Washing Water
Handout for Students
Abbreviated Version

Description:
You work at a local **wastewater** treatment plant and are discharging final effluent into the Atlantic Ocean. In order to meet state guidelines the **pH**, **turbidity**, and **residual chlorine** of your **effluent** must fall within a pre-determined water quality range. The wastewater **influent** 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.

Filter Material	Cost per Amount	Amount
Course 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, turbidity and chlorine tell us about water quality?

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

Trial 1:

Filter Material Used	Quantity (amount added)	Cost

Total Cost: _____

Post	Pre-filtration value	Post-filtration value	Water Quality Criteria
pH			6.5 – 8.5
Turbidity			< 20 ntu
Residual Chlorine			< 0.7 mg/L

Trial 2:

Filter Material Used	Quantity (amount added)	Cost

Total Cost: _____

Post	Pre-filtration value (Trial 1 post-filtration value)	Post-filtration value	Water Quality Criteria
pH			6.5 – 8.5
Turbidity			< 20 ntu
Residual Chlorine			< 0.7 mg/L

Trial 3:

Filter Material Used	Quantity (amount added)	Cost

Total Cost: _____

Post	Pre-filtration value (Trial 2 post-filtration value)	Post-filtration value	Water Quality Criteria
pH			6.5 – 8.5
Turbidity			< 20 ntu
Residual Chlorine			< 0.7 mg/L

Follow-Up Questions:

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?