Co-firing Wood with Coal

McIlvaine On-line Seminars

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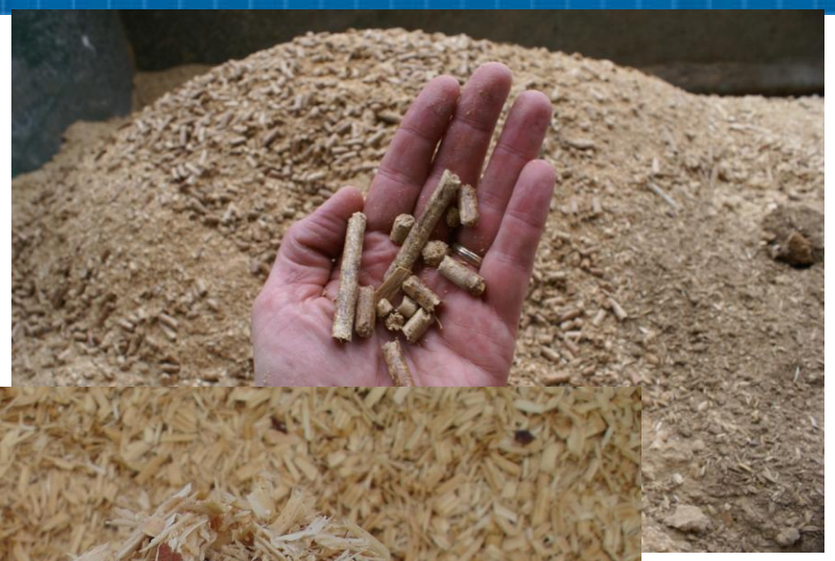
Material Quality



- 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

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Test Grind Set-up

- Controlled feed rate
- Monitored conditions
- Complete collection of samples
- Testing and analysis

