

MOSS WOOD BOILER SYSTEMS

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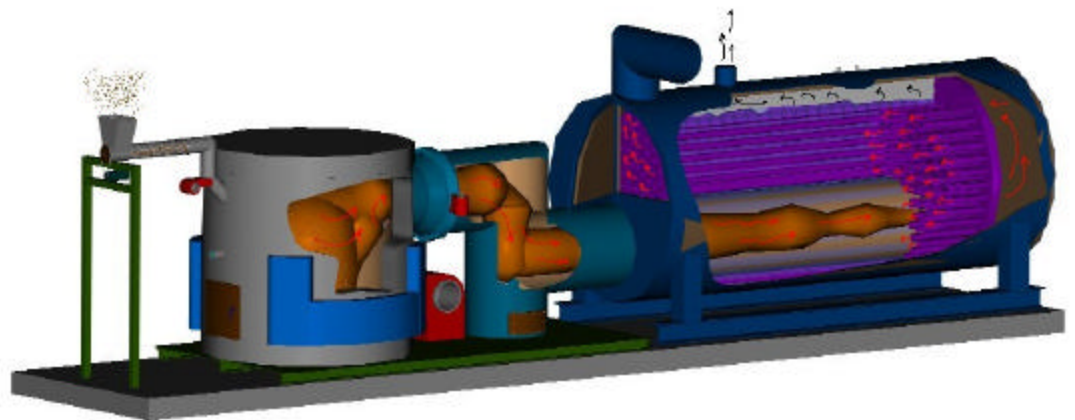
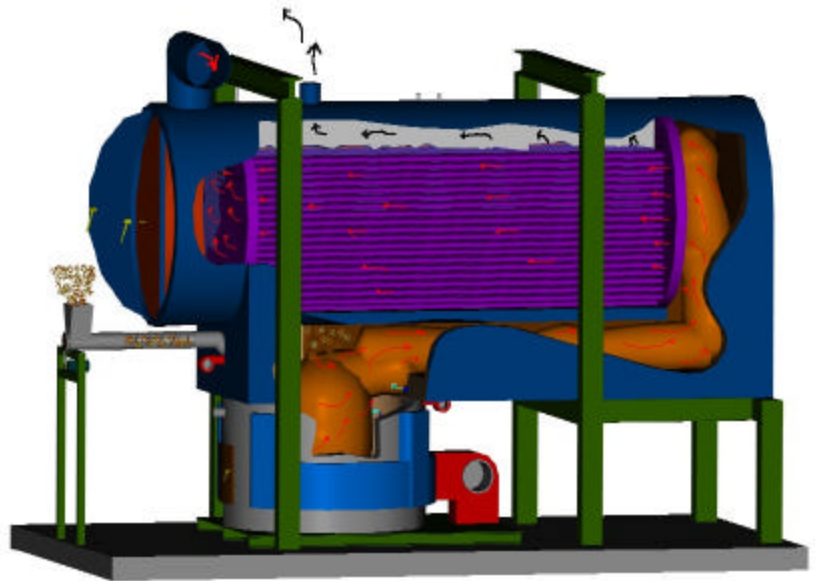
SPECIAL POINTS OF INTEREST:

- Moss has been in the boiler business since 1958
- Moss provides custom designed wood boiler/ combustion systems based upon customer requirements
- Moss provides turnkey installations including the supply and installation of metal buildings, foundations, material storage/handling and the required engineering for successful operations

George K. Moss Company supplies five different wood boiler designs and two different combustion systems that are engineered to burn all types, sizes and species of wood. You can be sure that we have a system that will match your application. Shown below is our pneumatic feed HRT firetube and scotch marine packaged firetube boilers. The HRT design has been around for many years and has proven to be one of the most durable solid fuel boilers ever built. Moss can supply this boiler ranging from 150 - 1,159 HP and design pressures from 15 - 400 PSIG. This design incorporates a large furnace and rear turnaround zone that is very conservatively designed. Structural steel beams hold the pressure vessel in suspension while the furnace is built around the boiler.

Below the HRT boiler is our scotch marine firetube boiler with a pneumatic combustion system. This is our most economical system and can be supplied with every option that our other boiler designs provide.

