Convert engine to Natural Gas

Good link for carburetor conversion kit for Brigs and Stratton engine.
http://www.propane-generators.com/
Converting to propane good on how to
http://theepicenter.com/tow102899.html

Subject: Is there any way to convert a gasoline engine to run on methane gas

`I have read about the break down of manure into methane gas, and I am`
Interested in different ways to harness the gas to do work.

Yes, a gasoline engine can definitely be converted to run on methane. The more common term for methane is natural gas. And natural gas is used all over the world to power cars, heat houses, cook food, etc.

The term you'll hear most often when refering to vehicles converted to run on methane is CNG for Compressed Natural Gas. There are many commercially available CNG vehicles on the market. There are also companies who sell converted gasoline engines, or will convert your engine for you.

Here are a few links to learn more about methane and CNG vehicles:

- Chemical of the Week: Methane

METHANE

Methane is a colorless, odorless gas with a wide distribution in nature. It is the principal component of natural gas, a mixture containing about 75% CH_4, 15% ethane (C_2H_6), and 5% other hydrocarbons, such as propane (C_3H_8) and butane (C_4H_{10}). The "firedamp" of coal mines is chiefly methane. Anaerobic bacterial decomposition of plant and animal matter, such as occurs under water, produces marsh gas, which is also methane.

At room temperature, methane is a gas less dense than air. It melts at –183°C and boils at –164°C. It is not very soluble in water. Methane is combustible, and mixtures of about 5 to 15 percent in air are explosive. Methane is not toxic when inhaled, but it can produce suffocation by reducing the concentration of oxygen inhaled. A trace amount of smelly organic sulfur compounds (*tertiary*-butyl mercaptan, $(CH_3)_3CSH$ and dimethyl sulfide, $CH_3–S–CH_3$) is added to give commercial natural gas a detectable odor. This is done to make gas leaks readily detectible. An undetected gas leak could result in an explosion or asphyxiation. (The attached scratch-and-sniff sheet from Madison Gas & Electric Company is for your use outside of class.)

Methane is synthesized commercially by the distillation of bituminous coal and by heating a mixture of carbon and hydrogen. It can be produced in the laboratory by heating sodium acetate with sodium hydroxide and by the reaction of aluminum carbide (Al_4C_3) with water.

In the chemical industry, methane is a raw material for the manufacture of methanol (CH_3OH), formaldehyde (CH_2O), nitromethane (CH_3NO_2), chloroform (CH_3Cl), carbon tetrachloride (CCl_4), and some freons (compounds containing carbon and fluorine, and perhaps chlorine and hydrogen). The reactions of methane with chlorine and fluorine are triggered by light. When exposed to bright visible light, mixtures of methane with chlorine or fluorine react explosively.

The principal use of methane is as a fuel. The combustion of methane is highly exothermic.

$$CH_4(g) + 2\ O_2(g) \longrightarrow CO_2(g) + 2\ H_2O(l) \qquad \Delta H = -891\ kJ$$

The energy released by the combustion of methane, in the form of natural gas, is used directly to heat homes and commercial buildings. It is also used in the generation of electric power. During the past decade natural gas accounted for about 1/5 of the total energy consumption worldwide, and about 1/3 in the United States. The cost of natural gas to Wisconsin consumers is regulated by the State Public Service Commission. Madison Gas Electric Company currently charges its residential consumers about $0.66 per 100 cubic feet.

Natural gas occurs in reservoirs beneath the surface of the earth. It is often found in conjunction with petroleum deposits. Before it is distributed, natural gas usually undergoes some sort of processing. Usually, the heavier hydrocarbons (propane and butane) are removed and marketed separately. Non-hydrocarbon gases, such as hydrogen sulfide, must also be removed. The cleaned gas is then distributed throughout the country through thousands of miles of pipeline. Local utility companies add an odorant before delivering the gas to their customers.