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Grind Analysis - Pine

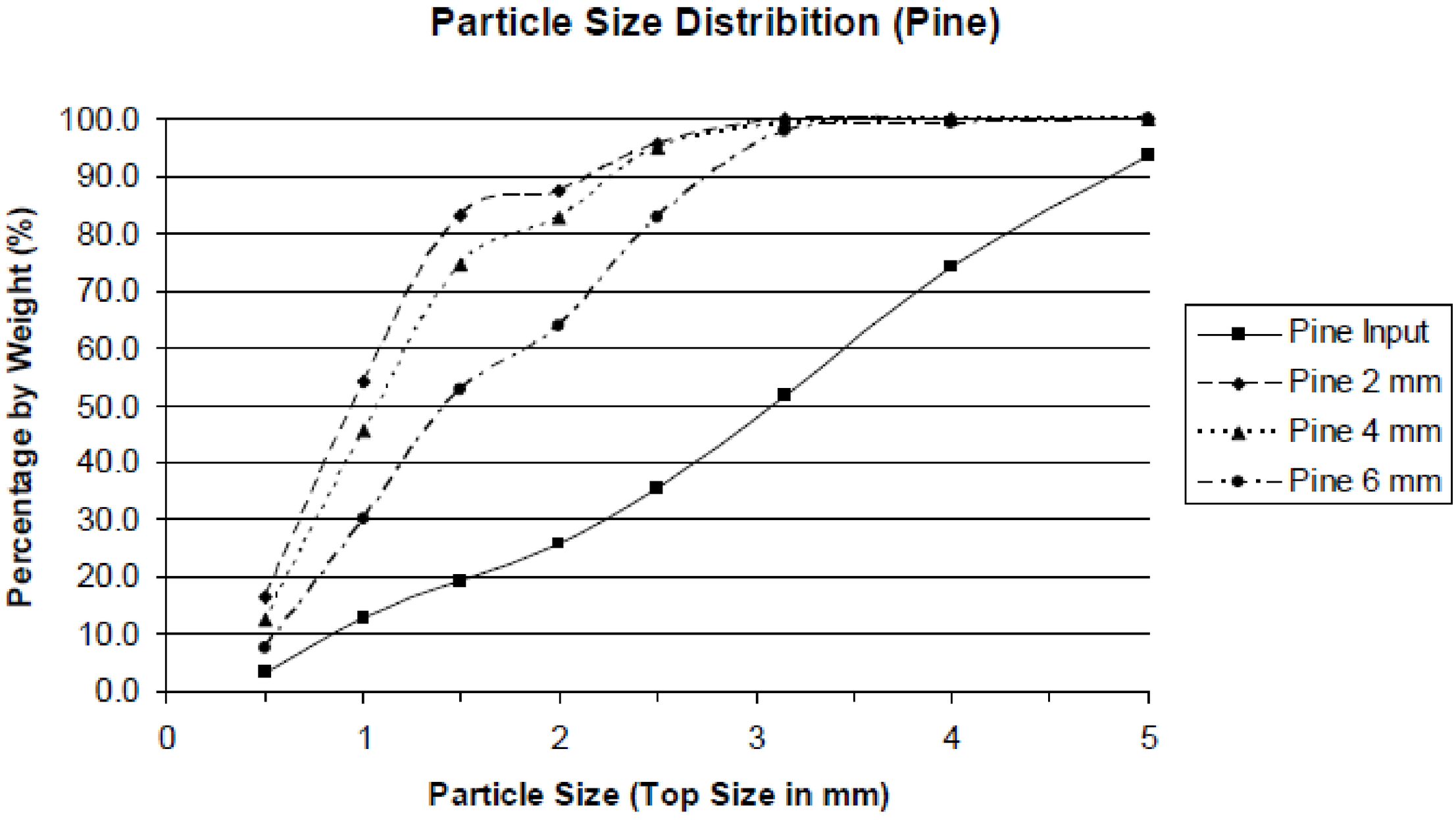

Figure 4.1. Particle Size Distributions for Pine (41% Moisture Content)

