EXPERIMENT ON DESIGN OF PELLET BURNING COOK STOVE

[1]Sohail Kureshi
[1]PG Scholar, Mechanical Engineering Department
Aisect University Institute of Science and Technology, Raisen (M.P.)
Aisect UniversityRaisen [M.P.] India
[2]Vijay Bhan Dinkar
[2]Assistant Professor, Mechanical Engineering Department
Aisect University Institute of Science and Technology, Raisen (M.P.)
Aisect University Raisen (M.P.) India
[3]Prakash Nerkar (Industrial consultant)

Abstract
Globally, Most of the people in the world don't have even electricity in villages .These people normally go with alternative type of fuel for ex. Charcoal, biomass, agricultural waste. As new design of stove is being introduced in this paper it is very helpful to the environment and eco-friendly to the atmosphere. Now a day's LPG has good market it has been widely used to make a food in cooking equipments.LPG cylinder, also referred to as simply propane or butane, is flammable mixture of hydrocarbon gases used as a fuel in heating appliances. Conventional sources of fuel are going to exhaust in times to come. The primary objective of the study is to design of pellet burning stove. Having a pellet is not enough, to burn out pellet we also require stove with good storage capacity. This design will give you good storage capacity around 10 Kg per shift. This stove we can use for commercial purpose as well .70% of Indians do reside in villages, and it is not difficult to make a pellet in India. If we have pellet then we can easily use this stove to make a food in India on greater purpose. With the use of Coal, Petrol & Diesel as energy resources the environment getting deteriorated. To develop a green environment we must use pellet as an alternative fuel. We are making a pellet with the help of agriculture waste environment. Use of pellet has got some inherent advantages. Fo making pallet raw maerials used are rcotton waste, saw dust, Soya bean, ground nut shell & toor dal .Calorific values of pellets rely heavily on raw material used. All types of pellets can be use in new designed stove. During burning it produced less ash content approximately 0.005%. Regularl, use of coal in commercial purpose can increase the shortage of coal that's why we need to introduce alternate source of energy i.e. pellet .Use of pellet can save the coal.

1. INTRODUCTION
In villages mostly cow dung is used for cooking the food. Use of cow dung can create harmful pollution. Use of pellet has some advantages over conventional fuel like being eco-friendly, economical Mostly users have regularl feeding problems in one shift .Stove capacity must be high but they don't have that type of storage capacity .This newly design stove will give highest storage capacity and users need not worry about feeding of pellets regularly. Cow dung having around 15% of carbon .Burning of cow dung in villages can create harmful atmosphere. For ex. India has banned the burning of cow dung in vicinity of TAJ MAHAL. Cow dung has have high carbon content it leads to fading in white colour TAJ MAHAL. Demand of pellets has been increased; because pellets have zero percentage of carbon content. High carbon content in cow dung is hazardous to health

Figure 1.1

2. OBJECTIVE OF THE PROJECT
1) The primary objective of this project is to have new design of stove that can give highest storage capacity of pellet.
2) The objective of this project is to provide information about pellet.

3) Comparison and analysis of experimental results of pellets i.e effect on calorific value of pallet using different raw material

3. SCOPE OF THE PROJECT

1) This Newly designed stove will change the perspective of users towards fuel and allow them the opportunity to manifest their affection towards mother earth.
2) It has some inherent advantages over conventional fuel like coal, LPG,petrol, diesel such as low cost, environment friendly easy to produce.
3) It can give you highest storage capacity of around 10kg/shift and burns completely with less ash content.

Figure 1.2

In developing countries majority of population relies on forest wood as basic source of fuel. This eventually leads to deforestation which is cause of concerne considering the present scenario of global warming .In developing countries over 50% population consumes their money to purchase wood ,coal .Besides this they have another problems while burning wood , charcoal and cow dung this create health problems as well.

Figure 1.3

According to WHO (world health organization) "4.3 million people die every year from smoke creation due to indoor cooking. The WHO has decided to reduce deaths caused by smoke from home fires.
As the country is developing villagers have found out new concept to overcome from health disease like lung infection, eye ailments etc .To decrease health effects from cooking, villagers can vent the smoke through chimney totally.
A newly designed stove concept will decrease all health and economical issues. By using a pellet will save the cost which is wasted during purchase of coal, charcoal and wood.

4. METHODOLOGY

Our efforts will be focused on the designing of stove for pellets.

1) Design of stove.
2) Drawing of stove with the help of AutoCAD software.
3) Fabrication of stove.
4) Experimental analysis on stove.
5) Comparison

5. DESIGN OF STOVE

Figure 1.4

While designing of stove following factors were taken care of:

1) We have selected one mild steel sheet because it is easy to roll (MS Roll diameter (i.e. inner diameter of cylindrical part = 304.8 mm). Holes are made over the entire sheet to ensure proper combustion of pellets. (Diameter of holes = 6mm, Distance between holes=25.4mm)
2) And outer part is made up of cast iron.(Outer Diameter =381 mm & Distance between outer diameter and inner is = 76.2 mm)
3) Height has been decided according to average height of person.
   Height of cylindrical part is 533.4 mm.

