosomonas and nitrobacter, are responsible for the conversion of ammonia into nitrite and then into nitrate, a crucial part of the nitrogen cycle. A pH level within 7.5 to 8.5 supports their enzymatic activity, promoting higher rates of nitrification. In this slightly basic environment, the bacteria can efficiently perform their functions, leading to effective nitrogen removal in wastewater treatment systems. Outside of this pH range, especially in more acidic conditions, the activity of these bacteria can be inhibited, leading to reduced nitrification efficiency and potential buildup of ammonia, which can be toxic to aquatic life. Understanding the specific pH requirements of nitrifying bacteria is key for operators in the wastewater industry to ensure optimal treatment performance and compliance with environmental regulations.

5. If adding sodium bicarbonate to an anaerobic digester for pH control, care should be taken not to overdose because ________

A. CO_2 will be consumed and can result in a vacuum in the tank

B. Sodium toxicity can result

C. Calcium carbonate can precipitate and cause problems

D. pH may spike above 12.0

Adding sodium bicarbonate to an anaerobic digester is a common practice used to help maintain optimal pH levels for digestion processes. However, it is important to monitor the dosage carefully because overdosing can lead to sodium toxicity. When excessive sodium bicarbonate is introduced, it increases the concentration of sodium in the digester, which can negatively affect microorganism activity. These microorganisms are crucial for breaking down organic matter in the digester, and high sodium levels can inhibit their growth and overall performance. Therefore, maintaining a balanced approach when adding sodium bicarbonate is key to preventing toxicity that could impede digestion and disrupt the operational efficiency of the anaerobic treatment process.

6. If a digester reduces volatile solids by 55%, how many lbs/day of volatile solids are destroyed per cubic foot of digester capacity?

A. 0.06 lbs VS destroyed/cu ft.

B. 0.1 lbs VS destroyed/cu ft.

C. 0.02 lbs VS destroyed/cu ft.

D. 0.04 lbs VS destroyed/cu ft.

To determine how many pounds of volatile solids are destroyed per cubic foot of digester capacity, it's important to consider the process happening within the digester. A reduction of volatile solids by 55% means that for every 100 lbs of volatile solids, 55 lbs are effectively broken down or destroyed. To convert this percentage reduction into a measurement per unit volume (cubic foot) of digester capacity, we must acknowledge that the total mass of volatile solids being treated is spread throughout the entire volume of the digester. Without the precise context regarding the total volatile solids present in the digester per cubic foot or the specific capacity of the digester, a direct calculation may seem tricky. Using a hypothetical example, if we assume a certain volume of digester has a known amount of volatile solids and we apply the 55% reduction, we can then understand that this volume will yield a specific amount of volatile solids destroyed per cubic foot. In the context of choosing an answer, and considering typical numbers used in this field, the answer that best aligns with common calculations and expectations of volatile solids destruction rates in wastewater treatment would be to indicate that approximately 0.02 lbs of volatile solids are destroyed per cubic foot of digester capacity. Hence,

7. What factor can influence the operational conditions of a digester?

A. Influent chemical composition

B. Biological activity rates

C. Temperature changes

D. All of the above

The operational conditions of a digester are influenced by multiple factors, which includes the influent chemical composition, biological activity rates, and temperature changes. Each of these factors plays a crucial role in determining how efficiently a digester functions. The influent chemical composition affects the types and amounts of organic matter present in the digester. This composition determines the availability of nutrients for the microorganisms, which in turn influences the efficiency of the digestion process. Depending on the characteristics of the incoming wastewater, the digester may need to adjust its operation to optimize treatment. Biological activity rates are central to the digestion process as they directly relate to the microbial populations within the digester. The rates at which these microorganisms convert organic material into biogas and digestate can fluctuate based on environmental conditions, such as pH and nutrient availability. High biological activity typically results in more efficient digestion, thus enhancing the overall performance of the digester. Lastly, temperature changes can significantly affect both the biological activity and the chemical reactions occurring within the digester. Temperature influences the metabolic rates of the microorganisms; for example, higher temperatures can accelerate digestion processes while lower temperatures may slow them down. Maintaining an optimal temperature range is crucial for ensuring efficient digestion and maximizing biogas production. Given all these interconnected

8. When chlorine is introduced to hydrogen sulfide gas, the hydrogen sulfide is _____________?

A. Oxidized and made odorless

B. Diluted to a weaker concentration

C. Not affected

D. Concentrated

When chlorine is introduced to hydrogen sulfide gas, the hydrogen sulfide undergoes an oxidation reaction. In this process, chlorine acts as an oxidizing agent, converting hydrogen sulfide (H_2S), which has a characteristic rotten egg odor, into sulfate or other less volatile compounds. This reaction effectively eliminates the offensive odor, making the gas odorless. This oxidation process is significant in wastewater treatment and odor control systems where hydrogen sulfide can pose health risks and unpleasant odors. The ability of chlorine to oxidize hydrogen sulfide makes it a valuable tool in managing wastewater and ensuring compliance with environmental standards. The transformation of hydrogen sulfide into sulfate results in a substance that is less harmful and less malodorous, improving the overall safety and quality of the treated wastewater.

9. What is a common operational challenge associated with anaerobic digesters?

A. Excessive oxygen supply

B. Maintaining temperature

C. High nutrient removal

D. Low sludge volume

Maintaining temperature is a critical operational challenge associated with anaerobic digesters because these systems rely on specific temperature ranges to optimize the microbial activity necessary for digestion. Anaerobic digesters typically operate most efficiently at mesophilic (around 30-40°C) or thermophilic (around 50-60°C) temperatures. Fluctuations in temperature can lead to inhibited microbial function, reduced gas production, and lower overall efficiency of the digestion process. If the temperature drops too low, it may adversely affect the digestion rates and the health of the anaerobic microbial community, potentially resulting in operational failures. The other challenges listed do not primarily align with the operational aspects of anaerobic digesters. Excessive oxygen supply is counterproductive in anaerobic processes where oxygen must be excluded for the system to function properly. High nutrient removal typically pertains to other treatment processes rather than being an inherent challenge of anaerobic digestion itself. Low sludge volume is often considered a benefit of effective anaerobic digestion, as the process generally reduces the volume of sludge produced compared to aerobic processes, and is not viewed as an operational challenge.

10. Potassium permanganate is used for _____________

A. Stabilization

B. Disinfection

C. Coagulation

D. Odor control

Potassium permanganate is commonly used for odor control in wastewater treatment processes. Its strong oxidizing properties make it effective in breaking down organic compounds that contribute to unpleasant smells. When added to wastewater, potassium permanganate reacts with odorous substances, neutralizing them and reducing their concentration, which in turn helps to improve the overall quality of the water and mitigate odor issues. In the context of wastewater treatment, the use of potassium permanganate is particularly valuable because it not only helps eliminate odors arising from hydrogen sulfide and other malodorous compounds but also has some capability for disinfection, albeit to a lesser extent compared to other agents. This dual functionality emphasizes its importance in maintaining an acceptable level of water quality and compliance with regulations regarding odors in wastewater facilities.