



Wood GunTM

Residential • Commercial • Industrial

Multi-Fuel Gasification Wood Boilers



Automatic Fuel Feed

Alternate Heating Systems, Inc.

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**ASME H-Stamp
Certified Boiler**



Welcome to the world of self-loading wood boilers. An automatic feed boiler is able to burn a variety of wood particle fuels, ranging from sawdust and wood chips to shavings, pellets, and other wood wastes¹. Additionally, with an AHS automatic feed system, only slight reconfiguration is required to **still burn log wood in the firebox**. An automatic feed system is available on all **AHS Wood Gun™** boilers.

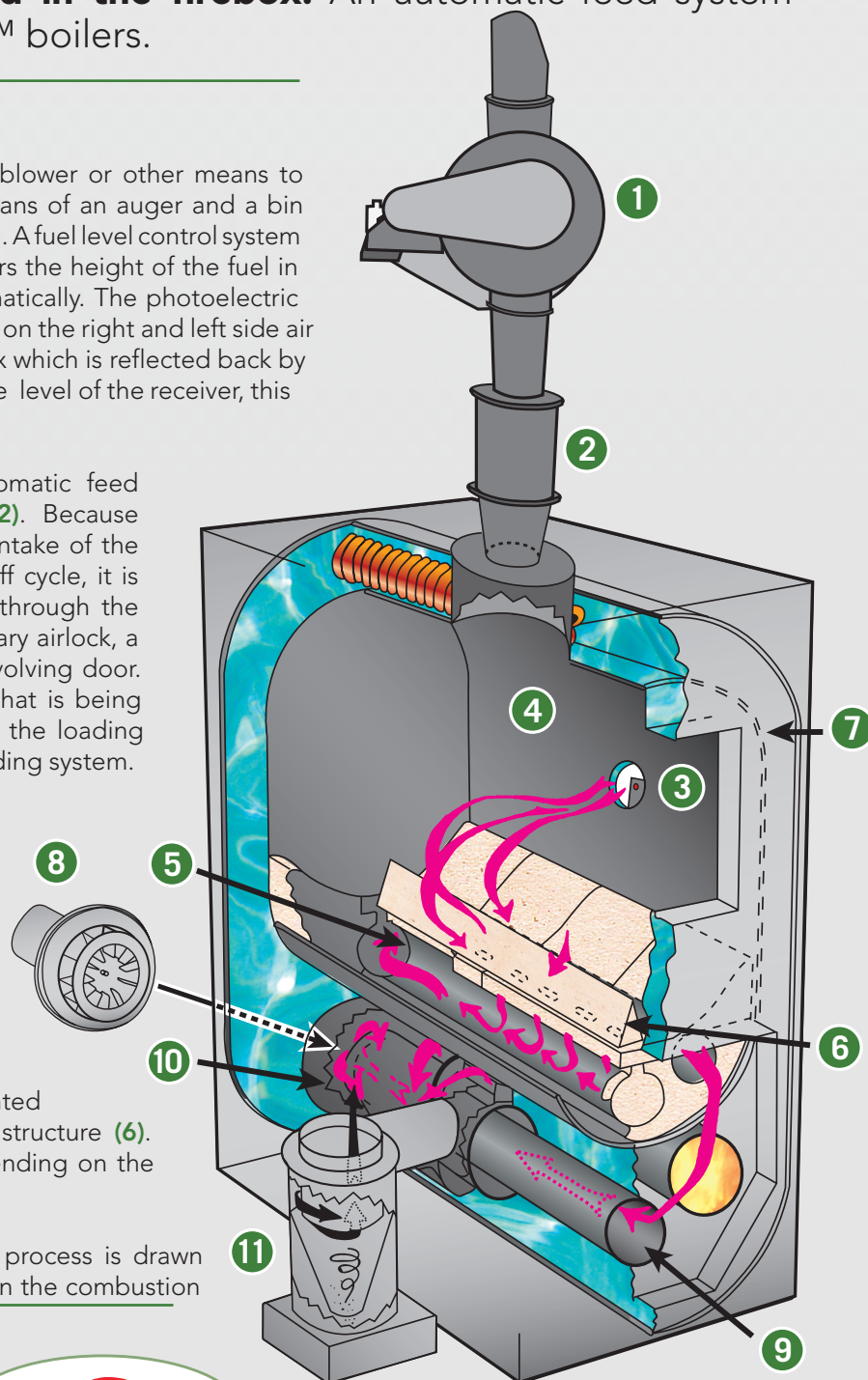
How it works.

