

Gasifying Cookstoves Database

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INTRODUCTION

The following document presents a database of advanced gasifying cookstove designs from around the world, and includes information on design, performance, and production where available. Note that the criteria for stove inclusion in this database is the presence of either a forced air injection system or a distinct secondary air supply. The stoves included below span a spectrum from partial gasifying stoves (combustion air split between primary and secondary, typically a TLUD configuration) to pyrolysis stoves (minimal or no primary air supply) to more traditional designs with secondary forced air injection (forced primary air for enhanced mixing, no secondary air). All of the stoves are in the <10kW power range, and larger-scale 'true' gasifying stoves (defined as lacking radiative feedback between the primary and secondary combustion zones) are not included. Also note that this database only includes selected stoves with information published on the internet, and should not be considered comprehensive. Specifically, we suspect that the Chinese gasifying cookstoves market is undersampled [1], [2] The intention was to include gasifying stoves that have been put into commercial production, that have documented testing data available, or that feature particularly novel designs.

Stove	WOODSTOVE, by Philips (Netherlands)
Design	TLUD gasifying stove, natural-draft or fan-powered versions, semi-continuously fed with wood
Production	In production for developing country market, cost = ??
Innovations/ Notes	Arguably the highest-profile of the partial gasifying cookstoves, is usually the cleanest stove in terms of particulate emissions in comparison tests.
References	[3], [4], [5]
URLs	http://www.hedon.info/PhilipsWoodStove



Stove	WOODGAS CAMPSOTVE XL, by Spenton LLC, Tom Reed (USA)
Design	TLUD gasifying stove, forced-air, batch fed with forest litter, wood chips, pellets or charcoal, charcoal-producer
Production	In production for the recreational market, cost = \$79
Innovations/ Notes	This company offers three sizes of woodgas stove; this is the middle size. Tom Reed is usually credited with the invention of the TLUD configuration in the 1980s.
References	[6], [7], [8]
URLs	http://www.woodgascampstove.com/Specifications.html



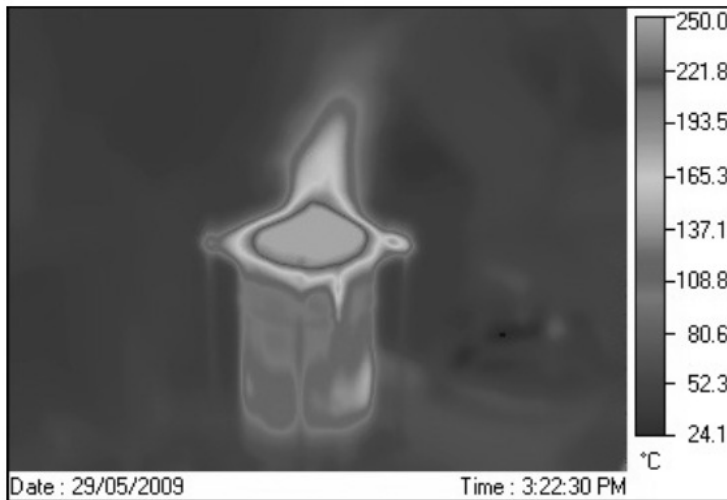
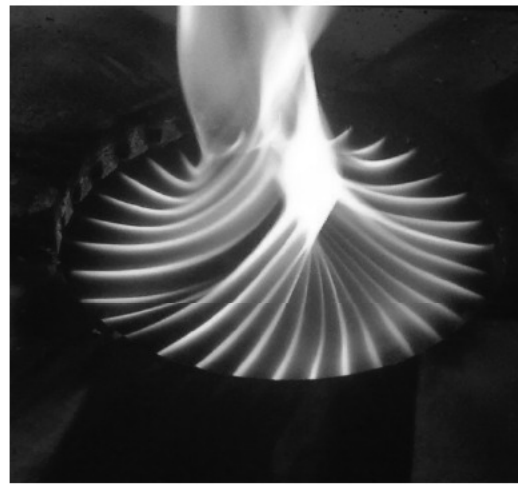
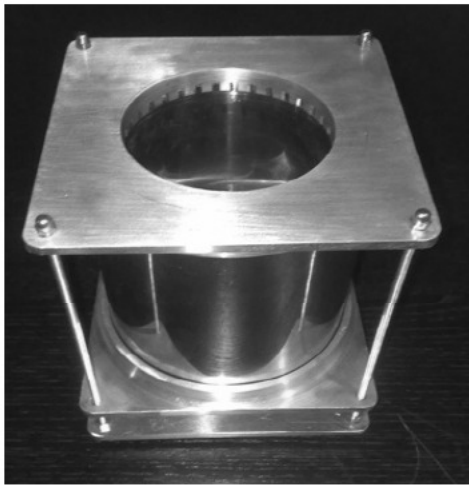
Stove	VESTO, by New Dawn Engineering (Swaziland)
Design	TLUD gasifying stove, natural-draft, batch fed with wood
Production	In production for developing country market, cost = \$61
Innovations/ Notes	Name is acronym for 'variable energy stove', designed for a high turndown ratio, body based off a 25 L paint can
References	-
URLs	http://www.newdawnengineering.com/website/stove/singlestove/vesto/ https://www.sabs.co.za/index.php?page=disa04



