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DEVELOPMENT OF ENERGY EFFICIENT COOKING SYSTEMS FOR RURAL MASSES

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ABSTRACT

In this experimental research study three different designed improved cooking stoves, Priyagni, Harsha and proposed modification of Modified multifuel cook stove developed on the basis of application of Dr Winiarski design principles and tested in fuel laboratory and compared in terms of efficiency and emission. The main focus was on the new modified stove design, which is so far a prototype. This stove, which can be locally produced with local materials, consists of an insulated combustion chamber with the comparative energetic analysis based on the experimental observation using different biomass(cow dung, babul wood and mango wood) available at the time of experiment, The merits and demerits of each cook stove model have evaluated experimentally and it is found that each model has expected the efficiency and other parameters of the modified multi-fuel cook stove is in the range of 30-35 % better than from the Priyagni and Harsha cook stove models and the thermal efficiency has been increased by the convective heat transfer co- efficient by forcing the flue gases to flew through the enclosure skirt between pot bottom and pot surrounding and heat transfer increased through preheating the secondary air. The India National Programme on Improved Chulas (NPIC) was only concerned about government design specification and did not respond to need for rural people. There is no option but to look for efficient improved cook stoves on the basis of application of Dr Larry Winiarski design principles during design and development of cook stoves. This paper presents the design principles to develop energy efficient cook stove model for rural masses and to improve the stove efficiency up to 40%.

The application of design principles of Dr. Larry Winiarki, the efficiency test results indicates that the modified cook stove performed better in combustion of wood and heat output. The rate of fuel saving from the modified cook stove was quite significant in comparison with the Priyagni and Harsha Stove of NPIC on average saved 30% of fuel wood per day. This was with the improvement in the combustion efficiency and the expenditure can be reduced by about 34 %.This is possible because of the application of design principles. This researchpaper brings out the minimization of thermal energy losses to get cooking efficiency of cook stoves up to 30-35% andflame temperature measurement under various combustion conditions. Reduction of heat losses by allowing the gases remain in contact with cooking vessel for more time in the insulated chamber of the combustion chamber.

KEYWORDS: Combustion Chamber, Efficiency, Flue Gases, Heat Transfer, Modified Cook Stove