NATURAL GAS

Many stoves use natural gas.

Natural gas, commonly referred to as gas, is a gaseous fossil fuelconsisting primarily of methane. It is found in oil fields and natural gas fields, and in smaller quantities, coal beds. Particular interest to engineering is its use in large quantities for electrical power generation.

Other sources

When methane-rich gases are produced by the anaerobic decay of non-fossil organic material, these are referred to as biogas. Sources of biogas include swamps, which produce swamp gas; marshes, which producemarsh gas; landfills, which produce landfill gas, as well as sewage sludge and manure, by way of anaerobic digesters, in addition to Enteric fermentation particularly in cattle.

Properties

Natural gas is tasteless and odorless.

Methane is an extremely efficient greenhouse gas which may contribute to enhanced global warming when free in the atmosphere, and such free methane, would then be considered a pollutant rather than a usefulenergy resource. However, methane in the atmosphere is oxidised, producing carbon dioxide and water, so that the greenhouse effect of released methane is relatively short-lived. Also, natural gas, when burned, produces much less carbon dioxide than more carbonaceous fuel sources, such as coal. Significant biological sources of methane are termites, ruminants and cultivation. Estimated emissions are 15, 75 and 100 million tons per year respectively.

Chemical composition and energy content

Chemical composition

The primary component of natural gas is methane (CH4), the shortest and lightest hydrocarbon molecule. It may also contain heavier gaseous hydrocarbons such as ethane (C2H6), propane (C3H8) and butane (C4H10), as well as other sulphur containing gases, in varying amounts, see also natural gas condensate.

Organosulfur compounds and hydrogen sulfide (H2S see acid gas) are common contaminants, which must be removed prior to most uses. Gas with a significant amount of sulfur impurities is termed "sour".

Energy content

Combustion of one cubic metre of commercial quality natural gas yields 38 megajoules (10.6 kWh). Equivalently, one cubic foot of natural gas produces 1031 British Thermal Units (BTUs).

Supply to end users

Since natural gas is tasteless and odorless, before gas is distributed to end-users, it is odorized by addingthiols, to assist in leak detection. Natural gas is, in itself, harmless to the human body -- unlike carbon monoxide, for instance, it is not a poison. However, natural gas is a simple asphyxiant and can kill if it displaces air to the point where the oxygen content will not support life.

Hazardous

Natural gas can also be hazardous to life and property through an explosion. Natural gas is lighter than air, and so tends to dissipate into the atmosphere. But when natural gas is confined, such as within a house, gas concentrations can reach explosive mixtures and, if ignited, result in blasts that could destroy buldings. Methane has a Lower Explosive Limit of 5% in air, and an Upper Explosive Limit of 15%.

Explosive concerns with compressed natural gas used in vehicles are almost nonexistent, due to the escaping nature of the gas, and the need to maintain concentrations between 5% and 15% to trigger explosions.

Storage and transport

Polyethylene gas main being laid in a trench.

The major difficulty in the use of natural gas is transportation and storage. Natural gas pipelines are economical, but are impractical across oceans.

Even the onland pipe lines of steel have to be provided with galvanic protection against corrossion and suitable electrical insulation covering increasing the cost to some extent.

LNG carriers can be used to transport liquefied natural gas (LNG) across oceans, while tank trucks can carry liquefied or compressed natural gas (CNG) over shorter distances. They may transport natural gas directly to end-users or to distribution points, such as pipelines for further transport. These may have a higher cost requiring additional facilities for liquefaction or compression at the production point, and then gasification or decompression at end-use facitilies or into a pipeline.

For electric power generating stations who consume enormous quantities the gas is supplied direct from gas wells with on line processing but without any storage at sending end. As an on line processing is involved gas is expected to be used non stop at generating stations without any break.

When gas is drawn from gas wells, the sending through pipe line involves reduction in gas pressure with consequent seperation of condensate (that is liquid petroleum). This is however stored in limited quantities in suitable tanks.

Flaring

In the past, the natural gas which was recovered in the course of recovering petroleum could not be profitablysold, and was simply burned at the oil field (known as flaring). This wasteful practice is now almost extinct, the same being reused. One method is to re-inject back into the formation for later recovery. This also assists oilpumping by keeping underground pressures higher. In Saudi Arabia, in the late 1970s, a "Master Gas System" was created, ending the need for flaring. The natural gas is used to generate electricity and heat fordesalinisation. Similarly, some land-fills that also discharge methane gases have been set-up to capture the methane and generate electricity.

Natural gas is often stored in underground caverns formed inside depleted gas reservoirs from previous gas wells, salt domes, or in tanks as liquefied natural gas. The gas is injected during periods of low demand and extracted during periods of higher demand. Storage near the ultimate end-users helps to best meet volatile demands, but this may not always be practical.

Source : http://engineering.wikia.com/wiki/Natural_gas