

Washing Water Worksheet

Description:

You work at a local WWTP and are discharging treated water into the Atlantic Ocean. In order to meet state guidelines the pH, salinity, and chlorine of your effluent must fall within a pre-determined water quality range. The water that is currently coming out of your pipe does not fall into this acceptable criteria range and it is your job to create a filter to solve the issue. You must use existing funds to create your filter rather than raising customer rates and thus have a limit of \$25,000.00 for media.

| Media | Cost | Amount |
|--------------------|-------------|----------|
| Coarse sand | \$4,000.00 | ¼ cup |
| Fine sand | \$4,000.00 | ¼ cup |
| Large gravel | \$1,000.00 | ¼ cup |
| Small gravel | \$2,000.00 | ¼ cup |
| Mesh | \$1,000.00 | 1 square |
| Cotton | \$1,000.00 | 1 square |
| Activated charcoal | \$10,000.00 | ¼ cup |
| Baking soda | \$5,000.00 | ¼ cup |
| Carbon filter | \$3,000.00 | 1 square |
| Screen | \$3,000.00 | 1 square |

Preliminary Questions:

1. Why is it important for wastewater treatment plants to clean water before sending it back into the environment?
2. What are some ways a filter can help clean water? Do you use filters in your daily life and if so, what do you use them for?
3. What do pH, salinity, and chlorine tell us about water quality?

Fill out the tables below as you're designing and testing your filter:

Trial 1:

| Media used | Amount added/ Quantity | Cost |
|------------|------------------------|------|
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| | | |
| | | |
| | | |

Total Cost: _____

| Post | Pre-filtration value | Post-filtration value | Criteria |
|-------------------|----------------------|-----------------------|-------------|
| pH | | | 6.5 – 8.5 |
| Salinity | | | 25 – 35 ppt |
| Residual chlorine | | | < 0.7 mg/L |

Trial 2:

| Media used | Amount added/ quantity | Cost |
|------------|------------------------|------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Total Cost: _____

| Post | Pre-filtration value | Post-filtration value | Criteria |
|-------------------|----------------------|-----------------------|-------------|
| pH | | | 6.5 – 8.5 |
| Salinity | | | 25 – 35 ppt |
| Residual chlorine | | | < 0.7 mg/L |

Follow-Up Question:

1. Did your filtered water look different from your "dirty" sample?

2. Were you able to successfully meet all of the water quality criteria? Is there anything you would do differently?

3. How are planning, trial-and-error, and budgeting important?