

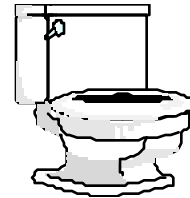
DESIGN A SEPTIC TANK

Objectives:

Students will evaluate the complexity and importance of building an environmentally sound septic tank using information on the Internet.

Materials:

- Access to the internet
- Paper to design a written plan for a septic system



Background:

In the past, many people were disposing of untreated human waste. As people began to get diseases, they decided to put waste into septic tanks where the waste could be treated before being released. Early tanks were made of clay and over the years have rotted or eroded away, leaching waste into the groundwater. Later on, better materials were used for more structurally sound systems. Concrete is a good material, but it too leaks sewage through the pores in the concrete. Chemicals have been used to treat the sewage. Unfortunately, many of these chemicals destroy the bacteria that help breakdown the sewage. Septic tanks should be pumped out annually to make sure they don't leak and are not spilling over. Modern improvements have made septic tanks more efficient.

Procedure:

1. Link to the EPA web-site stories about problem sites that you can find close to your home by connecting to: <http://www.epa.gov/superfund/sites/rodsites/index.htm>
2. Using the Internet, research how to build a quality septic system. Millions of Americans use septic systems and do not know how to treat them properly. For this project students will be developing their own septic system. Information about water treatment plants can be found through the EPA site: http://www.epa.gov/students/water_on_tap.htm.
3. Working in pairs, plan a septic system, making it the most efficient and environmentally sound system possible. Decide where you would place your tank to have the least effect on the surrounding area. To do this you will need to know where the groundwater is in relation to your septic tank, are there any wells nearby, are there water sources in the surrounding area, etc.
4. Evaluate your system. Make a list of components and the cost and discuss the following:
 - Do you need to add chemicals to the tank? If so, what are the safest to add?
 - Evaluate your system: make a list of components and the cost.
 - Is this a reasonable system to produce?
 - Is this what people in your area use?
 - What problems could arise if your system goes wrong?
 - Where could the untreated sewage or contaminated water go?
 - What are things around you that might be contaminated if you build a faulty system?
 - Is it possible for your single system to effect thousands of people?
 - After the sewage is reduced to septage or sludge, is there any use for it? (It can be a valuable resource as a soil conditioner because it contains nutrients that can reduce reliance on chemical fertilizers in the agricultural industry. Sludge must be tested to

make sure there are no heavy metals or other toxins in the material. If the material contains toxins, it has to be considered toxic waste and treated as such.)

- Define sludge.
5. Are there local companies that you could consult to help you build your system?
 6. Have students present their plan to the other groups. Have them combine plan ideas to develop one superior system. Consider sending your plans to a company. Check your local phone book for companies that design septic tanks or systems or see if there is an EPA office nearby. Ask them to review it and tell you if there are any problems or if it was a good design.
 7. If you lived in a city, how would the wastewater situation be different? Who is controlling the wastewater? What happens when there are spills or overflows at a treatment plant?

Notes:

The students should include the material the tank is made of, the liner used, the cost, any chemicals they plan to add, how often they plan to have it pumped or tested, how close it is to any water source, etc.

Discussion:

Talk about the repercussions of having a treatment facility fail. Where does the water go? What might it go through on its way to the groundwater? What if this tainted water was not able to be filtered because it was already below the soil and porous rock? How might it affect your drinking water? What if it were to seep into a cave? Would the contaminated water have any effect on the cave environment? What about cave life? (It might kill any cave life or add an unnatural nutrient source and create a population explosion.) What if it was a tourist cave? (It might make the visitors sick or create an unpleasant smell.) People seldom consider what they cannot see. Caves are scattered all over the world, both known and undiscovered. It is important to realize that our actions on the surface have a direct effect on what happens underground.

Extension:

How Much Does it Cost to Poop? After you flush the toilet, what happens? What did it cost to get your toilet to function and to have all of the attached parts working properly? Think about the path that the water takes after you push the handle and calculate how much the process costs. Think about the piping, the well, the treatment plant, the jobs, the roads, the drilling, etc. Try to determine a monetary estimate and an environmental estimate.

