CONSTRUCTION OF A WOOD GAS GENERATOR WITH INTEGRATED BOILER FOR FUELING INTERNAL COMBUSTION ENGINES BY USING WOOD PYROLYSIS

M. Rajasekhar[1], S. V. Durga Prasad [2]

[1] *MTech Student, Mechanical Department, Gandhiji Institute of Science and technology, Andhra Pradesh, India*

[2] *Associate Professor, Mechanical Department, Gandhiji Institute of Science and technology, Andhra Pradesh, India*

ABSTRACT

coal, wood and charcoal gasifiers have been used for operation of internal combustion engines in various applications since the beginning of this century. The utilization peaked during the Second World War when almost a million gasifiers were used all over the world, mainly vehicles operating on domestic solid fuels instead of gasoline. These gasifiers are mainly suitable for stationary engines like generators, gas stoves, and agriculture pump sets etc.Wood gas, the gas generated when wood, charcoal or coal is gasified with air, consists of 40 percent of combustible gases, mainly carbon monoxide, hydrogen and methane. The rest are non-combustible gas consists of mainly nitrogen, carbon dioxide and water vapor.The theory of gasification, different type of gasifiers, gasified fuels and design guidelines for down-draught gasifiers are studied. Techniques of gas cleaning and cooling are examined. By using this down-draught gasifier the internal combustion engine was tested. Then chapter concludes with a discussion of possible applications, hazards and environmental consequences, capital investment and emission analysis associated with this technology.

Keyword *Coal, Wood, Down-draught gasifiers, nitrogen and carbon dioxide.*

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1. Introduction

Wood Gas Generator

A wood gas generator is a gasification unit which converts timber or charcoal into wood gas, a syngas consisting of atmospheric nitrogen, carbon monoxide, hydrogen, traces of methane, and other gases, which - after cooling and filtering - can then be used to power an internal combustion engine or for other purposes. Historically wood gas generators were often mounted on vehicles, but present studies and developments concentrate mostly on stationary plants.

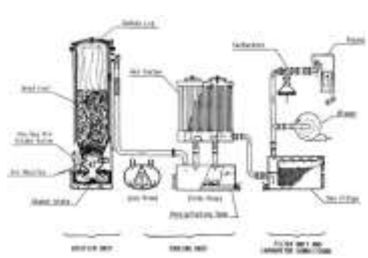

Fig 1: First Wood Gasifier (Imbert Design)

Wood Gas:

Wood gas is a syngas fuel which can be used as a fuel for furnaces, stoves and vehicles in place of gasoline, diesel or other fuels. During the production process biomass or other carbon-containing materials are gasified within the oxygen-limited environment of a wood gas generator to produce hydrogen and carbon monoxide. These gases can then be burnt as a fuel within an oxygen rich environment to produce carbon dioxide, water and heat. In some gasifiers this process is preceded by and flexural quality of this sort of cement is near or much higher than that of customary solid. The 28-day flexural quality is around 4.5 to 5.5MPa. examined slag and Red mud initiated by a composite strong soluble activator, and created antacid slag Red mud bond which has the properties of high compressive quality (the 28-day compressive quality can be up to 125 MPa), brilliant imperviousness to erosion, using 30% of the Red mud and more prominent early quality (the underlying and last setting is independently 62 min and 95 min). Reported that the use of phosphor gypsum, impact heater slag, Red mud, fly ash, squander tea, and so on are utilized as development materials and the long time ecological effect of such techniques have been considered. Utilized the impacts of Red mud on the unconfined compressive quality Red mud as a concrete stabilizer, swelling rate of compacted earth liners as water powered obstruction and study pressure driven conductivity. The test outcomes demonstrate that compacted mud tests containing cement-Red mud and Red mud added substances have diminished water driven conductivity and high compressive quality and swelling rate when contrasted with normal earth tests. Thusly, it is presumed that cement-Red mud and Red mud materials can be effectively utilized for the adjustment of dirt liners in geotechnical applications. The 28-day 2 compressive quality of the bond quality can achieve 63MPa and has concentrated the planning of conventional Portland concrete from Red mud, free stone and lime.
pyrolysis, where the biomass or coal is first converted to char, releasing methane and tar rich in polycyclic aromatic hydrocarbons. Wood gasifiers can power either spark ignition engines, where 100% of the normal fuel can be replaced with little change to the carburation, or in a diesel engine, feeding the gas into the air inlet that is modified to have a throttle valve, if it didn't have it already. On diesel engines the diesel fuel is still needed to ignite the gas mixture, so a mechanically regulated diesel engine's "stop" linkage and probably "throttle" linkage must be modified to always give the engine a little bit of injected fuel (Often under the standard idle per-injection volume). Wood can be used to power cars with ordinary internal combustion engines if a wood gasifier is attached.