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Grind Analysis - Spruce

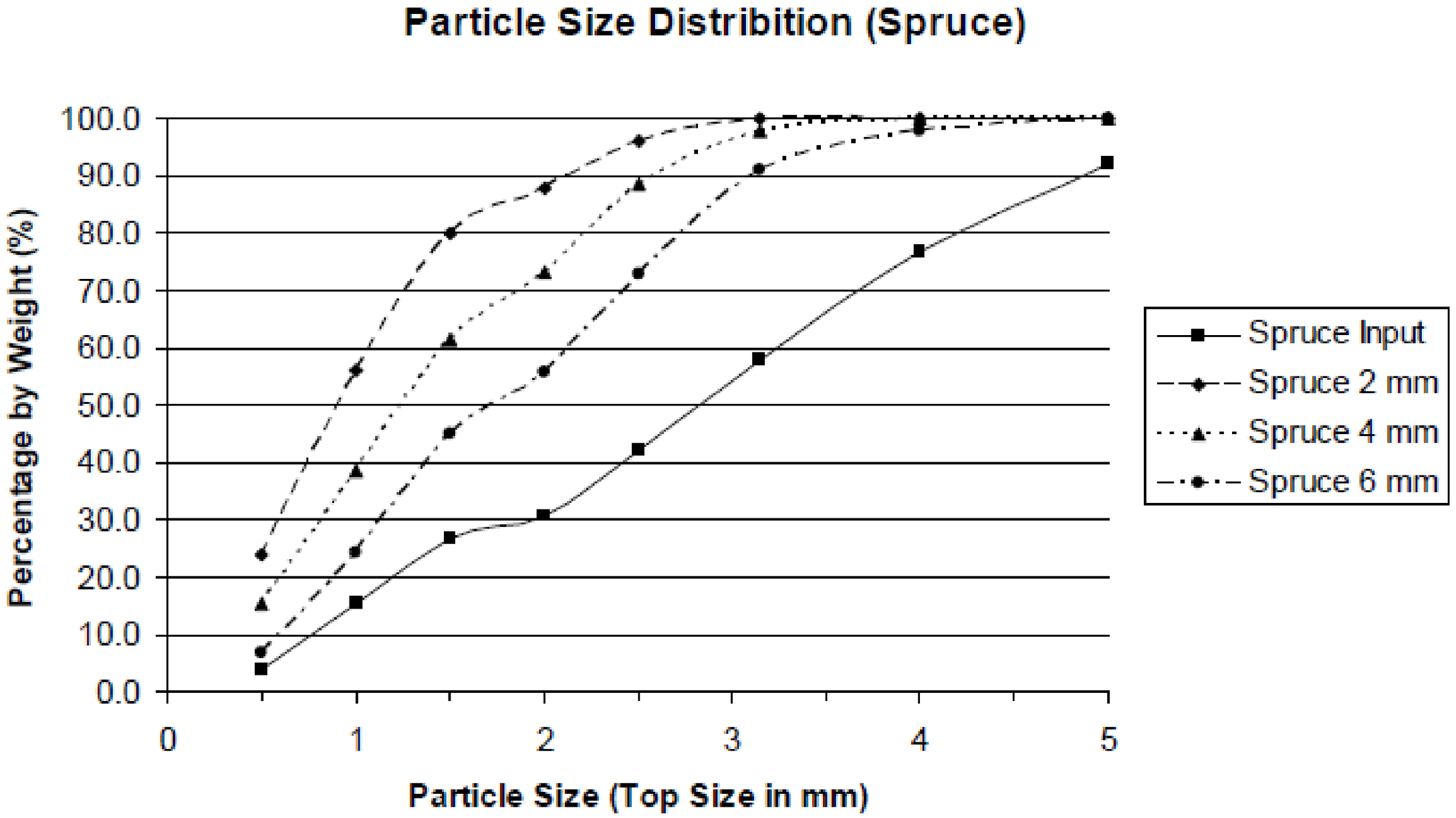

Figure 4.2. Particle Size Distribution for Spruce (34% Moisture Content)

