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What is a Rocket Stove?

March 21, 2011 · Filed under Rocket stoves, stoves, Wood · Tagged Buid your own rocket stove, clay elbow, DIY rocket stove, envirofit, How to build a rocket stove, Institutional rocket stove, rocket, rocket stove design principles, rocket stove downloads, rocket stove manufacturers, rocket stove resources, rocket stove videos, rocket stove websites, stove, stovetec, What is a rocket stove

Dr. Larry Winiarski, now Technical Director of **Aprovecho**, began developing the Rocket stove in 1980 and invented the principles of the Rocket stove in 1982. The Winiarski Rocket stove's simple design and use of common materials make it easily modified for optimal performance. In the last 29 years, variations of the Rocket stove have been built in over 20 countries. The Rocket elbow can be made from different materials such as sand/clay (**Lorena**), pumice/concrete, heavy steel pipe, 430 stainless steel or refractory ceramic. Find a comprehensive list of Websites, Videos, Downloads and Manufacturers at the bottom of this page with regards to building, using or purchasing a Rocket stove. **Click here to go to References**

What's wrong with an open fire?

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An open fire, as shown above, is often 90% efficient in turning wood into energy. But only a small proportion (10% to 40%), of the released energy makes it into the pot. Improving combustion efficiency does not appreciably help the stove to use less fuel. On the other hand, improving heat transfer efficiency to the pot makes a large difference. Improving the combustion efficiency is necessary to reduce smoke and harmful emissions that damage health. Improving heat transfer efficiency can significantly reduce fuel use. Fire is naturally good at its job, but pots are not as good at capturing heat because they are inefficient heat exchangers. In order to reduce emissions and fuel use, the stove designer's job is to first clean up the fire and then force as much energy into the pot or griddle as possible. Both of these functions can be accomplished in a well engineered cooking stove and a Rocket stove. A Rocket stove is a type of stove combining the air-intake with the fuel-feed slot in an opening into the combustion chamber extending into an "internal chimney" before exiting through the vertical chambered heat exchanger. Some models have the chimney located in a different location, drawing emission gases along a horizontal path (sometimes below cooking points) before exiting through the vertical chimney.

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A Rocket stove is signified by ease of construction and simplicity of building materials while accepting small-diameter fuel such as twigs or small branches, yielding high combustion efficiency and directing the resultant heat most

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effectively. A Rocket stove achieves efficient combustion of the fuel at a high temperature by ensuring that there is a good air draft into the fire, controlled use of fuel, complete combustion of volatiles, and efficient use of the resultant heat. As the fuel burns within the combustion chamber, convection draws in new air from below ensuring that any smoke from smoldering wood near to the fire is also drawn into the fire and up the chimney. The chimney should be insulated to maximize the temperature and improve combustion. The design of the stove means that it can operate on about half as much fuel as a traditional open fire and can use smaller diameter wood. Some models can accept whole logs, with only the tips combusting. In horizontal feed magazines the fuel has to be pushed into the combustion chamber at regular intervals. The advantage of this system is that the heat output can be adjusted as required, but the disadvantage is that if left unattended the fire will extinguish.

Rocket stoves are usually insulated and some are raised up from the floor which reduces the danger of children burning themselves. For space heating purposes the heat is transferred to a heat store which can in some cases be part of the structure of the house itself. The exhaust gases then pass out of the building via the chimney. The use of a cooking hood is recommended as the hood and chimney combination does not influence the rate at which air is introduced to the fire. The "internal chimney" creates the optimum amount of draft for fuel-efficient combustion.

A Rocket stove's main components are:

Fuel magazine: Into which the unburned fuel is placed and from where it feeds into the combustion chamber. The fuel magazine can be horizontal where additional fuel will be added manually or vertically for automatic feeding (gravity feed) of fuel. The fuel magazine can be simple steel piping or even ceramic pipe. Fuel shelves serve as the platform for the fuel that is used with the stove. This slightly raised platform makes it possible for air to flow over and under the fuel source.

Combustion chamber/Internal chimney: At the end of the fuel magazine where the wood is burned. Internal chimneys are mere extensions of the combustion chamber and may be constructed from a larger tin can to piping and provide the required draft to maintain the fire. The top of the combustion chamber/chimney serve as the support for the cooking area. Some Rocket stove designs have chimneys in a separate location to the combustion chamber.

