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Oil and Gas As A Source of Energy

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INTRODUCTION

Oil and gas are our primary source of energy and has been around for quite some time. Through research, oil and gas as a source of energy is developed into a unit that may be used in grades seven through nine science classes. The length of the unit should be two wells. The unit will address itself toward the explanation of how oil and gas was formed, prospecting for oil, oil and gas supply and demand, oil consumption, oil production primary, secondary, and tertiary recovery, refining of oil, transportation of oil and gas, oil pollution, how long will oil last, and where gas is found. Included are also a career, lesson plans, experiment, a reading list for students and teacher, vocabulary list and a bibliography.

Oil and gas are commodities that are used worldwide. There is a tremendous variety in the usage of oil and gas. As a result many questions have arisen in the minds of the consumers.

When we think of oil we mostly think of gasoline for cars or a lubricant, but oil is used all around us in a variety of things. Crude oil can be refined and made into many products. It provides large amounts of fertilizer for plants, synthetic fibers, and plastics. A lot of things in our every day life are made of oil. If we did away with oil we would have to get rid of a lot of the clothes that we wear, paints, plastic pan handles, detergents, road surface material, just to mention a few. Oil is used in many things that we take for granted.

Scientist believe that after millions of years of heat and pressure being applied to prehistoric sea animals and plants being trapped in sediments, change them to crude oil and natural gas.

Oil is made up of hydrocarbons which are chemical compounds of hydrogen and carbon.

CAREER

A GEOLOGIST Is a scientist who studies the earth and its history. He studies about the different types of rocks (igneous, sedimentary and metamorphic). He studies how they are formed and their physical content.

This career can be rewarding because the geologist can become a physical science teacher or work for an oil

company in helping locate oil.

HOW OIL WAS FORMED

It is erroneous to think that oil is found in enormous pools underground. It actually occurs in small spaces in porous rock. Often times it is found as a layer between water and gas.(see Appendix 1)

Estimates of proven recoverable reserves vary from year to year and are uncertain. Oil is under a lot of pressure and usually a well releases that pressure. It flows unassisted into the well where it rises to the surface because of pressure or it is pumped out. Usually this flow will continue for several years. Once the oil is collected the natural gas is separated. When the pressure becomes insufficient to lift the oil to the surface, a pump is installed in the well. The recovery may then continue for years.

Once oil has been located in the pores of rocks, turning it into a product to be used in the home, industry, vehicles and air crafts requires much work. Sometimes miles of digging is done and not always profitably. The reason is that oil is packed in the pores of rock so tightly and beyond reach. Once it is found only about half of the amount can be pumped out.

“Crude oil is technically defined as a mixture of hydrocarbons that exist in the liquid phase in natural underground reservoirs and remains liquid at atmospheric pressure often passing through surface separation facilities.” Crude oil is found in the crust of the earth.

An oil reservoir is formed out of porous sedimentary rock and capped with a layer of impermeable rock, liquids and gas cannot penetrate this rock layer. Originally water filled the pores but oil and gas from the adjacent source rock seeped or bubbled through and became trapped against the rock layer or cap rock. The cap rock prevents the oil and gas from moving up. (see Appendix II)

Because porosity and permeability vary well production varies. Oil also vary in nature from heavy to extremely light. The less viscous the oil the more easily it is to flow to the well.

PROSPECTING FOR OIL

In looking for oil, the first thing the prospector must do is to find the right kind of rock. The type of rock sort is the sedimentary rock. Sedimentary rocks are formed by pressing together of bits and pieces of other minerals. Oil is rarely formed in igneous or metamorphic rocks.

The geologist is the first on the site because of his expertise in the area of the earth’s original structure and history. He first looks for sedimentary rocks on the surface. By close examination of the rock he can estimate where the rock came from. According to thickness and age, oil maybe present. At times oil may seep to the surface which may mean that there is a reservoir or the underground oil has already escaped.

A geologist may use a magnetometer in an aircraft for rocks that cannot be seen on surface. This piece of equipment measures the magnetism of underground rocks. He can then get a clear picture of the types of

rocks that are buried.