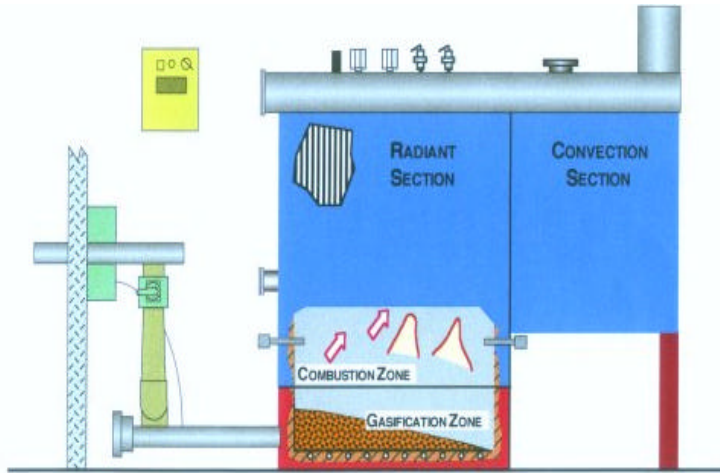
The HRT and scotch marine boilers can be supplied with either a Moss gasifier or pneumatic combustion system with each being explained within this brochure. Moss will make every effort to review your boiler plants requirements and supply the correct boiler and combustion system to meet your specific application. Because of our many boiler and combustion system designs, we will supply you with the equipment that meets **your** needs! Please give us the opportunity to custom design the proper equipment for your plant that will operate for many years with minimum maintenance while operating efficiently, economically and environmentally safe.



MOSS WOOD BOILER SYSTEMS

MOSS WOOD FIRED WATERTUBE BOILER WITH GASIFIER

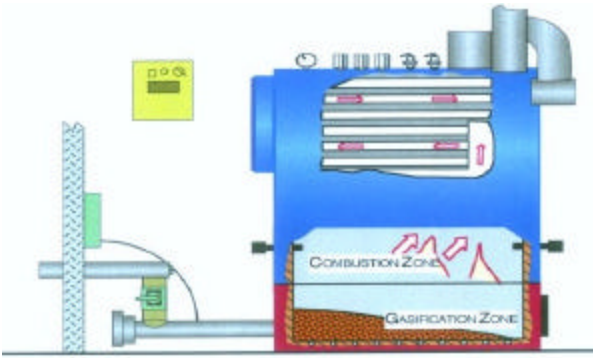
Moss watertube wood fired boilers provide large radiant and convection sections that provides an abundance of steam supply to meet the process load. Our watertube boiler offerings range in size from 150 - 1,500 HP (51,750 lbs./hr.) with design pressures from 15 - 900 PSIG. These boilers can also be provided with superheat for high temperature applications. Large conservative radiant zone allows complete combustion with an approximate heat release of 20,000 BTU/cu. ft. This provides lower particulate, CO and NOx emissions and the lower heat releases in the furnace will lengthen the combustion chamber refractory life. The watertube boiler can be supplied with either our gasifier or pneumatic spreader combustion system.



Moss watertube boiler installation with gasifier combustion system.

MOSS WOOD FIRED FIREBOX BOILER WITH GASIFER

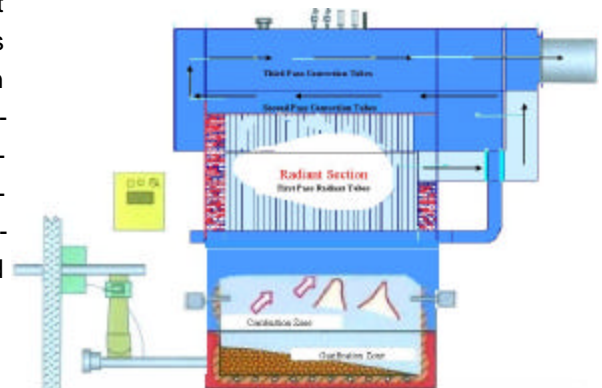
Moss firebox firetube wood boilers provide large radiant and convection sections for conservative steam supply for the process load. Our firebox boiler offerings range in size from 60 - 600 HP with design pressures from 15 - 150 PSIG. These boilers can also be provided for hot water applications. Our large conservative radiant zone allows complete combustion with an approximate heat release of 20,000 BTU/cu. ft. This allows for low particulate, CO and NOx emissions. Either our gasifier or pneumatic spreader combustion system can be used with this boiler.



Moss has a wood boiler design that can solve your steam, combustion and energy requirements! Give us the opportunity to install a custom designed system for your application.

