



Certification Boulevard

Roy Pelletier

Test Your Knowledge of Miscellaneous Topics

- Given the following data, what is the Specific Oxygen Utilization Rate (SOUR) in an aerobic digester?
 - OUR test starting D.O. is 6.9 mg/L.
 - OUR test ending D.O. is 4.2 mg/L.
 - OUR test time is 10 minutes.
 - Digested sludge total solids concentration is 1.7 percent.
 - 2.1 mg/hr/gm TS
 - 0.95 mg/hr/gm TS
 - 1.64 mg/hr/gm TS
 - 9.5 mg/hr/gm TS
- Based on the correct answer in Question No.1, is this SOUR acceptable to meet Class B standards for Vector Attraction Reduction requirements?
 - Yes.
 - No.
 - SOUR does not apply to aerobic digestion.

- What does the unit parts per million (ppm) mean?
 - 1 pound per million pounds
 - 1 gallon per million gallons
 - 8.34 pounds per million gallons
 - 1 milligram per liter
 - All of the above
- What does hydrogen sulfide (H_2S) smell like at low concentrations?
 - No smell
 - Chlorine
 - Rotten eggs
 - Sulfuric acid
- Why does scum float on the surface of a primary clarifier?
 - Because its specific gravity is greater than water.
 - It is mainly inorganic material.
 - Because its specific gravity is less than water.
 - Scum does not float ... it sinks to the floor of the clarifier.
- What two laboratory analyses are necessary to calculate the F/M ratio?
 - Aeration MLVSS and influent $CBOD_5$
 - Aeration MLSS and OUR
 - Aeration MLVSS and effluent $CBOD_5$
 - Aeration MLSS and influent $CBOD_5$

- What adjustment should be made if solids are rising in the secondary clarifier, accompanied by large, smelly gas bubbles?
 - Increase aeration D.O.
 - Decrease the RAS rate.
 - Decrease the WAS rate.
 - Decrease aeration D.O.
- Which activated sludge growth phase is considered to have the lowest F/M ratio, the highest SRT, the lowest sludge yield, and the poorest oxygen utilization efficiency?
 - High rate aeration
 - Extended aeration
 - Conventional aeration
 - Log growth
- What happens to the alkalinity in wastewater during the nitrification process?
 - It increases.
 - It decreases.
 - It does not change.
 - It stabilizes at 200 mg/L.
- What is the equivalent in gpm of a pipe that has 1 mgd flowing through it?
 - 694 gpm
 - 1,440 gpm
 - 133,690 gpm
 - 7.48 gpm

ANSWERS ON PAGE ??

SEND US YOUR QUESTIONS FOR CERTIFICATION BOULEVARD

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.

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Answer Key

From page ??

1. Given the following data, what is the Specific Oxygen Utilization Rate (SOUR) in an aerobic digester?

- OUR test starting D.O. is 6.9 mg/L.
- OUR test ending D.O. is 4.2 mg/L.
- OUR test time is 10 minutes.
- Digested sludge total solids concentration is 1.7 percent.

b. 0.95 mg/hr/gm TS

SOUR, mg/hr/gm TS

= OUR, mg/L/hr ÷ TS, gm/L

$(6.9 \text{ mg/L} - 4.2 \text{ mg/L}) \div 10 \text{ minutes} \times 60 \text{ mins/hr} = 16.2 \text{ mg/L/hr OUR}$

gm/L TS = mg/L TSS ÷ 1,000

$1.7\% \text{ TS} \times 10,000 = 17,000 \text{ mg/L TSS}$

$16.2 \text{ mg/L/hr} \div (17,000 \div 1,000)$

= 0.95 mg/hr/gm TS

2. Based on the correct answer in Question No.1, is this SOUR acceptable to meet Class B standards for Vector Attraction Reduction requirements?

a. Yes

The maximum allowable SOUR value for the aerobic digestion process to meet Class B standards for Vector Attraction Reduction is 1.5 mg/hr/gm TS ... therefore, 0.95 mg/hr/gm meets the standard.

3. What does the unit parts per million (ppm) mean?

e. All of the above

One part of anything in relationship to 1 million parts of the same thing is 1 ppm; like one gallon of water to 1,000,000 gallons of water. For another example, 1 inch in about 15.78 miles is equal to 1 ppm. Also, in water, one milligram per liter (mg/l) is the same as one parts per million (ppm) ... the conversion is long and drawn-out, but it's the same!

4. What does hydrogen sulfide (H₂S) smell like at low concentrations?

c. Rotten eggs

When the concentration of H₂S is low enough, as not to deaden the olfactory senses, it will smell like rotten eggs ... that's the smell you may detect in a sprinkler system using water from a canal.

5. Why does scum float on the surface of a primary clarifier?

c. Because its specific gravity is less than water.

Any substance that has a specific gravity less than water (which is 1.0) will float to the surface of a tank. FOG material will float to the surface due to its low specific gravity.

6. What two laboratory analyses are necessary to calculate the F/M ratio?

a. Aeration MLVSS and influent CBOD₅

The F/M ratio compares the food value as applied to the volatile bug population. The food value is indicated with the CBOD₅ content in the influent wastewater, and the volatile bug content is identified by testing the aeration system mixed liquor for its volatile fraction ... Mixed Liquor Volatile Suspended Solids.

7. What adjustment should be made if solids are rising in the secondary clarifier accompanied by large, smelly gas bubbles?

a. Increase aeration D.O.

Rising solids with gas could have various causes; however, large smelly gas bubbles is an indicator of septic conditions (opposed to denitrification conditions). Septic conditions must be resolved with the addition of oxygen to the aeration system. Also, increasing the RAS rate may help to improve the condition.

8. Which activated sludge growth phase is considered to have the lowest F/M ratio, the highest SRT, the lowest sludge yield, and the poorest oxygen utilization efficiency?

b. Extended aeration

An extended aeration process typically has a long hydraulic detention time (about 18 to 24 hours), which allows most of the available CBOD₅ to be consumed or tied up in other reactions. This reduces the F/M ratio and increases the SRT. Because of oxygen getting tied up in endogenous reactions, oxygen utilization efficiency typically gets worse as the sludge gets older.

9. What happens to the alkalinity in wastewater during the nitrification process?

b. It decreases.

Alkalinity is consumed in the nitrification process at a rate of about 7.2 lbs of alkalinity (measured as CaCO₃) for every pound of ammonia nitrogen converted. Therefore, the nitrification process decreases the total alkalinity in the activated sludge mixed liquor.

10. What is the equivalent in gpm of a pipe that has 1 mgd flowing through it?

a. 694 gpm

$1,000,000 \text{ gals per day} \div 1,440 \text{ mins per day} = 694 \text{ gals per min}$