Finally he checks the rocks on a large scale. The rocks must be folded in a way where as the trapped oil cannot escape. When all of the checking has been done the geologist will suggest where oil may be found. The final proof is in the drilling.

After the geologist, the oil explorer must then look beneath the earth. He sets off small explosions which sends out vibrations. These explosives are placed in small holes. Another method that is used is a special truck that thumps the ground sending out seismic waves. At sea, dynamite is launched from a ship. The vibrations are picked up by the explorers' seismic equipment.

Sometimes a stratigraphic hole is dug in areas where little is known of the geology. "Stratigraphic is the science of geological history and tells us in what order rocks were made."

OIL SUPPLY AND DEMAND (see Appendix 3 and 5)

World War II brought about an enormous demand for fuel. Coal and oil rose in price. By 1943 gas had become less expensive than either fuel in the markets.

Andrew R. Flower's report on World Oil Production suggest that, oil production inevitable will level off and fall. As a result, oil will fail to meet the increasing demand before the year 2000. Therefore alternative fuels will have to bridge the gap for the demand for energy. Some suggestions are the reliance on nuclear energy and eventually on renewable energy sources.

Two scenarios which will determine the energy supply and demand are the economic growth rate and the price of energy. Another point worthy of consideration is how long will the supply of oil satisfy the demands.

"The major factors that will determine potential oil supply are the amount of proven reserves (oil recovered from known reserves at current prices and with current technology) and the rate at which those reserves can be exploited." [2] The production rate depends upon the following three things: 1) the size of the fields, 2) its geology and 3) its installed facility. In any on year if ten percent of the recoverable reserves are superseded, the amount of oil will be reduced according to the amount that can ultimately be recovered. This may vary from field to field, nevertheless a reserve-to proportion (R.I.P.) ration 10 to 1 is the minimum ratio feasible for the world's oil reserves. The maximum estimate rate of production for worldwide proven reserves are RIP ratio 15 to 1.

The requirements necessary in order to project a basic oil-supply curve is a yearly for the remaining proven reserves. "That is the gross additions to reserves and then subtracting the amount of oil that has been withdrawn from reserves."3

The largest oil producing states are: Texas, Alaska, Louisiana, California, Oklahoma and Wyoming.

Of the nations one hundred largest fields there are thirty-five fields in Texas and twenty-seven fields in Louisiana. Prudhoe Bay fields on Alaska's North Slope is the largest field which has a reserve of 9.6 billion barrels of recoverable oil and 26 trillion cubic feet of natural gases as of December 31, 1974

In 1983 the demand for oil fell in the world excluding the USSR, Eastern Europe and China. It is estimated to have been 44.7 million barrels a day. Comparing that to the demands in 1982, the demand fell 0.8 million barrels a day.

There is great competition going on between gas, coal and oil. Coal and oil suffer as a result of the competition from gas, nuclear and hydro in a depressed power generator sector. “National programs to reduce dependency on oil continued to affect demand. In most countries, petrochemicals feedstocks (mainly naphtha) were buoyant; demand for transport fuels was also resilient.” [4]

In 1983 in Western Europe the demand for oil declined by 3 percent, in Japan 0.7 percent and in the United States 1.6 percent. To offset the demand for oil and gas the demand for coal increased (1 percent), nuclear (6 percent) and hydro (6 percent).

OIL CONSUMPTION

“In 1980 America consumed more than a quarter of the worldwide production of 60 million barrels a day to propel our cars, trucks, boats, to heat our homes, and drive industry and to provide raw material for petrochemicals.” [5]

Nine million barrels came from domestic wells and the remainder imported controlled by (OPEC) Organization of Petroleum Exporting Countries.

The U.S. has the equivalent of nine reserves left. Sixty thousand oil and gas wells were drilled in 1980. The investment in the search reached 20 billion dollars.

