Environmental Science Institute
UNIVERSITY OF TEXAS AT AUSTIN

Waste to Energy

Subject: Science

Grade Level: 6-8

Rational or Purpose:
Students will demonstrate how energy is made from waste and explain why it is done today.

Materials needed:
For each group:

- Coffee can
- Water
- Hot plate
- Toy wind mill or homemade mill system
- Safety goggles
- Pot holder

Lesson Duration: 1 hour

Source:
http://www.cleansweepusa.org/educators/EnergytoBurn051304j.pdf

TEKS:
Science Grade 6-8:

6th Grade: 1 A, B; 9 A
7th Grade: 1 A, B; 8 A
8th Grade: 1 A, B; 10 A.

Background:
What do we do when we are finished using an item? We throw it away in the dump. What happens to this material when it is thrown away? Today we will see what we do to the trash we through away and how we use it to benefit the earth and society.

Everyday people produce trash. When we have too much trash, what do we do to it in order to have more space? There are five ways that we can eliminate waste. We can reuse, recycle, compost, burn or put trash in a landfill. Today, we will simulate burning waste. This is commonly known as the waste-to-energy method, in which we reduce the volume of trash by burning it and creating energy. However, energy has many forms. It can be in the form of heat, light, and movement. We can store energy, or even change it from one form to another in order to store the energy more efficiently. In the simulation, heat energy will be converted into movement to produce electricity using

turbines. The waste-to-energy model takes heat that is produced by burning fossil fuels, natural gas, or from nuclear reactions and uses water to produce steam. Using this steam, energy is converted into movement since steam is rises and can be captured by a turbine, similar to the wind turbine used in lab. The steam causes the turbine to turn, which generates electricity. In waste-to-energy systems, waste materials are burned in incinerators to produce heat for this system to work.

Other information can be found at www.kab.org/cleansweepusa.

Activity:
Students will be able to explain how waste can be turned into energy. They will demonstrate this process with a simple model. Using the model they will explain the importance of this process and why it is done, and they will calculate the amount of energy produced by their models.

Procedure:

1. Form groups of four students and give out reading and procedure material.
2. Students will read and answer questions.
3. The students will then follow the procedure to develop a model showing how waste can become energy.
4. The students will draw and label the parts of their model. Also have students explain the process they have modeled.

Name: _____

Waste into Energy

Background:

Everyday, people produce trash. When we have too much trash, what do we do to it in order to have more space? There are five ways that we can eliminate waste. We can reuse, recycle, compost, burn or put trash in a landfill. One way we will simulate today is burning waste. This model is commonly known as the waste-to-energy model, in which we reduce the volume of trash by burning it and creating energy. However, energy has many forms. It can be in forms such as heat, light, and movement. People can store energy or even change it from one form to another in order to store more it more efficiently. Our simulations today will convert heat energy into movement so we can produce electricity by use of turbines. The waste-to-energy model that we are making today takes heat that is produced by burning fossil fuels, natural gas, or from nuclear reactions and uses water to produce steam. This steam is how the energy is converted into movement energy, since steam is able to rise and be captured by a turbine. This steam will cause the turbine to turn which generates electricity. In waste-to-energy systems, waste materials are burned in incinerators to produce heat for this system to work.

Materials:

- Coffee can and lid
- Water
- Hot plate
- Toy wind mill (pin wheel)
- Safety goggles
- Pot holder

Procedure:

1. Put one cup of water into a coffee can.
2. Tape your toy windmill to the side of the coffee can, making sure the windmill blades are over the coffee can.
3. Punch a small hole in the coffee can lid so that it is right below the windmill blades. You may want to have the lid on the coffee can first and use a pen or pencil to estimate where the hole should be located.
4. Now place the coffee can on the hot plate.
5. What do you hypothesize will happen?

6. What do you observe?

Draw your waste-to-energy system on the back of this sheet, labeling all of the parts and explaining how it works and what it produces.