Introduction to natural gas

Natural gas is one of the most important source of energy for reducing pollution and maintaining a clean and healthy environment we can call it as a future energy resource. In addition to being a domestically abundant and secure source of energy, the use of natural gas also offers a number of environmental benefits over other sources of energy, particularly other fossil fuels. This section will discuss the environmental effects of natural gas , interms of emission as well as the environmental impact of the natural gas industry itself.

Natural gas is used over 60 million homes. In addition natural gas is used in 78 percent of restaurants, 73 percent of lodging facilities, 51 percent of hospitals, 598 percent of offices, and 58 percent of retail buildings. Natural gas is vital to world manufacturers, not only to power their operations, but also as an essential feedstock for many of the products we use daily- clothing, carpets, sports equipment, pharmaceuticals and medical equipment, computers, and auto parts. It is also a primary feedstock for chemicals, plastics and fertilizers. Natural gas fuels our economy. It is a clean burning domestic energy source that powers our economy. It cools and warms our homes and businesses , is used to generate electricity, and helps maintain our quality of life.

Natural gas is a gas consisting primarily of methane. It is found associated with fossil fuels, in coal beds, as methane clathrates, and is created by methogenic organisms in marshes, bogs, and landfills. It is an important fuel source and a potent greenhouse gas.

Before natural gas can be used as a fuel, it must undergo extensive processing to remove almost all materials other than methane. The by products of that processing include ethane, propane, butanes, pentanes and higher molecular weight hydrocarbons, elemental sulphur and sometimes helium and nitrogen.

Overview of natural gas:

Natural gas is a fossil fuel source of energy, which represents more than one fifth of total energy consumption in the world. It has been the fastest growing energy souce fuel since the seventies.

Due to economical and ecological advantages that it presents as well as its safety quqlities, natural gas is an increasingly attractive source oof energy in many countries. At present, natural gas is the second energy source after oil. According to energy information administration, natural gas accounted for 31% of world energy production in 2006. It has excellent perspectives for future demand. Natural gas is considered the energy source of this century , as petroleum was last century and coal two centuries ago.

Natural gas presents a competitive advantage over other energy sources. It is seen as economically more efficient because only about 10% of the natural gas produced is wasted before it gets to final consumption. In addition , technological advances are constantly improving efficiencies in extraction , transportation and storage techniques as well as in equipment that uses natural gas.

Natural gas is considered as an environmentally friendly clean fuel , offering important environmental benefits when compared to other fossil fuels. The

superior environmental qualities over coal or oil are that emissions of sulphur dioxide are negligible or that the level of nitrous oxide and carbon dioxide emissions is lower. This helps to reduce problems of acid rain, ozone layer depletion orgreenhouse gases.

Although resources of natural are finite and natural gas is a non-renewable source of energy, these resorces are plentiful all over the world. Natural gas reserves are continuously increasing as new exploration and extraction techniques allow for wider and deeper drilling.

The growing importance of natural gas as a major energy source is shown by the amount of investment devoted to the natural gas industry. The sector shows a great dynamism at the beginning of the new milleniuum. Increasing demand and prices in tje recent in the recent past have led to new expansion and exploration projects in the natural gas industry. New pipeline construction projects are developed and planned all over the world. Furthermore, most governments are progressively including natural gas in their energy policy agenda, by following liberalization policies(particularly after the energy shortages of 1970s), in order to open the markets to competition. More and more, energy final users are also showing a preference for using natural gas a clean, safe, reliable and economical source of energy. Natural gas is used for heating, cooling and several other industry uses, while it is increasingly becoming the favoured fuel for power generation.

Natural gas is future of energy and fuel requirements as it is one of the most clean fuel the evidences for this is illustrated by following this data:

Chemistry of natural gas:

Natural gas, like all fossil fuels, is the remain of prehistoric living matter that existed million of years ago. In the marine environment, dead organisms came to rest on the ocean floor, where they were covered by layer after layer of mud or silt which over time became layers of rock. Buried beneath the sea bed, the hydroicarbons stored inside the once living matter were preserved , but their composition was altered by the heat and pressure from the rocks above. Millions of years later, deposits of these hydrocarbons can be found either in liquid form as petroleum, or as natural gas.

Natural gas forms in porous layers of rock, with bubbles of gas trapped inside the rock. Gas fields occur when a layer of impervious rock, such as limestone, has formed above the layer of porous rock, preventing the gas from escaping. Deposits of natural gas are often found alongside petroleum deposits. Natural gas is colourless and odourless. It consists mostlyof methane, but mixed in with the methane are likely to be other hydrocarbon compounds and a few impurities.

Natural gas is colourless odourless, tasteless, shapeless and lighter than air. It is gaseous at any temperature over -161 c. When it is at its natural state, it is not possible to see or smell natural gas. For safety reasons, a chemical odorant that smells a little like rotten eggs, mercaptan, is added to natural gas so that it can be smelled if there is a gas leak.

Natural gas is a mixture of light hydrocarbons including methane, ethane , propane, butanes and pentanes. Other compound found in natural gas includes co2, helium hydrogen sulphide and nitrogen. The composition of

natural gas is never constant, however, the primary component of natural gas is methane(typically, atleast 90%), which has a simple hydrocarbon structure composed of one carbon atom and four hydrogen atoms(ch4) . methane is highly inflammable , burns easily and almost completely, while it emits very little air pollution. Natural gas is neither corrosive nor toxic, its ignition temperature is high, and its has a narrow flammability range, making it an inherently safe fossil fuel compared to other fuel sources. In addition , because of its specific gravity of 0. 60, lower than that of air(1. 00), natural gas rises if escaping, thus dissipating from the site of any leak.