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The Power to Grind

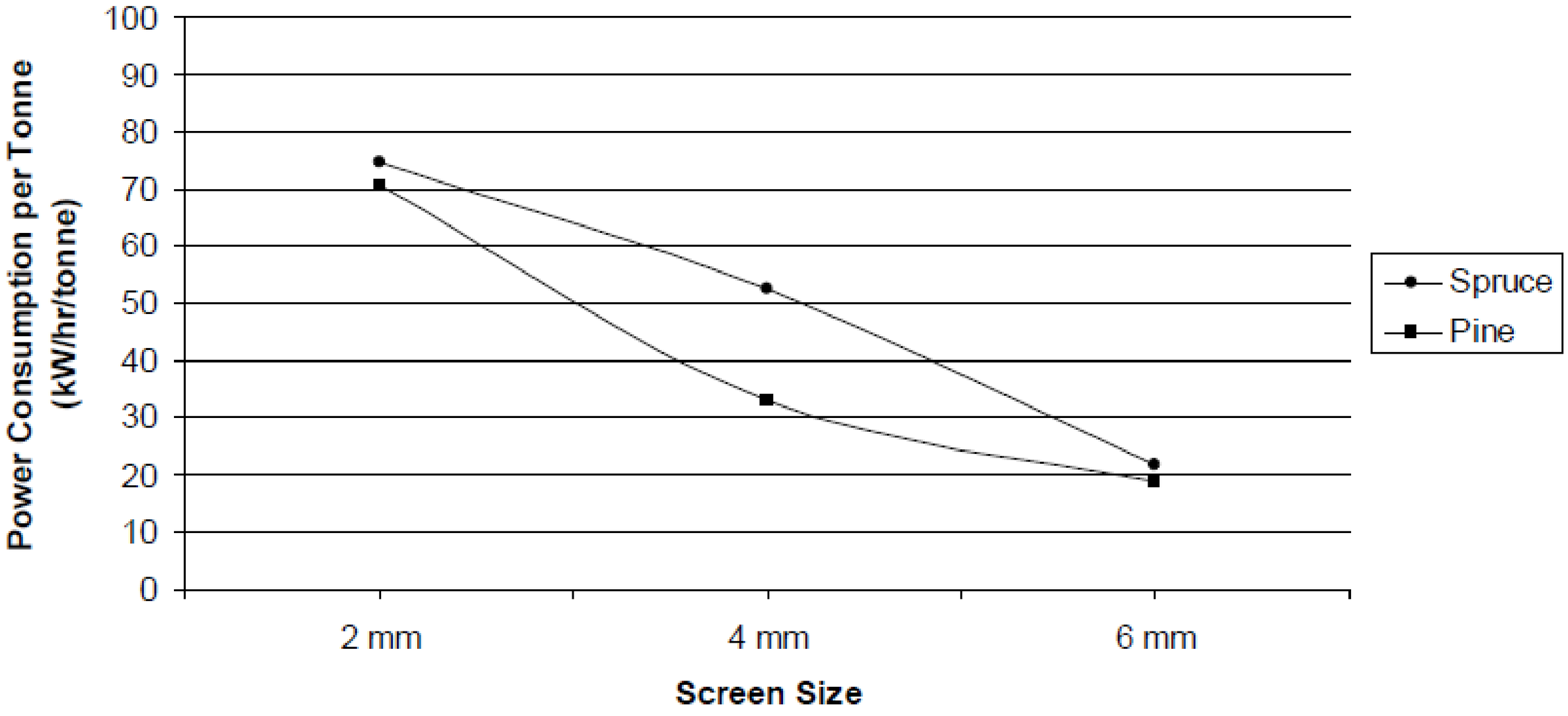

Figure 4.3. Power Consumption per Tonne vs. Particle Top Size

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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

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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?

