



Certification Boulevard

Test Your Knowledge of Operations & Utility Management Topics answer key

1. Given the following data, what is the cost of polymer used, in dollars per dry ton processed, in this Belt Filter Press (BFP)?
- Total sludge feed to the BFP is 144,500 gpd
 - Feed sludge concentration is 2.75%
 - Total neat polymer used is 25 gpd
 - Polymer specific gravity (S.G.) is 1.02
 - Polymer cost is \$0.79 per pound
- A. \$25.24 / dt
B. \$11.50 / dt
C. **\$10.14 / dt**
D. \$33.54 / dt

Formula: $\frac{\text{Total Cost of Polymer Used, \$}}{\text{Total Dry Tons of Sludge Processed, dt}}$

$$\begin{aligned} \text{Cost of Polymer} &= 25 \text{ gpd} \times 8.34 \text{ lbs/gal} \times 1.02 \text{ S.G.} \\ &= 212.67 \text{ lbs polymer used} \\ &= 212.67 \text{ lbs polymer} \times \$0.79 \text{ per lb polymer} \\ &= \$168.01 \text{ polymer used} \end{aligned}$$

$$\begin{aligned} \text{Dry Tons Processed} &= 0.1445 \text{ mgd} \times 27,500 \text{ mg/L} \times 8.34 \text{ lbs/gal} \\ &= 33,141 \text{ lbs dry solids divided by } 2,000 \text{ lbs/ton} \\ &= 16.57 \text{ dry tons processed} \end{aligned}$$

$$\begin{aligned} \text{Total Cost of Polymer Used} &= \$168.01 \\ \text{Total Dry Tons of Sludge Processed} &= 16.57 \text{ dt} \end{aligned}$$

$$= \$10.139 \text{ per dry ton processed}$$

2. Given the data from question No.1, is this an acceptable cost of polymer usage for a Belt Filter Press (BFP)?
- A. **Yes, very efficient**
B. No, it is way too high
C. There is not enough data to calculate this parameter

An acceptable cost of polymer used per dry ton processed in a BFP depends on the type of sludge and sludge conditioning process. Typically, with anaerobically digested sludge, an acceptable polymer consumption is anything less than about \$25 per dt processed.

3. Given the following data, what is the annual budget for lime in this plant?

- Lime dose rate is 28.5% of the sludge dry weight processed
- Sludge volume is 149 wet tons per day
- Sludge cake concentration is 20.5% TS
- Lime cost is \$120.00 per ton delivered
- Sludge is processed 5 days per week, 16 hours per day

- A. \$305,998
- B. \$271,440**
- C. \$148,594
- D. \$381,060

$$\begin{aligned} \text{Total dry tons of sludge per day} &= 149 \text{ wet tons multiplied by } 0.205 \text{ (20.5\%)} \\ &= 30.54 \text{ dtpd} \end{aligned}$$

$$\begin{aligned} \text{Lime used per day} &= 30.54 \text{ dtpd sludge} \times 0.285 \text{ (28.5\%)} \\ &= 8.70 \text{ tons per day lime used} \end{aligned}$$

$$\begin{aligned} \text{Cost per day lime used} &= 8.7 \text{ tons per day} \times \$120.00 \text{ per ton} \\ &= \$1,044.00 \text{ per day lime used} \end{aligned}$$

$$\begin{aligned} \text{Cost per year lime used} &= \$1,044.00 \text{ per day} \times 260 \text{ days per year} \\ &= \$271,440 \text{ lime per year} \end{aligned}$$

4. Given the following data, what is the annual budget for sulfur dioxide at this plant?

- Plant Flow = 25.6 mgd
- Preliminary Treatment Chlorine Dosage = 3.5 mg/L
- Effluent Filtration Chlorine Dosage = 2.0 mg/L
- Effluent Chlorine Dosage = 4.9 mg/L
- Effluent Chlorine Residual = 1.5 mg/L
- SO₂ to CL₂ feed ratio is 1.25:1
- Complete Dechlorination
- Chlorine Cost = \$0.17 per Pound
- Sulfur Dioxide Cost = \$0.22 per Pound

- A. \$25717
- B. \$24,840
- C. \$37,589
- D. \$32,146**

$$\begin{aligned} \text{Lbs/Day SO}_2 \text{ Feed} &= 25.6 \text{ mgd} \times (1.5 \text{ mg/L} \times 1.25) \times 8.34 \\ &= 400.32 \text{ lbs/day} \end{aligned}$$

$$\begin{aligned} \text{Lbs/Year SO}_2 \text{ Feed} &= 400.32 \text{ lbs/day} \times 365 \text{ days per year} \\ &= 146,116.8 \text{ lbs/year} \end{aligned}$$

$$\begin{aligned} \text{Cost per day for SO}_2 &= 400.32 \text{ lbs/day} \times \$0.22 \text{ per lb} \\ &= \$88.07 \text{ per day} \end{aligned}$$

$$\begin{aligned} \text{Cost per year for SO}_2 &= \$88.07 \text{ per day} \times 365 \text{ days/year} \\ &= \$32,145.55 \text{ per year SO}_2 \text{ budget} \end{aligned}$$

5. What is the main purpose for a comprehensive maintenance program?
- A. To give the mechanics something to do
 - B. To operate all of the plant equipment
 - C. To allow the plant to operate at its peak performance**
 - D. To repair equipment after breakage
6. What is the system called that requires proper documentation associated with the person who collects samples, the person who receives the samples in the lab, and the lab technician who performs the tests?
- A. Sample performance
 - B. Chain of custody**
 - C. Mapping
 - D. Sample journal
7. What are the responsibilities of plant management?
- A. To ensure Operations and Maintenance staff members are trained
 - B. To develop performance data records and reports
 - C. To evaluate and appraise employees
 - D. To develop and control budgets
 - E. To maintain public relations
 - F. All of the above**
8. What should be done to protect all personnel when repairs are made to an electrical component?
- A. Inform all personnel in the area that the repairs are being made
 - B. Lock-out the equipment controls
 - C. Tag the equipment controls
 - D. Be trained and understand the OSHA requirements for this procedure
 - E. All of the above**
9. Which item of information would not be of major importance if you were developing and presenting a report to your organization's council?
- A. Capital improvement program
 - B. Major equipment maintenance
 - C. O&M costs
 - D. Facility process performance
 - E. Detailed lab procedures**
10. Who benefits from the development of a facility annual report?
- A. The governing body
 - B. The responsible engineer
 - C. The health department
 - D. The facility management
 - E. All of the above**

Please forward your comments and sample questions for publication to:

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