At the close of each year estimates are made of new fields and pool discoveries. In addition, estimates for proved reserves for fields and or reserves discovered prior to current reserves and adjusted for by: 1) changes in the area, 2) revisions on better defined performances of the reservoir and, 3) “the effect of the current year’s production.” [6]

“In 1982, we consumed almost 5.7 billion barrels of liquid petroleum products and some 18 trillion cubic feet of natural gas. Thus, petroleum provided more than two-thirds of the energy we used that year. Nearly one-third of that oil and 5 percent of that natural gas we import.” [7]

In 1977 we accounted for nearly 48 percent of our domestic demand of oil. This illustrated a remarkable decline in our imports. As economic conditions in the U.S. improved this result in an increase in our dependency on energy from insecure foreign sources.

In the past we witnessed that such heavy dependency on foreign oil can mean in times of tight energy supply. “The Arab embargo of 1973-74 and the interruption of supplies caused by the 1978-79 Iranian Revolution both took their toll on U.S. consumers in skyrocketing prices and fuel shortage at the pump.” [8]

If we find and develop our own energy resource the U.S. need not rely so heavily on foreign oil for so much of its energy.

During the embargo the Organization of Petroleum Exporting Countries (OPEC) quadrupled oil prices. This shocked the non-OPEC world. Only the Soviet Union produced all of the oil that they needed.

The United States Geological Survey (USGS) indicates that the United States “may have as much as 180 billion barrels of liquid petroleum and more than 1 quadrillion cubic feet of natural gas remaining to be produced,” 9

from known and yet to be discovered reservoirs.

Underlying the submerged country of the United States is believed to be about 30 percent of our future oil and 28 percent of our future natural gas supply. Under the water of the Alaskan Outer Continental Shelf (OCS) is believed to be a substantial portion of the offshore oil and gas. The off shore lands comprises Nearly three quarters of the nations total off shore area. Despite the petroleum potential only a small portion of Alaska has been explored. This is due to remoteness, high cost of exploration, the need to create a transportation system onshore and offshore.

In 1970 our national bill for imported oil was three billion dollars. By 1980 it rose to 80 billion dollars. During this time the purchasing power of the dollar dropped. We were conserving fuel and we were also in a recession. Also during 1980 oil rose from three dollars a barrel to more than thirty-two dollars a barrel. World supplies were threatened while the war between Iraq and Iran dragged on.

“Even though we import oil, we are the world’s third largest producer of petroleum. We are at the moment virtually self-sufficient in natural gas.” [10] The Soviet Union and Saudi Arabia are the world top producers.

PRODUCTION (see Appendix 5)

In the early days a gusher was a common sight. A quaker is a wasteful and hazardous sporting of oil over the country side. There are three methods used in the production of oil, primary, secondary and tertiary.

“If the well strikes oil it is sealed with mud while the final casing is run. When all is cemented in, narrow tubing is run down to the level where the oil occurs.” [11] The casing is perforated there for it allows the oil to flow. To prevent the flow between the spaces of the tube and casing a plug or packer is used.

A group of valves on top of the well called a Christmas tree regulates the flow of oil. Once “the oil leaves the well head it goes through several drums.” [12] The drums are used to remove gas take out water and remove salt. If the oil pressure is high more drums are needed and visa versa.

PRIMARY RECOVERY

“In the U.S. today such production recovers on the average about five percent of the oil in a reservoir.” [13] As you conclude, this method fall short of the total the total recovery of oil that is in the field. In early days this was the only technique the drillers had available.

SECONDARY RECOVERY

“Secondary recovery involves the feasibility of the fields. Water or gas is pumped into the reservoir to produce more pressure on the oil. When natural pressure is too low to bring the oil to the well.” [14]

Incentives such as the operator knew where the oil was, the owning of the mineral rights, and having the facilities for processing was already in place. Such incentives led to the development of several techniques that are called “secondary recovery.” [15] “The four basic possibilities in such recovery are mining, squeezing,

pushing, and sucking." [16]

Mining involves removing the oil bearing rock from its position several hundreds or thousands of feet below the surface of the earth. It is brought to the surface for processing as an ore. This method proved to be uneconomical because of the concentration of ore is low and the depths of most deposits make mining difficult.

Squeezing has to do with the pressing out the oil from the rock by force.

Pushing is the most successful secondary recovery. This is done by displacing the oil from the rock with some other substance.

