



Oil Drop Hide and Seek

Renewable and Non-renewable Sources of Energy
Time: approximately 1-2 Class Periods

Adapted from Little Bits— An Elementary Earth Science Curriculum, developed for the Oklahoma Energy Resources Board, an agency of the State of Oklahoma.

Grade Level: 2-7

Subject: Science, Social Studies, Math

WONDER WHY...

Have you ever wondered why it is difficult to find oil and natural gas?

CONCEPT

Oil comes from nature and is a non-renewable source of energy.

CORRELATIONS TO CCSS AND ARKANSAS FRAMEWORKS:

<http://www.arkansasenergyrocks.com/educators/activities/Oil-Drop-Hide-and-Seek-Correlation.pdf>

MATERIALS

- 200 black discs or laminated drop shaped cut-outs (**See template that follows the lesson for oil drops.**)
- Pinwheel
- Crude oil sample—available from the following web sites:
 - <http://www.onta.com/id11.html>
 - <http://www.texasrawcrude.com/>
(If crude oil is not available, simulate your own. Try a mixture of used motor oil, tar, diesel fuel, paraffin and a small amount of WD-40 in your recipe. EXTREME CAUTION MUST BE EXERCISED WHILE PREPARING YOUR SAMPLE.)
- Blank overhead transparency or Smartboard documents for developing definition of renewable and non-renewable resources
- Overhead markers
- Crayons
- Four three-ounce plastic cups per pair of students
- Pencils
- **Oil Drop Hide and Seek Data Sheet**

TEACHER BACKGROUND:

<http://science.howstuffworks.com/environmental/energy/oil-refining1.htm>

Crude Oil is the term for "unprocessed" oil, the stuff that comes out of the ground. It is also known as petroleum. Crude oil is a fossil fuel, meaning that it was made naturally from decaying plants and animals living in ancient seas millions of years ago -- most places you can



find crude oil were once sea beds. Crude oils vary in color, from clear to tar-black, and in viscosity, from water to almost solid.

Crude oils are such a useful starting point for so many different substances because they contain hydrocarbons. Hydrocarbons are molecules that contain hydrogen and carbon and come in various lengths and structures, from straight chains to branching chains to rings.

There are two things that make hydrocarbons exciting to chemists:

1. Hydrocarbons contain a lot of energy. Many of the things derived from crude oil like gasoline, diesel fuel, paraffin wax and so on take advantage of this energy.
2. Hydrocarbons can take on many different forms. The smallest hydrocarbon is methane (CH_4), which is a gas that is lighter than air. Longer chains with 5 or more carbons are liquids. Very long chains are solids like wax or tar. By chemically cross-linking hydrocarbon chains you can get everything from synthetic rubber to nylon to the plastic in Tupperware. Hydrocarbon chains are very versatile!

The major classes of hydrocarbons in crude oils include:

- **Paraffins** general formula: $\text{C}_n\text{H}_{2n+2}$ (n is a whole number, usually from 1 to 20) straight- or branched-chain molecules can be gasses or liquids at room temperature depending upon the molecule examples: methane, ethane, propane, butane, isobutane, pentane, hexane
- **Aromatics** general formula: $\text{C}_6\text{H}_5 - \text{Y}$ (Y is a longer, straight molecule that connects to the benzene ring) ringed structures with one or more rings, rings contain six carbon atoms, with alternating double and single bonds between the carbons typically liquids examples: benzene, naphthalene
- **Napthenes or Cycloalkanes** general formula: C_nH_{2n} (n is a whole number usually from 1 to 20) ringed structures with one or more rings, rings contain only single bonds between the carbon atoms typically liquids at room temperature examples: cyclohexane, methyl cyclopentane
- Other hydrocarbons **Alkenes** general formula: C_nH_{2n} (n is a whole number, usually from 1 to 20) linear or branched chain molecules containing one carbon-carbon double-bond can be liquid or gas examples: ethylene, butene, **isobutene** **Dienes and Alkynes** general formula: $\text{C}_n\text{H}_{2n-2}$ (n is a whole number, usually from 1 to 20) linear or branched chain molecules containing two carbon-carbon double-bonds can be liquid or gas examples: acetylene, butadienes

<http://www.ask.com/question/what-products-are-made-from-crude-oil>

The most common product of crude oil is fuel of all sorts—gasoline, liquefied petroleum gas (LPG), kerosene, naphtha, and diesel. Other products include lubricants, wax, asphalt, tar, petroleum coke, sulfuric acid, and hundreds more.

