Poster for Wood Heater R&D Workshop 2022-01-11&12

Two Types of Carbon Negative Heating and Cooking Can Earn CO_2 Removal Credits

Category: Advanced hydronic heater design concepts, and more.

TLUD ("tee-lud")

Top-Lit UpDraft (TLUD) technology powers the **world's only carbon negative clean-burning advanced cookstoves.** TLUD is batch-operated.

Designed for developing societies that still cook on solid biomass or coal and need very low costs.

Could become essential (by 2050) when developed societies cannot use fossil fuels and electricity is likely reserved for higher purposes.

Two basic types: Natural Draft (ND) and Forced Air (FA; fan assisted). Both produce good biochar.

The TLUD-FA Fabstove is available in North America from www.blueskybiochar.com . See video at that website.

The Fabstove uses biomass pellets for Tier 4 performance. See documents at https://woodgas.com/resources

Participation sought for R&D for vented space-heating versions or funding overseas projects

Presenter - Inventor:

Paul S. Anderson, PhD
(a.k.a. "Dr TLUD")

Also invented Rotatable Covered Cavity (RoCC) kilns (patent pending) for larger volumes of biomass. Biosketch is on page 50 of his Dec 2020 white paper *"Climate Intervention with Biochar"* at https://woodgas.com/resources

Email: psanders@ilstu.edu Phone & text: 309-531-4434 in Illinois.

Introduction:

After 4 years of R&D, in 2005 Dr. Paul Anderson developed **two ways to control pyrolytic gasification in very small chambers.** Both types are **carbon negative because they create biochar** while making woodgas for clean burning. Called TLUD and AVUD, they are described in *"Micro-Gasification: What it is and why it works."* (2007) at https://woodgas.com/resources

Vision and Why:

The world climate crisis requires by 2050 that no heating be done with fossil fuels. The biomass-heater business sector must grow to serve hundreds of millions of homes and buildings worldwide.

Using pyrolytic gasification, we can remove many Gt of CO_2 for sequestration as biochar with additional benefits and value. Fortunately, AVUD pyrolytic technology is already proven to work at appropriate sizes.

Growth opportunities will include product refinement R&D, industrial capabilities for production, installation by service sector, biomass fuel supply chains (pellets+), and societal commitment to do what is needed.

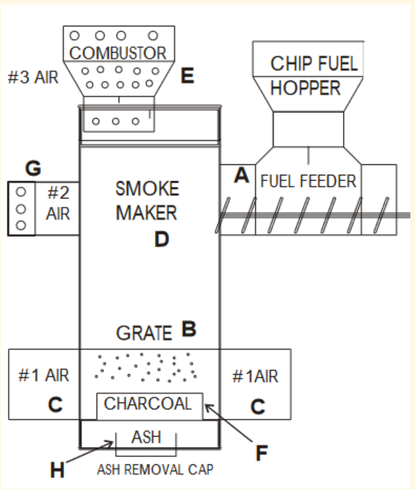
With carbon financing, these heaters should be especially attractive. The **financial benefits of carbon negative heating** can be enabled with data capture and verification using CERCS CharTrac (https://cercs.io).

My white paper "*Climate Intervention with Biochar*" discusses the many components. The "WHY" is because our future depends on prompt actions that we can do now.

AVUD ("a-vud")

Anderson Version UpDraft (AVUD) gasification is functional in small units suitable for **both home and larger heating applications.**

History: 2005 – Discovery / Invention; 2006 - 07 – Concept proven with product development by Chip Energy, LLC, with several sizes including a Chip Energy biomass grill; 2007 – Publication; 2008 – 10 -- With an **EPA SBIR grant** Chip Energy created its Biomass Furnace w/ 200 K BTU/hr (58 kW) continuous heat capacity.



The **US EPA SBIR program** for three years (2005-07) requested proposals for "outdoor wood-fired hydronic heaters (OWHH)" as alternatives to smoky outdoor wood boilers. We were the only applicant ever to be accepted. We constructed a fully automated unit called the "Chip Energy Biomass Furnace." Although successful, we were not selected for Phase II funding. Four units were constructed.

Technology: In 2010 Chip Energy introduced a new type (AVUD) of micro-gasification Biomass Furnace that allows industries, schools and municipalities a solution to stop using fossil fuels to heat their buildings. The Biomass Furnace is a virtually smokeless, high efficiency computer-controlled automated continuous replacement of outdoor boilers. It can use diverse biomass fuels, but pellets are preferred. No patent (yet). We offer much proprietary knowledge.

Difficulties, limitations and inactivity: AVUD technology works fine, but the units were too powerful and too expensive (~$12K) for residential needs, and not sufficiently developed for larger buildings. Both Anderson and Chip Energy moved on to other projects and the wood heat industry was focused on cordwood fuel and residential scale. Today we face climate change, possible CDR funding and new priorities.