In a typical setup, particle fuel is conveyed by blower or other means to a storage bin. Fuel is delivered on demand by means of an auger and a bin agitator which ensures a uniform discharge of material. A fuel level control system that incorporates a photoelectric sensor (3) monitors the height of the fuel in the fuel chamber (4) and activates the auger automatically. The photoelectric sensor consists of a receiver and a reflector mounted on the right and left side air valves. The receiver sends a signal across the firebox which is reflected back by the reflector. When the fuel in the firebox reaches the level of the receiver, this beam is broken and the sensor stops the auger.

Two key safety components of the AHS automatic feed system are the rotary airlock (1) and the fuel valve (2). Because it is necessary to maintain full control over the air intake of the boiler system to control combustion and enable off cycle, it is important that no air be able to enter the boiler through the top feed opening. This is accomplished using a rotary airlock, a device that works much like a department store revolving door. The fuel valve is a device that separates the fuel that is being burned in the fuel chamber and the fuel that is in the loading system, preventing the ignition of the fuel in the loading system.

The Wood Gun combustion chamber (5) is located beneath the fuel chamber and is composed of cast refractory sections which are positioned end to end to create several tunnels. This material has properties and texture similar to firebrick and helps to create the environment needed to achieve the high temperatures required for clean combustion. Slots in the refractory bricks provide passageways from the fuel chamber to the combustion chamber. Small fuel particles are prevented from falling through the slots by a fuel diversion structure (6). Various types of fuel diverter blocks are used depending on the size and type of fuel being burned.

All of the gas released during the gasification process is drawn down under the fuel diverter and through the slots in the combustion



¹ A variety of fuels can be burned, including corncobs, nut hulls, cherry pits, and pelletized paper. Fuel sources are limited only by environmental concerns, such as amount of ash produced, and fuel economy concerns, such as availability and BTUs per pound.

chamber where temperatures in excess of 2000° F are reached. The intense heat produced here radiates through the refractory lining (7) in the lower portion of the fuel chamber, evaporating moisture from the fuel and causing it to gasify (pyrolysis).

In order to draw the gases into the combustion chamber, a draft inducing fan (8) is used. The negative pressure causes the fuel to effectively burn upside down. This is important because it allows fuel to be loaded continuously without extinguishing the fire. Once the gases are drawn into the combustion chamber, they pass through the firetubes (9) where most of the heat exchange takes place. On smaller Wood Gun models like the one shown, there is only one firetube. To increase the surface area available for heat exchange in the larger models, multiple firetubes are used. After the firetubes, the gases, which have cooled to about 350 F, are given a swirling action as they pass through the swirl chamber (10) and into the cyclone ash separator (11). Here, ash is removed from the exhaust air and deposited for easy disposal. Due to the unique design of the both the refractory and the swirl chamber, exhaust passes through the boiler in a swirling motion that scrubs the inner chambers, preventing much of the buildup that could decrease efficiency. Exhaust air then exits through the top of the cyclone ash collector into the flue.

During off-cycle, wood gas inside the machine condenses on the inner walls forming a solid that will eventually flake off. It can then be re-combusted with the remaining fuel. Due to our large superheated refractory mass, reignition of the fuel occurs automatically after off-cycle when oxygen is reintroduced to the system.

Fuel Heating Value Comparison

Fuel Type	BTU/Unit	Equivalent Units
Softwood	15,000,000 Btu/cord	0.51 cords
Hardwood	24,000,000 Btu/cord	0.32 cords
Green Sawdust	10,000,000 Btu/ton	0.76 tons
Kiln Dried Sawdust	18,000,000 Btu/ton	0.42 tons
Wood chips - 45% moisture	7,600,000 Btu/ton	1 ton
Hogged Wood	20,000,000 Btu/ton	0.38 tons
Bark	10,500,000 Btu/ton	0.72 tons
Wood Pellets - 10% moisture	16,000,000 Btu/ton	0.48 tons
Natural Gas	100,000 Btu/therm	76 therms
Propane	91,600 Btu/gal	83 gal
Methane	1,000 Btu/cu ft	7,600 cu ft
Ethanol	76,000 Btu/gal	100 gal
Kerosene	135,000 Btu/gal	56.3 gal
#2 Fuel Oil	138,500 Btu/gal	54.9 gal
#4 Fuel Oil	145,000 Btu/gal	52.4 gal
#6 Fuel Oil	153,000 Btu/gal	49.7 gal
Waste Oil	125,000 Btu/gal	60.8 gal
Biodiesel/Waste Vegetable Oil	120,000 Btu/gal	63.3 gal
Gasoline	125,000 Btu/gal	60.8 gal
Anthracite Coal	28,000,000 Btu/ton	0.27 tons
Bituminous Coal	24,000,000 Btu/ton	0.32 tons
Electricity	3413 Btu/kWh	2227 kWh