Sucking is a type of variation of pushing. The air in the atmosphere is used as a pusher.

The primary techniques are supplemented by the injection of water or gas in the secondary recovery technique. They do not displace all of the oil. That which is trapped by capillaries force in the pores is called residual oil.

TERTIARY RECOVERY

The third type of recovery is tertiary or enhanced. This "can sometimes be achieved if the viscosity of the oil is lowered so that it flows more easily, either by heating the oil (by injecting steam, for example) or by injecting chemicals into the reservoir." [17] Secondary and tertiary methods have increased recovery in the U.S. from about 25 percent to 32 percent.

Enhanced recovery can be subdivided into three categories: miscible, chemical and thermal.

The miscible processes involve the displacing of fluids mixed with oil in a way so that there is no sharp interface between the injected and displaced fluid. This causes the capillary trapping capacity to be reduced and therefore more oil can be mobilized. The miscibility of a fluid is expressed in two types: direct miscibility where by fluids are mixed in all proportions and developed miscibility where components exchange between two fluids.

The five miscible drive fluids are hydrocarbon, solvents, nitrogen, carbon dioxide, enriched hydrocarbon gas and high-pressure hydrocarbon gas.

In chemical processes "chemicals are added to the displacing fluid to change its physico-chemical properties and those of the oil." [18] The aim is to increase the viscosity of the displacing fluid in order that more oil can be recovered. Caustic chemicals are used in this process.

The aim of the thermal processes is to inject or generate heat. This process is the most widely used of all the enhanced recovery techniques.

"Two principal methods are used to generate and transport heat for thermal recovery-surface generation and underground in situ combustion." [19] The most common is surface heat generation. This procedure involves water to transfer heat to the surface reservoir.

Water is cheap and an excellent heat carrier. The water can be converted to steam and carries three times more heat.

REFINING OF OIL (see Appendix 6)

The process of refining oil is first distillation. This means to boil oil until it turns to vapor and travel up the column where condensation causes it to turn back into liquid. Gases travel to the top of a column and at different points various liquids are drawn off. From oil we get gas, gasoline, Kerosene and diesel fuel. The heavier the liquids the less it rises in the tower. Residual fraction can be used as fuel oil or it can go into another tower (the vacuum distillation column) to be separated into still different fractions. Except for the USSR, Eastern Europe and China the primary world refining capacity continued to decline in 1983. Western Europe and Japan had the largest cutbacks. The primary capacity was 0.9 million barrels a day and 0.6 million barrels a day down in 1982. In the Middle East countries a new refining capacity was introduced in 1983. The primary capacity increased by 0.4 million barrels a day. The Indonesia refining capacity also increased.

"The refining industry in many areas of the world has been living with considerable excess primary capacity for several years although substantial reductions have taken place in the United States and Western Europe." [20] The results have no upgrading facilities. Low demands in 1983 brought about low usage rates.

TRANSPORTATION OF OIL (see Appendix 7)

Since oil is found hundreds or thousands of miles from where it is needed means of transportation is of necessity. In the early days oil was moved in barrels on a horse drawn wagons. After which it was taken by rail, barge or ship to the various destinations.

Today the large amount of oil is moved by pipelines from the well to the refinery or port. The sea-going tankers move it from country to country. When the output is small or the country is less-developed the road and rail tankers or barges are used.

The most economical way to move large amounts of oil over land is by way of the pipeline. They may be beneath the ground several feet or supported above the ground. Pumping stations along the line assist in the flow. The climate determine the necessity of insulation for the pipes. Sometimes heating stations are built along the line, again to aide in the flow.

When oil has to be shipped a tanker is used. This is a ship used especially to transport oil. The ship is divided into many small tanks. The object being to prevent the slopping about of cargo and if the ship were hold the result would be small leaks.

By the "end of 1983 the world tankers and combination carrier fleet comprised 3482 ships of 10,000 deadweight tons (dwt) and over totalling 329.3 million dwt. This consisted of 3138 tankers (289.2 million dwt) and 344 combination (40.1 million dwt.)" [21]

POLLUTION

When the land, air and water is made dirty by oil, it is then said that it is polluted. Laws have been made to prevent pollution. Pollution can be dangerous to human life and even kill plants and animals. Laws have been passed whereby companies must use anti-pollution equipment.

