



# BIOMASS ENERGY SYSTEMS

## Typical applications

- » Pellet Plants
- » OSB / MDF Plants
- » Particleboard Plants
- » Sawmills & Dry Kilns
- » Power Generation
- » Combined Heat & Power
- » District Heating
- » Hot Gas Generation for Direct Dryers
- » Thermal Oil Heating
- » Steam Generation

Sigma Thermal is a leader in providing modern Biomass-fired energy systems and related equipment for industrial clients worldwide.

We offer complete package systems including Design, Engineering, Manufacturing, Automation, Installation Supervision, Parts, and Equipment Service, all backed by decades of energy system experience.

We understand that no two projects are identical, and therefore every system we engineer is designed to meet our customer's specific circumstances. In addition, we stand by our equipment and fully support both you and your process with top quality field service and spare parts for the life of the system.

The Sigma Thermal reciprocating grate furnace is the most effective design for complete combustion of waste materials with low heating value, high moisture content, and high ash content. The reciprocating grate design is capable of utilizing dryer fuels as well. Our design allows for finite combustion control, minimizing emissions and utilizing a large range of different waste fuels with varying characteristics (i.e. chemical composition, fuel size, and moisture content).



# BIOMASS FIRED COMBUSTION SYSTEMS

## Wet Fuel Furnace (FIG 6.1)

Reciprocating Grate Technology is used largely in the wood products industry where higher moisture content fuels such as hogged bark and green wood chips are available. The reciprocating grate achieves gasification through the staged combustion of wet fuel. Our grate is divided into multiple sections allowing varying speeds, and also controlled under-fire air zones resulting in a more complete combustion of your fuel. Depending on the moisture content of the fuel, the grate reacts to obtain the maximum energy amount from the fuel. Altering the amount of time that the fuel spends on the grate prevents over burning of dry fuel and the underutilization of wetter fuels.



FIG 6.1 Wet Fuel Furnace



## Secondary Combustion Chamber

Retention time is an extremely important factor of combustion that is often overlooked in many combustion systems, and true complete combustion requires this to be considered. Our secondary chamber is designed for each job in order to ensure ideal combustion. The result is lower emissions, maximized energy transfer, and total utilization of the potential energy available in your fuel.

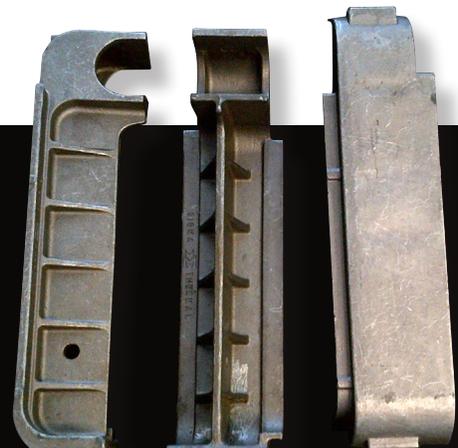
## Dry Fuel Burner

The Underfeed Stoker Furnace is designed for processes in which the available fuel is of a dryer content. An underfeed stoker (screw) controls the feed rate to a pile burner which is completely encircled by rows of centrifugal combustion air nozzles to ensure an even combustion of all the fuel.

## Suspension Burners

Suspension burners can be used in addition to our Wet and Dry Furnace designs or as a single unit combusting finer materials such as sander dust or hammer milled material. The material is blown through high pressure tubing into a centrifugal burner. The burner makes use of primary and secondary air, allowing adjustments to fuel consumption, as well as flame length and width.

FIG 6.2 Reciprocating Grate Bars with T-Bar design



## Sigma Thermal Grate Bars

Sigma Thermal grate bars are the most advanced and reliable grate bars available on the market today. The T-bar design insures uniform air movement and cooling of each individual bar, and the high alloy steel composition insures durability and long lasting performance (FIG 6.2).

