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Continuing Education Course #118
Re-mineralization of Desalinated Water

1. Which of the Chemicals Listed Below is Not Used for Re-Mineralization of Desalinated Water?
 - a. Lime
 - b. Ferric Sulfate
 - c. Calcite
 - d. Calcium Hypochlorite

2. Sequential Feed of Lime and Carbon Dioxide is the Most Widely Used Re-mineralization Process at Existing Seawater Desalination Plants – True or False?
 - a. True
 - b. False

3. How Much Hydrated Lime is Needed to Increase Desalinated Water Hardness and Alkalinity by 1 mg/L (as CaCO₃) if a Combination of Lime and CO₂ is Used for Re-mineralization?
 - a. 0.01 mg/L
 - b. 2.21 mg/L
 - c. 0.56 mg/L
 - d. 0.74 mg/L

4. Carbon Dioxide Used for Re-mineralization of Desalinated Water is Typically Delivered to the Desalination Plant in Gaseous Form – True or False?
 - a. True
 - b. False

5. What is the Typical Range of Total Water Hardness of the Finished Water Produced by Majority of Desalinated Plants (expressed as CaCO₃)?
 - a. 1 to 5 mg/L
 - b. 80 to 120 mg/L
 - c. 10 to 20 mg/L
 - d. 200 to 500 mg/L

6. When Desalinated Water And Seawater Are Blended In Order To Re-Mineralize The Desalinated Water The Amount Of Source Seawater That Can Be Added Is Limited To:
 - a. 10 %
 - b. 30 %
 - c. 1 %
 - d. 5 %

7. Blending of Low-salinity Brackish Water and Desalinated Water is Common Practice – True or False?
 - a. True
 - b. False

8. Limestone is Natural Mineral Made of:

- a. Calcium carbonate
- b. Barium sulfate
- c. Magnesium chloride
- d. Sodium Chloride

9. How Much Calcite Has to Be Added to Desalinated Water in Order for Increase Its Hardness and Alkalinity to 100 mg/L (expressed as CaCO_3)?

- a. 80 mg/L
- b. 100 mg/L
- c. 5 mg/L
- d. 0 mg/L

10. The Use of Lime is Usually More Cost Effective and Environmentally Palatable for Re-mineralization than the Application of Calcite – True or False?

- a. True
- b. False

11. How Much More Calcite Will Need to Be Added In order to Provide the Same Amount of Alkalinity if Sulfuric Acid is Used for Re-mineralization Instead of Carbon Dioxide?

- a. 3 times
- b. 1.5 times
- c. 5 times
- d. 2 times

12. Using Sulfuric Acid for Re-mineralization of Desalinated Water Instead of Carbon Dioxide May Be More Advantageous if this Water is intended for Agricultural Use – True or False?

- a. True
- b. False

13. Why the Use of Dolomite for Re-mineralization Sometimes May Not Be Viable?

- a. Product Water May Have Unacceptably High Hardness
- b. Dolomite is Non-homogenous
- c. Dolomite Does Not Contain Magnesium
- d. Dolomite Does Not Contain Calcium

14. Dolomite is More Widely Used for Desalinated Water Re-mineralization than Calcite – True or False?

- a. True
- b. False

15. Lime Silos are Typically Designed for Storage Time of:

- a. 7 days
- b. 15 to 60 days
- c. 5 to 10 days
- d. 90 days

16. What is the Typical Lime Slurry Concentration?

- a. 0.1 %
- b. 1.0 %
- c. 10 %
- d. 30 %

17. What is the Maximum Lime Solubility in Water?

- a. 1,500 mg/L
- b. 100 mg/L
- c. 900 mg/L
- d. 10 mg/L

18. What is the Amount of Impurities (in mg/L) Introduced When Lime with 90 % Purity Is Used to Produce Desalinated Water with 100 mg/L of Alkalinity and Hardness (as CaCO_3)?

- a. 0 mg/L
- b. 10 mg/L
- c. 90 mg/L
- d. 8.2 mg/L

19. What is the Recommended Frequency of Flushing of Dosing Lines for Saturated Lime?

- a. Six to twelve hours
- b. One to two minutes
- c. One to two weeks
- d. Four to six months

20. Which of the Following Equipment is Not a Typical Component of a Carbon Dioxide Feed System for Re-mineralization of Desalinated Water?

- a. Vaporizer
- b. Lamella settler
- c. Refrigeration unit
- d. Heater

21. Addition of Carbon Dioxide to Desalinated Water Accelerates the Solubility of Calcite with Which the Water Enters in Contact – True or False?

- a. True
- b. False

22. What Material is Typically Used for Carbon Dioxide Storage Tanks?

- a. Fiberglass reinforced plastic
- b. Polyethylene
- c. Stainless Steel
- d. Carbon Steel

23. What is the Recommended Size of Calcite Grains Used in Limestone Contactors?

- a. 1.5 to 2.5 mm
- b. < 1.0 mm
- c. > 5 mm
- d. 5 to 10 mm

24. What is A Typical Indication that Calcite Should be Re-loaded to the Contactors?

- a. Water temperature increase over 30 °C
- b. Change of calcite color
- c. Steady decrease of pH
- d. Calcite media headloss reaching maximum design level

NOTE: The following question was revised on 3 July 2018

25. DrinTech Re-mineralization Contactors Add Calcite Grains Continuously to the Water

- a. True
- b. False

26. The Main Purpose of the Ion Exchange Reactors Included in the RWM Re-mineralization System is to Add Which Mineral?

- a. Calcium
- b. Sodium
- c. Manganese
- d. Magnesium

27. What Is the Typical Total Cost for Re-mineralization of Desalinated Water Expressed in US\$/1,000 gallons?

- a. US\$0.25 to 0.50/1,000 gallons
- b. US\$0.15 to 0.30/1,000 gallons
- c. US\$0.05 to 0.10/1,000 gallons
- d. US\$0.50 to 1.60/1,000 gallons

28. Calcite Re-mineralization Systems Have Smaller Carbon Footprint than Lime/Carbon Dioxide Systems?

- a. True
- b. False

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