



TeachEngineering

STEM Curriculum for K-12

CRYSTALLINE CLOTH PRESENTATION

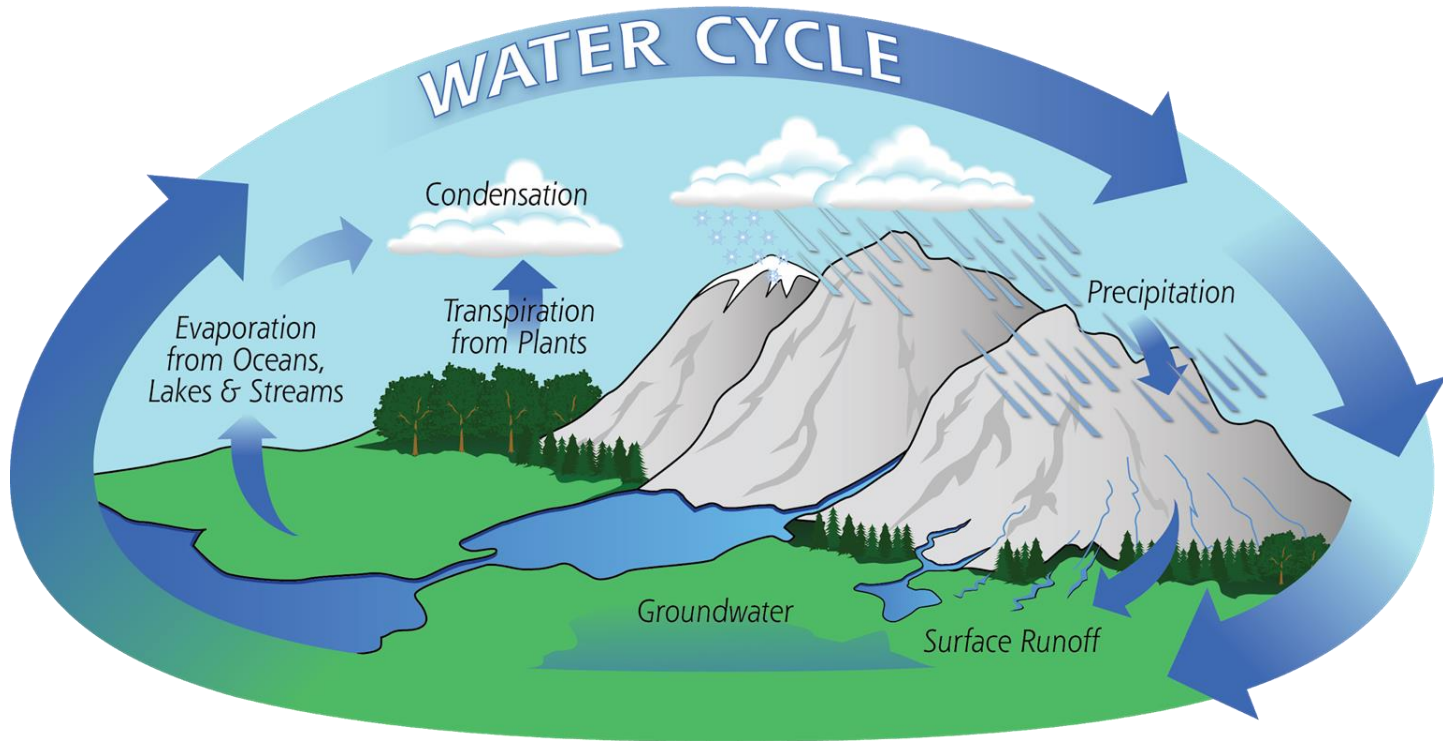


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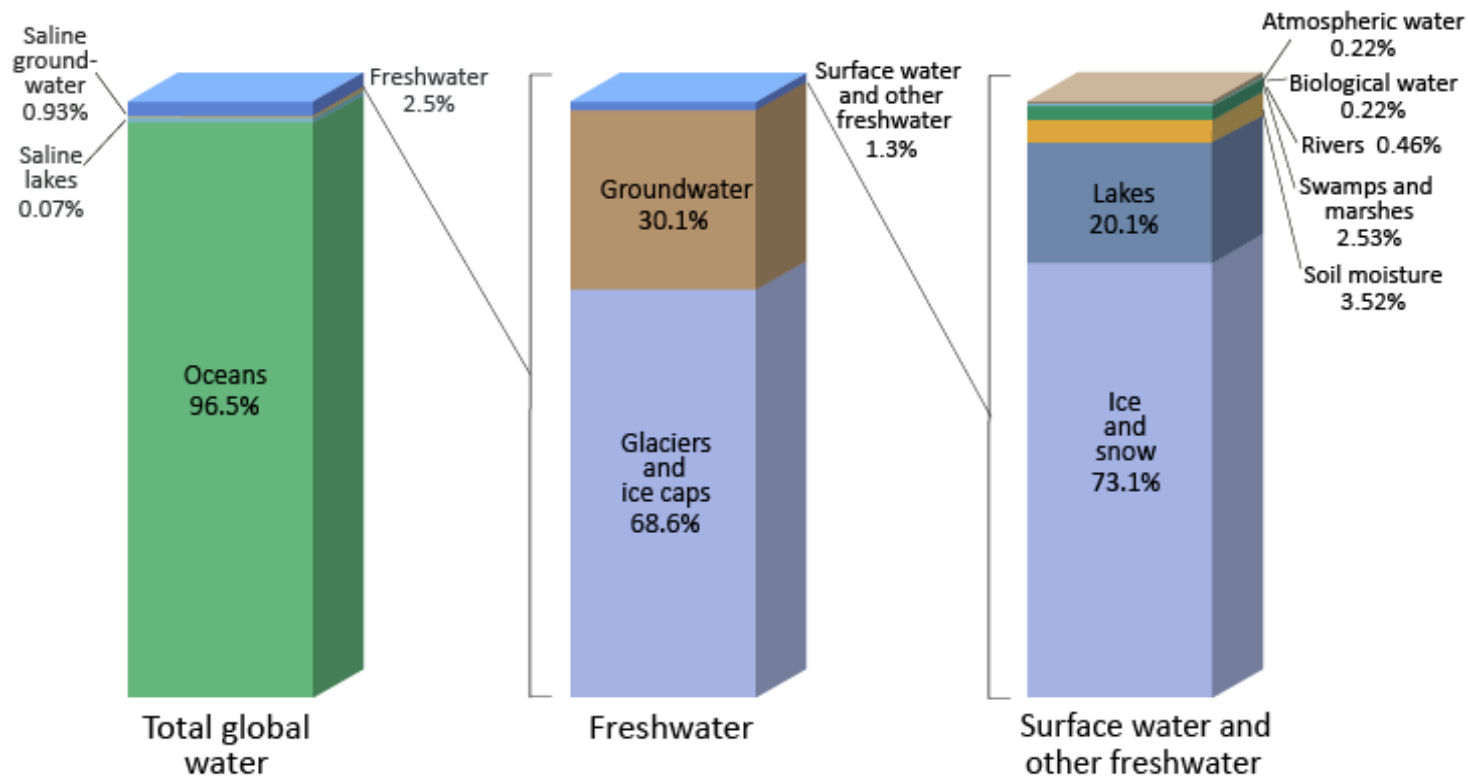
Brought to you by



The water cycle is the continuous movement of water between Earth and its atmosphere.



Distribution of Earth's Water



Source: Igor Shiklomanov's chapter "World fresh water resources" in Peter H. Gleick (editor), 1993, *Water in Crisis: A Guide to the World's Fresh Water Resources*.



limitedwater.weebly.com

Why is it important to have clean water?



How can we make dirty water clean?