Figure 1.4

The cylindrical part is mounted on cubical rigid structure. In this cubical rigid structure we have mounted two fan assemblies one is to ensure proper circulation of O2 to pellets and another is for even flame distribution.

Figure 1.5

On this cylindrical part we are going to mount fans & regulator. We have used square pipes whose dimensions (area = 25.4 x 25.4 mm²).

Figure 1.6

Temperature in the inner part of stove will be around 400˚ to 500˚ C so inner part of the stove will be made up of mild steel having melting point of 1350 ˚ C to 1530 ˚ C so that it can sustaine flame temperature .
Due to combustion of pallets, in the cylindrical part, high amount of heat will be generatred & to ensure max utilization of this energy we have to ensure that this heat is not lost from the walls of the stove .We are using ceramic blanket for insulation & prevent loss of heat .Heat will not travel from inner diameter of mild steel to outer diameter of cast iron. Using thermocouple we have measured the flame temperatures.

Consumption of pellets (Kg)	3 kg	7kg	9 kg	10 kg
Flame temperature achieved(˚C)	178	357	402	488

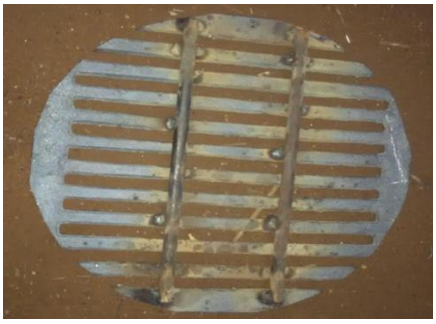

Figure 1.7

The pellet will be placed over the frame shown in figure. After burning the ash will be collected at the bottom of the stove with the gaps shown in the frame.
Diameter of frame is 300 mm.
The total weight of stove is 22kg.Ceramics is costly than bricks, but we can use bricks. It will increase the weight of stove, and then it is difficult to move from one place to another place.

6. LITERATURE REVIEW

1) Renewable non conventional energy protect royal Thai government U.S agency (or International Development Biomass cooking stoves have been used by human beings for a long time but the knowledge of how various stove designs conditions is still vague. Most of the work done in the past was directed at trying to improve stove configuration a few studies attempted to develop methods of testing stove performance. In this Chapter, a review of stove construction and design, methods of testing

stove performance, and factors affecting stove performance will be presented.

7. STOVE CONSTRUCTION AND DESIGN

Various stove configurations are seen in Thailand and overseas. The variation comes about as a consequence of cooking habits and simplicity.

1) Meechai (Intrapanich 1981)
Feechai rice husk stove

The Meechai stove is composed of four structural metal pieces a cone ,a stove body stands, and as ash receiver .The cone, the stove body and the ash receiver are made from scrap metal or galvanized sheet ,the stands are steel rods. The stove body is put into the cone ,which itself is set on the stands rice husks fill the space between the stove body and the cone.At the apex of the cone ,an ash removal service is positioned to let the ash fall out of the stove.The stove is recommended for a medium income family (Intrapanich 1981)because it can use any waste materials as fuels.

2) Osuwan and boonyakiat
Thai Stoves

A variety of stoves can be found in Thailand, both user built and commercially manufactured. Charcoal bucket stoves, which can be found almost everywhere in Thailand, have been studied by Thai investigators (Osuwan and boonyakiat,1982).The structure of this stove will be described in a later chapter, The book by Dunn, et al.(1982) and De Lepeleria.et al.(1981) also has detailed descriptions. Since the Thai charcoal bucket stove was investigated in this study, it is appropriate to review the literature and the various investigations already conducted.

3) Pounoumetal
Thai Charcoal Bucket Stove

Although there are various kinds of bucket stoves in Thailand, they have a common structure. The stove is normally made of fired clay in the shape of an inverse truncated cone, (or cylinder) which is placed in a metal (generally zinc) bucket-liked container; hence, the name "bucket stove." Charcoal is the main fuel for this kind of stove. In 1982, Meta Systems Inc. Thai Group, sponsored by USAID, investigated the performance of Thai charcoal bucket stoves made by different local manufacturers (Pounoumetal, 1982). The group utilized boiling water tests and cooking tests (described later in this chapter) in their study. Using the water boiling tests, they found that the ratio between the water and the fuel affected stove performance more than the size of stove and cooking vessel. Time to boil ranged from 11 to 51 minutes. The average amount of released heat from the fuel consumed was found to be 3.2 kilo calories per gram of food cooked. Further, stove efficiency obtained from "the water boiling test" demonstrated that the average value used by food in cooking was 650 calories per gram of food. Osuwan and Boonyakiat (1982) applied water boiling tests to examine the performance of Thai charcoal bucket l Loves. They found that stove performance was affected by stove size, air inlet area, gap height, grate hole area, aluminium pot size, quantity of water used in the test, and quantity and mass of charcoal. Their results showed that stove performance improves if stove diameter is increased, or the air inlet area is decreased, or the gap height is reduced. The efficiency of stove performance is reduced. The efficiency of stove performance varied from 20.86 to 33.95.

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