Chimneys: Located above the combustion chamber or to one side or can be part of the hood extraction system.

Heat exchanger: To transfer the heat to where it is needed, i.e. the cooking pot. From the chimney the heat passes into a suitable heat exchanger to ensure the efficient use of the generated heat. For cooking purposes the design keeps the cooking vessel in contact with the fire over the largest possible surface area by use of a pot skirt to create a narrow channel which forces hot air and gas to flow along the bottom and sides of the cooking vessel. The pot is usually encompassed by a fixed or adjustable pot skirt. The pot skirt functions as a shield to force the emission gases to pass close to the container holding the food. The gap between the skirt and the pot is also known as the pot gap. The pot gap calculation is crucial to the performance of the stove and excel spreadsheets are usually used to **calculate this gap**.

Rocket stoves are found more commonly in third world countries where wood fuel sources are scarce but it has been introduced in the United States in recent years. Some of them are small for portability with insulation inside a double-walled design with a chamber for partial biomass gasification and additional mixing to increase power output and provide a cleaner, more complete burn. In some models, as the wood is converted to charcoal, it falls through a grate for later collection and **carbon sequestration**. Since the Rocket stove is a wood burning cooking stove, obtaining fuel while on a camping trip is easy. Unlike a campfire, the Rocket stove will function very well using small branches and limbs that tend to litter the floor of the woods. This means there is no need to chop larger sections of wood into smaller sections in order to feed the fire.

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- Development of emissions indices for cookstoves in rural India March 14, 2011

The charcoal project

- Ugandan schoolmaster leads way in seeking energy efficiency & sustainable renewable fuels for schools March 31, 2011
- Space-probe technology to generate electricity from biomass-burning stoves? March 31, 2011
- The Charcoal Project goes boots-on-the-ground in Uganda March 28, 2011

Favorite downloads

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- Journey to Forever
- Legacy Foundation – fuel briquette making
- REPP Stove Page
- South Africa's Greenhouse Gas Emission Levels
- Sustainable Energy Store in South Africa
- Switch from wood-burning stoves to charcoal offers health benefits—CBC Health & Science News:
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- The Charcoal Project
- Tom Reed's WoodGas Stove
- WHO Posters and Maps

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Videos

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http://www.rocketstove.org/index.php?option=com_content&task=view&id=42&Itemid=93 How to build an institutional Rocket stove – Part 1 to 8 by Peter Scott
http://www.youtube.com/watch?v=YIMi0DVDvqw&feature=player_embedded Build a Rocket stove by Aprovecho
http://www.youtube.com/watch?v=CsDjcv5vO4c&feature=related Operation of the StoveTec Combo Two Door Stove by Dean Still
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http://www.youtube.com/watch?v=GmEiLMT56L0&feature=player_embedded Redneck Rocket Stove using cinder blocks
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Downloads

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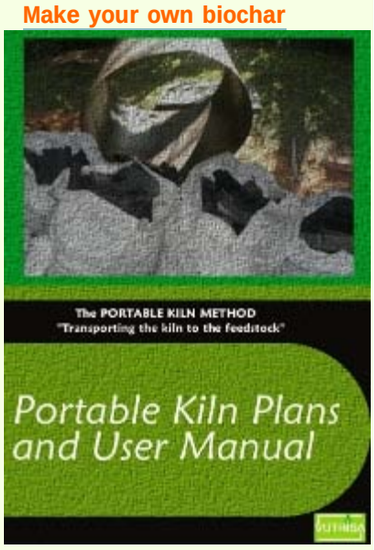

Recommended books

Institutional Rocket Stove (IRS) Assembly Guide Designed by Peter Scott
http://www.rocketstove.org/images/stories/chimney%20tool/IRS%20Calcu
Pot gap calculation

Manufacturers
http://www.stovetec.net/us/index.php – StoveTec
http://www.envirofit.org/cookstoves.html – Envirofit
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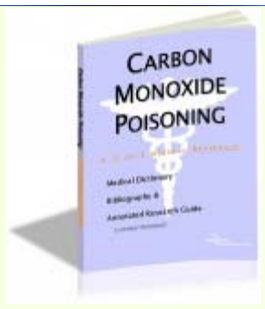

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