

# Topics for TLUD Research and Development

(2013-09-09 -- Dr TLUD)

The following topics are identified as being worthy and probably fruitful for R&D about TLUD micro-gasification. Not in order of priority. Not dependent on other topics being concluded earlier. May be generic for many designs or may be specific to locations and cultures.

**A. Institutional cookstoves with large-size TLUD gasifiers** and other associated applications of the heat. This is of special interest to the Haiti TLUD Stove Project at the Univ of IL, and will have high priority. It also relates to many of the other topics listed below.

**B. Insulation of the reactor body** to lower the temperature of the outer surface.

Multiple layers of insulation, air gaps, reflective materials, impact of forced air  
Known: Five layers of metal with separating layers of air (and possibly one layer of insulation) are sufficient to permit carrying the ignited unit with bare hands. (work of Paul van der Sluis)  
Consider low-cost materials that will not decay, including foil of aluminum inside.  
What spacing is needed for proper air flows? (See Topic S below)

**C. Optimizing the entrance of secondary air** via different sizes and number of holes and gaps. Needed for both TLUD-ND and TLUD-FA (Natural Draft and Forced Air (fan assisted)).

**D. Analyses (and explanations) of stove structures** that support the cooking applications (pots, etc). Major factors are strength, size and cost. Many of the solutions are culturally influenced, such as desire for plancha top for tortillas or for having two or three pots cooking at the same time. Stoves as heaters also.

**E. Longevity / life-span of component parts**, to include recommendations about different materials for manufacturing. (Active at Univ of Dayton, Ohio)

**F. Improvements on semi-industrial methods of production.** Build upon existing methods for Quad stoves. Understand and build upon the jigs from U of Dayton. Consider die sets and presses.

**G. Production of reference materials**, including text documents and **video**, about Quad TLUD stoves.

**H. Many topics of business, cost accounting, marketing, etc.**

**I. Compendium of ways to ignite TLUD devices, (digital document)**

Tentative title: *101 Ways to Ignite TLUDs, including some that are not recommended.*

1. Major categories of ignition methods:
2. Unique ways

**J. Special applications of TLUD heat.** Example of EWB-JSC (NASA) for a fruit dryer for Rwanda.

**K. Forced Air (FA) electronics and channels for TLUD stoves.** (See Ron Vanetten's experimental unit.)

**L. Fuels and fuel preparations, especially for drying of damp fuel.** An enormous topic!!!

**M. Low-cost (under \$3000) continuous feed AVUD-style gasifier** for commercial or DIY/kit production . Compare with the Chip Energy "Dragon" Biomass Furnace (\$15,000). Requires motorized augers and PLC with thermal sensors, etc. (Requires written agreement with Chip Energy.)

**N. Any and all topics related to biochar** production, characterization, soil application, and plant impact.

[end from Doc]

R&D List from Bob Fairchild:

Here are my research lists:

**P. Gasifier stove secondary air enhancement research**

Insulate inside or outside of outer cylinder (see below)

Round/smooth secondary air path at top

Venturi

**Q. Gasifier Combustion Chamber Research**

Dog bowl, round bowl, bucket, cylinder

Insulated

Stainless vs galvanized - durability, reflectivity

**R. Gasifier stove concentrator research**

Flame stability, flame height, and emissions as a function of concentrator type: disk, ring, full venturi, half venturi, full inventuri, half inventuri

Inverted bowl to smooth flow of secondary air

**S. Gasifier Stove Insulation Research**

Insulate combustion chamber

Insulate outer cylinder

Thin or thick insulation inside with quilted aluminum or stainless steel foil inner

Thin or thick insulation outside with another sheet metal outer (See Topic B above.)

**T. Gasifier stove pot skirt research**

Open and closed skirts

Insulated skirts

Bob

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Other topics to be added:

**U. Emissions and efficiency testing**

**V.**

**W.**

**X.**