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Review of Rocket Cook-Stove Geometrical Aspects for its Performance Improvement

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Abstract

The inefficient traditional three-stone fire cook stoves are used as benchmark for performance comparison in many of developing countries for every improved cook stove. In order to improve energy security in developing countries many modern cooking fuels and technologies are introduced. This paper reviews studies of such technologies studied by researchers for performance improvement. Even though there are several factors that can be considered to improve the efficiency of these cook stove, this paper highlights many geometrical design principles of the stoves in order to increase heat transfer efficiency and reduce emissions. This study can be used as a basis of design for kinetic modeling and modification of existing cook stove model for better performance.

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Keywords: Cook Stove, bio-mass, performance, efficiency, emission.

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1. Introduction: Biomass Cooking Stoves

1.1 Biomass Cooking:

It is estimated that about 50% world's population more than 3 billion people cook over an open biomass fire. This energy source is especially prevalent in rural areas of developing countries, where a majority of households rely on biomass fuels for cooking [1]. The incomplete combustion results in harmful green house

gas emissions. These indoor emissions are responsible for deaths of children worldwide [1].Also it has important global implications on greenhouse gas and black carbon emissions.

1.2Three Stone Cook Stove:

The three stone cooking stoves are most inefficient in its performance due to wastage of heat from unequal spaces between them.

Figure – 1 Three stone cook stove [1]

This traditional three-stone fire is most basic and commonly used method for benchmark for performance comparison of the stoves as shown in below Fig 1.

1.3Rocket Elbow Cook Stove:

The rocket elbow stove design has been studied and refined for at least two decades. And it is available in the form of benchmark design guidelines have been document [4]. This design simplifies analysis of draft for performance improvement by considering two basic fundamental driving processes: heat addition from combustion (at point 2), and kinetic energy addition/conversion (between points1 and 2) due to the chimney effect. These two processes are interconnected and together governs the overall stove operation as shown in below Fig 2.

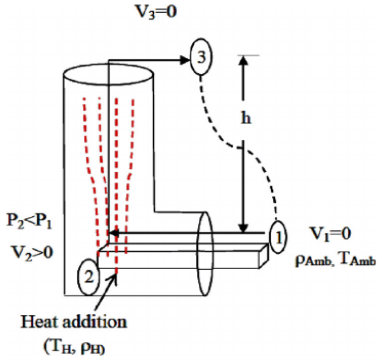

Figure – 2 Rocket cook stove [3]