Co-firing Wood with Coal

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Material Quality

- **Fuel value**
  - Btu’s per pound
  - Density
    - Basic wood density
    - Packing density
    - Energy density
  - Age and conditioning
    - Standing dead timber
    - Trees left out in the sun to dry
  - Co-firing wood with coal
Test Grind Set-up

- Controlled feed rate
- Monitored conditions
- Complete collection of samples
- Testing and analysis
Figure 4.1. Particle Size Distributions for Pine (41% Moisture Content)
Grind Analysis - Spruce

Particle Size Distribution (Spruce)

Figure 4.2. Particle Size Distribution for Spruce (34% Moisture Content)
The Power to Grind

Power per Tonne vs. Screen Size

Power Consumption per Tonne (kW/hr/tonne)

Screen Size

2 mm
4 mm
6 mm

Spruce
Pine

Figure 4.3. Power Consumption per Tonne vs. Particle Top Size
Moisture content

- Moisture content of the material
  - Green condition: 55 – 45%

- Moisture variability
  - Varies by species, source, age, condition, season

- Process sensitivity to moisture
  - Wide variety of issues
  - Incineration, co-firing, gasification, digestion, torrefaction, pelletizing, grinding, chipping

- Controlling moisture
  - **Passively** in storage, handling, blending
  - **Actively** with moisture control equipment
Why is moisture a big issue?

- **Chip processing**
  - Chipping
  - Transportation
  - Storage
  - Grinding

- **Boiler Issues**
  - Fuel values
  - Suspension burning issues
  - Boiler gas volumes and pressures
  - Post-boiler gas processing
Issues with drying

- Availability of drying energy
  - Excess or waste heat?
  - Heat transport and access
- Source of drying energy
  - Parasitic load on the process
- VOC and Particulates
  - High or low temperature
  - Post-dryer air processing
  - Permitting issues
- Extent of drying required by the process
  - NTE limits or Targets?
  - Process optimization?
Energy balance requires careful consideration of local conditions

- Ambient air temp and RH
- Seasonal fluctuations
- Drying endpoint
A basic fuel handling system

- Truck dumper
- Screen and hog tower
- Storage silo
- Fuel dryer
- Fine grinding
- Pneumatic delivery to the boiler
Energy logs for electrical power

- Logs sorted in the woods for energy
- Stored for a time to reduce moisture content
- No debarking
- Chipped and screened
  - Overs are rejected to ground
  - No fines screening
- 100 tons per hour chipping capacity
- 20 tons per hour boiler feed rate
- Large covered storage bunker
- 20 mW electrical power generation
Pine logs into wood chips
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