



rocket stoves



what are they?

They're stoves designed to burn wood at high enough temperatures to superheat the wood to release gases that are also burnt, increasing efficiency. The flammable gases released are hydrogen and methane, which are burnt, along with carbon monoxide, carbon dioxide and steam, which are vented. There's no smoke with a rocket stove. With a wood stove you burn plant matter, which releases gases as smoke, which is vented. Modern stoves with baffles hold the smoke and gases longer, and are more efficient, but not as efficient as a rocket stove.

A rocket stove is usually a simple L-shape, comprising combustion chamber / flue and a 'magazine' to load wood in at the front - usually but not always horizontally. Air is drawn in past the wood, so that combustion occurs at the bottom of the insulated flue (which is often double-skinned, infilled with wood ash or vermiculite). The insulation and the airflow means that the heat is concentrated in the combustion chamber / bottom of the flue, and extremely high temperatures can be achieved. They are more prevalent in poorer countries such as Somalia and Ethiopia, and have been used successfully in refugee camps in Rwanda. They can be made from various materials, including bricks, clay and recycled oil drums or cooking oil cans.

From simple, single-burner outdoor cooking facilities, you can utilise the same principle for indoor ovens, water boilers, multiple burner stoves or mass heaters, where the heat from the flue is used to heat up a mass of earth, cob or some other material that will store the heat. This way you can make a heated cob bench next to the stove, for example. Throw on a few cushions and we're talking very, very cosy. For an indoor



'A warm tent, 8 liters of hot water and an omelette on the hob. Life's good.' Note the flue pipe leaving the tent, and the little back boiler.

heater, there needs to be a flue to vent gases outside, with a vertical chimney to take carbon monoxide up and away from windows etc, where it may re-enter the house.

There are presses that can make little round briquettes from sawdust that fit exactly into the magazine of a rocket stove. They have a hole through the middle that allows the air to flow through. They are pushed further into the stove by the next briquette as they burn down.

The principle of superheating wood to release gases, then burning the gases, is the basis of a wood gasifier, which produces gas to be used as a fuel. Wood is burnt in an anaerobic environment (pyrolysis), and the gases released can be used immediately or stored for use elsewhere. Cars can be adapted to run on wood gas.

what are the benefits?

- lower emissions of carbon and pollutants
- use wood more efficiently; you can bring a pot of water to the boil twice as fast as an open fire or wood stove, using less than half the wood
- smoke leaving a wood stove flue is hot, but the exhaust from a rocket stove is around room temperature; heat is radiated into the room or into the food being cooked, not lost via the flue
- you don't have to spend so much time chopping firewood
- cheap to construct, from recycled materials
- can reduce deforestation - a big problem in sub-Saharan Africa due to firewood harvesting
- in countries where cooking is over an open fire, there is a high incidence of pneumonia due to smoke inhalation; using a rocket stove instead removes this problem, as there's no smoke



Rocket mass heater with heated cob bench - has to be the cosiest way to heat your space.



what can I do?

You can buy or make a stove. Search online for instructional videos, or occasionally courses. The simplest stove is made with 3 cans (e.g. olive oil cans) - a large can for the exterior, smaller one for the interior chamber, and a third, horizontal one for the feed magazine. Put wood ash between the interior and exterior cans for insulation, and you have a basic stove. You could also make a clay stove by forming it around two pieces of pipe in an L-shape, then taking the pipes out. Sturdier stoves can be fabricated from metal, which is more involved, and you'll need welding skills.

You can use a rocket stove on the patio, or for camping. They can be used as cooking stoves, bread ovens and/or water heaters. It's possible to incorporate the principles described above into a rocket mass heater to be installed in a house as a sealed unit with a flue, and used to heat water and/or a mass such as ceramic, fire bricks or cob bench that will store and radiate heat. These are very efficient as heat is stored by the mass rather than wasted from the chimney. They are used successfully in homes around the world, and even in cold climates, located in the centre of the home, they can perform all these functions with a couple of hours burning in the morning, and a couple in the evening. If you tweak the design so that the fuel (sticks) is inserted vertically, then gravity will feed them into the fire, and you can see when you need to add more.. Portable designs are available for tents, yurts, tipis etc for cooking and heating.

If you want to install a rocket mass heater in your home, you need to think about building regs, as your house insurance may be invalidated if your installation isn't signed off properly. Some people in rural, self-built, low-impact housing often ignore building regs altogether, are confident in their ability to install a heater safely, and don't have house insurance for a property they can fix or even completely rebuild themselves anyway. If this isn't you, then our advice is: be nice to your building control officers. They could block your project, because equipment should really be lab tested, which is expensive. The officer may not know that, but will know about document J, covering flues and surrounds. Flues aren't allowed to be horizontal, but you could argue that the horizontal run is in fact part of the heater, and then hook up to a vertical chimney after the horizontal



Example of a tiny, portable rocket stove.

run. It depends on what your local officer is like, but if you approach them in a non-antagonistic way and ask for help with an interesting, environmentally-friendly (but safe) project, you're likely to get a better response. There also has to be a good hearth around the heater, to protect flammable materials from falling embers.

Rocket stoves are good for camping and there are designs using an enclosed rocket stove that can provide a hot plate cooking surface, water heating and little side flue that can be used in your tent.

They are simple to light. Start a small fire at the bottom of the flue using balls of paper and kindling, and then feed in dry wood. You have to tend the fire more often than a conventional wood stove, especially when cooking, due to the small amounts of wood involved. If you leave it for more than 15 minutes at a time, it could go out. However you will have cooked your meal, heated some water or mass to radiate heat and all using a lot less fuel than a conventional wood stove.

resources

- see lowimpact.org/rocket-stoves for more info, courses, links, advice & stoves
- squidoo.com/rocketstoves - lots of random info and videos on rocket stoves
- aprovecho.org - info on rocket stoves and other appropriate technologies
- stoves.bioenergylists.org - info on making many different types of rocket stove

Feel free to upload, print and distribute this sheet as you see fit. 220+ topics on our website, each with introduction, books, courses, products, services, magazines, links, advice, articles, videos and tutorials. Let's build a sustainable, non-corporate system.

[facebook.com/lowimpactorg](https://www.facebook.com/lowimpactorg)

Lowimpact.org

twitter.com/lowimpactorg

Registered in England. Company Ltd. by Guarantee no: 420502