Stove	SIERRA, by ZZ Manufacturing (USA)
Design	Fan stove, batch fed with twigs/bark/pinecones/charcoal
Production	In production for the recreational market, cost = \$57
Innovations/ Notes	Termed a 'mini-forge' stove; primary air is used to cool the combustion chamber, is preheated in the process
References	-
URLs	http://www.zzstove.com/sierra.html http://www.zzstove.com/faq.html http://www.kk.org/cooltools/archives/000012.php



Stove	LUCIA, by WorldStove (Italy)
Design	Pyrolyzing stove, natural-draft or fan-powered versions, batch fed, charcoal-producer
Production	In production for developing country market, cost = \$51-72 (depending on options)
Innovations/ Notes	Highly modular design can be configured for gasification or pyrolytic operation. Complex flow path designed using CFD. Currently being distributed in Haiti in earthquake-affected areas.
References	-
URLs	http://worldstove.com/products/lucia-stove-for-developing-nations/ http://www.treehugger.com/files/2010/03/biochar-breaks-through-in-haiti.php



Stove	DAXU, by Beijing Shenzhou Daxu (China)
Design	TLUD gasifying stove, natural-draft, batch fed with agro waste or wood
Production	In production for developing world market, cost = \$50-94, volume > 25,000
Innovations/ Notes	Design features 1-2 hot plates and a chimney, optional boiler for space and water heating. Winner of a 2007 Ashden Award.
References	[2], [9], [10]
URLs	http://www.time.com/time/specials/packages/article/0,28804,1921165_1921239_1921209,00.html http://www.ashdenawards.org/winners/daxu http://www.youtube.com/watch?v=x65M9zX4gAo



Stove	BEANER, by WorldStove (Italy)
Design	TLUD gasifying stove, natural-draft, batch fed with forest litter, charcoal-producer
Production	In production for the recreational market, cost = \$39
Innovations/ Notes	Extremely light and portable. Uses an empty soda can for an outer sheath.
References	-
URLs	http://worldstove.com/products/the-beaner-backpacking-stove/