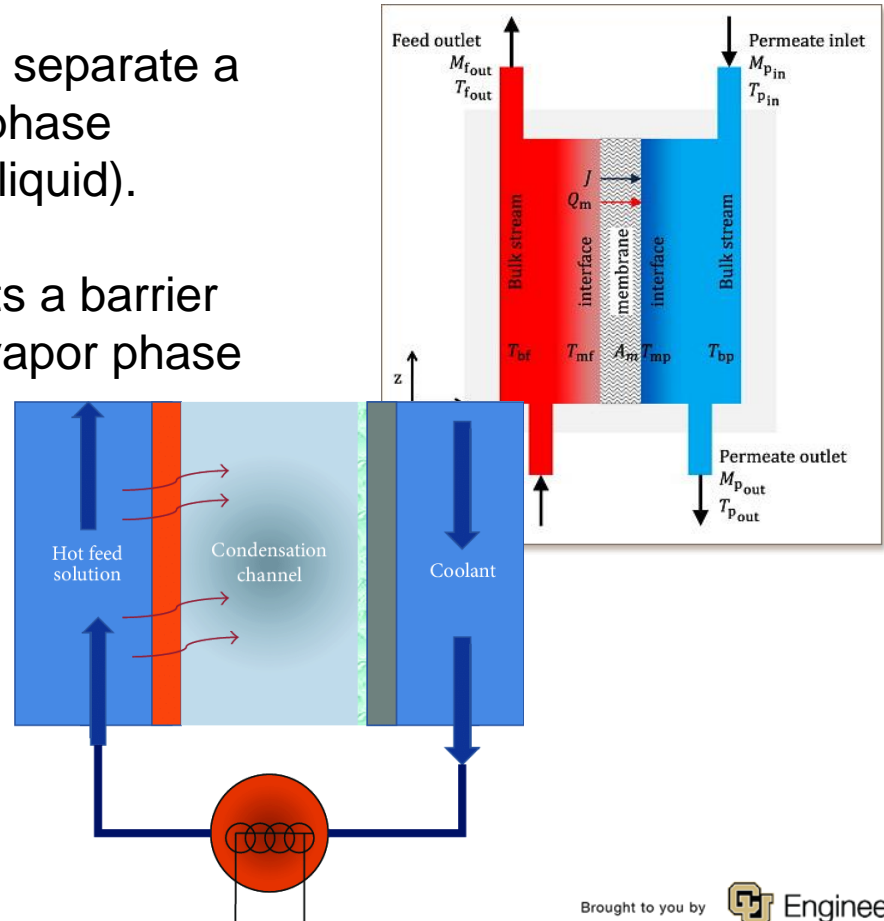
Membrane Distillation!