At one time big cities were unhealthy places to be in winter because of the dirty fuels that factories used and the burning of coal. Buildings were blackened, plants died and pollutants got into peoples' lungs.

Water can be polluted by tankers being holed or a disaster where the crude oil poured into the sea. Many sea birds die as a result of such disaster.

Major oil companies came up with a system to stop pollution called "Load-On-Top." [22] In this procedure crude oil carriers tanks are washed out at the end of voyages and the oily water from the wash out is loaded in one tank. Some oil from the next cargo is put on top of the water. Once the cargo reaches the refinery the oil and water is separated. Therefore some oil pollution is controlled.

On land firms can re-refine oil and make a product as good as new. Motorists add to the pollution problem by being careless where they empty out the oil from their cars. Some disposal methods used are burning, burying or pouring the oil down drains.

HOW LONG WILL OIL LAST?

Where you live depends upon the amount of oil you will use. The concern over how long will our oil reserve last is a genuine concern. The oil that we are using today, it took millions of years to form. Some experts believe that it should only be used to make important products. We have been reassured that new oil fields are being found every day and will continue to be used in some way when you are old.

There are many ways that we can save oil: 1) keep car engines tuned, 2) insulate hot water tanks, 3) and insulate buildings and houses.

We need to use oil carefully. "Once oil has been used it cannot be used again. One day the world will run out of it. It is therefore important to develop ways to replace it." [23]

There are other sources of oil where we can produce oil apart from the oil wells. Shale is one source. Oil is in the structure of this hard rock. In order to recover the oil it must be heated in a retort. This process is expensive and requires lots of water.

Tar sand is another source, but unlike shale, is not part of the rock. It is so thick it will not flow. This rock is mined, and again heat is used to extract the oil. This process is cheaper and lots of water is needed.

We can also make oil from coal by heating it in a retort. The gas that it gives off can be converted into oil by adding hydrogen.

The two questions we must answer concerning our future oil supply are: how fast should we use up our natural

resources and what are we going to replace the with?

HOW GAS IS FORMED

Like oil gas is found underground, often in the same fields. Scientist believe that after millions of years of heat and pressure being applied to prehistoric sea animals and plants being trapped in sediment, caused them to change to crude oil and natural gas. The properties of natural gas are colorless odorless, and lighter than air.

Drilling is the method used to locate gas. It is brought to the surface in pipes. It rises automatically because it is under a lot of pressure and lighter than air.

Gas has many uses. The industries that produce canned and frozen fruits, mills that convert grains into breakfast foods, dairy plants, and bread companies all use gas. Some "products which use chemicals from natural gas are inks, glue, and other adhesives, paints, explosives, anti-freeze compounds, synthetic rubber and many kinds of plastics, fibers such as nylon, insect repellents, photographic film, detergents, and solvents." [24]

Once gas has been located it is sent to the cleaning plant where it is cleaned and an odor is added. It is of the utmost importance that the odor is added because it is dangerous to breathe in heavy concentrations and easily ignited. After gas has been cleaned it is sent by pipeline to be stored.

Gas produced from a field or existing in a field is termed raw gas, that gas in its natural state. Through the process of partically removing certain hydrocarbons and nonhydrocarbons from the raw gas, it is the marketable natural gas. This is often referred to as pipeline gas, residue gas or sales gas.

The porous sedimentary rock where natural gas is formed is composed of natural reservoirs which allows space for the accumulation of hydrocarbons. Natural gas is a mixture of hydrocarbon compounds and small quantities of various nonhydrocarbons in the gaseous phase. Or it may be in a solution with oil in natural underground reservoirs. Usually the principle hydrocarbons contained in the mixture are methane, ethane, propane, butane, and pentanes. In natural gas reservoirs the typical nonhydrocarbon gases are carbon dioxide, helium, hydrogen sulfide and nitrogen.

Natural gas liquids become available solely by separation from produced natural gas. The availability rate depends on the rate of production from crude oil or from natural gas reservoirs.