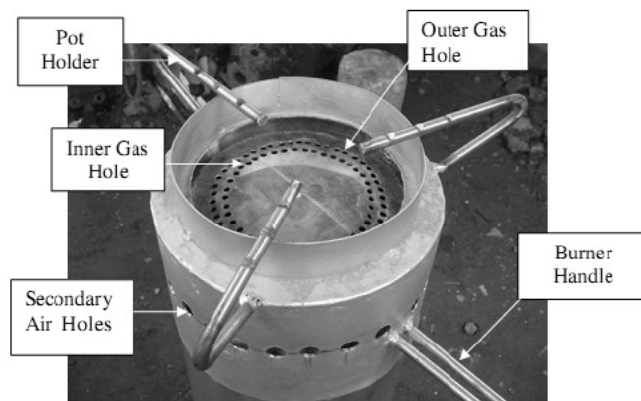
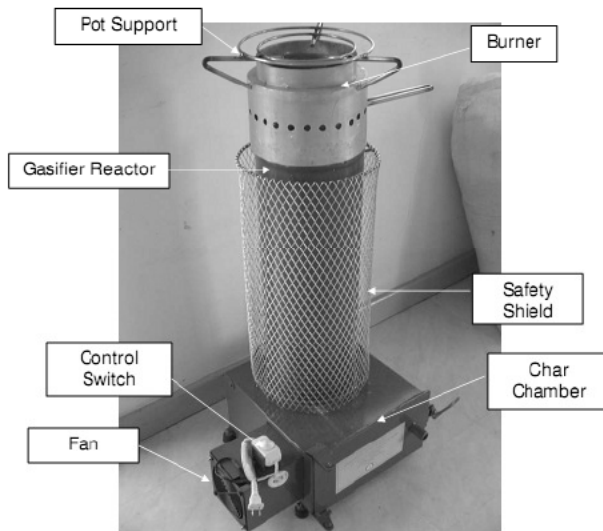
Stove	OORJA, by British Petroleum and later First Energy (India)
Design	TLUD gasifying stove, forced-air, batch fed with custom wood pellets
Production	In production for developing world market, cost = \$23, volume > 400,000 units
Innovations/ Notes	Probably the highest production volume of any gasifying cookstove. Original design team from BP now developing the stove under the name First Energy.
References	[6], [11], [12]
URLs	http://www.netroadshow.com/custom/bp/bpflv3.asp?cf=053008b http://yaleglobal.yale.edu/content/small-stove-big-ambitions http://www.hindu.com/2007/06/05/stories/2007060505830500.htm http://www.consumercomplaints.in/news/indian-firms-shift-focus-to-the-poor.html http://www.thinkchangeindia.org/2010/03/02/tc-i-changemakers-first-energy-to-change-the-way-rural-india-cooks/



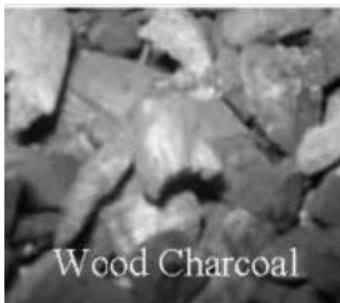
Stove	SAMPADA, by the Appropriate Rural Technology Institute (ARTI, India)
Design	TLUD gasifying stove, natural-draft, continuously fed with wood chips and pellets, charcoal-producer
Production	In production for developing world market, cost = \$23
Innovations/ Notes	Has a supplementary side fuel-loading port for continuous operation. A.k.a. the Karve Sampada charcoal maker.
References	[3], [6]
URLs	http://www.arti-india.org/index.php?option=com_content&view=article&id=52&Itemid=88 http://www.arti-india.org/index.php?option=com_content&view=article&id=76:improved-cookstoves-for-the-rural-housewife&catid=15:rural-energy-technologies&Itemid=52



Stove	RICE HUSK STOVE, by Alexis Belonio (Philippines)
Design	TLUD gasifying stove, forced-air, batch fed with rice husk, charcoal-producer
Production	In production for developing country market, cost = \$22
Innovations/ Notes	Marketed as a direct alternative to LPG stoves. Primary air is forced, but secondary air is natural-draft. Sold with different reactor sizes to achieve differing cook times. Winner of 2008 Rolex Award.
References	[13], [14]
URLs	http://www.minangjordanindo.com/ricehuskgastove.htm http://crhet.org/ http://rolexawards.com/en/the-laureates/alexisbelonio-the-project.jsp



Stove	BIOMASS GAS STOVE, by Minang JordanIndo Approtech (Indonesia)
Design	TLUD gasifying stove, forced-air, batch fed with
Production	In production for developing country market, cost = ??
Innovations/ Notes	Evolution of the Belonio Rice Husk Gas Stove, also marketed as a direct alternative to LPG stoves. Primary air is forced, but secondary air is natural-draft. Features a removable fuel canister to facilitate fuel loading and char removal.
References	[15], [16]
URLs	http://www.minangjordanindo.com/biomassgastove.htm http://www.bioenergylists.org/beloniomjgasstove