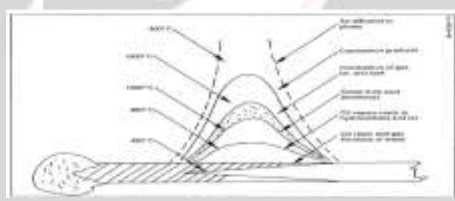

Fig 2: By Using Match Stick Showing Wood Gas

II. WOOD GAS PROCESS

The Heat Required Accomplishing Gasification:

The heat required to accomplish gasification is generated in the combustion zone and the heat flows upwards with gas, starting the gasification processes. These four different zones will largely overlap in practice; still their differences will take a prominent place in the development of a model for the gasifier. A description of the reactions that take place in each zone will be discussed next.

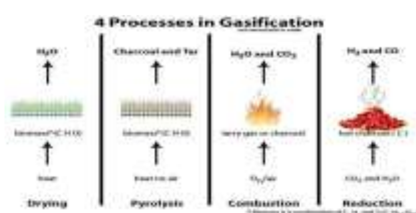

Fig 3: Process in Gasification

Zones in Wood Gasification Combustion zone

The combustible substance of a solid fuel is usually composed of elements carbon, hydrogen and oxygen. In complete combustion carbon dioxide is obtained from carbon in fuel and water is obtained from the hydrogen, usually as steam. The combustion reaction is exothermic and yields a theoretical oxidation temperature of 14500C. The main reactions,therefore, are:

$C + O_2 = CO_2$(+ 393 MJ/kg mole) (1)

$2H_2 + O_2 = 2H_2O$ (- 242 MJ/kg mole) (2)

Reaction zone

The products of partial combustion (water, carbon dioxide and un-combusted partially cracked pyrolysis products) now pass through a red-hot charcoal bed where the following reduction reactions take place.

$C + CO_2 = 2CO$ (- 164.9 MJ/kg mole) (3)

$C + H_2O = CO + H_2$ (- 122.6 MJ/kg mole) (4)

$CO + H_2O = CO + H_2$ (+ 42 MJ/kg mole) (5)

$C + 2H_2 = CH_4$ (+ 75 MJ/kg mole) (6)

$CO_2 + H_2 = CO + H_2O$ (- 42.3 MJ/kg mole) (7)

Reactions (3) and (4) are main reduction reactions and being endothermic have the capability of reducing gas temperature. Consequently the temperatures in the reduction zone are normally 800-10000C. Lower the reduction zone temperature (~ 700-8000C), lower is the calorific value of gas.

Pyrolysis zone

Wood pyrolysis is an intricate process that is still not completely understood. The products depend upon temperature, pressure, residence time and heat losses. However following general remarks can be made about them.Up to the temperature of 2000C only water is driven off. Between 200 to 2800C carbon dioxide, acetic acid and water are given off. The real pyrolysis, which takes place between 280 to 5000C, produces large quantities of tar and gases containing carbon dioxide. Besides light tars, some methyl alcohol is also formed. Between 500-7000C the gas production is small and contains H_2.

Drying zone

Finally in the drying zone the main process is of drying of wood. Wood entering the gasifier has moisture content of 10-30%. Various experiments on different gasifiers in different conditions have shown that on an average the condensate formed is 6-10% of the weight of gasified wood. Some organic acids also come out during the drying process. These acids give rise to corrosion of gasifiers.