Sources: US Department of Energy, The Biomass Energy Foundation

Equivalent units based on 1 ton of wood chips at 45% moisture. For example, 1 ton of woodchips is the BTU equivalent of 54.9 gallons of #2 fuel oil.

Wood Gun™ E Series Specifications

	E100	E140	E180	E250	E500	E1000
BTU/Hour Max	150,000	200,000	230,000	350,000	600,000	995,000
BTU 8 Hour Avg Output*	100,000	140,000	180,000	250,000	500,000	995,000
Oil BTU/Hour	80,000	130,000	160,000	230,000	500,000	995,000
Water Capacity	60 gallons	80 gallons	80 gallons	140 gallons	210 gallons	435 gallons
Fire Box Capacity	6.5 ft ³	10 ft ³	14 ft ³	22 ft ³	28 ft ³	61 ft ³
Fire Box Length	28"	32"	32"	48"	54"	60"
Standard Door Opening	14" x 14"	14" x 14"	14" x 14"	14" x 14"	18" x 18"	18" x 18"
Height	58"	64"	66"	74"	90"	102"
Width (cyclone removed)	26"	26"	31"	31"	34"	48"
Depth	44"	48"	48"	66"	72"	78"
Flue Size	6"	6"	6"	8"	10"	12"
Weight (w/o oil)	1,400 lbs	1,650 lbs	2,100 lbs	3,000 lbs	4,500 lbs.	9,000 lbs.
Typical Heating Capacity**	3,000 ft ²	4,000 ft ²	5,000 ft ²	9,000 ft ²	20,000 ft ²	50,000 ft ²

*Based on loading firebox with seasoned hardwood **Subject to building design/construction
Specifications subject to change without notice



Carbon vs. Stainless Steel

The Wood Gun™ now features stainless steel as standard equipment for the fuel storage area. This is the area where it is normal for creosote to form and adhere to the vessel wall. We utilize ¼" 304 stainless steel in this area to eliminate corrosion and assure long service life. Alternate Heating Systems has been fabricating boiler vessels with stainless steel since 1986, and our stainless steel Wood Guns have proven themselves reliable and extraordinarily durable, allowing us to offer a 20 year vessel warranty!

ASME Certification

The American Society of Mechanical Engineers (www.asme.org) certification is available on any of our boiler lines for an additional charge. This certification assures that the pressure vessel has been designed and constructed in accordance with the ASME Code. This certification is required for all commercial installations. The certification is also required for some residential installations depending upon local codes - it is up to the homeowner to determine the need for an ASME certification on any boiler purchased.

Optional Wood Gun™ Features

- Domestic hot water coil(s).
- Draft cycle timer - extends reignition period for times of low demand.
- Low water cutoff - safety shutdown if water level drops.
- Low temperature shutdown - fan shutdown if fire goes out.
- Variable speed drive for induction fan.
- Liquid fuel backup package - manual or automatic switchover.
- Low pressure steam package.
- Smoke exhaust hood - 485 CFM.
- Canister pool heater - carbon steel or stainless steel
- Custom engineering.

Testimonials

If you're going to burn wood I don't know a better way to do it...

Fred Hess

Owner

Hess McWilliams Veterinary Services

*We have been running an E500 Wood Gun™ for production in our plant for about two years now. We purchased the boiler from Alternate Heating Systems because we needed a boiler that we could use in making our product and we wanted to use our rejected pellets to fire the boiler. Since the installation of our boiler we have added another mill and the boiler has been able to produce enough steam to run both of our mills. **We are very happy with the way the boiler has operated and we are happy with our automatic feed system. It really makes it easy for us to operate the boiler without having to have extra help to keep it fed and running.***

Waymon Stokes

Plant Manager

Nature's Earth Pellets, LLC



Alternate Heating Systems manufactures alternative fuel burning heating equipment and sells (primarily direct) throughout the US, Canada, and internationally. Call us today to schedule a tour of our facilities, visit our showroom, and see a working demonstration of any boiler models.

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Time is the best friend of Truth.