Wood Charcoal



Carbonized Coal



Biomass Pellets

Stove VIVEK, by the Appropriate Rural Technology Institute (ARTI, India)

Design TLUD gasifying stove, natural-draft, batch fed with sawdust

Production In production for developing world market, cost = \$13

**Innovations/
Notes** Requires a high surface-area fuel such as sawdust or similar

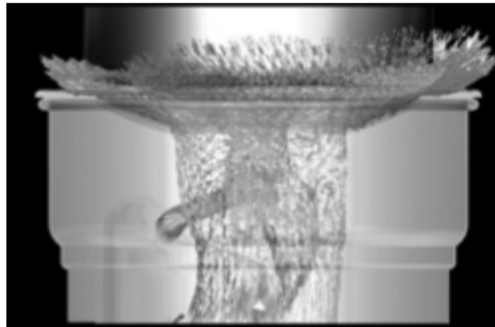
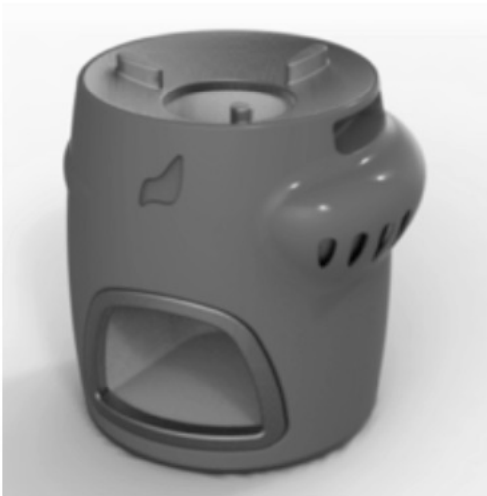
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URLs http://www.arti-india.org/index.php?option=com_content&view=article&id=52&Itemid=88

http://www.arti-india.org/index.php?option=com_content&view=article&id=76:improved-cookstoves-for-the-rural-housewife&catid=15:rural-energy-technologies&Itemid=52



Stove	FORCED AIR ROCKET STOVE, by BioLite (USA)
Design	Hybrid rocket/gasifier , continuously fed
Production	Production expected soon for developing country market
Innovations/ Notes	Developed in collaboration with Aprovecho. Traditional rocket stove design, modified with the additional of a fan.
References	-
URLs	http://biolitestove.com/NextGen_Cook_Stove.html



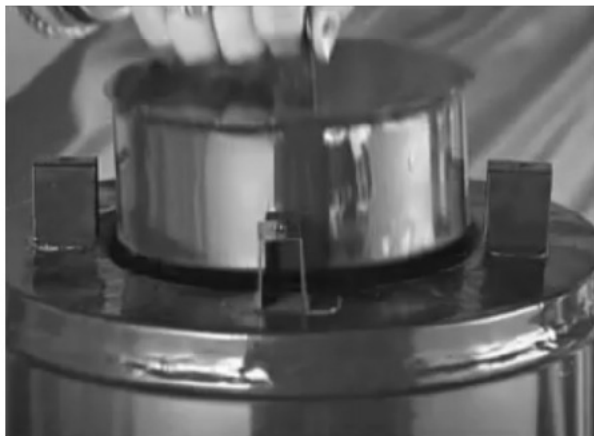
Stove	CAMP STOVE, by BioLite (USA)
Design	TLUD gasifying stove, forced-air, batch fed with forest litter, charcoal-producer
Production	Production expected soon for recreational market
Innovations/ Notes	Integrated TEG for fan power. Designers advertise an extremely quick water boiling time. Nice industrial design work.
References	[17]
URLs	http://biolitestove.com/Camp_Stove.html



