

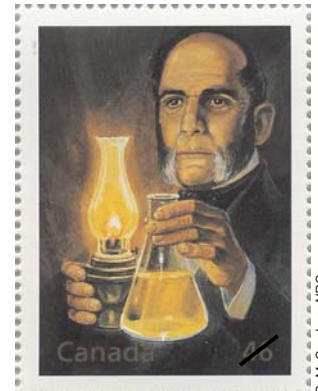


PETROLEUM

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Oil and Natural Gas

It would be hard to imagine our lives without oil and natural gas (petroleum). They keep us warm in winter and cool in summer. They allow us to travel by car to the store or by airplane to the other side of the world. They can be converted to chemicals that we see and use every day. We are dependent on petroleum, but it hasn't been that way for very long. In the mid-1800s there was no electricity, and many homes were lit by whale oil lamps. But as the cost of whale oil went up, people began to look for cheaper alternatives. In 1846, a Nova Scotian, Abraham Gesner, perfected the process of extracting kerosene from coal, tar, and oil. With the development of new technologies the need for oil and gas grew. Now we are in a position similar to the one in the mid-1800s; the days of unlimited, cheap energy from petroleum are over, and we are looking for alternative sources of energy.



Stamp honouring Abraham Gesner: "Father of the Oil Industry"

S. McCracken, NRCCan

Natural gas burner E. Macey, NRCCan



Pumpjacks in Alberta

G. Mossop, NRCCan

What are These Amazing Compounds?

Often called fossil fuels, oil and gas are hydrocarbons that burn easily. Crude oil, straight from the ground, is a hydrocarbon that may flow like water or be so thick and sticky that it needs to be heated or diluted before it can be pumped. This sticky type of crude, called bitumen, is the oil in Alberta's vast oil sands.

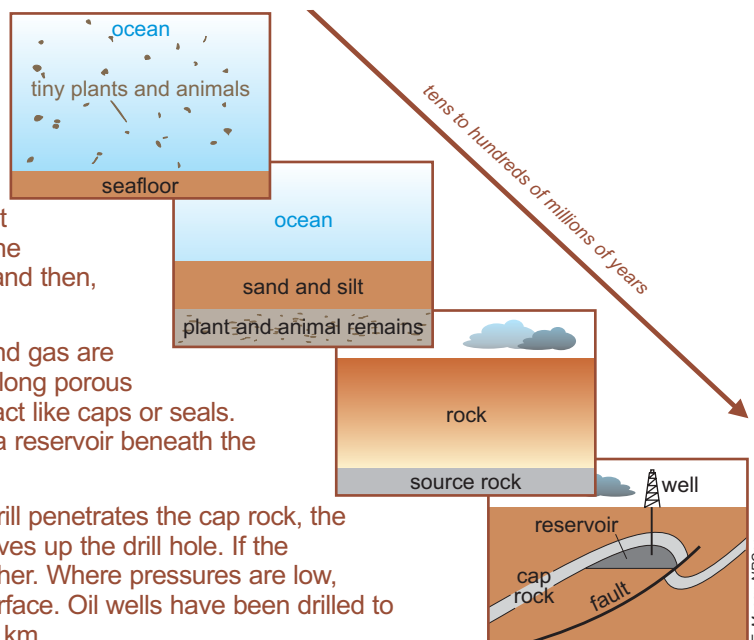
Natural gas is colourless and odourless in its pure form. It consists mainly of methane, but can include other gases: ethane, propane, butane, and pentane. Natural gas is the cleanest burning fossil fuel.

How does Petroleum Form?

The oil and gas we use today began as countless tiny plants and animals that lived in ancient oceans. When they died their remains sank to the seafloor, to be buried over time under mud and sand. As burial got deeper and deeper, the organic-rich sediments turned to rock. Under the right conditions of increasing pressure and temperature, the organic remains were converted into petroleum: oil, and then, at greater depths and temperatures, natural gas.

The organic-rich rock is called the source rock. Oil and gas are usually squeezed from the source rock and moved along porous pathways until trapped by harder, denser rocks that act like caps or seals. As more and more petroleum accumulates, it forms a reservoir beneath the surface.

Oil and gas are usually found by drilling. When the drill penetrates the cap rock, the reservoir pressure is released and the petroleum moves up the drill hole. If the pressure is high, oil can rush to the surface as a gusher. Where pressures are low, pumping is required to move the petroleum to the surface. Oil wells have been drilled to depths greater than 8 km; gas wells to more than 10 km.



E. Macey, NRCCan



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Where is Petroleum Found in Canada?

Canada is rich in oil and natural gas. They are found in rocks that formed in and near ancient oceans. Most provinces and territories, including offshore areas, have petroleum resources.

Gas station



Courtesy of Petro-Canada
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Pipeline construction



Courtesy of TransCanada Pipelines Ltd.
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How is it Transported?

Oil is transported to processing plants and to market by pipelines, rail cars, and tankers. Gas is transported mainly by pipelines. Chances are you've never noticed any part of the 580,000 km of pipeline that links resource areas to where petroleum is needed. That's because for the most part pipelines are at least a metre underground. They form a vast, hidden circulatory system that supplies North America with most of its energy needs.

In the near future, specially designed ships will become more important in transporting liquefied natural gas (LNG) and compressed natural gas (CNG) around the world.

Courtesy of Petro-Canada
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Montreal refinery



Arctic Princess, LNG carrier

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How is it Used?

Many products are made from crude oil, such as gasoline, diesel oil, jet fuel, furnace oil, lubricants, and petrochemicals. The process of making useful compounds from oil is called refining, and the plants where this is done are called refineries.

Gas plants remove impurities such as water and hydrogen sulphide, and separate the gas components. The natural gas delivered to homes is almost pure methane. The other gas products such as propane and butane are sold separately, as is sulphur, which is produced from the hydrogen sulphide.

Petrochemical compounds are the building blocks of plastics, fabrics such as nylon, rubber, fertilizer, and many of the other materials that we have come to depend on. There are over 3000 products made from crude oil: ink, crayons, bubble gum, dishwashing liquids, deodorant, eyeglasses, tires, ammonia, and heart valves are just a few.

Did you know?

It takes a month for crude oil to be piped from Alberta to southwestern Ontario, but less than a week for gas

When natural gas is burned, it produces mainly carbon dioxide and water vapour – same as when we breathe

A tiny amount of a smelly chemical (related to that in a skunk's spray) is added to the natural gas we use, so we can detect it

Fossil fuels are being consumed 100,000 times faster than they are being formed

Alberta sells almost two-thirds of its crude oil to the United States

Micro-organisms in landfills can transform organic garbage into natural gas

Biogenic gas is made by anaerobic bacteria decomposing organic matter in rock – much of the gas in southeastern Alberta is this type