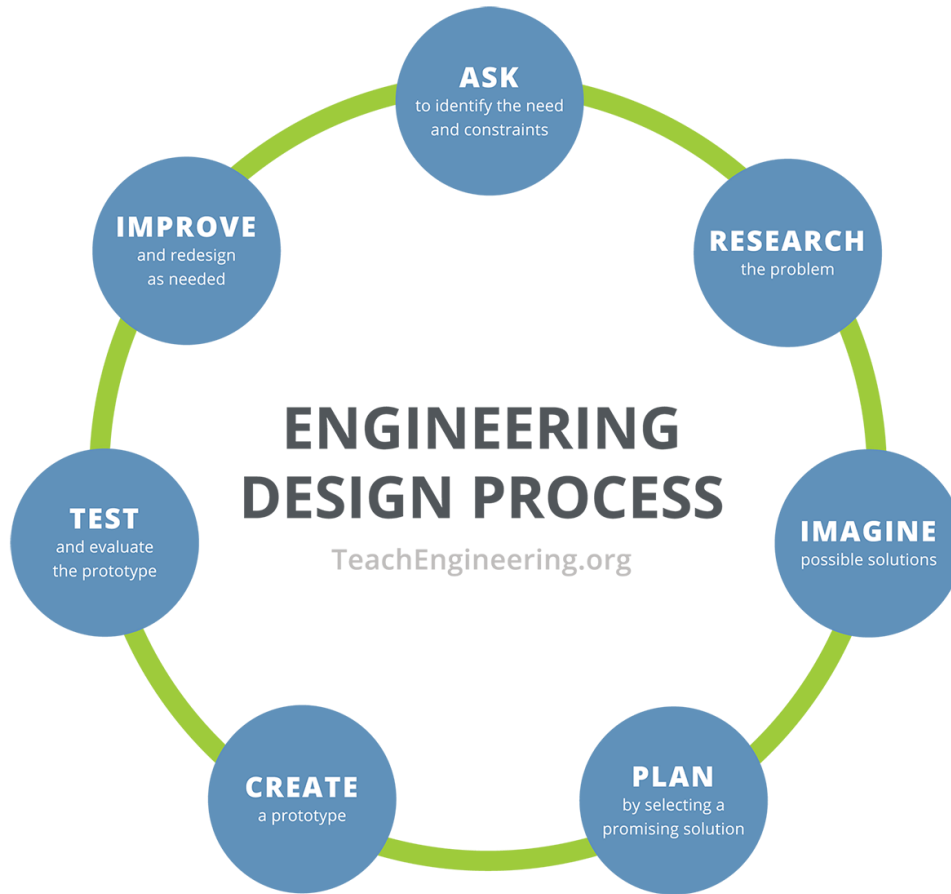
What is Membrane Distillation

Membrane distillation is when you separate a liquid based on temperature and phase changes (liquid to gas and gas to liquid).

A hydrophobic membrane presents a barrier for the liquid phase, allowing the vapor phase (e.g. water vapor) to pass through the membrane's pores.

The driving force of the process is a partial vapor pressure difference commonly triggered by a temperature difference.





Engineers and scientists use the “Engineering Design Process” to both solve existing problems and prevent future issues.

Today, we will be following part of this to create a solution to a problem common to water filtration and treatment.

Write on a sticky note one problem that you think can occur when trying to clean water in a membrane distillation system.

Post sticky note up at the front when complete.

Challenges

Dissolved minerals form a layer of “scale” on the membrane itself, preventing the membrane distillation from functioning properly.



How do you think we think we could fix a membrane?

Take 45 seconds to confer with your group, then I will pick someone to report to the rest of the group.

How can you fix the membrane?

1. Stop running the MD system and clean the membranes by hand.

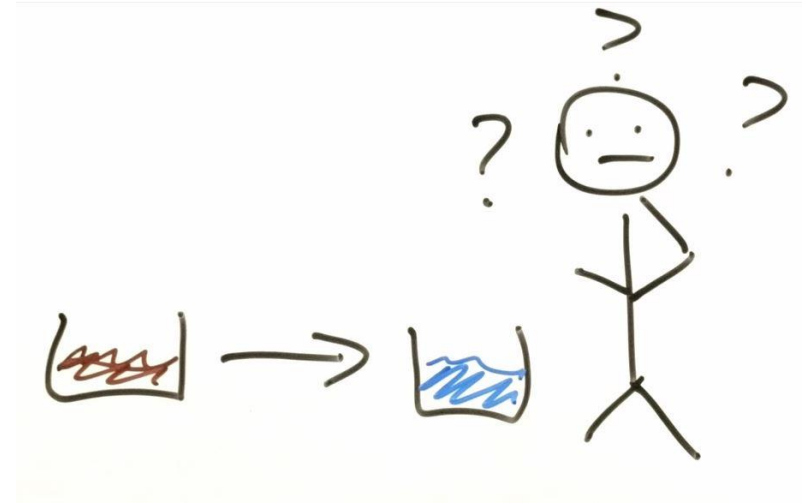
The downside is that the time spent taking the system down loses production of distilled water, a serious problem if the system is relied upon to provide water.

How can you fix the membrane?

2. Prevent the growth of the scaling in the first place. This can be done by adding a material to the membrane itself, or changing the type of material the membrane is made of.

The downsides of this could be the new membrane material would increase cost.

Let's watch a video
that explains
membrane
distillation!



Objective

Try to devise a way to keep dissolved particles (crystals) off your membrane (cloth).

Pre-Lab

1. Obtain a piece of cheese cloth, weigh it and write it in the mass of cloth box.
2. Follow instructions for how to create your crystal solution.
3. Complete the rest of the pre-lab instructions.

Lab

1. Obtain a piece of cheese cloth, weight it and write it in the mass of cloth box.
2. Choose from the provided materials what you would like to coat your cloth in and write it in the treated with box. Make sure you weight how much you are using before you coat your cloth.
3. Coat your cloth in your chosen substance.
4. Follow instructions for how to create your crystal solution.

Post Lab

1. Following the instructions, you should be filling out the following boxes:

Cloth Mass:(g)	Mass of Crystals +Cloth: (g)	Crystal Mass (GC1): (g)

2. Determine the Crystal Growth (GC) Reduction for your treatment.
3. Find at least two other groups and compare your Crystal Growth Reductions. What treatment did they use? Was your treatment more effective, or less?