MOSS WOOD FIRED HYBRID BOILER WITH GASIFIER

Moss provides a hybrid boiler design that ranges in size from 150 - 1,500 HP (51,750 lbs./hr.) and design pressures from 15 - 400 PSIG. The boiler pressure vessel incorporates a watertube radiant water membrane section in the boilers combustion zone and a two-pass HRT firetube pressure vessel for the convection zone. The boiler design provides a large steam disengagement area (reduces the possible carry-over of water from the boiler), large steam storage area (reduces the possibility of lowering operating steam pressure at times of severe steam demand) and a large volume of hot water that is stored in the vessel promoting fast responses to load swings. The hybrid boiler design can be used with either our gasifier or pneumatic combustion system. This hybrid design provides another example of the Moss design teams capabilities to supply multiple boilers and combustion systems to meet your specific application.

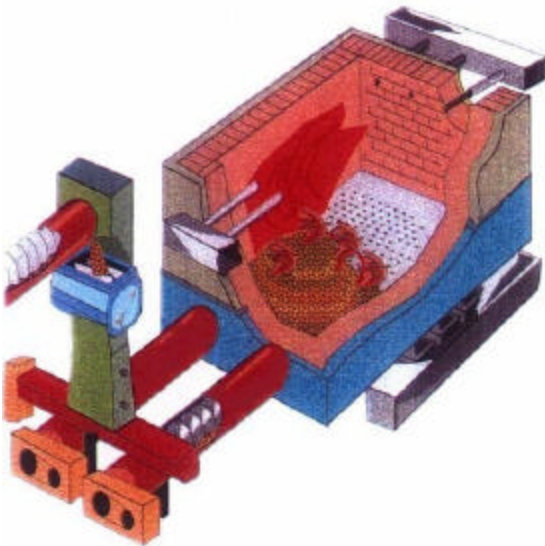


MOSS WOOD GASIFIER SYSTEM

Moss gasifier systems have proven their ability to burn dry or wet fuel at a very low turn-down rate making it particularly suitable for heating applications in lumber dry kilns, veneer log vats, veneer dryers and other industrial facilities and processes. Our system provides superior combustion technology by providing large furnace volumes (generally 20,000 BTU/cu. ft. of heat release), multi-zone grate underfire air system, multi-port overfire air system with high turndown capabilities and is operated by our superior PLC combustion control system. The gasifier system can be installed on any of our new boiler designs including hybrid, firetube, HRT, watertube and firebox. Generally, the gasifier is our best system for existing wood boiler retrofits. A brief gasifier system description is as follows:

The automated fuel feed system, with variable speed drive, provides fuel input based upon steam demand. The fuel feed system is provided with a steel tip rotary air lock and heat sensors for each auger when burning dry fuel (this is optional on wet wood systems). Fuel is supplied from the wood metering bin and is transferred to the boiler by augers. All necessary control of the augers is supplied by our PLC control system.

* The multi-zone grate underfire air system provides the flexibility to burn different species of wood from sanderdust to whole tree chips and from low (less than 10%) to high (55%) moisture content fuels. The grate air supply is provided with convenient external hand valves allowing for the proper amount of air to be sent into the areas where combustion occurs within the firebox. The total amount of underfire air is metered by a variable speed drive that is connected to the underfire air fan assembly and is controlled by the PLC. Moss can provide up to four (4) different grates for our gasifier system. They are (1) gravel grate, (2) refractory tile, (3) refractory grate with stainless steel nozzles and (4) cast iron grate. Our gravel grate system is unique to the wood industry and provides superior underfire air distribution to the fuel with minimum maintenance required. Even though in most applications we believe the gravel grate is far superior to other grate designs, we will provide the others upon request.

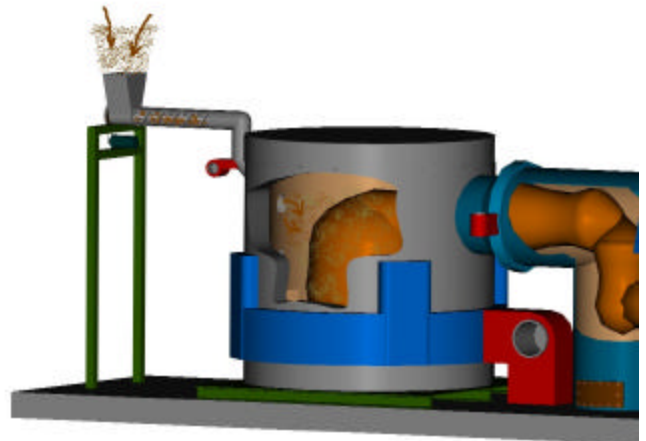


* The firebox auger(s) gradually pushes the fuel across the multi-zone underfire air grate system promoting low bed turbulence. The objective of this process is to gasify the fuel on the grates without the wood particles becoming airborne and being carried through the boiler (sometimes sticking to the tubes) and out the stack into the flue gas cleanup equipment.