Natural gas liquids are comprised of hydrocarbon compounds (propane, butane, and pentanes-plus, referred to as condensates) or a combination of the previous gases subject to recovery from raw gas liquids. This procedure is done by processing it in the field by separators and scrubbers, in the processing and reprocessing plant or cycling plants. The components butane and propane are referred to as liquified petroleum gases or LPG.

WHERE GAS IS FOUND

In 1951 “the largest natural gas field in the country and possibly in the world was the Hugoton field underlying the former Dust Bowl of southwestern Kansas and the Oklahoma Panhandle.” [25] Major dry gas fields are also located in western Texas and the Gulf coast of Texas and Louisiana. In the past Texas, Louisiana, Oklahoma, and New Mexico were the largest producers of natural gas. There were some significant fields in the West Virginia-Ohio-Pennsylvania area.

Natural gas is found in all petroleum fields, both in the oil solution and as free gas trapped within the reservoir. In earlier years oil well drilling, vast amounts of gas were vented into the air. Eventually oil companies found its worth by pumping it back into depleted wells to increase pressure and keep the wells flowing and prolong their productive lives.

Stripped natural gas is remarkably economical and a high energy fuel. Its heat value is nearly twice as that of manufactured gas made from coal and cost less per cubic foot.

GEOLOGY

Geologists and engineers can estimate what gases lie beneath the earth by studying the rock and sand samples brought up by the drill. The samples can give such information as the length and breath or the gas producing area. Estimates are given on how much gas is held in the rock below.

TRANSPORTATION OF GAS

Natural gas is move across the United States by way of pipelines. The pipelines extends from the gas fields to the various states in the U.S.. Locally the pipes that carries the gas is much smaller than the ones that carries it across country.

It is very costly to build pipelines. The “cost is nearly one million dollars per mile to build large transmission pipelines.”

The natural gas companies are concerned about their safety record. Also committees from the Senate and the House of Representative came up with recommendations for the passage of the Pipeline Safety Act. “Natural gas companies cooperated in writing this safety law because the industry wanted to insure the continuation of its fine record for safety.” [27]

SUPPLY AND DEMAND

In 1984 there were about 200 trillion cubic feet of natural gas in proved reserves in the United States and adding Mexico and Canada brings it up to 360 trillion cubic feed. “Proved reserves are gas deposits underground that can be produced using today’s methods and machinery.” [28]

The above data does not include natural gas deposits that have been discovered. Some scientist speculate that “potential for future gas discoveries to be up to 10 times today’s proved reserves.” [29]

In the U.S. we consumed “between 17 and 18 trillion cubic feet of natural gas a year.” [30] We are balancing the scale with that which is used up and new discoveries. In areas such as Canada and Mexico proved reserves are growing.

Due to government regulation control on natural gas prices, gas was priced low in the 1970’s. As a result we consumed more gas. This brought about a shortage of supply in some areas. The government allowed prices to increase to encourage companies to explore more. The increased prices encouraged people to conserve even more. Today companies have produced an abundance of gas ready to be consumed.

In the future experts expect the use of natural gas to continue to grow through the year 2000. It is also believed that the supply and demand will continue to be an important source of energy.

CONCLUSION

Oil and gas as a source of energy in the U.S. have been plentiful. We had unlimited supplies and enjoyed it for a long time. In the past oil and gas have been fairly low in cost until OPEC increased prices.

Now America consumes great amounts of natural resources which means the feasibility of whether gas and oil will be around in the future as a source of energy. We may have to limit the use of gas and oil to making necessities only. At the present we are importing the majority of the gas that we use from other countries and holding on to ours.

Energy is vital to human existence and extracting of raw materials from the earth requires lots of energy and technology. Eventually there will be an energy shortage which means that we must develop new means of developing energy. For now we are safe but not for long. We must continue to explore and find new reservoirs to supply our growing consumption. There are alternatives that we can use to supply our energy needs.