The carbon and hydrogen occurs from the remains of plants and animals (composition in natural gas)

Which were inside the lakes and seas millions of years back. The organic material then mixed up with huge layers of sediments and then turned back to natural gas and crude oil as heat from the earth’s inside and pressure from the layers changed it.

Natural gas is found all over the globe in resorviors deep inside the earth and in oceans. It is trapped in porous rock formations. Natural gas can be found in oil deposits, as associated natural gas.

Natural gas when cooled ton a temperature of approx -260 f, it converts to a liquid naming liquefied natural gas(LNG). LNG has weight one half as that of water, or you can say 45% less weight then water to be exact. It is non corrosive, non toxic, odourless and colourless. For convenience in transportation and storing natural gas is liquefied to form LNG.

Natural gas is practically free from sulphur and therefore does not produces so2 so considered as clean and environment friendly source of energy it also emits lower values os nitrogen oxides when compared with coal or oil.

Power generation:

Natural gas is now used widely in the generation of electricity by using gas turbines and steam turbines. By combining gas turbines with steam turbines we can increase efficiency of electric generation and this mode is called combined cycle mode. Natural gas produces less greenhouse gases like carbon dioxide for an equivalent amount of heat when compared to petroleum(30% less)

and coal(45 % less) therefore combined cycle generation of electricity using natural gas is the cleanest source of power available using fossil fuels. Natural gas is used in power generation wherever we can obtain it at a reasonable price further fuel cells(discussed in detail below) can be used for power generation using natural gas but it is not economically a good deal.

Fuel cells using natural gas:

Fuel cells using natural gas for power generation are under development. Fuel cells are devices that uses hydrogen to produce electricity their working is approximately same as of batteries. It is one of the cleanest way of generating electricity as their is no emissions what so ever and as we know that natural gases are a rich source of hydrogen so it can be used in fuel cells. Fuel cells are still under development process as the process of using natural gas in fuel cells is very expensive but if they are used widespread all over the world then we can assure a very clean environment and can reduce emissions associated with the generation of electricity.

Electricity generation and industrial application uses fossil fuels for generating electricity and heat . we can use natural gas for such type of operations as it can help to reduce the emissions associated with the generation of electricity.

In transportation:

Natural gas can be used as a fuel for vehicles, trains and air transport also it can be a very clean fuel as in the case of CNG (compressed natural gas) used in four and three wheeler vehicles . by 2008 9. 6 million vehicles uses natural gas as their source of fuel supply.

Its efficiency is slightly less then diesel engine but comparable to gasoline engines but if we make it compulsory for all public transport vehicles to use natural gas as their energy source supply we can led to a very clean world as the major source of air pollution is from the transport sector.

In aerospace:

Development processes are running to develop aircrafts that uses natural gas the source of their fuel supply Russian company Tupololev is trying to develop an aircraft that uses LNG and HYDROGEN as the source of its power supply it will also cost lower then normal aircraft and also with reduction in nitrogen oxide and carbon monoxide emission reduction.

The advantage of using natural gas as a fuel for aircrafts is that its specific energyis more than normal aircraft fuel(kerosene mixes) and one advantage is that it can can be used as a cooler for cooling air replacing a intercooler in engine.

Natural gas can also be use for manufacture of plastics, paints, glass steel, fabrics and other useful products.

Advantages and Disadvantages of natural gas:

The main advantage of using natural gas over other fossil fuel as a source of energy is that it is a clean fuel and contributes very less effect on air and environment around us as there is no emissions, no residue, no smoke and no smell. Its growth of use as domestic fuel, for power generation , in industries is increasing rapidly day by day. From a survey it has been found that use of natural gas as a source for power generation nearly accounts for around 20% of our total energy source(world energy outlook 2000).

But as every coin has two phases using natural gas is also not free from this comment, it is considered that natural gas is clean source of energy but this is not a true fact, it does affect the environment to some extent. Natural gas also produces carbon dioxide while burning like all other fossil fuels although it is very less as compared to coal and petroleum and also natural gas that is used as a energy source is always not free from impurities and this lead to emissions of unwanted particulates. Therefore it may be noted that it is not a complete clean fuel as it is not carbon neutral and also produces small emissions so from an environmental point of view it is not an complete ideal source of energy.

Another disadvantage is that which is common to all fossil fuels is that their extraction leads to a process called mining and drilling which may lead to an ecological inbalance and also causes pollution which can be visualised.

Future:

Natural gas has many advantages over other energy sources but we can’t depend on natural gas as a future source of energy the facts that ensures this facts are

1. after a period of regular extraction one day all supplies will be exhausted or will be depleted to that extent that cost of extracting will overweigh the value of the value of the fuel we obtain this is a common fact to all fossil fuels.
2. natural gas is considered to be a clean fuel but above we have discussed that it is not an complete ideal source of energy, so research work is going on to discover that future source of energy. Solar and hydel energy can also be the future source of energy.

Natural gas will have a very bright future as compared to other fossil fuels as globally all government are encouraging use of natural gas in power stations in preference to other fossil fuel.