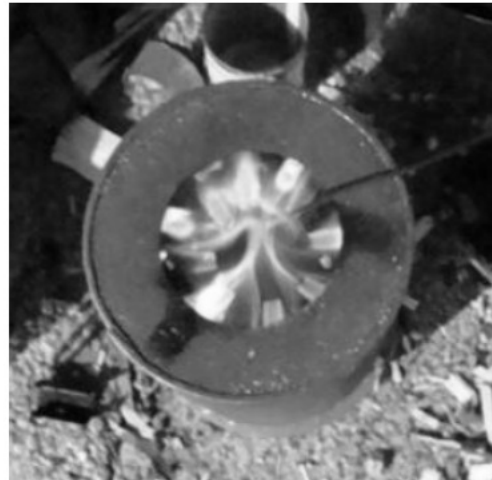
Stove	SPECTRA, by Spectra Lanka Industries (Sri Lanka)
Design	TLUD gasifying stove, natural-draft, batch fed with wood
Production	In production for developing world market, cost = ??, volume > 20,000
Innovations/ Notes	Removable inner combustion chamber for easy fuel loading.
References	[18]
URLs	http://spectra.lk/product/wood%20gas%20stove.html#



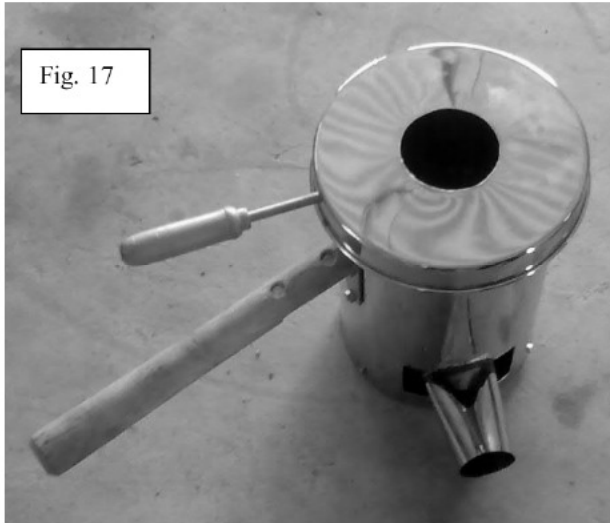
Stove	NAVAGNI, by Qpre Energy (India)
Design	TLUD gasifying stove, natural-draft, batch fed with any biomass, charcoal-producer
Production	In production for developing country market, cost = ??
Innovations/ Notes	Includes a cap for the combustion chamber, used to smother hot coals when cooking is complete. Company recommends selling the charcoal generated.
References	-
URLs	http://www.navagni.com/index.html http://www.bioenergylists.org/content/navagni-gasifying-co



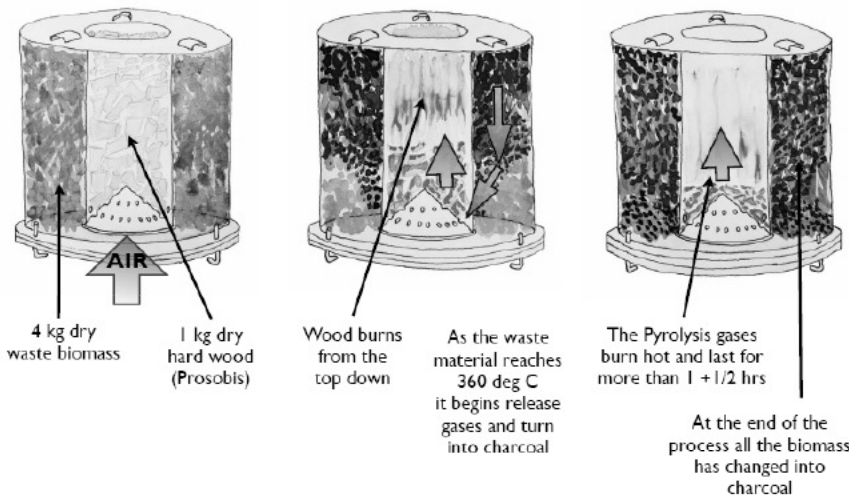
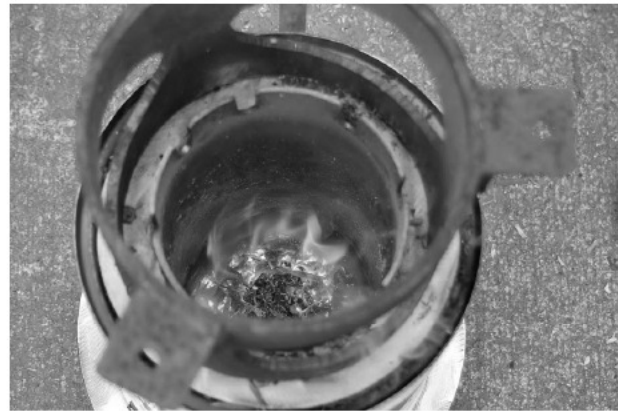
Stove	PEKO PE, by Paal Wendelbo (Norway)
Design	TLUD gasifying stove, natural-draft, batch fed with any biomass, charcoal producer
Production	Prototype for developing world market, over 5000 units disseminated
Innovations/ Notes	Has a 'concentrator disk' for creating turbulence at point of secondary air injection. A riser can be included to enhance natural convection. The name means 'no problem'.
References	[6], [19], [20], [21]
URLs	http://www.hedon.info/ImprovedCookstovesInUganda