* The multi-port overfire air system is provided to complete the combustion process. Our design provides total control of airflow and provides low CO, NOx and particulate emissions. The overfire air system is specifically designed for each customer's application. Our overfire air nozzle design covers the entire combustion system, burning gases and redirecting any wood particles that becomes airborne back down into the combustion chamber to be re-burned or gasified. A properly designed overfire air system can increase the steam production of the boiler while reducing particulate carryover and emissions.

MOSS PNEUMATIC COMBUSTION SYSTEM

Moss pneumatic combustion systems can be supplied for new or existing boilers. This highly efficient, clean burning and responsive system is provided with all necessary fans, air headers, controls and material handling equipment to provide you with a completely automatic boiler system. The unit can be installed on HRT, firetube, hybrid, watertube and firebox boiler designs and can make each a very responsive and safe operating boiler system. In most cases, an existing wood boiler can be retrofitted so the boiler can produce more steam and maintain the desired operating pressure. If you choose to retrofit your existing wood boiler in lieu of purchasing a new system, this system should save you thousands of dollars in addition to not having to obtain a new operating air permit. This pneumatic combustion system is offered with five (5) different grate assemblies and incorporates years of experience in the wood burning industry into one system.



Moss combustion systems burn clean and provide our customers with state of the art wood burning technology.

MOSS PLC WOOD BOILER CONTROL SYSTEM

The Moss PLC wood-fired boiler control panel uses the latest technology and software that allows you to run your boiler around the clock safely with minimum to no supervision. The Moss control system design is supplied with a panelview screen to provide you with a high quality view of the boilers operating parameters. All necessary lights, switches, power supplies, modems, etc. are a standard with our system. This sophisticated device reads actions as they occur within the system and translates them in a logical manner so the system reacts properly. The control system is easy to use and provides on call personnel with invaluable information about the boilers operation and can direct the operator to the exact location of any problems, drastically reducing downtime. Other major benefits of this control system are the safety features built into the software and the ease in making parameter changes on the panelview screen. All system control screens are password protected and will prevent unauthorized changes. No other system can provide the control, safety and ease of operation in this price range!

Shown below are a few of our solid fuel boiler control systems features and benefits:

A Variety of Fuel Types: Four different fuel settings can be preprogrammed into the PLC, which modifies the fuel feed and air input automatically. This is done by simply turning the switch on the front door of the control panel to the correct fuel setting for the fuel being burned.