Biomass + Poorly Designed Gasifier = Tar! SCHEMATIC OF THE GASIFIER

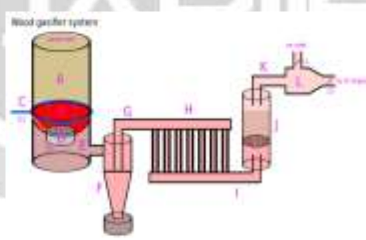

Fig 4: Schematic of the Gasifier

Back to the schematic, basically, the outer shell of the gasifier is just a 5-gallon steel drum. The drum must be steel because of the extreme heat generated during the gasification process. The drum collects the gas that is generated. The gas exits through one of the drum's bungs. Ash and char produced collect in the bottom of the drum. An access door cut in the side of the drum allows for periodically cleaning out the ash and char. The solid by-products remaining in the bottom of the drum is known as bio-char. It is often used to improve poor soils. A stainless steel tube 4 1/4 inches in diameter serves as both fuel hopper and reaction tube. There is a constriction in the tube near the bottom. A perforated stainless steel grate at the bottom of the tube prevents the contents from just spilling out the bottom. The grate can move, and is shaken periodically during operation to allow ash and char to exit the reaction tube and allow fresh fuel to fall into the reaction zone. The gases produced travel downward and exit through the shaker grate. So this type of gasifier is called a down draft gasifier. Six j-shaped copper tubes pipe air into the reaction zone at the base of the stainless steel tube. Since the outer drum is full of hot gas during operation, the long j-tubes also pe-heat the air before it goes in to the reaction tube.

III. THEORY OF GASIFICATION

Reaction Chemistry

The substance of a solid fuel is usually composed of the elements carbon, hydrogen and oxygen. In addition there may be nitrogen and sulphur, but since these are present only in small quantities they will be disregarded in the following discussion.

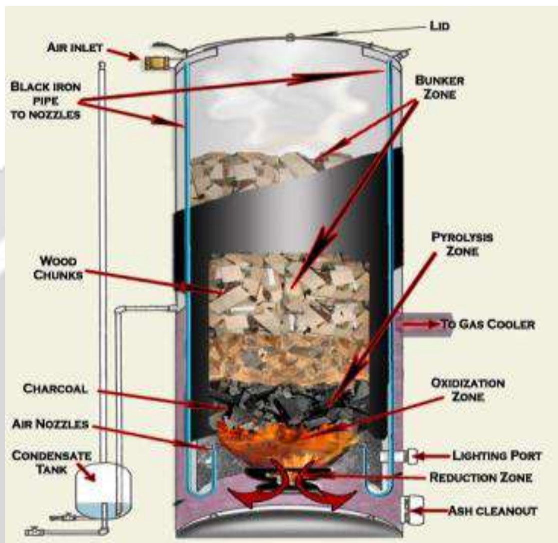

Fig 5: Reaction Chemistry

The combustible substance of a solid fuel is usually composed of elements carbon, hydrogen and oxygen. In complete combustion carbon dioxide is obtained from carbon in fuel and water is obtained from the hydrogen, usually as steam. The combustion reaction is exothermic and yields a theoretical oxidation temperature of 14500C. The main reactions, therefore, are: Oxidation, or combustion, is described by the following chemical reaction formulae:

$C+O_2 = CO_2 - 401.9$ kJ/mol
$H+1/2O_2 = H_2O - 241.1$ kJ/mol

In all types of gasifiers, the carbon dioxide (CO_2) and water vapour (H_2O) are converted(reduced) as much as possible to carbon monoxide, hydrogen and methane, which are themain combustible components of producer gas.The most important reactions that take place in the reduction zone of a gasifier between thedifferent gaseous and solid reactants are given below. A minus sign indicates that heat isgenerated in the reaction, a positive sign that the reaction requires heat

$C+CO_2 = 2CO + 164.9$ kJ/kmol
$C+ H_2O = CO+H_2 + 122.6$ kJ/kmol
$CO+ H_2 = CO+H_2O + 42.3$ kJ/kmol
$C+2H_2 = CH_4$
$CO+3H_2 = CH_4 + H_2O - 205.9$ kJ/kmol

Equations (a) and (b), which are the main reactions of reduction, show that reduction requires heat. Therefore the gas temperature will decrease during reduction.Reaction (c) describes the so-called water-gas equilibrium. For each temperature, in theory,the ratio between the product of the concentration of carbon monoxide (CO) and water vapour (H_2O) and the product of the concentrations of carbon dioxide (CO_2) and hydrogen(H_2) is fixed by the value of the water gas equilibrium constant (KWE).

