



what's the risk?

A ready-to-use lesson plan and video on what every student should know about the potential dangers of hanging around well sites.

FOR MIDDLE SCHOOL AND HIGH SCHOOL STUDENTS

A complete and flexible half-hour lesson plan, with a discussion guide and independent or team-based research ideas for use in health, science or physical education courses.

Provided as an educational public service by the Railroad Commission of Texas, Interstate Oil and Gas Compact Commission, U.S. Department of Energy and the Oklahoma Energy Resources Board.

"What's the Risk?" is an awareness-building video and lesson plan that helps you teach students, in their terms, the dangers of well sites. "What's the Risk?" can be used with middle and high school students as a stand-alone or integrated component of your health, science, or physical education/safety curriculum.

objectives

Well sites can be dangerous places, and we see stories in the media about the injuries and deaths of curious young people who wandered too close to a tanker, pumping unit or pipeline.

We hope this guide will be helpful for you as you share the "What's the Risk?" video with your students. The Railroad Commission of Texas believes preventing well site accidents begins with teaching your students the dangers of messing around with a well site, because as it says in the video, "knowing makes all the difference."

key messages

- The video uses a skateboarding theme and the importance of "knowing the risks before you take them" to explain that well sites can be dangerous.
- Oil sites may not look risky, but sometimes they are.
- Oil sites include tankers, ladders, pumping units on timers, high voltage electrical boxes, pipelines and dangerous oilfield chemicals.
- Messing around well sites is a bad idea.

introducing the video

Our video today is called "What's the Risk?" It is about the dangers of hanging around well sites. Before we watch the video, I want to ask you a few questions.

- **Has anyone ever seen or visited a well site?**
- **Can anyone describe what a well site looks like and what kinds of equipment might reside on a well site?**
- **What would you guess can be dangerous about hanging around well sites?** (Dangerous equipment, high-powered electrical equipment, chemicals, flammable materials)

After we watch the video, we'll talk about the kinds of equipment you might find on a well site and why it is so dangerous. You might want to take a few notes so you'll be ready for the discussion. (*Show the video*)

discussion #1

Basic Video Review

Okay, so even though the big equipment on an oil site might look like a tempting place to skateboard or hang out, why is it a bad idea? (There are lots of places to get hurt – dangerous equipment, pressurized natural gas lines, tankers, ladders, pumping units on timers with counterweights that weigh 50,000 pounds, high voltage electrical boxes, pipelines, oilfield chemicals and flammable materials.)

What are some other similar risks you might encounter in the environment around your house or neighborhood?

(Electrical lines, deep holes, sewer lines and drainage ditches, gasoline and other flammable materials, polluted creek beds, discarded paint or aerosol cans, etc.)

How do you avoid risky behavior that might endanger you or your friends? (Become knowledgeable about the risks associated with certain behaviors or things; don't let your curiosity get in the way of good common sense; and don't fold to peer pressure or "dares.")

What should you do when you encounter a place or a thing that you are uncertain about or don't know much about?

(When in doubt, don't check it out.)

discussion #2

Oil sites and consumption

Now that we've discussed the dangers of petroleum sites identified in "What's the Risk?," let's talk about other issues related to these sites and our consumption of natural gas and oil.

Why do these sites even exist? (Production sites are a necessary part of our landscape because of our country's demand for energy and our national security.)

Did you know that Americans consume petroleum products at a rate of three-and-a-half gallons of oil and over 250 cubic feet of natural gas every day for every man, woman and child, 365 days a year? That's a lot of oil and gas!

Part of the reason petroleum is in such high demand is that it is a component of over 3,000 different products. **Can you name some petroleum products?** (Ink, telephones, purses, deodorant, panty hose, car sound insulation, motorcycle helmets, hair coloring, fishing lures, skis, model cars, dishwashing liquid, footballs, cameras, fishing rods, sunglasses, toothbrushes, shoes and many more).*

In conjunction with the state of Texas, the oil and gas industry is working to identify new and less invasive ways to extract oil more safely and efficiently, and to minimize impacts to the environment.