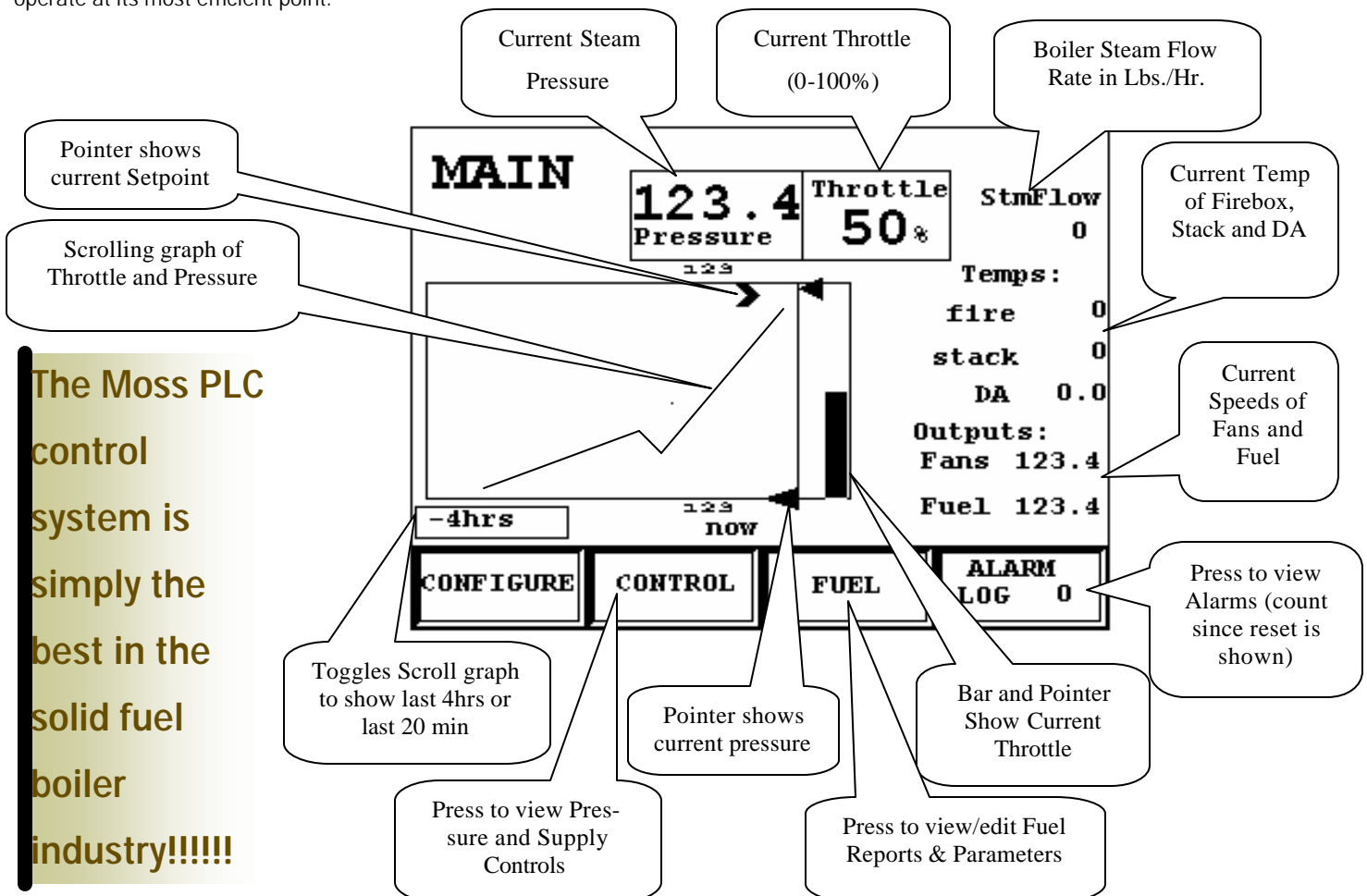
Fan to Fuel Control: The operator has full access to use the panelview screen to change the underfire air fan or the fuel feed supply auger variable frequency drive HZ settings for each of the four (4) wood settings.

Password Protected: A four (4)-digit group of numbers must be entered on a keypad in the setup parameters of the control system in order to make changes to these parameters. This protects the system from unauthorized changes.

Alarm Log Status: Indicates if a fault has occurred since the alarm counter was last reset. The operator can display a special alarm screen, which details the source of the system errors.

Draft Controls: Built in draft controls are provided within the PLC panel to maintain a negative draft in the combustion system.

