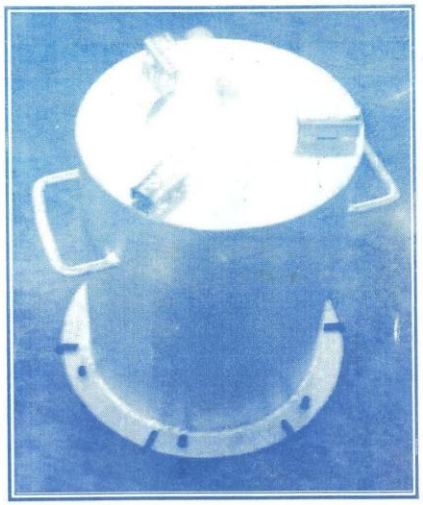
ANILA GASSIFIER

Page – 1

SCAD

ANILA GASSIFIER

A Sustainable device to save energy & Protect Environment



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Page – 2

INTRODUCTION

The energy demands of modern societies are steadily increasing; today much of this demand is satisfied by fossil fuel such as gas, coal energy resources that are not available. The growing scarcity of fuel wood requires more and more rural people in the developing countries to seek locally available lowcost alternatives to satisfy the household cooking. One such readily available resource is agricultural residue. However, due to inherent bulkiness most agricultural residues cannot be used directly as fuel substitutes for wood or charcoal. SCAD has introduced a device called 'ANILA stove' (invented by Mr. Ravi Kumar, Mysore) suitable for handling loose biomass for bioenergy production. This process is environmentally friendly and smokeless compared to the traditional system.

METHODOLOGY

1. Hard wood and some stones are packed inside the combustion chamber and lit from the top.
2. Heat generated heats up the bio residue packed in the annular space and pyrolyses it. Pyrolysis gas flows from a series of holes at the bottom of combustion chamber and burns. This induces further gasification and the process continues.

PROCESS

Initially the moisture is removed as steam (vapour) on heating. On further heating it undergoes a process called pyrolysis wherein all the volatiles present in the wood evaporates and if unburnt will escape as smoke. At elevated temperatures the cellulose breaks down releasing carbon monoxide and carbon (char).

REACTIONS OCCURRING IN WOOD GASIFICATION

100 -120° C	The input material dries with moisture passing up through the bed
275° C	The output gases are mainly N2,CO &CO2. Acetic acid and methanol distill off.
280°C-350°C	Exothermic reactions occur, driving off complex mixtures of chemicals (Ketones, aldehydes, phenols, esters, CO2, CO, CH4, C2H6, H2)
Above 350° C	All volatiles are drives off, a higher proportion of H2 is formed with CO and carbon remains as charcoal with ash residues.

PRODUCTS OF PYROLYSIS

Wood is basically composed of cellulose held together by lignin. It also contains several other hydrocarbons in small amounts.

A typical wood composition is as follows:

Constituent	Percentage
Methane CH_4	1-5%
Water vapour H_2O	6-8%
Heaviver Hy dro carbons	0.2-0.4%
Carbon Dioxide CO_2	9-12%
Hydrogen H_2	13-19%
Carbon monoxide CO	15-30%
Nitrogen N_2	45-55%
Oxygen O_2	0.2 5-0.5%

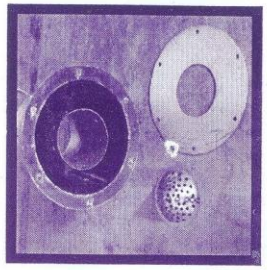
(Source : Mr. Ravi kumar, Anila Stove)

MATERIALS / FEED STOCKS USED

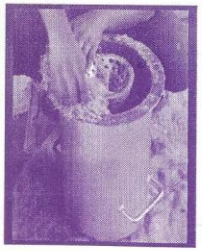
Bioresidues are available abundance in rural areas. Materials such as coir, coconut frond, baggase, corncob, groundnutshell, paddy husk, small sticks of cotton, prosopis, crop waste, tree bark, wood chips and cotton rind. Similar cellulosic agro wastes can be used.

STOVE ASSEMBLY

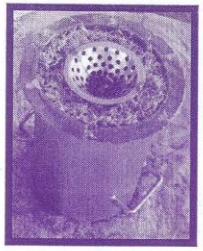
Stove consists of 2 cylinders of large and small diameter placed one inside the other. The annular space closed on one end and sealable on the other. Inner cylinder has a conical grate at the bottom and holes near the bottom for the gas to issue from the annular space.



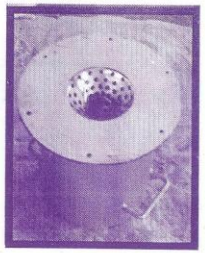
HOW TO FILL THE STOVE



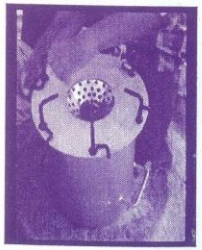
Fill the bioresidues in outer cylinder



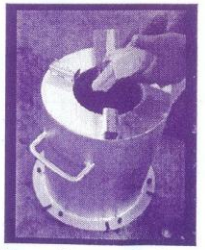
Place the conical grate



Place the bottom lid



Lock with lever



Place the wood pieces in inner cylinder

HOW TO LIGHT THE STOVE

Wood pieces in the center cylinder are lit from the top using waste cotton cloth or wax dipped in kerosene as a starter fuel. It is allowed to burn about 5-10 minutes. The gas derives from the loose biomass starts issuing and sustains the process of smokeless combustion for a period of 1 hour in the Gassifier mode.

HOW TO USE STOVE

One can keep the cooking vessel directly or a stand can be used if the cooking vessel is bigger or even smaller as per the convenience. Also if the cooking needs to be continued after one hour, it is possible to add any biowaste fuel or char briquette or woody biomass into the center combustion chamber for another ½ hour or as required. The stove will remain hot for about an hour after fire burning stops. This can be used to retain heat in the cooking vessel.

After the stove has cooled down it is turned upside down. The nuts and bolts are removed and the bottom lid is opened. Now if it is upturned, the biowaste would have converted to char comes out. It is observed that if 3 kg biomass is filled, about 1-1.5 kg of char can be obtained after combustion and energy recovery.

USES OF BIOCHAR

- Biochar can be mixed with clay make briquette used for saw dust burning stove
- Biochar can be used for soil conditioner.
- Biochar enriched with cow urine and vermi wash increased soil fertility favourably by way of increasing microbial population.

The following benefits occur with addition of biochar to the soil

- Enhanced plant growth
- Suppressed methane emission and reduced nitrous oxide emission
- Reduced fertilizer requirement
- Reduced leaching of nutrient
- Stored carbon in a long term stable sink
- Increase soil microbial population
- Soils with biochar additions are typically more fertile, produce more and better crops for a long period of time.

Black carbon!!

Green environment!!!

Further Details

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