The Whitfield Home & Garden Biochar Pellet Stove

Technology for

Home Heating, Soil Health & Carbon Sequestration



Concept rendering of Whitfield Home & Garden Stove

Benefits:

- Uses a broad range of pelletized fuels from locally available low cost residues;
- · Gas flame provides higher thermal efficiency;
- Produces Biochar charcoal that is stable in the ground for centuries;
- Improves soil quality of the home garden compost mixed with biochar;
- Eliminates need for peat moss, pearlite & vermiculite;
- Better smelling cat boxes and compost buckets;
- Offsests the CO2 in 90 gallons of gasoline per ton of fuel used.

SCHEMATIC OF BIOCHAR SOLUTIONS



Graphic Courtesy of Ryan D. Hottle & Biochar Farms

The Whitfield Home & Garden Biochar Pellet Stove

The Biochar Pellet Stove will possess many similarities to a modern pellet stove. The pellet fuel will be manually loaded and stored in the fuel hopper and automatically fed. A dancing flame will be visible through a front window and ignited electronically. Heat will be circulated by a convection fan. Exhaust venting will use standard pellet vent, and heat control will be from a wall thermostat.

The stove will be qualified to use a wide range of densified biomass fuels including pelletized grasses, straws, corn stover, nut shells, olive and cherry pits to name a few. A large char bin will store the biochar during operation and may be pneumatically emptied into a larger storage container located remotely.

Specifications regarding heat output, fuel consumption and overall efficiency will await final design and model testing. Biochar production rate will depend on fuel type and heat demand. However more than sufficient biochar will be produced annually for an average sized garden.

The carbon offset derived from this product will be roughly equivalent to the carbon produced from 90 gals of gasoline for every ton of biomass fuel used. For example if 5 tons of grass pellets are used for winter time heating this will offset the use of 450 gals of gasoline which at 28 miles per gal is equivalent to approximately a year's driving or 12,600 miles.

History

The pellet stove was conceived as a clean alternative to the popular wood stove at a time of growing wood smoke emissions in the '70's and '80's. Since its introduction in 1984, the pellet stove has provided convenient and clean wood heat to many thousands of households in North America, and has created a domestic industry producing wood pellets at over 100 pellet mills across the continent.

Today, growth of this industry is constrained by the current low cost of natural gas, increasing demands (and cost) for premium grade sawdust used for wood pellets, and the recognition that opportunities for new heating technologies must fully address the problem of carbon emissions.

The Home & Garden Biochar Pellet Stove conceived and patented by Dr Jerry Whitfield, the inventor of the first wood pellet stove in 1984, seeks to address both of these issues and to provide a new direction for this industry.

Many forms of biomass materials may be conveniently and economically pelletized. However lower grade (and cost) materials, including most non-woody agricultural residues, are difficult if not impossible to burn in conventional pellet stoves due to ash clinkering caused by inorganic impurities in the fuel.

Pyrolysis is a low temperature process that releases the thermal energy from the biomass material, eliminates ash clinkering, and produces a charcoal residue commonly called biochar. The biochar is well known to improve soil fertility when added to soils, particularly as part of a compost mixture, and to permanently fix about 25% of the original carbon in the biomass material in the soil. (This carbon was first derived from atmospheric carbon dioxide through plant photosynthesis.) Applied to a

pellet stove, this process can provide an economic heating alternative to the home owner, a means to improve their home garden productivity, and can help each household reduce its carbon footprint significantly.

A recent survey of the heating needs of the North East¹ identifies that heating with biomass materials grown in the region can economically provide at least 25% of the heat demand, and that 60% of this supply can come from agricultural residues and energy crops. Although pellet stove sales are lower than a decade ago, due primarily to low natural gas prices, nearly 60% of current pellet stove sales are in the Northeast where fuel oil and propane are still widely used for home heating.

Market for a Home & Garden Biochar Pellet Stove

It is likely that a broader market will develop for a Home & Garden Biochar Pellet Stove since the appeal will extend to market segments that now include home gardeners, organic farmers, "eat local" and "heat local" promoters, as well as citizens desiring to minimize their carbon footprint. In addition it will extend geographically to agricultural communities that traditionally have little access to wood pellets.

Vermont and the Northeast region is considered a suitable first market in which to establish use of this product since it possesses many of the segments for which there should be market appeal.

For further information, please visit <u>www.whitfieldbiochar.com</u> If you would like to be considered for the Beta program during the 2012 – 2013 heating season, please contact Jock Gill via the same web site.

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¹ Heating the Northeast with Renewable Biomass. A Vision for 2025. Biomass Thermal Energy Council et al. April 2010