Some methane is manufactured by the distillation of coal. Coal is a combustible rock formed from the remains of decayed vegetation. It is the only rock containing significant amounts of elemental carbon. The composition of coal varies between 60% and 95% carbon. Coal also contains hydrogen and oxygen, with small concentrations of nitrogen, chlorine, sulfur, and several metals. Coals are classified by the amount of volatile material they contain, that is, by how much of the mass is vaporized when the coal is heated to about 900°C in the absence of air. Coal that contains more than 15% volatile material is called bituminous coal. Substances released from bituminous coal when it is distilled, in addition to methane, include water, carbon dioxide, ammonia, benzene, toluene, naphthalene, and anthracene. In addition, the distillation also yields oils, tars, and sulfur-containing products. The non-volatile component of coal, which remains after distillation, is coke. Coke is almost pure carbon and is an excellent fuel. However, it may contain metals, such as arsenic and lead, that can be serious pollutants if the combustion products are released into the atmosphere.

http://scifun.chem.wisc.edu/chemweek/methane/methane.html

- Natural Gas Vehicle Coalition

- Facts about CNG and Propane Conversions
- Alternative Fuels Data Center

http://www.madsci.org/posts/archives/2000-03/954344961.Eg.r.html

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Natural gas

From Wikipedia, the free encyclopedia

For other uses, see Natural gas (disambiguation).

This article needs additional citations for verification.
Please help improve this article by adding reliable references. Unsourced material may be challenged and removed. *(March 2008)*

Natural gas is a gaseous fossil fuel consisting primarily of methane but including significant quantities of ethane, propane, butane, and pentane—heavier hydrocarbons removed prior to use as a consumer fuel —as well as carbon dioxide, nitrogen, helium and hydrogen sulfide.[1] It is found in oil fields (associated) either dissolved or isolated in natural gas fields (non associated), and in coal beds (as coalbed methane). 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, marshes, and landfills (see landfill gas), as well as sewage sludge and manure by way of anaerobic digesters, in addition to enteric fermentation particularly in cattle.

Since natural gas is not a pure product, when non associated gas is extracted from a field under supercritical (pressure/temperature) conditions, it may partially condense upon isothermic depressurizing--an effect called retrograde condensation. The liquids thus formed may get trapped by depositing in the pores of the gas reservoir. One method to deal with this problem is to reinject dried gas free of condensate to maintain the underground pressure and to allow reevaporation and extraction of condensates.

Natural gas is often informally referred to as simply **gas**, especially when compared to other energy sources such as electricity. 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 sulfur, and sometimes helium and nitrogen

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METHANE GAS PRODUCTION - POINTS TO CONSIDER

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Manure has been called everything from waste to liquid gold. Now we hear that manure can make gas that will save the world in the energy crisis. This might be true - But -

The process of making a methane gas mixture from manure or other organics is an exacting one. Stable temperature, uniform loading rate, time, and patience are required. If just mixing a tank of manure produces gas, why hasn't every farmer with a liquid manure storage tank and a lighted pipe of cigarette blown himself up or at least singed an eyebrow or two? But, on the other hand, almost every lagoon bubbles up black goop and releases methane gas. Maybe there is something to look at here.

In the following pages we'll outline some of the advantages or disadvantages of producing and utilizing your own methane fuel. The design of a production system will be developed in a separate report.

Energy

Let's look at a hypothetical situation to get a better grasp of what to expect. Say your home has a gas furnace, gas hot water heater, gas range and other appliances. We'll estimate your energy need at 200,000,000 BTU's per year.

The BTU (British Thermal Unit) is a measure of heat or energy potential. The heating value of fuel, normally expressed in BTU's varies with the type and composition of the fuel. Therefore, different amounts of various fuels would be required to produce a given amount of energy.

Your needed energy of 200,000,000 BTU's could be supplied by 200,000 cubic feet of natural gas rated at 1,000 BTU's per cubic foot. The same amount of energy could be supplied by 2,170 gallons of liquid propane at 92,000 BTU's per gallon.

Suppose we built a methane generator to take care of these needs. The generator would have to produce approximately 300,000 cubic feet of "bio-gas" to meet the demand. The "bio-gas" is a combination of water vapor, carbon dioxide, methane, and other organic compounds with an estimated energy content of 650 BTU's per cubic foot. This amount of "bio-gas" can be produced by digesting the manure from 24 cows or 200 hogs or 2000 chickens.

Production Process

The digestion of organic matter is a result of the activity of bacteria in an environment without free molecular oxygen. During the process, the organic matter is digested by the bacteria to form more bacteria, stable organic waste products, carbon dioxide, organic acids, water, methane, hydrogen sulfide, and other gaseous products.

The combined gaseous products or "bio-gas" contains from 50 to 70 percent methane which is the combustible fuel. The volume of gas produced is dependent on the characteristics of the manure and the temperatures maintained in the digester. High temperatures (90°F or higher) produce the best conditions for gas production. You might expect from 0.3 to 1.0 cubic feet of gas per day for each cubic foot of active digester volume. Gas production may not be established until three to six months after start up of the digester depending on process conditions.