Stove	CHAMPION, by Paul Anderson (USA)
Design	TLUD gasifying stove, natural-draft, batch fed with any biomass, charcoal producer
Production	Prototype for developing world market
Innovations/ Notes	Has a 'concentrator disk' for creating turbulence at point of secondary air injection. A riser can be included to enhance natural convection. Reportedly has a good turn-down ration
References	[6], [22], [23]
URLs	http://www.chipenergy.com/thirdworld/index.htm

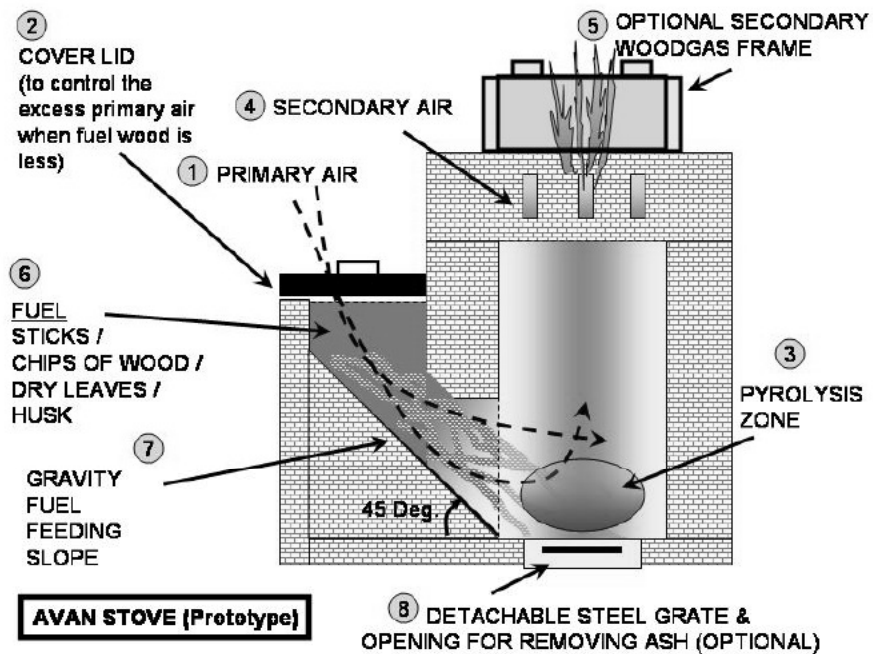
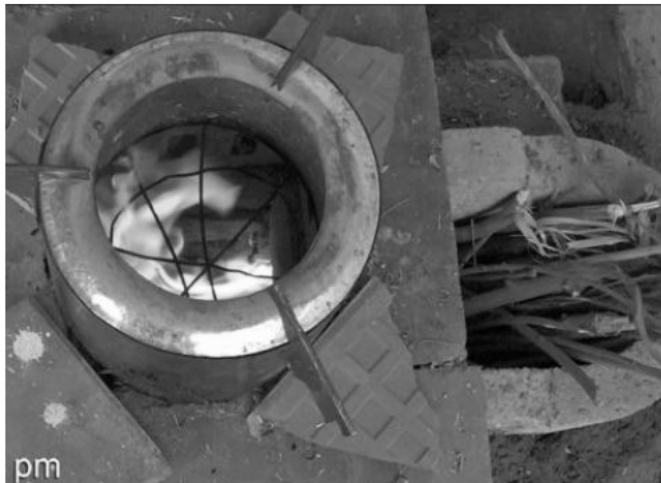