ASSESSMENT OF THE SUITABILITY OFVARIOUS TYPES OF BIOMASS AS GASIFIER FUEL

Table 1: Composition of Producer Gas from Various Fuels

Fuel	Treatment, bulk density, moisture (m.c)	Tar produced g/m³	Ash content %	Gasifier	Experience
Coconut husks	Pieces 2-5 cm,65 kg/m³	Insignificant tar coconut	3.4	downdraft	Slag on grate but no operational problem
Corn cobs	304 kg/m³ m.c.=11%	7.24	1.5	downdraft	Excellent fuel. No slagging
Cotton stalks	Cubed,259 kg/m³ m.c. =20.6%	5	17.2	downdraft	Severe slag formation
Peat	Briquettes, 555 kg/m³m.c.=13%	-	-	downdraft	Severe slagging
Rice hulls	Pelleted, 679 kg/m³m.c.=8.6%	4.32	14.9	downdraft	Severe slagging
Safflower	Cubed, 203 kg/m³m.c.=8.9%	0.88	6.0	downdraft	Minor slag formation
Sugarcane	Cut 2-5 cms,52 kg/m3	Insignificant	1.6	downdraft	Slag on hearthring. Bridging
Walnut shell	Cracked, 337 kg/m³m.c.=8%	6.24	1.1	downdraft	Excellent fuel. No slagging
Wheat straw and corn stalks	Cubed (50% mix), 199 kg/m3m.c.=15%	0	7.4	downdraft	Slagging
Wood blocks	5 cm cube,256 kg/m3m.c.=5.4%	3.24	0.2	downdraft	Excellent fuel
Wood chips	166 kg/m³ m.c. = 10.8%	6.24	6.26	downdraft	Severe bridging and slagging.

Table 2: Gasification Characteristics of Various Fuels

Fuel	Gasification method	Volume Percentage					Calorific value MJ/m³
		CO	H_2	CH_4	CO_2	N_2	
Charcoal	Downdraft	28-31	5-10	1-2	1-2	55-60	4.60-5.65
Wood with 12-20% moisture content	Downdraft	17-22	16-20	2-3	10-15	55-50	5.00-5.86
Wheat straw pellets	Downdraft	14-17	17-19	-	11-14	-	4.50
Coconut husks	Downdraft	16-20	17-19.5	-	10-15	-	5.80
Coconut shells	Downdraft	19-24	10-15	-	11-15	-	7.20
Pressed Sugarcane	Downdraft	15-18	15-18	-	12-14	-	5.30
Charcoal	Updraft	30	19.7	-	3.6	46	5.98
Corn cobs	Downdraft	18.6	16.5	6.4	-	-	6.29
Rice hulls pelleted	Downdraft	16.1	9.6	0.95	-	-	3.25
Cotton stalks cubed	Downdraft	15.7	11.7	3.4	-	-	4.32

Acceptable fuel sizes fox gasification systems depend to a certain extent on the design of the units. In general, wood gasifiers operate on wood blocks and woodchips ranging from 8 x 4 x4 cm. to 1 x 0.5 x 0.5 cm. Charcoal gasifiers are generally fueled by charcoal lumps ranging between 1 x 1 x 1 cm. and 3 x 3 x 3 cm. Fluidized bed gasifiers are normally able to handle fuels with particle diameters varying between 0.1 and 20 mm.

IV. DESIGNINGOF DOWN DRAUGHT GASIFIER

Design of Downdraught Gasifiers

The downdraught gasifier makes it possible to use wood as fuel and produce a gas with sufficiently low tar content to operate an internal combustion engine. There are other means of handling the tar problem but these may create their own problems. Fox example, use of charcoal as fuel involves a loss of energy and increases the risk of depletion of wood resources. Use of cleaning systems after the gasifier involves difficult waste disposal problems.

Down-draught gasifiers being comparatively easy to build and operate are likely to be the most appropriate for developing countries as a source of decentralized power supply to rural communities and industries. The conversion of solid fuel to gas in a down-draught gasifier and the design basis for such gasifiers will therefore be examined in more detail.

