

## **KK NDG**

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### **INTRODUCTION**

Dear Stover's,

I (R.KrishnaKumar) had developed a Natural Draft Gasifier (NDG) to suit for multi-fuel adaptability, mainly wooden logs (Prosopis Juliflora) where considered for the test initially. I would mainly like to thank Lanny Hensen, for his valuable guidance throughout the course of my work and also like to thank Paul Anderson and Kobus for the initial guidance. I would like to give a special thanks to my guide Dr.R.Sethumadhavan for giving me an opportunity to do the project o NDG.

India is a 2<sup>nd</sup> largest Populated country in the world with a total land area of 3 000 000 km<sup>2</sup> with a population of over 100 million and a forest area of 640 000 km<sup>2</sup> and having a potential of 17 000 MW from Biomass estimated by Ministry of Non-Conventional Energy Sources (MNES) , with a large potential of Biomass but with very less efficiency of utilization of these biomass fuels especially in the rural villages of India. This NDG is mainly designed to suite for the rural villages for cooking and small industrial applications depending upon the size requirement.

### **KKNDG**

The main aim is to develop the (KKNDG) for the villages including the forest and hill stations where the trees are chopped for the open fire cooking with very less efficiency. The fuel wood that is commonly found is Prosopis Juliflora and Casurina. Hence I have carried out the experiment with these fuel wood especially Prosopis Juliflora for varying sizes.

I would like to attach preliminary experiment that I have carried out along with it photos of the KKNDG

## Experiment: 1

Date	:	25 Feb 2k4
Wood	:	Prosopis Juliflora
Wood size	:	$\phi$ 40 mm & 300 mm long
Fuel Firing	:	Top
Weight of Water taken ( $M_w$ )	=	8 kg
Weight Wood taken ( $m_f$ )	=	4.15 kg
Weight of Water evaporated ( $M_s$ )	=	4.61 kg
Boiling time	=	32 min
Moisture content of Wood ( $m_{fs}$ )	=	19.2 %
Initial water temperature ( $T_i$ )	=	27 °C
Boiling temperature ( $T_f$ )	=	98 °C
Total time of operation ( $\Delta t$ )	=	65 min
Charcoal (C)	=	0.35 kg
Dry wood Calorific value (Cv)	=	3800 kcal / kg
Equivalent dry wood consumption ( $m_d$ )	=	$m_f / (1 + m_{fs} / 100) -$ $1.5 \times C$ kg
	=	2.956 kg
Heat input ( $H_i$ )	=	$m_d \times C_v$ 11233 kcal
Heat output ( $H_o$ )	=	$M_w \times 1 \times (T_f - T_i) + M_s \times 540$ kcal 3056 kcal
Efficiency ( $\eta$ )	=	$H_o / H_i$ <b>27.21 %</b>
Total Equivalent dry wood Consumption rate ( $m_t$ )	=	$m_f \times 60 / \Delta t$ <b>2.73 kg / h</b>
Power Rating	=	$m_t \times C_v \times \eta / 860$ <b>3.28 kW</b>



**KK-NDG**



**Front View showing  
Thermocouples**



**Top View**



**Top View -Grate**



**R.KrishnaKumar with KKNDG**



**Fuels Used for Test- Wood (Prosopis-Juliflora)**



**Water Boiling**



## **Glowing Bed**

These are just the preliminary results that I have carried out; I would like to attach the detail results of my experiments in few days after my experiment is fully completed. The primary and secondary air supply is varied with help of damper.

I would like to have the Questions and Suggestions to be sent to [krishnakumar\\_07@yahoo.co.uk](mailto:krishnakumar_07@yahoo.co.uk)