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Fuel Yard Improvements for Boiler Performance

Why Upgrade Your Fuel Yard?

WRBA Conference – March 2015

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Introduction

Kevin Tangen, PE CEM

- 6 years as Mechanical Engineering Manager for a biomass boiler manufacturer – Designed over 25 turn-key biomass fuel plants – 10 cogeneration plants
- 25 years of mechanical design experience, 15 years in the Wood Products Industry
- Mechanical Design, Project Management, and Construction Management
- Certified Energy Manager

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Problems in the Fuel Yard

- Wet biomass
- Screening for fines
- Blowing fuel and loss of biomass
- Water discharge from the biomass – Leachate

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Wet Biomass - Energy

- One ton of wood has enough energy to evaporate 6 tons of water
- BD – 100% energy/weight unit
  - Air Dried (20% MC) – 81%
  - Green (50% MC) – 62%
  - Wet (100% MC) – 41%
- Wet wood – 4,000 btu/lbm
  - Dry wood – 7000 btu/lbm

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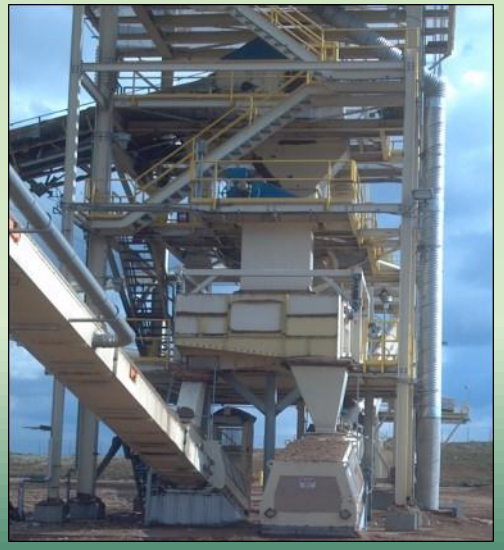
Wet Biomass

- Boiler design for 1 operating point – emissions guarantee point
- Firing rate and wet fuel
  1. 5 NW plants can't meet their production needs due to wet fuel
  2. Add air to the fire to assist in combustion
  3. Increased carry-over leads to higher PM due to less than emissions guarantee point
  4. Increased charred wood in ash system due to incomplete combustion
  5. Inefficient combustion increases maintenance costs

Screening for Fines

Fines screening allows for removal of dirt and other non-combustible material

- Decrease in performance due to the non-combustible material on the pile
- Increased discharge in the ash system
- Additional wear in the grates
- Sell the non-combustible material as mulch to outside vendors
- Additional carry-over



Fines Screening

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Blowing Fuel and Loss of Biomass

- Loss of fuel – loss of $
- Will continue to be an environmental concern
- Increased hazards to personnel (Dust etc.)

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Water Discharge from Biomass – Leachate

- EPA continues to look at water contaminated by the wood pile as a source requiring treatment
- Plugging of catch basins, storm sewers
- Leachate treatment is $

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Solutions

- Several Possibilities – for all 4 problems in the fuel yard
  1. Several recent projects put in full sorting with storage capability
  2. Building Types
     - Steel Buildings
     - Fabric Buildings
     - Existing on-site Buildings
     - Silos
     - Covered Concrete Bunkers

Solutions (cont.)

3. Screening – Specialized testing with screening vendors to get desired results
   - Cost of screening may be justified by improved boiler performance
   - Reduce noncombustible material to boiler
   - Reduce ash volume
   - Reduced grate wear
4. Blowing Fuel Loss
   – Screening walls
   – Handling Methods

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Conclusion

- ✓ Solutions for problems are varied based on location and conditions at plant site.
- ✓ Capital costs are high but paybacks can be as low as 2 years.
- ✓ EPA will continue to require more stringent control of fuel, water, and combustion air discharges at sites.
- ✓ With proper advanced engineering study and design, improvements can be justified and assist in meeting EPA requirements

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Thank You

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Kevin Tangen, PE CEM
ktangen@eeeug.com
541-484-4771
www.evergreenengineering.com