Processes Occurring in the Down-Draught Gasifier

In the down-draught gasifier, schematically illustrated in, the fuel is introduced at the top, the air is normally introduced at some intermediate level and the gas is taken out at the bottom

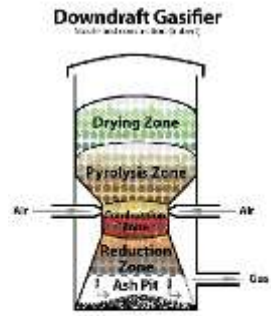

Fig 6: Downdraught or Co-Current Gasifier Designing

This is the equipment belongs to the biomass gasification system

Fig 7: Design

PARTS

1. Combustion chamber
2. Cyclone filter (primary filter)
3. Radiator
4. Secondary filter
5. Blower fan
6. Boiler

Combustion Chamber

Combustion chamber is used to burn the wood in this combustion chamber and this combustion chamber was made of steel.

Fig 8: Combustion Chamber

Grate

A grate is a frame of iron bars to hold fuel for a fire. It may also refer to: A covering of a drain, also called a grating. The act of using a grater, a kitchen utensil

Fig 8: Grate

Cyclone Filter

Cyclonic separation is a method of removing particulates from an air, gas or liquid stream, without the use of filters, through vortex separation. Rotational effects and gravity are used to separate mixtures of solids and fluids. The method can also be used to separate fine droplets of liquid from a gaseous stream. A high speed rotating (air)flow is established within a cylindrical or conical container called a cyclone. Air flows in a helical pattern, beginning at the top (wide end) of the cyclone and ending at the bottom (narrow) end before exiting the cyclone in a straight stream through the center of the cyclone and out the top. Larger (denser) particles in the rotating stream have too much inertia to follow the tight curve of the stream, and strike the outside wall, then fall to the bottom of the cyclone where they can be removed. In a conical system, as the rotating flow moves towards the narrow end of the cyclone, the rotational radius of the stream is reduced, thus separating smaller and smaller particles.

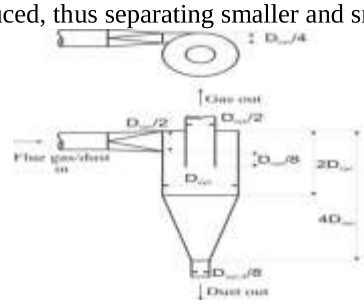

Fig 9: Cyclone Filter

Boiler

Boiler is used to heat the water while wood gas generator working.it has been working depending on the principle of heat exchange.

Fig 10: Boiler

In our project i.e construction of a wood gas generator with integrated boiler for fueling internal combustion engine by using wood pyrolysis,we made an attachment to the combustion chamber i.e boiler.

Radiator

Radiators are heat exchangers used to transfer thermal energy from one medium to another for the purpose of cooling and heating. The majority of radiators are constructed to function in automobiles, buildings, and electronics. The radiator is always a source of heat to its environment, although this may be for either the purpose of heating this environment, or for cooling the fluid or coolant supplied to it, as for engine cooling. Despite the name, radiators generally transfer the bulk of their heat via convection, not by thermal radiation, though the term "convector" is used more narrowly; see radiation and convection, below.

Fig 11: Radiator

One might expect the term "radiator" to apply to devices that transfer heat primarily by thermal radiation (see: infrared heating), while a device which relied primarily on natural or forced convection would be called a "convector".

Secondary Air Filter

Several methods are available to filter particles from a gas. These include:

Baffle chambers
Settling chambers
Cyclone separators
Wet scrubbers
Fabric filters
Electrostatic precipitators

A particulate air filter is a device composed of fibrous materials which removes solid particulates such as dust, pollen, mould, and bacteria from the air.A chemical air filter consists of an absorbent or catalyst for the removal of airborne molecular contaminants such as volatile organic compounds or ozone. Air filters are used in applications where air quality is important, notably in building ventilation systems and in engines.

Fig 12: Secondary Air Filter

The combustion air filter prevents abrasive particulate matter from entering the engine's cylinders, where it would cause mechanical wear and oil contamination.

Blower Fan

A centrifugal fan is a mechanical device for moving air or other gases. The terms "blower" and "squirrel cage fan" (because it looks like a hamster wheel) are frequently used as synonyms. These fans increase the speed of air stream with the rotating impellers. They use the kinetic energy of the impellers or the rotating blade to increase the pressure of the air/gas stream which in turn moves them against the resistance caused by ducts, dampers and other components.

