Mechanics of Small Scale Boiler System

Bob Bartz
Palisade Supply Inc.

Woody Biomass Harvesting and Utilization Workshops
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WHY A SMALL BOILER SYSTEM?

High propane costs-15,000 sq ft of buildings needed to be heated- 25 year learning curve

barrel stove-in building
burn wood scraps
heat a small area
move hot air
fire hazard

larger barrel stove-in building
same conditions
larger fire hazard

small outdoor wood stove-in building
burn lumber scraps
heat a larger area
move heat around with hot water
less fire hazard

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Why a Small Boiler System . . . . (cont’d)

larger outdoor wood stove-in building
burn lumber scraps and dry slabs
generate creosote
heat larger area
heat dry kilns
labor intensive-seven days a week and evenings

12 HP commercial boiler-separate metal building
prepared wood fuel
regulate combustion with fuel and air
clean burning
heat larger area with hot water-better temperature control

50 HP commercial boiler-separate metal building [2,000,000 BTU]
automatic fuel feed
sawdust old, green, dry
shavings green and dry
chips green and dry
regulate combustion with fuel and air
heat larger area and add dry kilns
very user friendly
most problems have been with conveying systems and poor fuel mix:
non-uniform fuel size, variable moisture content, trash in fuel
The cost of biomass is only part of the overall energy cost.

Pollution control
Fuel
Labor
Maintenance
Depreciation

Energy system

What is the fuel value to my plant?
- Efficiency of combustion
- Cost of pollution control with that fuel
- Labor required
BASIC COMBUSTION PRINCIPLES

COMBUSTION IS A CHEMICAL PROCESS
- Reaction occurs on a molecular basis

WOOD FUEL MUST BE DRIED BEFORE BURNING
- Drying may be done as part of the combustion process or
- May be done separately in equipment designed for that purpose

WOOD MUST BE GASIFIED TO BURN COMPLETELY

GOOD CombUSTION REQUIRES
- Temperature for ignition
- Turbulent air for maximum efficiency
- Time for completion of process

AIR SHOULD BE IN PROPER PROPORTION TO THE FUEL

GOOD CONTROL SYSTEM RECOMMENDED

### Moisture Effect on BTU Content

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<tr>
<th>MOISTURE CONTENT (%)</th>
<th>TREE CHIPS</th>
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### A Comparison of Wood Heat to Other Fuels

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<tr>
<th>FUEL</th>
<th>Btu/lb</th>
<th>Weight (%H)</th>
<th>Weight (%O)</th>
<th>Weight (%CO2)</th>
<th>Weight (%N2)</th>
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**Notes:**
- Btu/lb = British thermal units per pound
- Weight (%) = Percentage by weight
- H, O, CO2, N2 = Carbon, Oxygen, Carbon Dioxide, Nitrogen
Comparison of Traditional Processing With Green Dimension Processing

Present Process Flow

- Log Grade #1 and #2
- Lumber Sanded
- Dry
- Ship
- Defect
- Machine
- Assemble
- Retail

Green Dimension Process Flow

- Log Grade #1 and #2
- Lumber Sanded
- Dry
- Ship
- Defect
- Machine
- Assemble
- Retail