VOCABULARY

1. crude oil—a mixture of hydrocarbons found in a liquid phase underground
2. reservoir—a place where anything is collected or stored, generally in large quantity

3. hydrocarbon—any compound containing hydrogen and carbon
4. natural—gas in its natural state
5. oil—combustible substances obtained from animal, vegetable, or mineral sources
6. geology—the science that deals with the physical nature and history of the earth
7. recovery—the removal of oil from the earth
8. tanker—a special ship used to transport oil cargo
9. petroleum—an oily, flammable, liquid solution of hydrocarbons
10. sedimentary rock—rocks made from bits and pieces of sediments
11. pore—tiny openings through which fluids may pass or collect

LESSON PLANS

LESSON 1

Objective To explain how oil came into existence

1. where did oil come from
2. exploration for oil
3. definition of oil
4. explanation of hydrocarbons
5. explanation of sedimentary rock in contrast to igneous and metamorphic rocks
6. geology findings
7. Activity (explaining the pores in sedimentary rock by using a household sponge)

LESSON 2

Objective To see what an oil well looks like by using a drawing
1. oil rig set up (parts and function)

2. onshore drilling

3. offshore drilling

4. oil well drawing and explanation

5. major oil producing countries

6. oil supply and demands

LESSON 3

Objective An explanation of the three types of recovery
1. primary recovery

2. secondary recovery

3. tertiary recovery

4. what happens to a community when an oil company moves in to start mining

LESSON 4

Objective To explain what happens to oil once it is mined
1. oil transportation (tankers, trains, and trucks)

2. pollution

3. oil consumption

LESSON 5

Objective:

To relate to the by-products of oil by looking around the home

1. uses of oil (household and commercial)

2. how long will our oil last

3. from where do we get our supply of oil

LESSON 6

Objective To explain where gas comes from
1. exploration for gas

2. where gas is found

3. the treatment of gas

4. the distribution of gas

5. household and commercial uses of gas

LESSON 7

Objective To emphasize the properties of gas
1. properties of gas

2. odor is added to gas

3. major gas fields in the U.S. and Canada

4. Activity (blowing a strip of paper to illustrate that gas can cause movement)

LESSON 8

Objective To bring to the surface our concerns about our gas supply
1. our current supply of natural gas

2. our future supply of natural gas

3. the demands upon natural gas

4. storage of natural gas

LESSON 9

Field trip to the BRIDGEPORT UNITED ILLUMINATING COMPANY.

Purpose: To see a facility that uses both coal and oil as a source of energy to produce more energy in the form of electricity, in order that the consumer may enjoy many of its benefits.

LESSON 10

Objective Summative test
In a written essay form answer any 5 out of 7 questions.

1. Where are gas and oil found?

2. Where does most of our oil and gas that we use come from?

3. List and describe 2 out of 3 types of oil recovery.

4. List 7 items that are made from oil and 3 byproducts of gas.

5. Explain crude oil?

6. What causes gas and oil to form underground?

7. How are gas and oil transported?

CONCLUSION:

Alternatives to gas and oil as a source of energy.

Notes

1. World Resources Oil p.14
2. Oil and Gas In 1983 p.66
3. Scientific American p.43
4. Ibid p.43
5. American Petroleum Institute p.59
6. American Petroleum Institute p.1
7. Ibid p.1
8. Ibid p.1
9. Ibid p.16
10. World Resources Oil p.18
11. Ibid p.18
12. Scientific American p.42
13. Scientific American p.35
14. Ibid p.35
15. Ibid p.35
16. Ibid p.42
17. Enhanced Oil Recovery By Miscible and Chemical Methods p.1 18. Ibid p.2
19. Oil and Gas In 1983 p.6
20. Ibid p.8
21. World Resources Oil p.18
22. Ibid p.8
23. The Story Of Gas Energy p.41
24. Scientific American p.18
25. The Natural Gasbook p.12
26. The Story Of Natural Gas and Energy p.12
27. The Natural Gasbook p.12
28. Ibid p.12
29. Ibid p.12

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3. Energy National Geographic, Special Report, February 1981, Washington, D.C.

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3. Scientific America. “World Oil Production”; Vol. 238 No.3 March 1978.

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Appendix I

(figure available in print form)

Appendix II

(figure available in print form)

Appendix III