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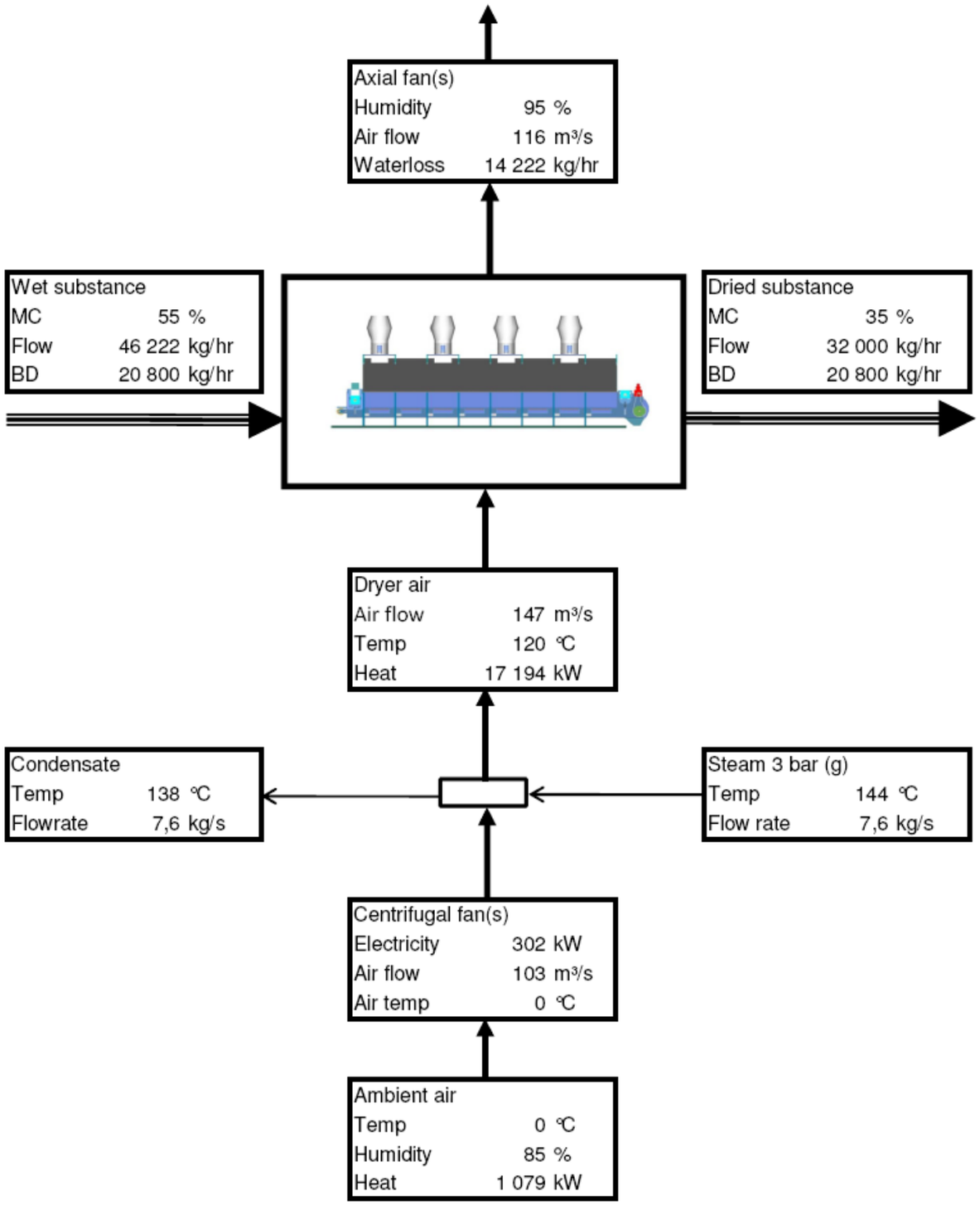
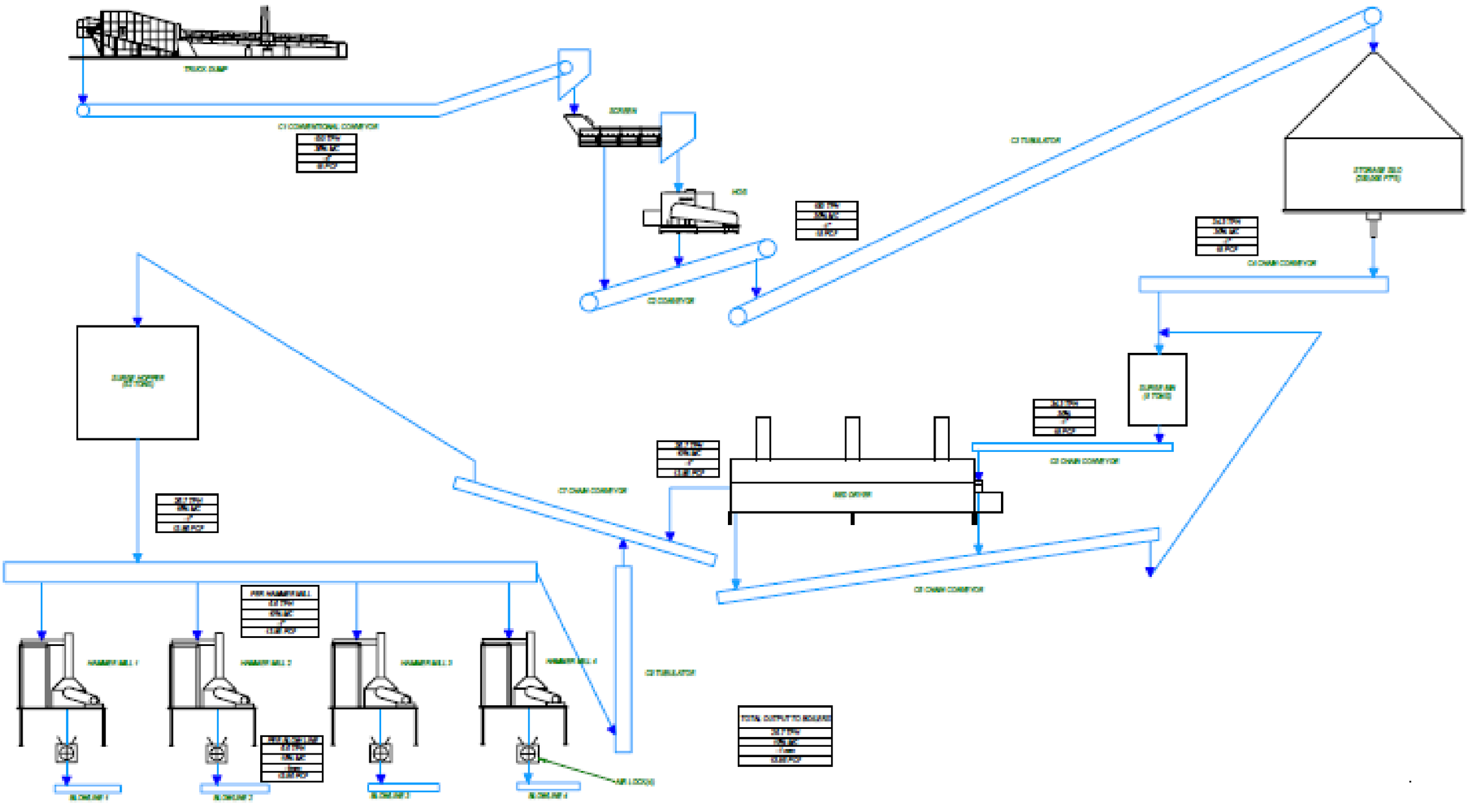
Heat balance for drying