RESEARCH IDEAS:

- Have students investigate what chemical contribution petroleum makes to some of the products listed above.
- Identify some of the chemicals that are used in the petroleum drilling process. What are scientists doing to make oil field chemicals and oil sites safer for the environment and for people?
- Research the types of alternative energy sources available today. What are their advantages and disadvantages when compared to oil and gas as energy sources?

discussion #3

The Science of Drilling a Well

When you watched the video, "What's the Risk?" you heard about the dangers of oil field equipment and chemicals, but what do you know about the science of drilling an oil well?

*Source: Oil Information Committee, Texas Mid-Continent Oil and Gas

Who can tell me what systems are included in an oil drilling rig? (Power system, lifting system, rotating system and pumping system.)

The power system to run oil rigs comes from strong engines called "prime movers." Some rigs are diesel powered, while the more modern rigs are powered by electronic transmission systems. Big rigs actually have three or four prime movers that create up to 4,500 horsepower, compared to a car's 300-600 horsepower.

Lifting systems include the derrick, a tall tower that holds up pipes reaching thousands of feet into the well hole, and the traveling block, that uses strong wire rope to lift drill pipe and other equipment up and down out of the well.

Rotating systems are all the parts that help the drill bit spin into the ground. The swivel is just below the traveling block and the drill bit actually scrapes and cuts through layers of rock to reach the oil and natural gas.

Pumping systems are primed by drilling fluid called "mud" that is stored in mud tanks. **What is drilling mud?** It is water or oil, clay, weighting material and chemicals. Mud pumps send the mud through the drill stem down to the drill bit where it cools the bit, and helps spin it more easily. Fluid then carries the drilled-out rock and dirt back to the surface.

Based on the obvious power of these systems used to drill an oil well, you can begin to understand why drilling sites can be so dangerous. While it might be tempting, you should never hang out around these sites.

SUGGESTED SCIENCE-RELATED RESEARCH PROJECT:

Ask your students to work in small groups to do online research regarding why oil is drilled by boring deep into the earth's surface, and how petroleum is formed.

Hint: Petroleum is often called a "fossil fuel."

SUGGESTED VOCABULARY REVIEW AND QUIZ:

Ask your students to complete a matching quiz over the following oil well site terms, and to discuss the dangers of working or playing around the these tools:

- **Barrel (bbl):** a unit used to measure petroleum products in the United States equal to 42 gallons.
- **Breakout tongs:** large tongs used to help unscrew one section of pipe from another.
- **Casing:** steel pipe put into an oil or gas well to stop the wall of the well from caving in.
- **Christmas tree:** the control valves, pressure gauges and chokes at the top of a well that control the flow of oil and gas after the well is finished.
- **Collar:** collar-shaped metal used to seal together two pieces of pipe.
- **Heater treater:** equipment that heats and purifies oil to raise its quality for pipeline transmission.
- **Hydrogen sulfide:** with its distinctive rotten-egg odor, H₂S gas is frequently found in oil and gas reservoirs, and is extremely poisonous and corrosive.

- **Separator:** (1) an item of production equipment that uses gravity to separate liquids from gases during well production: heavier liquids fall to the bottom and gas rises to the top. (2) equipment used to separate liquids which have very different properties.
- **Service well:** a well drilled to assist production in an existing field, including injection wells and disposal wells.
- **Sour crude oil:** an oil whose total sulphur content is in excess of one percent; also known as "sour crude."
- **Tank battery:** a series of tanks and related equipment placed close together and operated as a unit.

Source: Maguire Energy Institute: SMU Cox School of Business: www.cox.smu.edu

SUPPLEMENTARY RESOURCE:

Visit the Oklahoma Energy Resources Board web site for kids at www.xploration.com



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