Fig 13: Blower Fan

V. GAS CLEANING AND COOLING

6.1 Gas Cleaning:

Trouble free operation of an internal combustion engine using producer gas as fuel requires fairly clean gas. As has been mentioned well designed downdraught gasifiers are able to meet the criteria for cleanliness at least over a fairly wide capacity range (i.e. from 20% -100% of full load). Up draught gasifiers in engine applications have to be fitted with bulky and expensive tar separating equipment. It is however possible to get the gas from up draught gasifiers up to specification as is reported.Methods are under development to reform the gas in a high temperature zone (secondary gasification), in order either to burn or crack the tars.

Cleaning Dust from the Gas

The major problem in producing an engine quality gas is that of dust removal.For normal type "Imbert" downdraught gasifiers, the dust leaks when using wood blocks of about 4 x 4 x 4 cm are reported to vary between 0.5 - 5 g/m³ gas (34). Investigations of the size and size distribution of generator gas dust were undertaken by Nordstrom (33) and the results are reproduced in Table 2.8. It is possible to separate about60% - 70% of this dust from the gas steam-by means of a well-designed cyclone. The best cleaning effect is obtained by employing cloth filters. However, normal cloth filters are very sensitive to the gas temperature. In the case of wood or agricultural waste gasification, the dew-point of the gas will be around 70 C. Below this temperature water will condense in the filters, causing obstruction of the gas flow and an unacceptable pressure drop over the filter section of the gasification system.

Fig 14: Gas Cleaning

Electrostatic filters are also known to have very good particle separating properties, and most probably they could also be used to produce a gas of acceptable quality. However, such filters are expensive, and it is for this reason that their use is foreseen only in larger installations, i.e. equipment producing 500 kW electric powers and more.

VI. TESTING

Testing Of Gasifier:

In this project we took **HERO HONDA CD 100 SS (2000)**.

Hero Honda's Profilation of This Bike

This bike - anyway you look at it - represents toughness. And the ability to handle even off road, dirt track conditions with ease.

Fig 15: HERO HONDA CD 100 SS (2000)

General Information

Model: Hero Honda CD 100 SS
Year: 2000
Category: Sport
Rating: 62.9 out of 100. Show full rating and compare with other bikes

Engine and Transmission

Displacement: 97.20 ccm (5.93 cubic inches)
Engine type: Single cylinder, four-stroke
Power: 9.65 HP (7.0 kW)) @ 8000 RPM
Starter: Kick
Ignition: Electronic
Gearbox: 4-speed

Transmission Type

Final drive: Chain
Clutch: Wet multiplate

Chassis, Suspension, Brakes and Wheels

Frame type: Back bone type
Front suspension: Telescopic hydraulic fork
Rear suspension: Spring loaded hydraulic type with both side actions

Physical Measures and Capacities

Weight incl. oil, gas, etc: 112.0 kg (246.9 pounds)
Overall height: 1,050 mm (41.3 inches)
Overall length: 1,960 mm (77.2 inches)
Overall width: 720 mm (28.3 inches)
Fuel capacity: 10.10 litres (2.67 gallons)

Operational Procedure Start-Up

In order to start-up the unit, the following operations have to be performed:

1. Closing of valve E and opening of valve D
2. Opening of the reactor ignition port.
3. Starting the fan by switching the fan button control.
4. Lighting of a piece of paper that has to be put into the reactor ignition hole. This paper will be sucked into the gasifier and will ignite the charcoal present in the reactor. It takes about a minute before the charcoal inside the reactor is burning and the ignition hole can be closed.
5. Opening of the gasifier air inlet. Product gas is now escaping through the flare. The gasmust be flared for about ten minutes, before the engine can be started.
6. Switch the fan button to out position, close valve-D and open valve E.
7. put the air inlet valve to the engine into the half-open position.
8. Close the reactor air-inlet for a short period to create a slight overpressure in the system.

9.Start the engine by pushing the starter button on the control panel.

10.Leave the engine running unloaded for a period of about five minutes.

The whole starting-up procedure takes about twenty minutes.

Closing Down

1. Switch off the engine's ignition.

2.Close valve E.