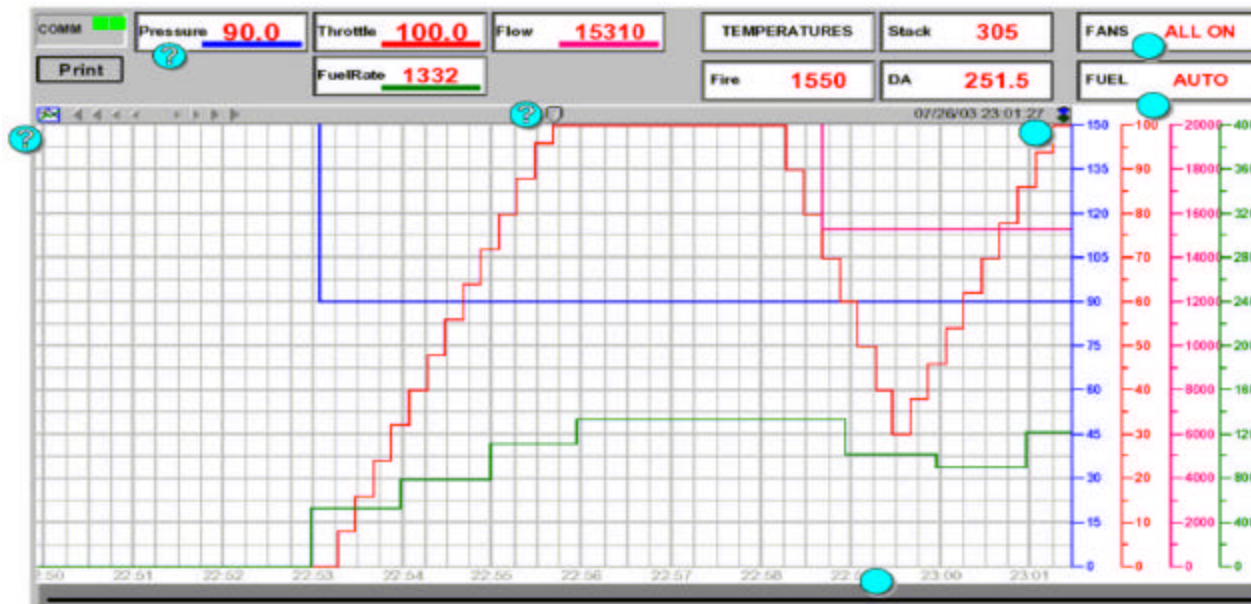
Oxygen Trim System: Oxygen trim systems can be provided, as an option, and are fully compatible to our PLC control system either at the time of installation or at a later date. The trim system automatically controls air input to a preset amount making the combustion system operate at its most efficient point.



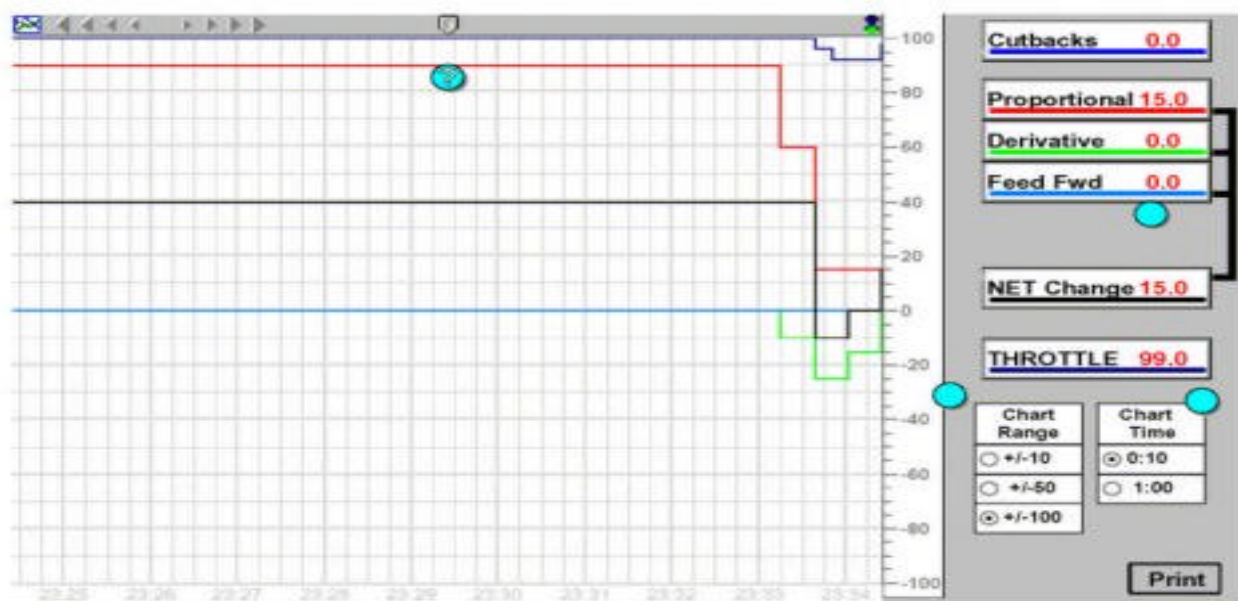
The Moss PLC control system is simply the best in the solid fuel boiler industry!!!!!!