- **Energy balance requires careful consideration of local conditions**
  - **Ambient air temp and RH**
  - **Seasonal fluctuations**
  - **Drying endpoint**


TRUCK DUMP
C1 COMMINTIONAL CONVEYOR
SCREEN
HOD
C2 CONVEYOR
C3 TUBULATOR
STORAGE SILO
C4 CHAIN CONVEYOR
C5 CHAIN CONVEYOR
C6 CHAIN CONVEYOR
ABC DRYER
C7 TUBULATOR
HAMMER MILL 1
HAMMER MILL 2
HAMMER MILL 3
HAMMER MILL 4

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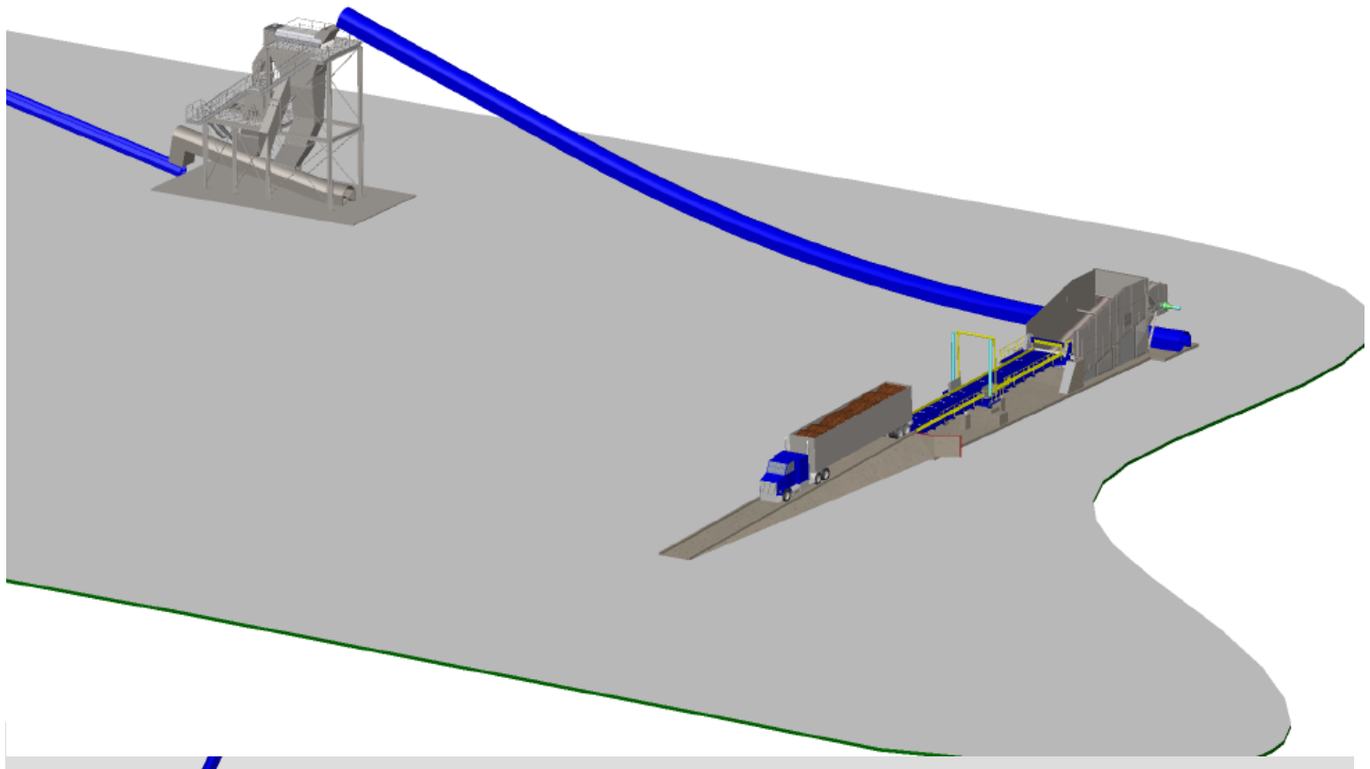
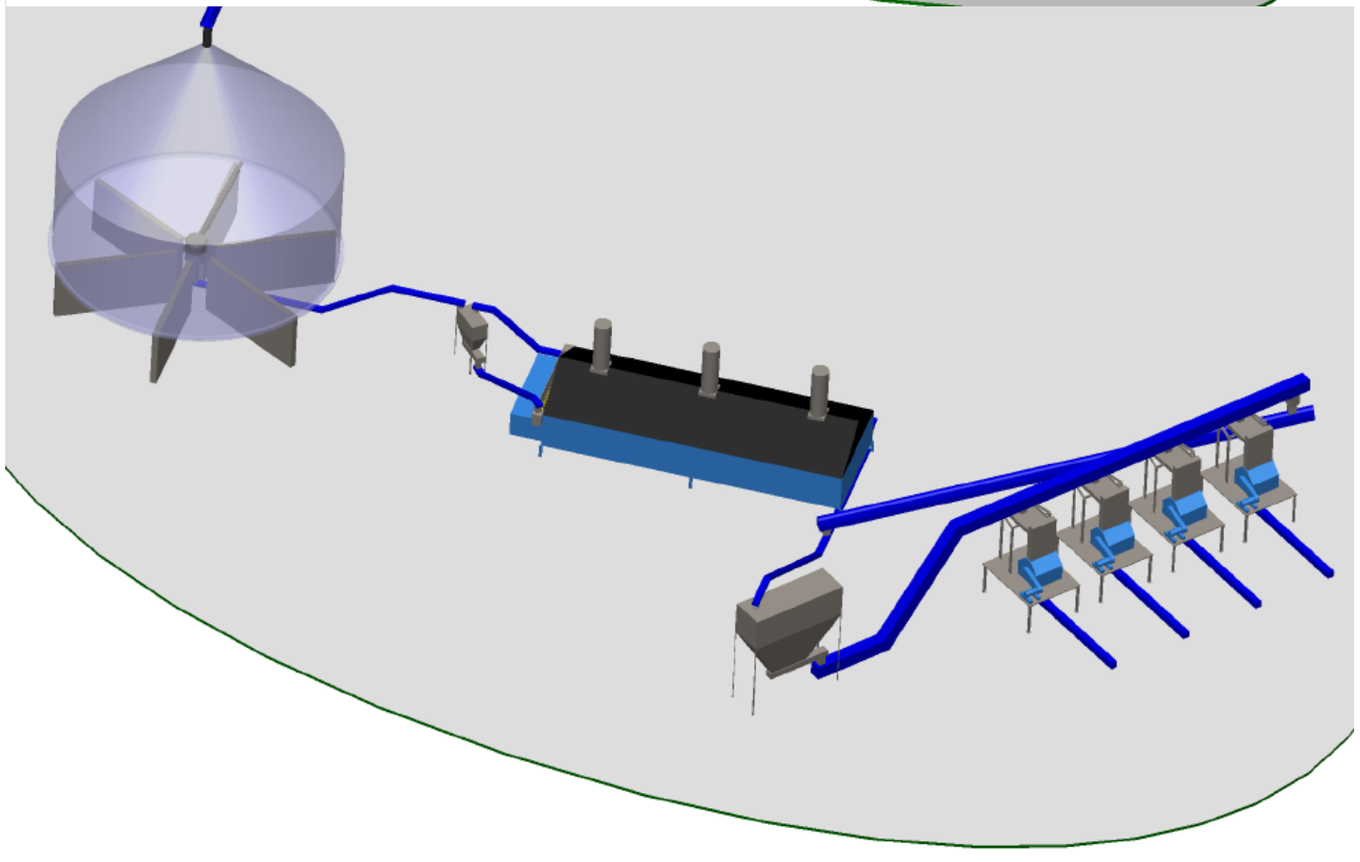
A basic fuel handling system





