A Cheap, Simple Alcohol Stove

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January 25, 2006

Advanced Studies in Appropriate Technology

There has been some discussion about the possible utility of using alcohol as a viable alternative fuel for cooking technology. In my personal experience, great potential could be developed. I recently completed a 2000 mile journey along the Pacific Crest Trail. On such an endeavor weight on one's back becomes a significant issue. During a search for efficient, lightweight backpacking stoves, I came across designs on the internet for the Pepsi-G Stove. I built one of my own and used it for the entirety of the trail, cooking each day and sometimes multiple times per day. The stove is an extremely compact, lightweight design wonder.

The reasons why it works are well documented on the internet, so I will refrain from going into great depth here – a simple overview should suffice. Liquid alcohol is poured in the stove reservoir and lit. After a sufficient warming period during which the stove body and liquid fuel heat up, the stove begins to send jets of blue flame out of holes punched in the can ring (see Figures 1-4). It is believed that these jets of flame are produced from the vaporization of fuel within the stove body between the inner and outer walls. With nowhere else to go, the vaporized fuel ignites as those pretty blue jets.

Upon returning to the world of stove improvement, I thought why not modify the Pepsi can stove to better suit household cooking tasks. That is the subject of this little paper. Using two Foster's cans, I fashioned a replica of the Pepsi can design. The Foster's cans have the advantage of being significantly larger, allowing for a bigger stove with increased firepower and an increased fuel reservoir for longer cooking times.

This design relies upon a simple self-pressurization and therefore requires a fuel with a very low flashpoint. Thus, only fuels such as methyl alcohol, denatured alcohol, or Heet antifreeze should be used. Everclear grain alcohol or isopropyl alcohol can be used, but with added sooting on the pot. In all laboratory testing herein, denatured alcohol was used.

Figure 1: Unlit stove.

Figure 2: Lit stove under pot .

Figure 3: Lit stove.

Figure 4: Close-up of lit stove jets.

After some rough initial testing, I have determined that a Foster's can stove design has significant implications for the world of alcohol stoves with respect to firepower and affordability. The test performed was a rough water boiling test using three liters of water. See Table 1 below. The results show that three liters of water were boiled in under 24 minutes using only 127 grams of fuel. That's pretty fast with not much fuel.

Table 1: Results from rough WBT using 3 L Water

	Time	Temperature (C)	Fuel (g)
Start	9:38:30	6.3	145
Full Power	9:41:00	-	-
	10:00:00	99.0	-
BOIL, +Hold 30s	10:02:05	99.1	16
Total	23:25 min		127

No complete emissions or water boiling testing has been performed to date, but this is forthcoming in the future ASAT studies on low-cost liquid-fueled cooking technology. Furthermore, optimization of jet hole size, reservoir size, and other design parameters remain to be explored. Nevertheless, the extremely low-cost and high effectiveness of this stove design show that alcohol stoves are a viable addition to the toolbox of cooking technology design solutions.