

About this activity



In this activity you will learn about how we use filters to separate things. You will test different materials to find which ones are best at cleaning murky water. Just like scientists in industry, you will prepare samples, carry out a fair test and record measurements.

Kit List

- ✓ 'Reservoir water' (see instructions below)
- ✓ Small plastic cup and containers e.g. small pop bottles and empty jars (see-through if possible)
- ✓ Timer (tablet, phone or watch)
- ✓ Funnel (can be home made from bottle top – see instructions on next page)
- ✓ A selection of filters – choose from:

colander	sieve
fishing net	tea strainer
old nylon tights	old sock
muslin cloth	kitchen roll
cotton wool	coffee filter
dish cloth	J-cloth
anything else you can find at home	

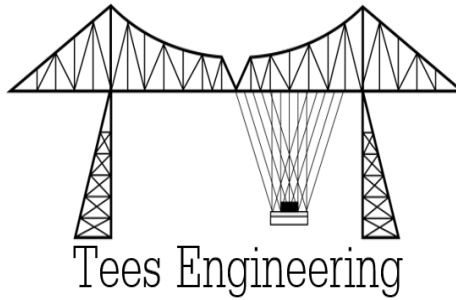
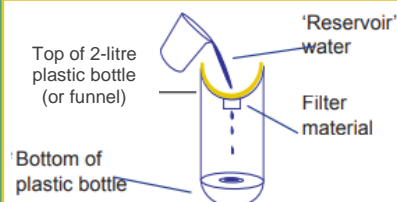
Make your own 'reservoir water':



Fill a bucket or other large container with tap water and use a stick to stir in a few handfuls of garden soil.

Add a good mix of whatever else you can find, such as: leaves, twigs, stones, gravel, compost and sand. If you can't access a garden, go for a walk to your local park or field and collect your items from there.

Setting your experiment up:



Important words to understand:



- industry
- engineer
- filter/filtration
- murky
- clear
- reservoir
- separate
- sample
- solid
- liquid
- observation

Not sure what they mean? You could use a dictionary to check (paper or online).

Filter Hunt



Before we get started, take a look around your home for some common household filters. Here's a list to get you started. Can you find any examples of your own?

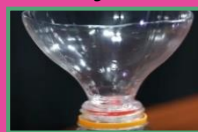
sieve	colander	tea bag
washing machine drum	fishing net	kitchen sink strainer

The engineers at 'Tees Engineering' are finding the murky water from a nearby reservoir is not clear enough to use for cooling their equipment. It needs to be clean, otherwise the particles in the water block the pipes and pumps. The water needs filtering to remove any solids. Speed of filtration is important but so is ensuring the filter does a good job. Can you help them find the best filter to clean the reservoir water?

OUR METHOD

- Set up your experiment (see diagram).
- Give the murky water a stir and then use this to fill a plastic cup.
- Pour the water in to the filter lined funnel and begin timing immediately (you may have to pour a little at a time to prevent overflowing).
- Stop the timer once all the water has filtered through into the clear container.
- Record the time and other observations in the table of results.
- Repeat these steps for each filter you are testing.

Make your own funnel:



If you don't have a funnel you can easily make one by asking an adult to cut the top off a 2-litre pop bottle. You will need to make the edge safe by wrapping tape around it or **asking an adult** to carefully use a flame to smooth the sharp edge as shown in this YouTube video:

<https://www.youtube.com/watch?v=uca75hi0aYw>

⚠ Watch out!

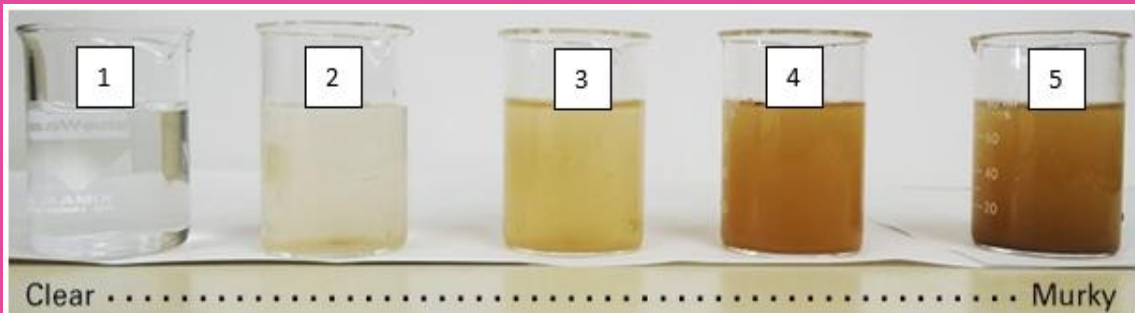
- You must wash your hands thoroughly after handling soil and 'reservoir water'.
- Do not rub your eyes or touch your mouth whilst handling soil and 'reservoir water'.
- If collecting the items to make 'reservoir water' outside of your home, remember to stay 2 metres away from people you do not live with and wash hands thoroughly when you get home.

Recording your Results – compare your filtered water to the samples pictured below to help you decide how clear it is and circle the number.



Filter type	Time taken	How clear?					Other observations
		1	2	3	4	5	
		1	2	3	4	5	
		1	2	3	4	5	
		1	2	3	4	5	
		1	2	3	4	5	
		1	2	3	4	5	

How do your samples compare to these?



Once you have carried out your investigation, you must convince the engineers that you have found the best filter.



THEY WILL WANT TO KNOW...

- How did you test each type of filter?
- How did you make your tests fair?
 - What are your results?
- Which material made the fastest filter?
- Which material gave the clearest water?
- Which was the best overall filter? (fast and clear)

Write a short report or make a video to share your results with Tees Engineering. Share it with us @ciecyork

TAKING IT FURTHER

Follow up investigations:



- Make sure your filtered water is in a clean container. Shine a torch through on to a wall to check its clarity by seeing how many pieces of paper it takes to block out the torch light.
- Make your own filters by cutting holes of different sizes into card using a hole punch, scissors and a pin and folding it in to a cone shape. Now try using these to sort some other mixtures like flour, rice, raisins and seeds (avoid any personal allergens).
- Repeat the investigation using measured quantities of soil, gravel etc. to see if the filters perform differently.

Things to think or talk about:



- Is the time taken to filter the water or the water's clarity (how clear it is) the most important result? Why?
- Which materials made good filters? Which made bad filters? What properties do they have that make them good or bad?
- Why is the water unsafe to drink, even after filtering?
- Did any of the filters become blocked quickly? Why?
- What might engineers do when industrial filters get blocked?
- Were any of your results unexpected?

Visit our website to find out more about this investigation: <http://club.cciproject.org/waterForIndustry/filter1.htm>