Stove	ANILA, by UN Ravikumar of (India)
Design	True pyrolysis stove, natural-draft, fed with agro wastes
Production	Prototype for developing country market
Innovations/ Notes	Pyrolysis chamber is separate from, surrounding combustion chamber. Pyrolysis gases are vented into combustion chamber. Stove retains heat long after the main combustion is extinguished.
References	[24], [25]
URLs	http://africaclimate.org/2009/06/14/updated-testing-of-anila-stove/ http://www.hindu.com/2005/12/04/stories/2005120405530400.htm

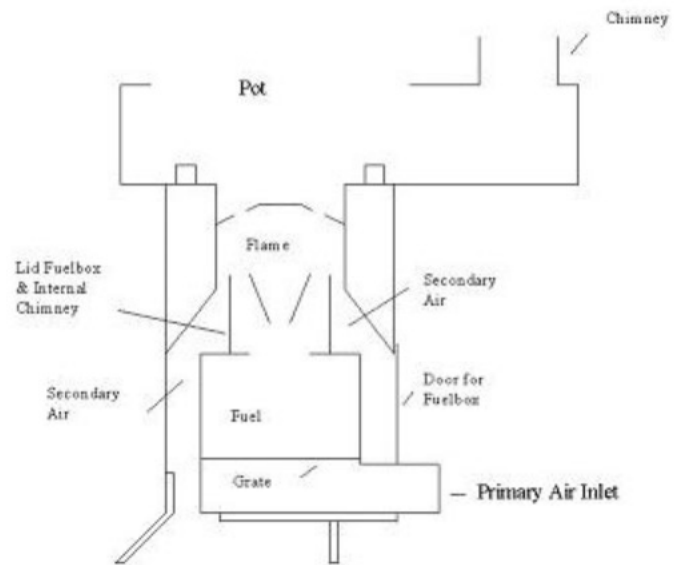


Raw Material → Pyrolysis → Charcoal

Stove	AVAN series, by Sai Bhaskar Reddy (India)
Design	Hybrid rocket/gasifier, natural-draft, continuously fed with any biomass fuel
Production	Prototype for developing country market
Innovations/ Notes	Fuel feed is similar to a rocket stove, but more restrictive. Secondary air ports facilitate the combustion of pyrolysis gases.
References	-
URLs	http://www.goodstove.com/



Stove	JIKO MBONO, by Bjarne Laustsen (Tanzania)
Design	TLUD gasifying stove, natural-draft, batch fed with jatropha seeds, charcoal-producer
Production	Prototype for developing country market
Innovations/ Notes	Name means 'jathropa stove' in Swahili, development supported by the organization Partners for Development
References	-
URLs	http://www.bioenergylists.org/jiko_mbono



Stove	HOLEY BRIQUETTE SOTVE, by Richard Stanley and Kobus Venter (South Africa?)
Design	TLUD gasifying stove, natural-draft, batch fed with custom-made fuel briquettes of non-woody biomass
Production	Prototype for developing country market
Innovations/ Notes	Briquettes are produced using a manual press (lever) out of a water slurry, and can be enriched with charcoal fines.
References	[26]
URLs	http://www.bioenergylists.org/node/185 http://www.bioenergylists.org/stovesdoc/Stanley/BriqGasstove.htm



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