MOSS STEAM MANAGEMENT SYSTEM

Moss steam management systems provides certain boiler operating data to a remote located PC. This system provides a **continual readout** of the boilers operation and can be downloaded to a PC for reporting, printing, graphing and provides invaluable information concerning the steam production at your facility. The steam management system does not allow changes to be made from the PC on any boiler operating parameter because of safety and insurance reasons. However, this system will allow your production and operational personnel to work on other things rather than to continually monitor or be concerned with the boilers operation. Our steam management system includes a PC that is located in a remote office. With this system you will know how much steam or wood is being used in the process along with all pertinent operating temperatures. The low, average and maximum flows and temperatures are recorded into an Excel spreadsheet for printing or graphing operating conditions.



Shown above is the main overview screen for our steam management system. Four (4) operating parameters can be graphed on a 24 hour strip chart at one time with four (4) more operating parameters being digitally shown. The parameters can be switched easily from one setting to the other.



Shown above is one of the many operating screens that can be displayed on the PC to review the boilers operating condition. Other screens include the alarm (event screen), oxygen trim and draft. With a click of the PC mouse, you can review the boilers operation without leaving your office.

MOSS DEAERATOR SYSTEMS

Moss provides high quality deaerators, surge tanks and high - pressure condensate return systems designed to meet your boiler room requirements.

Moss provides three (3) pressurized deaerator designs (spray, tray and packed column) and one (1) atmospheric spray deaerator. Once your requirements are determined, one of these designs can be promptly proposed. Deaerators can be provided as packaged or non - packaged, again to meet your specific needs.

Moss Deaerator Systems:

- Spray Systems: Capacities from 200 – 300,000 #/HR
- Tray Systems: Capacities from 5,000 – 500,000 #/HR
- Packed Column Systems: Capacities from 100 – 30,000 #/HR
- Atmospheric Spray Systems: Capacities from 100 — 250,000 #/HR

Other Moss Systems:

- Surge Tanks: Capacities to 5,000 gallons
- Boiler Feedwater Systems: Capacities to 5,000 gallons
- High Pressure Condensate Systems: Custom Designed Applications



HIGH PRESSURE CONDENSATE RETURN SYSTEM

Moss provides a packaged engineered high - pressure condensate return system that is designed for plants using process pressures from 75 – 300 PSIG. The high - pressure condensate return system is a closed system that is designed to thoroughly drain all of the condensate from the process equipment and return it directly back into the boiler with a minimum drop in temperature and pressure. This equipment can save steam users a significant amount of money yearly and generally has a return on investment of less than 18 months. The high - pressure condensate system can be designed with deaerator internals and controls so that make-up water is sprayed inside the high pressure tank and all gases are removed thru our vent pipe design. High temperature pumps are provided so that feedwater can be pumped back into the boiler maintaining proper water level inside the boiler at all times.

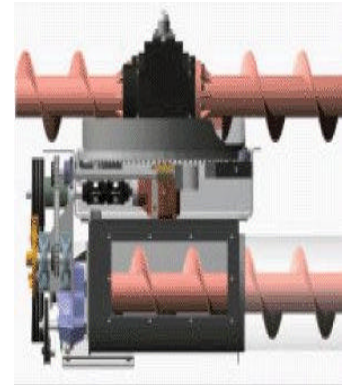


The Moss system works based on the pressure drop across the process equipment - using steam to drain the equipment. The pressure drop ensures the complete removal of condensate from the equipment while allowing steam into the process equipment. This process increases heat transfer in the equipment and allows the process equipment to be more efficient. Once the condensate is collected in the ASME code receiver, the high temperature water is forced into the pump suction and pumped directly into the boiler. The systems pump is designed to pump high temperature water. The control panel is provided as part of the package and can be either a PLC or relay based system.

Shown to the left is a Moss 105,000 lb./hr. high pressure condensate return deaerator system that was designed to operate with 60 PSIG back-pressure @ 300° F. This system saved the Owner several hundred thousands of dollars per year in fuel operating cost.

MOSS CONCRETE SILO SYSTEMS

Moss provides concrete silos that are designed to last for many years. These slip form systems can be engineered and installed in various diameters and heights and are designed using good engineering practices. Our systems are provided with two different unloaders (Laidig and Flying Dutchman) depending on the application, customer preference and budget. Truck unloading systems are available should stored wood need to be removed from the silo. We supply bucket elevators, conveyors or pneumatic conveying systems to fill our silo installations.