# ENERGY DELIVERY SYSTEMS

## Biomass Fired Hot Gas Generators

Clean hot gas generation is available for systems requiring direct heat. Direct heat is commonly used by rotary dryers in the preparation of material for OSB, MDF, Particleboard and Pelletizing. Maximum combustion control results in fewer issues from sparks and dirty flue gas that are common with other systems. (FIG 6.3, 6.5)

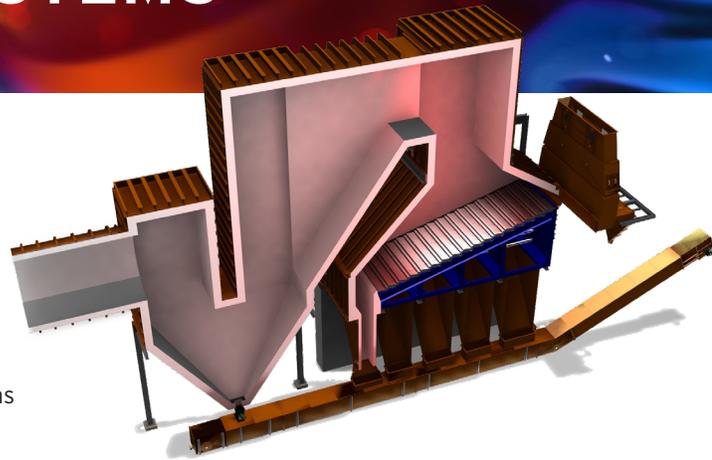


FIG 6.3 Hot Gas Generator

## Biomass Fired Thermal Fluid Heaters

Thermal fluid heating, sometimes referred to as thermal oil heating, is a type of indirect heating in which a liquid phase heat transfer medium is heated and circulated to one or more heat energy users within a closed loop system. Thermal fluids offer the user the capability of high temperature operation (up to 600F with organic thermal oils and 800F with certain synthetics) at very low pressures. Due to the low operating pressure and properties of thermal oils, most heaters are built to ASME Section VIII, and a licensed boiler operator is not typically required. (FIG 6.4)



FIG 6.4 Biomass Fired Thermal Oil System

## Biomass Fired Steam Boilers

Steam generation from direct fired wood-fired furnace with a water tube or fire tube steam boiler depending on the steam pressure requirement. We can provide steam generation for process heating (saturated steam) or high pressure and superheated steam for power generation.

## Thermal Oil to Steam Generation

Using a thermal oil heat exchanger, low pressure steam generation can be generated for different steam process applications. Let our engineers take a look at the energy you have available and design a system to transfer that energy into usable steam for your process.

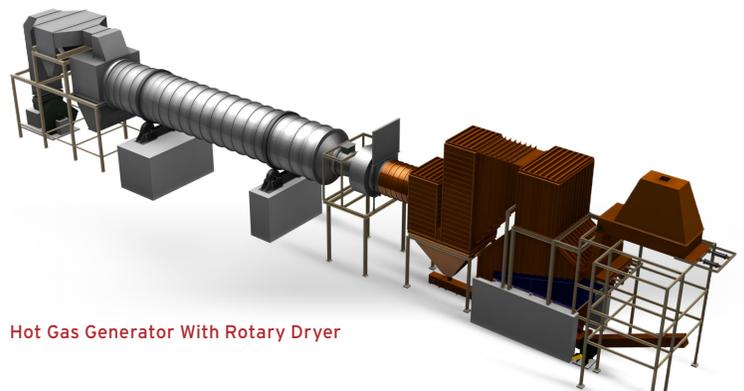


FIG 6.5 Hot Gas Generator With Rotary Dryer

## Biomass Control Systems

Control systems for biomass fired energy systems are complex due to the integration of fuel handling, combustion control, and ash removal. It is imperative that all of these systems work in harmony together and are designed in such a way that gives operators maximum control while maintaining safe operation. Sigma Thermal can offer complete control systems and/or integration support for all aspects biomass fired energy systems. Talk with our automation group to see how we can help you install a safe and effective control system.



## Biomass Systems Parts & Service

Sigma Thermal services and supplies parts for biomass combustion equipment, including retrofits and replacement parts for existing systems from other suppliers.

The parts for Biomass Energy Systems include:

- » Grate Bars
- » Replacement bars for any GTS system. No retrofit required.
- » Fuel Feed Equipment / Conveyors
- » Ash / Dust Handling equipment
- » System Analysis
- » System Commissioning and Re-Commissioning

