Exam Math Review
Treatment Systems
Grades III & IV
Practice Problems

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Math Problems

Wastewater Characteristics

1. How many pounds of BOD are received at the treatment plant, if the flow is 900,000 gpd and the BOD influent concentration is 235 mg/L?

2. An industry produces 23,000 pounds of BOD per day. If the average resident is assumed to produce 0.2 pounds of BOD per day, what is the residential equivalent of the industry?

Screenings

1. How many 3 yd³ dumpsters a day will have to be supplied for a mechanical bar screen that removes 1.3 yd³ of material per million gallons. The flow through the plant is 2.5 MGD.
Grit Removal

1. If the influent wastewater has 28 pound of grit per 10,000 gallons, and the grit removal process unit captures 90% of it. The flow through the plant is 3.1 MGD. how many pounds of grit are removed per day?

Sedimentation

1. If the efficiency of the primary clarifier is 55% and the TSS influent to the clarifier is 280 mg/L. What is the TSS effluent from the clarifier?

2. How gallons of wastewater are there in a 45 foot diameter primary clarifier that operates at 10 foot sidewall depth? Assume the clarifier has a 2 foot deep conical bottom.
3. A polymer has a specific gravity of 1.3, will it float or sink? What is its weight per gallon?

Biological Treatment

1. An activated sludge plant has two 55 foot diameter aeration tanks, each are 12 feet deep. The MLSS concentration in one tank is 3,500 mg/L, and the other concentration is 4,000 mg/L. Sludge is wasted at a rate of 450 lbs./day and the effluent concentration is 2 mg/L. If the flow through the plant is 1.35 MGD, what is the SRT of the plant?

2. The activated sludge system has two 55 foot diameter aeration tanks and three 40 foot diameter clarifiers. Both the tank and the clarifiers are 10 foot deep. Due to sludge accumulation the aeration tank has 85% of its volume available, and the clarifiers have 78% available. One clarifier is out of service for repairs. If the flow into the system is 4 ft³/s, how long does it take for wastewater to be treated?
3. A trickling filter plant receives 28,000 pound of COD per day. If the primary clarifiers remove 32% of the COD, what is the organic loading rate in lbs/1,000 ft³? The plant has two trickling filters both 80 foot in diameter and 6 feet deep.

4. An oxidation ditch has a volume of 0.75 million gallons. The MLSS concentration in the ditch is 3,800 mg/L. The influent BOD is 230 mg/L and the plant has a flow of 0.5 MGD. The volatility of the influent is 65%. What is the F/M ratio?
Clarification

1. What is the total clarifier surface area of the treatment plant. The treatment plant has two 40 foot diameter primary clarifiers and three 45 foot diameter secondary clarifiers?

2. If the efficiency of the primary clarifier is 55% and the TSS influent to the clarifier is 280 mg/L. What is the TSS effluent from the clarifier?

Filtration

1. A 25 foot by 10 foot granular media filter is backwashed at a flow rate of 200 gpm. If the filter's backwash cycle is for 5 minutes, how high will the media rise under backwash, assuming that the media has a specific gravity of 1.
2. A rapid sand filter can be loaded at a hydraulic rate of 5 gallons per square foot per minute. What is the maximum daily flow rate of a 25 by 15 foot filter?

Disinfection

1. What is the chlorine feed rate per day for a flow of 1.5 MGD with a dose rate of 15 mg/L.

2. If a treatment plant requires 200 pounds of "free" chlorine a day for disinfection, how many pounds of sodium hypochlorite at 15% will be needed?