Shown above are the internals of a Laidig 243 unloader system

MOSS WEDGE FLOOR SYSTEM



Moss wedge floor being shipped to a Midwest jobsite

Moss wedge reciprocating floor system can be designed to store and handle various amounts of fuel. Storage designs includes a metal bin or concrete slab and walls incorporating several hydraulic cylinders that transfer wood fuel to exit augers. These heavy-duty systems can be designed for various lengths and widths to meet your specific application. Our systems include a hydraulic system, controls, augers, conveyors and any required equipment to meet your application.

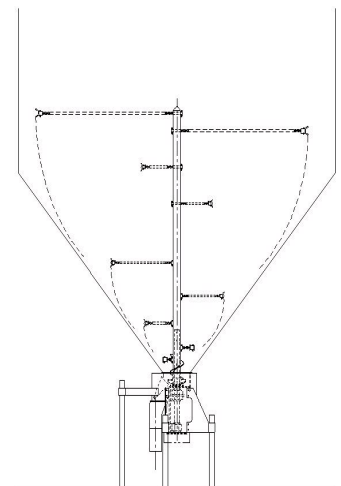
The many material handling and storage systems provided by Moss allows you to select the system that is best for you!

MOSS METAL STORAGE SYSTEM

Our least expensive storage system is our metal silo and bins. These systems are generally used in small storage applications and can be supplied in various diameters and heights. However, these bins can be used to store green or dry fuel for boiler applications up to 600 HP. Our metal bins are supplied with Flying Dutchman unloaders, bin hoppers, exit augers and all required controls.



Shown above is a metal bin with a Flying Dutchman unloader and exit auger burning green fuel at a sawmill installation.



Flying Dutchman unloader schematic.

MOSS INSTALLATIONS

George K. Moss Co., Inc., in the boiler business since 1958 and medical waste industry since 1982, specializes in the design, equipment supply and construction of industrial steam boiler and medical waste facilities. Our staff is experienced in the steam and pressure vessel plant design to ensure your facility will operate as efficiently and maintenance free as possible. Our customers can be assured the correct equipment will be selected for their projects based upon good engineering and design practices. Since Moss does not have an affiliation with any of the large equipment manufacturers, we will select the equipment for your facility based on the application and not because it's the only equipment we have to offer or because we represent a particular manufacturer that forces us to sell their equipment, no matter if their equipment is the proper equipment for the application or not.

Our mechanical/electrical/structural installation crews are experienced in the proper installation and startup/training of our industrial boiler and medical waste facilities. Proper credentials, including insurance certificates, are provided at the beginning of the project. Our work scope has included general building and concrete construction, structural steel supply and erection, piping fabrication and installation, material storage and conveying systems, electrical/control wiring, ductwork/breeching, fan installations, wood boiler combustion system retrofits, process instrumentation and all phases of mechanical installation. Our project team provides a high level of planning that assures our customers their project meets the specified completion time schedule.

We are on the web @ www.gkmoss.com

MOSS CO-GENERATION SYSTEMS

Moss provides a complete line of single or multi-stage turbines to fit most applications. Our systems are supplied with synchronous or induction generators and a complete set of controls to meet your utilities requirements. The systems can be used to replace a pressure reducing station or can be installed with air or water cooled condensers for steam cooling capabilities. In either application, the steam from the boiler plant can be used to produce electricity without affecting the plants steam process requirements. Since we have a non-exclusive relationship with several turbine manufacturers, we can provide the best turbine system for your application. Included in our scope of supply is the all important installation phase of the project. This includes all required mechanical piping, electrical wiring and design engineering. Moss provides single source responsibility, including if required a complete boiler facility, buildings and foundations. A Moss project manager will oversee the complete project so that you can operate your plant without having to worry about the construction of your power generating or boiler facility. So if your Company needs a cogeneration facility, let Moss provide a turnkey project! Free estimates are available!!

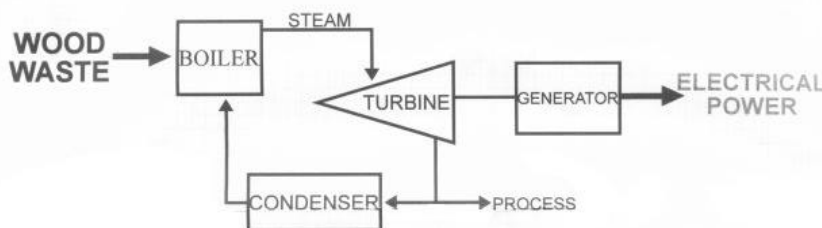
CONVERT



WOOD WASTE TO



ENERGY



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