

Fractional distillation of crude oil



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8. 2. 1 (iv) Fractional Distillation of Crude Oil By Blake Turner - Year 11

Fractional Distillation of Crude Oil Introduction 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 colour, from clear to tar-black, and in viscosity, from water to almost solid. On average, crude oils are made of the following elements or compounds: * Carbon - 84% Hydrogen - 14% * Sulphur - 1 to 3% (hydrogen sulfide, sulfides, disulfides, elemental sulfur) * Nitrogen - less than 1% (basic compounds with amine groups) * Oxygen - less than 1% (found in organic compounds such as carbon dioxide, phenols, ketones, carboxylic acids) * Metals - less than 1% (nickel, iron, vanadium, copper, arsenic) * Salts - less than 1% (sodium chloride, magnesium chloride, calcium chloride) The Process Fractional Distillation The oldest and most common way to separate things into various components (called fractions), is to do it using the differences in boiling temperature.

This process is called fractional distillation. You basically heat crude oil up, let it vaporize and then condense the vapour The various components of crude oil have different sizes, weights and boiling temperatures; so, the first step is to separate these components. Because they have different boiling temperatures, they can be separated easily by a process called fractional distillation. The steps of fractional distillation are as follows: 1. You heat the mixture of two or more substances (liquids) with different boiling points to a high temperature.

Heating is usually done with high pressure steam to temperatures of about 1112 degrees Fahrenheit / 600 degrees Celsius. 2. The mixture boils, forming vapor (gases); most substances go into the vapor phase. 3. The vapor enters the bottom of a long column (fractional distillation column) that is filled with trays or plates. The trays have many holes or bubble caps (like a loosened cap on a soda bottle) in them to allow the vapor to pass through. They increase the contact time between the vapor and the liquids in the column and help to collect liquids that form at various heights in the column.

There is a temperature difference across the column (hot at the bottom, cool at the top). 4. The vapor rises in the column. 5. As the vapor rises through the trays in the column, it cools. 6. When a substance in the vapour reaches a height where the temperature of the column is equal to that substance's boiling point, it will condense to form a liquid. (The substance with the lowest boiling point will condense at the highest point in the column; substances with higher boiling points will condense lower in the column.). 7.

The trays collect the various liquid fractions. 8. The collected liquid fractions may pass to condensers, which cool them further, and then go to storage tanks, or they may go to other areas for further chemical processing.

Components of the Mixture Crude Oil Components All the Product| Boiling point (degrees Celsius)| Petroleum gas| 40| Naphtha or ligroin| 60-100| Gasoline| 40 - 205| Kerosene| 175-325| Gas oil| 250-350| Lubricating oil| 300-370| Heavy gas| 370-600| Residues| 600|

Products of Separation Assessment
Question: Why is the mixture separated?

What are the components used for? Why is Mixture Separated? 42393793

161b What are the Components Used For? Below is a list of separated

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components and what they are used for: Petroleum gas Used for heating, cooking and making plastics. Commonly known by the names methane, ethane, propane, butane. Naphtha or Ligroin Intermediate that will be further processed to make gasoline. Gasoline Motor fuel. •liquid Kerosene Fuel for jet engines and tractors; starting material for making other products. •liquid Gas Oil or Diesel Distillate

Used for diesel fuel and heating oil; starting material for making other products. •liquid Lubricating Oil Used for motor oil, grease, other lubricants. •liquid Heavy Gas or Fuel oil Used for industrial fuel; starting material for making other products. •liquid Residuals Coke, asphalt, tar, waxes; starting material for making other products •solid Wastes Bibliography <http://science.howstuffworks.com/environmental/energy/oil-refining4.htm> http://www.aip.com.au/industry/fact_refine.htm www.theoil drum.com/node/6089 en.wikipedia.org/wiki/Separation_process