DIRECT-FIRED GREEN SAWDUST GASIFICATION DRY KILN

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KDS–What We Do

HIGH PERFORMANCE S.Y.P. KILNS
GREEN SAWDUST BURNER SYSTEMS
ALL ALUMINUM HARDWOOD KILNS

High performance S.Y.P. kilns

Direct Fired Dry Kiln with Sawdust Gasifier
Basic S.Y.P. Facts

- Drying times for 2" dimension ranges from 15 to 24 hours depending on kiln and schedule
- Most kilns run at 240°F
- Kiln charge load and unload = 15-20 min.
- Heating system types include:
  - Indirect fired: H.P. steam, a few are hot oil
  - Direct fired: Gas, dry shavings or green sawdust

Green Sawdust Gasification System Components

Green sawdust is stored in the silo and delivered to the burner fuel hopper by an inclined screw conveyor. The fuel hopper must remain full of fuel as it provides an air lock for the system.

The gasification chamber has a sloped grate system on which the sawdust is loaded and burned until the refractory is hot.

The underfire air is then cut back to 15 or 20% of what is needed for full combustion.

The process of pyrolysis takes place producing gas above the red hot sawdust bed.

The gas is pulled out of the gasification chamber into the refractory lined tee and secondary gas burner.

The secondary blower provides the additional oxygen required to complete the combustion process in the tee and secondary burner.

Abort Stack

The abort stack stays in the closed position during normal run time when the kiln is shut down or has an alarm shutdown. The stack opens but is very clean and virtually nothing is visible but heat waves. The photo was taken as a new kiln charge was being loaded and the burner is at idle.
Burner System Temperatures

1. Temperatures are monitored in the gasification chamber, under the grates, in the secondary burner and in the fuel hopper
2. Temperature in the gasifier runs around 1400 degrees F
3. In the secondary burner the temp is 1850 degrees F
4. Fuel hopper temp. And under grate temp are safety systems

Recirculating Air System

The recirc system takes air from the kiln, mixes it with hot air from the burner, and returns it back to the kiln.

Overhead Heat System

The supply duct delivers the recirc air into the overhead heat distribution duct to heat the first track of lumber (left photo).

Center Re-Heat System

After exiting the first track of lumber, the air is re-heated before entering the second track (right photo).

Lumber produced is clean as long as burner is tuned properly and cleaned out on schedule. Typical clean-out is 10-12 weeks but will be more often if there is sand in sawdust.

Why Use Sawdust Gasification?

Typical S.Y.P. example:

85’ D.T. kiln
145,000 BF capacity
Burner system sized @240-250 BTU/BF
Burner size = 35,000,000 BTU/HR
Drying time @ 22 hours
Fuel usage efficiency = 95% (approx.)

**Energy Requirements**

Assume the following for S.Y.P.:

BTU’s required to dry 1 BF to 19% = 2,4090 BTU
Total BTU’s required for 1 charge = 145,000 x 2,4000 = 348,000,000 BTU

**Comparison of Fuels**

BTU values for TYP fuels
Natural gas = 1,000,000 VTU/MCF
Dry planer shavings @ 20% MC = 8,200 BTU/LB
Green sawdust @ 50-55% MC = 4,000 BTU/LB

**Fuel Needed Per Charge**

348,000,000 total BTU divided by:
1,000,000 BTU/MCF of gas = 348 MCF
8,200 BTU/LB of dry shavings = 42,439 lbs or 21.22 tons
4,000 BTU/LB of green sawdust = 87,000 lbs or 43.5 tons.

**Fuel Needed per Charge Adjusted for 95% Efficiency**

Gas: 348 MCF/.95 = 366 MCF
Dry shavings: 21.22 tons/.95 = 22.34 tons
Green sawdust: 43.5 tons/.95 = 45.79 tons

**Assumptions for Fuel Costs Based on TYP. S.Y.P. Mill.**

Gas $4.50 MCF (has been as high as $9.00+)
Dry shavings: $29.00/ton
Green sawdust: $4.00/ton

**Fuel Cost Per Charge**

Gas: $4.50/MDF x 366 MCF = $1,647
Shavings: $29.00/ton x 22.34 tons = $648
Sawdust: $4.00/ton x 45.79 tons = $183

**Fuel Cost Per Year Based on 300 Charges Per Year**

Gas: If $4.50/MCF then $494,100/year
If $9.00/MCF then $988,200/year
Shavings: $194,400/year
Sawdust: $54,900/year

Changes in gas prices make a huge difference!