Introduction of Improved Metallic Stove for People Living in High Altitude Regions of Nepal

Hari Gopal Gorkhali (Director)
Center for rural Technology, Nepal

Introduction

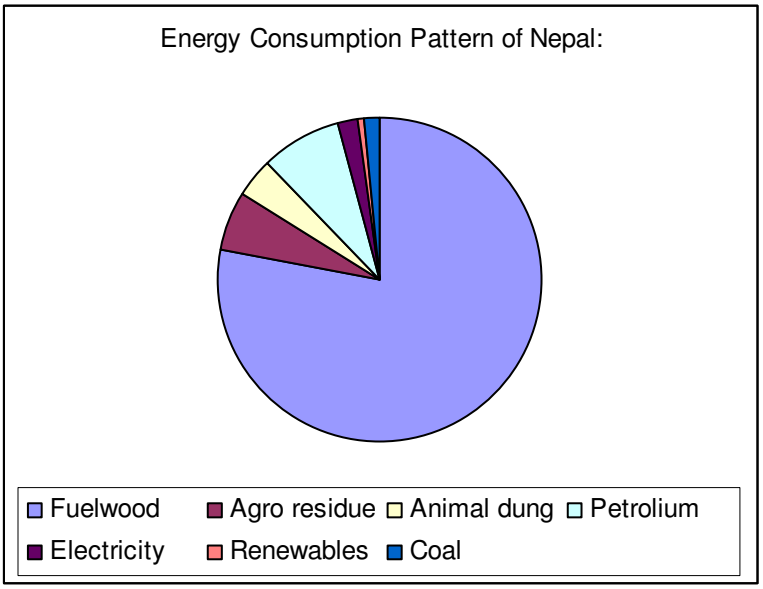
Majority of households in Nepal use open fire places inside their homes for cooking, heating and even for light generation. This badly affects their health especially among women and children (who spend more hours in a day around the open fire places than men), as the "pine" and "utish" woods used in the high altitude regions of Nepal have a lot of resin and burn producing lots of black smoke. Interim Improved Metallic Stove is specially designed for space heating and cooking for people living in high altitude regions of Nepal, and also specially designed to protect people's health from smoke as it takes all the smoke out of the room through a chimney. Thus the indoor air is clean and the firewood consumption is also reduced up to 40%. It has 3 pot-holes of different sizes to allow cooking rice, lentile and vegetable dishes, at the same time providing hot water continuously from small attached-tank for washing purposes. There is also a provision of bread roasting slit on which one can insert roti/bread directly exposed on to the flame/fire inside the combustion chamber.

This stove has a double bottom, which is insulated with mud underneath, and a firebox, from where the fire flames directly hit the pots. Draught can be regulated through an adjustable vent in the main door and a damper in the chimney.

Picture of a Complete Improved Metallic Stove

Energy Consumption Pattern of Nepal:

Over the years, biomass has served as a main source of energy in the world especially in developing countries like Nepal. These account in Nepal for about 88% of total energy consumption in Nepal (WECS, 2006). Among biomass fuel wood, agricultural residues and animal dung are being utilized as a main source of energy since centuries.

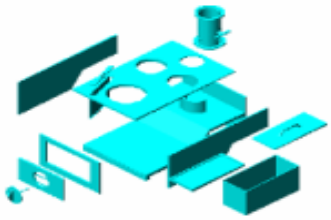


- Fuel wood: 78%
- Agro Residue: 5.77%
- Animal Dung: 3.80%
- Petroleum: 8.19%
- Electricity: 1.82%
- Renewable: 0.53
- Coal : 1.78%

Specification of Metallic Stove:

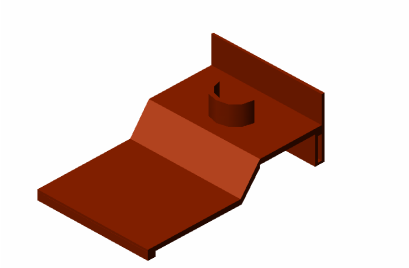
- Length : 675 mm
- Breadth: 430 mm
- Height: 260 mm
- Number of Pothole: 3 of different sizes
- Water Tank Capacity: 9 liters.
- Weight of the Stove: 40 Kg.

Description of the main parts:



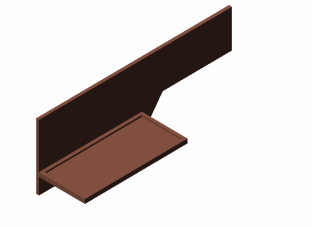
Base Plate:

- Made of 16 gages Ms Sheet metal consist of 2 plates with gap of 40 mm that is insulated by mud, which acts as thermal mass.



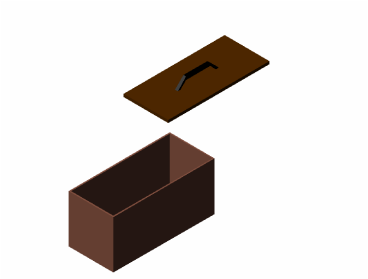
Side Plates:

- Made of 16 gage Ms sheet metal
- One of the side plates consists the water tank (9 litres)



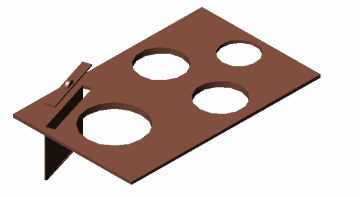
Water Tank:

- Made of 18 gage Ms sheet metal
- It can hold 9 litre of water



Top Plate

- Made of 4mm Ms sheet
- Consist of 3 potholes and a roti/bread grilling slot
- Potholes are reinforced from below by 4 mm metal



Fuel Door and Air Vent:

- Made of 16 gage Ms sheet meta
- Consist of air vent.
- Air supply for the combustion and can be regulated through the air vents.