3.Leave the gasifier air inlet open for a short period in order to release the pressure build-up caused by continuing pyrolysis of the fuel. Be aware that poisonous carbon-monoxide is being produced.

Fig 16:T-Joint and Ball Valve

For connecting to the engine we require two ball valves and a t-joint .one for adjusting the wood gas flow and another for adjusting the atmospheric air.After that connect the wood gas pipe to the engine inlet manifold

Fig 17: Connecting Wood Gas to the Engine

Now slowly adjust the ball valves for accurate acceleration. Shake the grate after some time to get accurate burning. Remove the blower after connecting to the engine.

Emission Analysis

A muffler (silencer in British English, or back box in Irish English) is a device for reducing the amount of noise emitted by the exhaust of an internal combustion engine.

S.No	Gas Emission	% Of Gas (Petrol)	% Of Gas (Wood Gas)
1.	CO	7.8 %	6 %
2.	CO_2	12.56 %	15.28 %
3.	O_2	18%	22%
4.	HC	1200 %VOL	1100 %VOL

Several such exhaust systems that utilize various designs and construction methods:

Vector muffler - for larger diesel trucks, uses many concentric cones [citation needed]

Spiral baffle muffler - for regular cars, uses a spiral-shaped baffle system

Aero turbine muffler - creates partial vacuums at carefully spaced out time intervals to create negative back pressure, effectively ‘sucking’ the exhaust out of the combustion cylinders

Emissions of many air pollutants have been shown to have variety of negative effects on public health and the natural environment. Emissions that are principal pollutants of concern include:

Hydrocarbons - A class of burned or partially burned fuel, hydrocarbons are toxins. Hydrocarbons are a major contributor to smog, which can be a major problem in urban areas. Prolonged exposure to hydrocarbons contributes to asthma, liver disease, lung disease, and cancer.

Carbon monoxide (CO) - A product of incomplete combustion, carbon monoxide reduces the blood's ability to carry oxygen; overexposure (carbon monoxide poisoning) may be fatal. Carbon Monoxide poisoning is a killer in high concentrations.

Nitrogen oxides (NOx) - Generated when nitrogen in the air reacts with oxygen at the high temperature and pressure inside the engine. NOx is a precursor to smog
and acid rain. NOx is a mixture of NO, N2O, and NO2. NO2 is extremely reactive.

Emission Analysis with Petrol, Wood Gas Emission Analysis of the Engine with Petrol

Emission analysis of the engine while engine running with petrol.

S.NO	GAS EMISSION	% OF GAS
1.	CO	7.8 %
2.	CO_2	12.56 %
3.	O_2	18%
4.	HC	1200 %VOL

Emission Analysis of the Engine with Wood Gas

Emission analysis of the engine while engine running with wood gas.

S.NO	GAS EMISSION	% OF GAS
1.	CO	6 %
2.	CO_2	15.28 %
3.	O_2	22%
4.	HC	1100 %VOL

This emission test was done by R.T.A approved pollution check at kodad.

Total Cost for Gasifier Equipment= 5,800 /-
Total Cost for Engine =15,200/-
Total Expenditure
Required Materials = 3,320
Pipes& Fittings = 400
Engine = 15,200
Fabrication Cost = 2,080

Total Cost =21,000/-

VIII. CONCLUSION:

Maximum usage of producer gas has been in driving internal combustion engine, both for agricultural as well as for automotive uses. However direct heat applications like grain drying etc.isvery attractive for agricultural systems.By using this Down draft wood gasifier the emissions of an engine with petrol got carbon monoxide 7.8%, carbon dioxide 12.56%.oxygen 18%, whereas wood gas emission got carbon monoxide 6%, carbon dioxide 15.28.oxygen 22%, wood gas blends with petrol got emissions has got carbon monoxide 5.8%, carbon dioxide 16%.oxygen 20%.A spark ignition engine running on producer gas on an average produces 0.55-0.75 kWhof energy from 1 kg of biomass. Compression ignition (diesel) engines cannot run completely on producer gas. Thus toproduce 1 kWh of energy they consume 1 kg of biomass and 0.07 liters of diesel .Consequently they effect 80-85% diesel saving. Hence by using this emission analysis hope that wood gas becomes a future alternate fuel and this gas not harmful to the atmosphere compare with petrol and diesel

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