To learn about everyday products we use go to:

<http://www-tc.pbs.org/independentlens/classroom/ww/petroleum.pdf>



PROCEDURE:

1. Prior to class, hide 200 oil drops around the classroom. Make sure that some are hidden in very obscure places.

(Note: This activity could also be done outside.)

2. Begin class by showing a container of crude oil and asking for student volunteers to tell what it is and how it is used. Help students identify products they may not know are made from petroleum. (See Teacher Background for ideas.) Record the responses.

*(Possible answers: Crude oil is a dark substance consisting mainly of hydrocarbons created through the heating and compression of organic materials over a long period of time. It is used for fuel of all sorts-- gasoline, liquefied petroleum gas (LPG), kerosene, naphtha, and diesel. Other products include lubricants, wax, asphalt, tar, petroleum coke, sulfuric acid, and hundreds more. **[Simplify for lower grades]**)*

3. Lead the students to classify it as a source of energy.
4. Show the students a pinwheel and demonstrate its movement by blowing toward it or let a volunteer show how this is done.
5. Again ask students to identify the source of the energy. (If they say "you," be sure to translate that into "wind" that comes from nature or "nature.")
6. Ask how the pinwheel uses the wind – how it is captured or harnessed. Students should be able to recognize and explain that the shape of the pinwheel creates the rotation when a current of air strikes it.
7. Ask students to suggest which one of the energy sources is more likely to run out of its supply—**petroleum/oil or wind**.
8. In comparing the two energy sources, students should explain why they think one will likely run out and the other is not likely to run out.
9. Label the two energy sources: non-renewable (oil) and renewable (wind). Write the definition of non-renewable and renewable resources on the Smartboard or marker board. Students will copy the definition in their notes.

Renewable: any natural resource (as wood or solar energy) that can be replenished naturally with the passage of time

Non-renewable: any natural resource that exists in limited supply and cannot be replaced if it is used up; also, any natural resource that cannot be replenished by natural processes.

10. Arrange students in pairs and hand out the **Oil Drop Hide and Seek Data Sheet**, plastic cups, pencils and permanent markers.



11. Tell students that they are going to form an oil company and begin searching for a nonrenewable source of energy (oil drops). Show an example of the oil drops that are hidden around the room.
12. The students should come up with a name for their oil company and write the name on the space provided on the **Oil Drop Hide and Seek Data Sheet**.
13. Using their marker, have students label their cups 1 through 4. For younger students, you may want to pre-label the cups.
14. Give students four 15-second opportunities to find the oil drops.
15. After each search, have them count and record the number found and deposit the oil drops into a cup (one labeled for each search).
16. At the end of four searches, they should make a bar graph (with color crayons) on their data sheet and analyze their data.
17. When the paired groups have completed the data sheet, ask for volunteers to share their results. Once a few pairs share similar results, lead the class in a discussion. From the data, students should be able to deduce that, due to a limited supply, the search probably yielded smaller returns each time.
18. Ask questions such as:
 - Look at your graph. Did you collect the most oil drops in the first, second, third or fourth search?
 - What is the difference between the number of oil drops you found in your tallest graph and your shortest graph?
 - Why do you think it became increasingly harder to find oil drops?

(Activity variation: Have students divide into 4 groups (oil companies). Each group should name their company. Have one group conduct the first search for oil drops; group 2 conducts the 2ND search, etc. Once each group has searched, compare data. Which group discovered the most oil?)

STUDENT HANDOUTS – (See separate files for editable Word documents)