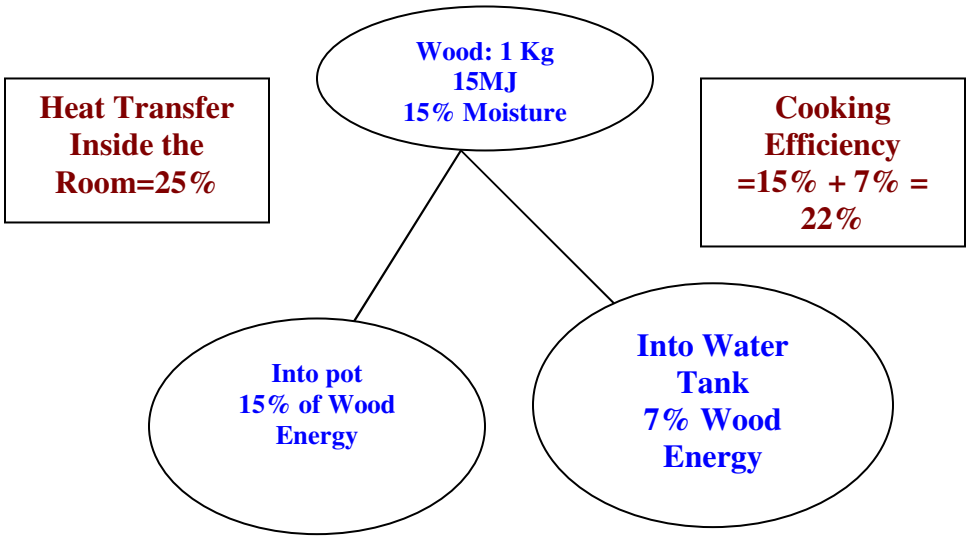
Damper:

- Made of 16 gage Ms sheet metal
- Air draughts are regulated through dampers
- It consist of a butterfly valve

Performance:

- Consumes around 40% less firewood compared to the traditional open fire stoves.
- Average firewood consumption per person per day for all day for food and space heating is 1.8kg to 2.6kg.
- Maintaining average room temperature of 31-32^{0}C
- Maximum pothole temperature: 300-350^{0}C during cold and up to 450^{0}C during hot
- Time of firewood burning: 30-35 minutes for 1 kg fuel wood.
- Water temperature inside the tank: 30-40^{0}C
- Cost: NRs. 6000.00-7000.00 (US$.75-87)

Energy Flow Chart



Subsidy Policy:

According to Nepal Government Policy on "Renewable Energy Subsidy Arrangement 2008", following subsidies have been arranged for Metallic Stoves:

- Flat subsidy of NRr. 4000.00 (US$ 50.00) will be provided to Improved Cook Stoves used for cooking and space heating, as they are costly and unaffordable in high mountain regions.

- Subsidy will be provided to the people who live above the altitude of 2000m or above1500m in the case of north facing areas.

Program:

- Under ESAP Phase II, Biomass Energy Support Programme has set aside a target to install about 50,000 Metallic Stoves with partial subsidy in high mountain areas of Nepal for 2007-2011. The program is funded by Energy Sector Assistance Program (ESAP) of DANIDA and executed by Alternative Energy Promotion Center (AEPC) of Nepal Government. The Center for Rural Technology, Nepal (CRT/N) has been working as a key service providing partner to AEPC/ESAP and facilitator to National Biomass Activities in 16 of 75 districts. The overall objective of the program is to support the development and application of the new biomass technologies like mud made Improved Cook Stoves for mid hills; biomass gasification and metallic stoves in high mountainous areas where space heating needs are to be addressed. The program will also facilitate for improved capacity of local organizations to offer affordable biomass energy (BE) solutions to the rural communities with quality assurance.

Achievements

- With high priority, Government of Nepal has launched the Metallic Stove dissemination program in cold regions of the country for 2007-2011

- 15 manufactures are pre-qualified by AEPC /ESAP and trained to manufacture quality metallic stoves

- Few hundreds of metallic stoves are already being distributed in high altitude areas under the ESAP Phase II program.

- Increase in demand for more stoves from northern part of Nepal.

- Since 1999 about 4500 Metallic stoves are being distributed by Rural Integrated Development Services (RIDS-Nepal) in Jumla district situated in northern part of Nepal with 50% financial subsidies.

(Cooking and warming family members from Improved Smokeless Metallic Stove)

Positive Aspects:

Experience has shown that smokeless metal stove saves fuel consumption and cooking time. The installation of an Improved Smokeless Metal Stove in households has drastically reduced the amount of IAP produced. Breathing has become easier and families enjoy much more to sit around the warm stove and in the kitchen for long time in cold season. Children are much cleaner; their hands and faces can be regularly washed with the hot/warm water from the water tank.

Moreover, the local traditional meal can be cooked all at once. Homes are much cleaner, without smoke and black soot in the air of the kitchen. The important aspect of the stove is heat that is produced inside the kitchen, which is a great relief in those villages that are situated at a high altitude, around 3,000 meter and experience freezing temperatures and heavy snow for 5 months of the year.