The waste products of the digester consist of a slurry of sludge and water. The volume of this waste is about the same as the volume of material that was put into the digester. Thus, in the example of 24 cows approximately 500 tons of waste products must be disposed of each year from the digester.

The waste is a useful fertilizer. Little if any fertilizer value has been lost in the digestion process. The waste is biologically stable and should have less of an odor than the original manure.

Gas Utilization

The "bio-gas" produced from the digestion can best be utilized as a heating fuel. Burners must be specifically sized for the "bio-gas" because it will not burn properly, if at all, in burners sized for propane or natural gas. You will have to burn twice as much "bio-gas" as natural gas and three times as much "bio-gas" as propane to develop the same heat output.

In general, heating units are not made to be easily changed from one orifice size to another. Suppose your entire inventory of gas using equipment was fitted with nozzles for the burning of "bio-gas". Then suppose your methane generator malfunctioned, which can occur very frequently if not properly managed. You could not turn a valve and automatically convert to burning propane unless you had developed a dual fuel system on each appliance. A dual system would consist of two orifices for each appliance that could be readily interchanged or selected.

This situation could be avoided by having all electric power consumption and using the "bio-gas" to operate an engine-driven generator. Then, if the methane process failed, you could still run the engine with gasoline or just plug into the electric utilities company's connection.

However, the conversion of the gas to mechanical energy and then to electrical energy and finally to heat energy suffers a great deal from inefficiency. Twenty-two cubic feet of gas would be required to produce one kilowatt hour of electricity with an engine generator.

The conversion has an efficiency of less than twenty-five percent. The previous example would require the manure from one hundred cows rather than twenty-four to operate the household. The cost of the power would also be greatly increased. The efficiency can be increased by collecting heat from the engine for use in heating the digester but the economy would still be low.

The operation if stationary engines with "bio-gas" is feasible. With the adoption to a gas carburetor the engine will require approximately sixteen cubic feet of gas per horsepower hour. The operation of the engine will be similar to operation with other fuels if the proper carburetion is used. However, the "bio-gas" contains water vapor and many corrosive compounds which could possibly lead to early deterioration of some engine components.

A mobile engine cannot readily be adapted to operate on "bio-gas" because of the volume of gas required and the associated storage. Methane does not easily liquefy. The amount of potential power stored in a container is relatively small. Propane liquefies at about 100 pounds per square inch pressure while methane will not liquefy until the pressure is approximately 2,500 pounds per square inch at normal temperature.

One cubic foot of liquid propane at a pressure of 100 pounds per square inch has the potential to produce 690,000 BTU's. One cubic foot of "bio-gas" at the same pressure will produce only about 9750 BTU's. A one horsepower engine operating at thirty percent efficiency could run almost seventy hours on one cubic foot of liquid propane. The same engine would run only about an hour on the cubic foot of "bio-gas" at the same pressure.

A small automobile engine producing seventy horsepower would require 1,120 cubic feet of "bio-gas" to operate for one hour. If this gas was stored at a pressure of 100 pounds per square inch, the fuel tank volume would have to be seventy cubic feet which is almost half the volume of the automobile. The standard gasoline tank for this size automobile is between two and three cubic feet of volume. Of course, the gas can be stored at greater pressure resulting in a smaller storage volume requirement. This, however, requires more expensive and less available compression equipment and the need for heavier and stronger gas containers. Standard gas cylinders could be used, but a considerable change in the price structure must occur before high compression is economical.

Safety

Any container used for storage of gas must have sufficient strength to meet storage pressure requirements. The use of any container other than a rated tank for those storage pressures may be hazardous. Due caution should be maintained with the handling of gas. The "bio-gas" is very flammable. At 6 to 15% in an air mixture methane is quite explosive. It can also kill by suffocation. Storage in weak containers, in closed rooms, or near open flame could produce dangerous conditions.

The production of methane gas on your farmstead may have some effect on your present fire insurance policy. You should check with your insurance company to determine if any policy changes would be necessary.

The production of methane gas on a useful and economic scale is possible. The gas is far more limited in its use than many fuels presently available. Like other fuels it should be handled with caution. The digestion process requires considerable care and can easily be upset. There is very little reduction of waste volume and sludge disposal is still a management problem.

Impco and technocarb should have systems that are perfect.

Hybrid Fuel Systems: http://www.hybridfuelsystems.com/

Omnitek: http://www.omnitekcorp.com/engconvert.htm

Alternative Fuel Systems: http://www.afsglobal.com/

Technocarb: http://www.technocarb.com/