

Woodgas

Contributed by Administrator
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Jump to: navigation, search

Wood gasifier on a Ford truck converted to a tractor (an EPA tractor).

Wood gas, also known as producer gas, syngas, water gas, air gas or blue gas, is the product of thermal gasification of biomass or other carbon containing materials such as coal in a gasifier. It is the result of a high temperature reaction (>700C), where carbon reacts with steam or a limited amount of air or oxygen producing carbon monoxide (CO), molecular hydrogen (H2), and carbon dioxide (CO2) In several gasifiers the actual gasification process is preceded by pyrolysis, where the biomass or coal turns into char releasing PAH rich tar and methane (CH4). Other gasifiers are fed with previously pyrolysed char. Wood gas is flammable because of the tar, carbon monoxide, hydrogen and methane content.

Wood gas can be used to power cars with ordinary internal combustion engines if a wood gasifier is attached. This was quite popular during World War II in several European countries because the armies active in the war had all available oil. In more recent times, wood gas has been suggested as a clean and efficient method to heat and cook in developing countries, or even to produce electricity when combined with a gas turbine or internal combustion engine. Compared to the WWII technology, gasifiers have become less dependent on constant attention due to the use of sophisticated electronic control systems, but it remains difficult to get clean gas from them. Purification of the gas and feeding it into the natural gas pipelines is one variant to link it to existing refuelling infrastructure, liquidification by the Fischer-Tropsch process is the other possibility.

A wood gasifier takes wood chips, sawdust, charcoal, coal or similar materials as fuel and burns these incompletely in a fire box, producing solid ashes and soot (which have to be removed periodically from the gasifier and constantly from the gas) and wood gas. The wood gas can then be filtered for tars and soot/ash particles, cooled and directed to e.g. an internal combustion engine, gas turbine, Stirling engine or fuel cell to produce electricity. Most of these devices have severe requirements to the purity of the wood gas, so the gas often has to pass through extensive gas cleaning in order to remove or convert (to "crack") tars and particles. If you plan to run wood gas in an internal combustion engine, get to know your local cylinder head repair shops.

The heat of combustion of producer gas is rather low compared to other fuels. Taylor reports in his book "Internal-Combustion Engine in Theory and Practice", 2nd Ed, 1985, p.46, that "producer gas" has a lower heating value of 5,7 MJ/kg versus 55,9 MJ/kg for natural gas and 44,1 MJ/kg for gasoline. Presumably, these values can vary somewhat from sample to sample. The same source reports the following chemical composition by volume which most likely is also variable:

- Nitrogen N2 50,9%,
- Carbon monoxide CO 27,0%,
- Hydrogen H2 14,0%,
- Carbon dioxide CO2 4,5%,
- Methane CH4 3,0%,
- Oxygen O2 0,6%.

The quality of the gas from different gasifier varies very much. Staged gasifiers, where pyrolysis and gasification occur separately (instead of in the same reaction zone as was the case in e.g. the WWII gasifiers) can be engineered to produce essentially tar-free gas (<1 mg/Nm3), while single reactor fluid-bed gasifiers may exceed 50.000 mg/Nm3 tar. The fluid bed reactors have the advantage of being much more compact (more capacity per volume and price). Depending on your intended use of the gas, tar can be beneficial as well; increasing the higher heating value of the gas.

The first wood gasifier was apparently built by Bischof in 1839. The first vehicle powered by wood gas was built by Parker in 1901. Around 1900, many cities delivered wood gas (centrally produced typically from coal) to residences. At this time also, Rudolf Diesel and Georges Imbert were also developing their various engines. It has been theorized that all of these internal combustion engines had been inspired by observing the operation of the fire piston fire making device which had been discovered in New Guinea and Sumatra early in the 1800's. Natural gas began to be used only in 1930. Wood gasifiers are still manufactured in Singapore, China and Russia for automobiles and as power generators for industrial applications. [edit]

See also

- Syngas
- Town gas [edit]

External links

- Biomass Energy Foundation (American) extensive site on wood gas and gasifiers, <http://www.woodgas.com/> .
- Food and Agriculture Organization of the United Nations: Wood Gas as Engine Fuel, 1986, <http://www.fao.org/DOCREP/T0512E/T0512e00.htm>. Detailed explanation of the theory and praxis of wood gasifiers, including dangers and downsides.
- Hans Hochwald: Wood gas producers, <http://highforest.tripod.com/woodgas/woodgas.html>. A schematic of a wood gasifier, and links.
- Report about an '85 Yugo car converted to wood gas by Igor and Anton Peterka: <http://freeweb.deltha.hu/zastava.in.hu/wood-gas.htm>
- Description of several wood gas stoves: http://journeytoforever.org/at_woodfire.html
- GasNet, European Union biomass gasification research coordination, <http://www.gasnet.uk.net/>
- Tar measurements on gasifiers, European standardisation effort, <http://www.tarweb.net/>
- Description of Fire Piston, <http://www.geocities.com/firepiston/>
- Information to build/use your own wood gasifier for the auto, <http://www.gengas.nu/byggbes/index.shtml>
- Economic evaluation of operation of vehicles on wood gas
- Info about wood gas as vehicle fuel Retrieved from "http://en.wikipedia.org/wiki/Wood_gas"

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