- Truck dumper
- Screen and hog tower
- Storage silo
- Fuel dryer
- Fine grinding
- Pneumatic delivery to the boiler

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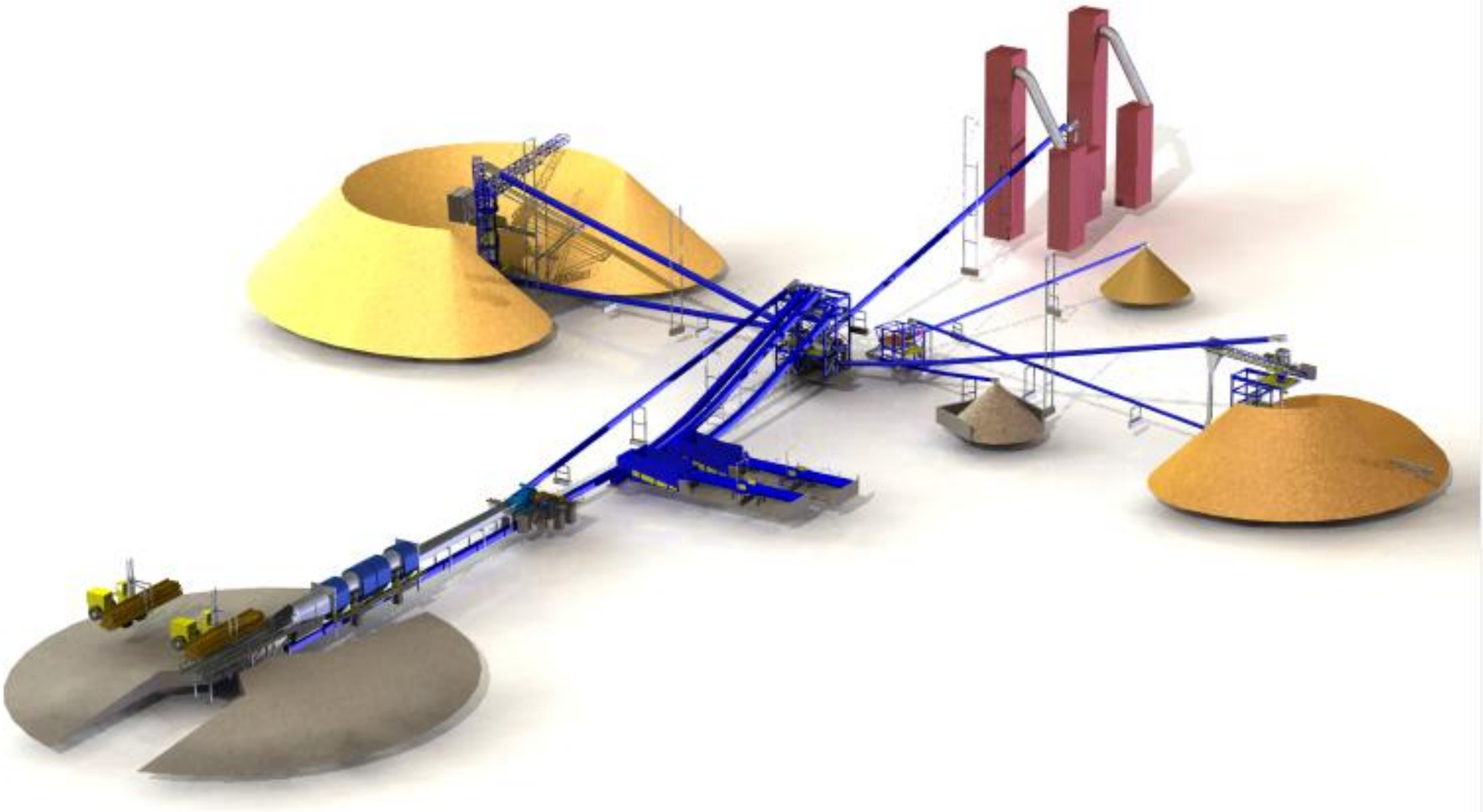
Energy logs for electrical power

- 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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550,000 tpy pellet plant

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