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Continuing Education Course #278
Introduction to Wastewater Clarifier Design

1. What is the Clarifier Sidewater Depth?
 - a. Clarifier weir depth
 - b. Total depth of the clarifier
 - c. Depth of the sludge accumulation
 - d. Depth of the clear water zone

2. Which of the following features is an advantage for rectangular clarifiers?
 - a. Longer flow path
 - b. Longer sludge detention time
 - c. More simple sludge collection system
 - d. Lower overall maintenance requirements

3. Rectangular tank unit width is selected usually based on available standard sizes of sludge collection mechanisms?
 - a. False
 - b. True

4. Length-to-width ratio of rectangular clarifiers is typically in a range of?
 - a. 1:1 to 2:1
 - b. 1:15 to 1:30
 - c. 3:1 to 15:1
 - d. 1:3 to 1:15

5. Sidewater Depth of Rectangular Clarifiers is Usually Less than 4 feet – True or False?
 - a. True
 - b. False

6. Sidewater Depth of Circular Clarifiers is Always Larger than Their Diameter – True or False?
 - a. True
 - b. False

7. Diameter of the conventional center feed well for circular clarifiers is what percentage of the diameter of the clarifier:
 - a. 15 to 25%
 - b. 5 to 10%
 - c. 30 to 50%
 - d. 5 to 10%

8. Enhanced clarifiers have:
 - a. Vertical depth of 25 feet or more
 - b. Double bottom

- c. Lower surface overflow rate than conventional clarifiers
 - d. Inclined (lamella) plates
9. What is the typical total suspended solids (TSS) removal rate of primary clarifiers as percentage of influent TSS?
- a. 95 to 100%
 - b. 75 to 85%
 - c. 50 to 65%
 - d. 5 to 10%
10. Flocculating center feed wells are used to enhance the performance of primary clarifiers – True or False?
- a. True
 - b. False
11. Primary sedimentation tanks are typically designed for effluent weir loading rate of less than?
- a. 5,000 gpd/ft of weir length
 - b. 190 gpd/ft of weir length
 - c. 1,000 gpd/ft of weir length
 - d. 500 gpd/ft of weir length
12. A widely accepted practice to prevent sludge septicity in primary clarifiers is to?
- a. Remove sludge continuously or very frequently from the clarifier's bottom
 - b. Use aerated grit chambers upstream of the primary clarifiers
 - c. Pump activated sludge to the primary clarifiers
 - d. Install lamella settlers
13. The optimum primary sludge concentration is?
- a. 0.5 to 1.0%
 - b. 6.0 to 8.0%
 - c. 3.0 to 5.0%
 - d. 1.0 to 2.0%
14. Turbidity of the raw wastewater has significant impact on clarifier performance – True or False?
- a. True
 - b. False
15. Use of equalization basins will be beneficial for clarifier performance if wastewater plant influent flow peaking factor ?
- a. exceeds 2.5
 - b. is lower than 2.0
 - c. equals 1.5
 - d. never exceeds 0.5

NOTE: The following question was revised on 3 July 2018

16. Ballasted flocculation processes is suitable for handling of transient flows – True or False?
- a. True
 - b. False
17. The minimum design sidewater depth recommended for wastewater treatment plants with wet weather peaking factors higher than 2.5 is?
- a. 10 to 12 feet
 - b. 3 to 4 feet

- c. 14 to 16 feet
- d. 5 to 8 feet

18. Operating activated sludge system at lower solids inventory (lower mixed liquor suspended solids concentration) has potential to improve clarifier performance – True or False?

- a. True
- b. False

19. What is the recommended maximum return activated sludge (RAS) recycle rate during rain events to minimize disturbing clarifier performance:

- a. 1%
- b. 5%
- c. 10%
- d. 50%

20. Which of the following activities will not mitigate transient flows?

- a. Use of shallow clarifiers
- b. Installation of adjustable effluent weirs on the aeration basins
- c. Use of step-feed aeration
- d. Implementation of activated sludge contact stabilization

21. Installation of in-line grinders for the intake screenings will decrease the quantity of primary sludge – True or False?

- a. True
- b. False

22. What is the recommended design retention time for aerated grit chambers used for pre-aeration/septicity control?

- a. 2 to 5 minutes
- b. less than 5 minutes
- c. 10 to 20 minutes
- d. 1.5 minute

23. How much influent alkalinity expressed as CaCO_3/mg of Fe is consumed for chemical precipitation of phosphorus using iron coagulant?

- a. 2.7 mg as CaCO_3/mg of Fe
- b. 5.8 mg as CaCO_3/mg of Fe
- c. 4.17 mg as CaCO_3/mg of Fe
- d. 8.0 mg as CaCO_3/mg of Fe

NOTE: The following question was revised on 3 July 2018

24. Retaining sludge in the clarifier for a long time will prevent denitrification and phosphorus release in the secondary clarifiers?

- a. True
- b. False

25. Maintaining high solids blankets in the secondary clarifiers deteriorates effluent water quality in plants with biological nutrient removal (BNR) – True or False?

- a. True
- b. False

26. What is the typical primary sludge concentration if the clarifier cannot carry sludge blanket and sludge withdrawal is continuous?

- a. 4 to 6%
- b. 2 to 3%
- c. 0.5 to 1.5%
- d. 3 to 5%

27. Co-thickening of primary and secondary sludge usually has detrimental effect on the overall performance of the primary clarifiers – True or False?

- a. True
- b. False

28. The recommended primary sludge concentration for optimum performance of anaerobic digesters is?

- a. 1 to 2% solids
- b. 3 to 4% solids
- c. 6% solids
- d. More than 8% solids

29. Aerobic digestion favors feed sludge concentration of 4 to 6% solids – True or False?

- a. True
- b. False

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