Petroleum

Slide 1 Petroleum seminar requested by the Kurdish Governor in northern Iraq.

Slide 2 Picture of oil rigs from the air. A British Petroleum rig in the Gulf of Mexico lost containment control of a well in April 2010 as head pressures from a volcanic like well spewed oil at an estimated 70,000 to 110,000 psi at 400F according to Internet reports. I can relate to head pressure.

In October 1987 I was experiencing my second stroke. I was like the BP rig. The pressure in my head was so great I thought it would explode all over the back of the room. I called out to God and said "You can have all of me." Immediately I was standing in the presence of a holy God and he said "Do My Will." God was calling me to obedience. As I thought what is Your will He said "As I have forgiven you, so must you forgive others. I saw a video strip and in each frame was a person I had not forgiven. The first frame was a picture of my dad. I said "I forgive them all." I experience incredible love and forgiveness from God the Father.

Slide 3 Oil Outline **History of Use,** B. Formation of Oil**,** C. Concentration of Oil**,** D. Oil Recovery**,** E. Oil Refining**,** F. Where is the oil? G. How long will it last? What are the environmental Concerns? I. Real cost of oil

Slide 4 History of Use

Genesis 2:10-12 Amplified Bible (AMP)

10Now a river went out of Eden to water the garden; and from there it divided and became four [river] heads.

11The first is named Pishon; it is the one flowing around the whole land of Havilah, where there is gold. (Underground river of oil)

12The gold of that land is of high quality; bdellium (pearl?) and onyx stone are there.

1000 A.D. Arab scientists discovered distillation and were able to make kerosene. This was lost after the 12th century! Rediscovered by a Canadian geologist called Abraham Gesner in 1852

Slide 5 Picture of Petroleum seep with oil and gas rising to the surface. The seep began after the 1994 Northridge earthquake in the North Sulphur Mountain Area of Ojai oil field, Ventura County, CA. Photo by S. Mulqueen.

Slide 6 History of Use

History of Use1858: first oil drilled in Canada in 1859: Edwin Drake! Who is he? He was the first person in the U.S. to drill for oil. Where? In Titusville, Pennsylvania. The initial cost was: $20 per barrel, within three years dropped to 10 cents. Now why do we measure oil in barrels?

Slide 7 History of Use

1901: Texas! The Spindletop gusher gave 100,000 bbl. a day

Name:

Petro means rock

Oleum means oil

Slide 8 Oil Outline

History of Use, B. **Formation of Oil**, C. Concentration of Oil, D. Oil Recovery, E. Oil Refining, F. Where is the oil?, G. How long will it last?, H. What are the environmental Concerns?, I. Real cost of oil

Slide 9 Formation of Oil

Oil usually occurs with natural gas: mixture of hydrocarbons of light molecular weight

Forms almost exclusively from organic matter in marine sediments—whereas natural gas forms in both marine and terrestrial rocks? Remember coal? What is that?

Slide 10 Formation of Oil

Marine Realm

Remains of free-floating planktonic organisms

Plankton is rich in lipids

Terrestrial plant has cellulose and lignin

Slide 11 Formation of Oil Diagram

Depth represents

Increase in time

Increase in temperature

Increase in pressure

Slide 12 Formation of Oil

Digenesis

Surface to about ½ km, T, 50°C; CH_4

Catagenesis

50 to 150°C, P about 1.5 kb

Compaction of sediment, expulsion of water

Organic matter becomes kerogen and liquid petroleum—biogenic gas decreases, however some formed by thermal cracking of kerogen

Wet gas: methane+ethane+propane+butane

Slide 13 Formation of Oil

Metagenesis

Greater than 4 km, and 150°C

Dry gas

C rich residue

Graphite developed

Slide 14 Oil Outline A. History of Use, B. Formation of Oil, C. **Concentration of Oil**, D. Oil Recovery, E. Oil Refining, F. Where is the oil?, G. How long will it last?, H. What are the environmental Concerns? I. Real cost of oil

Slide 15 What do we need?

Source rock, Reservoir rock, Cap Rock, Traps, Structural, Stratigraphic, Concentration of Oil

Slide 16 Concentration of Oil Structural Traps, Fault, Anticline, Salt Dome
http://www.priweb.org/ed/pgws/systems/traps/traps_home.html

Slide 17 Concentration of Oil Diagram

http://www.priweb.org/ed/pgws/systems/traps/traps_home.html

Slide 18 Concentration of Oil Diagram

http://www.priweb.org/ed/pgws/systems/traps/traps_home.html

Slide 19 Oil Outline, A. History of Use, B. Formation of Oil, C. Concentration of Oil, D**. Oil Recovery** E. Oil Refining, F. Where is the oil?, G. How long will it last?, H. What are the environmental Concerns? I. Real cost of oil

Slide 20 Oil Recovery

Initially used cable tool drills – Diagram

Slide 21 Oil Recovery – Picture Cable tool bits

http://www.lloydminsterheavyoil.com/cablebit.htm

Slide 22 Oil Recovery – Picture rotary drill bit

Slide 23 Oil Recovery

Primary Recovery —20 to 30% of oil in reservoir

Least expensive

Uses natural pressure supplied by:

Water

Gas cap

Solution gas

Slide 24 Oil Recovery – Diagram of water dive

Slide 25 – Oil Recovery Diagram of Gas cap recovery

Slide 26 Oil Recovery – Diagram Solution gas drive

Slide 27 Oil Recovery

Secondary Recovery—or Enhanced Oil Recovery—increases production to 50-60%

Water injection

Gas re-injection

Steam flooding

Fire Flooding

Chemical Flooding

Slide 28 – Oil Recovery Injecting CO2/water

Slide 29 Oil Recovery – Diagram of Steam flooding

Slide 30 Oil Recovery – Diagram of chemical flooding

Slide 31 Oil Recovery Tertiary-OIL Mining

Slide 32 Oil Outline A. History of Use, B. Formation of Oil, C. Concentration of Oil, D. Oil Recovery E**. Oil Refining**, F. Where is the oil?, G. How long will it last?, H. What are the environmental Concerns? I. Real cost of oil

Slide 33 Oil Refining

Method by which crude oil converted to petroleum products

(I think that a barrel (42 gal—produces 44 gal of petroleum products)

Distillation (fractionation)

At high temperature the lightest fractions rise to the top of a tower, heavier fractions condense at bottom

Slide 34 Oil Refining

Typical Oil

Gasoline C4 to C10	27%	
Kerosene C11 to C13	13%	
Diesel C14 to C18		12%
Heavy gas oil C19 to C25		10%
Lubricating oil C26-C40	20%	
Residue>C40	18%	

Slide 35 Oil Refining

What we get out of oil now with modern refineries:

50% gas

30% fuel oil

7.5% jet fuel

HOW??

Slide 36 Oil Refining Thermal Cracking

Catalytic Cracking

adds H, hydrogenation and thus increase the gas productions

Contaminants

Sulphur, Vanadium, Nickel

Slide 37 Oil Outline, A. History of Use, B. Formation of Oil, C. Concentration of Oil, D. Oil Recovery E. Oil Refining, F. **Where is the oil?**, G. How long will it last? H. What are the environmental Concerns? I. Real cost of oil

Slide 38 Where is the Oil? "After more than 100 years of exploration in > 75% of the potential oil bearing sedimentary areas, including all of the largest and most accessible ones, we have found only 7 major provinces that contain more oil than the world used in a single year in the peak consumption years of the 1970's."

Slide 39 Where is the Oil? World Oil Reserves 2005 Chart

Central and S. America is mostly Venezuela

Eurasia is mostly Russia

Africa is mostly Libya and Nigeria

Slide 40 Where is the Oil? – World Oil Reserves Jan.2007 Chart

Slide 41 Where is the Oil? World Oil Reserves 2005 Pie Chart

Slide 42 Oil Outline, A. History of Use, B. Formation of Oil, C. Concentration of Oil, D. Oil Recovery E. Oil Refining, F. Where is the oil?, G**. How long will it last?**, H. What are the environmental Concerns? I. Real cost of oil

Slide 43 How long will it last

Things to take into account

Reserves

Rate of use

Recovery percent

Undiscovered Resources

Price

New Technology

Slide 44 How long will it last? World Daily Crude Oil Production Chart

http://www.eia.doe.gov/emeu/aer/txt/ptb1105.html

Slide 45 How long will it last? Quick Calculation. According to the previous graph we use about 72 million barrels per day. Oil reserves are 1201.332 billion barrels.

This equates to approximately 45 years of oil!

http://www.eia.doe.gov/emeu/aer/txt/ptb1105.html

Slide 46 Quote from King Hubbert

M. King Hubbert

October 5th, 1903 -- October 11th, 1989

"Our ignorance is not so vast as our failure to use what we know."

His prediction in 1956 that U.S. oil production would peak in about 1970 and decline thereafter was scoffed at then but his analysis has since proved to be remarkably accurate.

1971

Slide 47 How long will it last? Chart

Slide 48 How long will it last? US Oil Production Chart

Slide 49 How long will it last? The growing gap chart.

http://www.hubbertpeak.com/campbell/

Slide 50 How long will it last? World Oil Production forecast table

http://www.eia.doe.gov/pub/oil_gas/petroleum/feature_articles/2004/worldoilsupply/oilsupply04.html

Slide 51 Oil Outline, A. History of Use, B. Formation of Oil, C. Concentration of Oil, D. Oil Recovery E. Oil Refining, F. Where is the oil?, G. How long will it last?, H. **What are the environmental Concerns?** I. Real cost of oil

Slide 52 What are the environmental concerns?

Depends on what we use oil for? It will vary from country to country—however because 50% of oil is refined for gas, transportation is the most important

Slide 53 Estimated oil demand by end of 2005 bar chart.

Demand for petroleum products in the United States averaged 20.8 million barrels per day in 2005. This represents about 3 gallons of petroleum each day for every person in the country. By comparison, petroleum demand averaged about 2 gallons per person per day in the early 1950's and nearly 3.6 gallons per person per day in 1978.

Slide 54 What are the environmental concerns?

Oil Spills

Pollution

According to 1992 Worldwatch breathing in Bombay is equivalent to smoking 10 cigarettes/day

Transportation infrastructure

Slide 55 What are the environmental concerns?

Oil Spills

How do you clean up?

Slide 56 Burning Gasoline in cars and trucks

Produces the following

95% of CO

58% of hydrocarbons

32% of nitrous oxides

2% of sulphur dioxide

11.3% of the particulates

Slide 57 What are the environmental concerns? Projected Premature Deaths

Slide 58 Oil Outline, A. History of Use, B. Formation of Oil, C. Concentration of Oil, D. Oil Recovery E. Oil Refining, F. Where is the oil?, G. How long will it last?, H. What are the environmental Concerns? I**. Real cost of oil**

Slide 59 Real cost of Oil = Supply and Demand