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## **Forest Operators Biomass Workshop Summary**

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Newcastle, Wyoming**

Brian Hunt – General Manager, Western Biomass Energy (WBE)

The WBE ethanol plant in Upton, WY is owned by KL Process Design Inc., Rapid City, SD. The firm has 7 grain based and 1 cellulose based project across the US in various stages of development. While corn based ethanol is easier to process currently, biomass/cellulose should provide cheaper feedstock sources in the future due to the variety and large quantities of this resource.

Wood cellulose ethanol is currently being developed nationwide through several different pretreatment options including acid based, gasification technologies and the thermo-mechanical process used in Upton. WBE believes that the thermo-mechanical process is the most efficient and has none of the waste disposal issues of acid pretreatment. The pretreatment process is essential to expose the cellulose in the wood for enzymatic breakdown into sugars. The sugars are then fermented into ethanol - as with corn based processes.

Corn based ethanol is energy efficient and may produce 30% more energy than all energy inputs. However, cellulosic ethanol will be many times more energy efficient since the feedstock is a waste product. In the laboratory, WBE has produced 45 gallons of ethanol per dry ton of Ponderosa Pine wood chips. Since its startup in January 2008, the Upton plant has achieved 20gal/ton during its commercialization. This efficiency may get as high as 60-80 gal/ton.

The ethanol plant is calibrating its pretreatment and enzymatic processes to improve feedstock flows and ethanol conversion efficiencies. While Ponderosa Pine is a plentiful feedstock source in the Black Hills, other hardwood tree species are actually easier to convert to ethanol. Burnt wood seems to convert well but rotten wood does not. The cost of the enzymes is very high currently and should decline as the enzyme manufacturers are able to optimize production.

Bob Baker, Baker Timber - Rockerville SD



Mr. Baker has been working with the KL Process Design team for 10 year in the development of the WBE project and has provided many samples for the lab work. He is the primary supplier to the ethanol plant and has also been supplying industrial users of chips in the Black Hills region, such as Merillat Cabinets, since 1993. Baker has been refining the logistics of in-forest chip procurement and transportation in his operation for many years. Baker timber currently operates 90 pieces of equipment in various logging and chipping operations.

The current lumber market is at a forty year low, making it very difficult for logging operators. The board-ft price is actually lower than it was in 1983. Chipboard products (i.e. cabinets) are also in very low demand due to the lack of new home starts nationwide. He is hoping that with increasing gasoline prices the ethanol plant will be able to pay more for chips. His current cost to deliver chips is around \$60/ton.



Baker uses a 20 year old Morbark chipper to chip logging residue at forest landings. Increasing the horsepower to 200 HP has reduced fuel costs substantially by making the chipper more efficient. Normally he can fill a 40 foot van in about 40 minutes to an hour depending on the site. Ideally the logging slash will dry for about 6-9 months to less than 50% moisture. Dry material sheds the bark and needles better and is cleaner for chipboard manufacturers. He doesn't chip material under 2" in diameter. Average moisture levels from the forest in the last several years have been less than 40%. All material is sold on a bone-dry-ton equivalent basis.

Baker uses several innovative pieces of equipment to make the forest landing and slash piles work for his chipper. Smart grapple and skidder work is the key to an efficient operation that allows the chipper to be set up in one location for the longest time possible. A portable, in-forest truck scale has been an excellent investment to avoid overweight trucks and fines.

Kevin Jump, John Jump Trucking – Kalispell, MT

Kevin Jump operates a family business that was started by his father in the 1950s. He uses a Peterson Grinder to mostly produce boiler fuel for an industrial client in Missoula. He does some landscape work for urban clients. His grinder is reasonably mobile and has remote control features and uses about 14 gal/hour of diesel in the forest. He can grind about 25-30 acres of residue before needing to move the grinder a significant distance. For boiler fuel, the needles and bark are desired because they are high BTU. Every pound of boiler fuel he produces averages 9000 BTU and at least 35% moisture. The plant that uses his boiler fuel saves \$2.5 million/year in natural gas. When his operation is going well, he can get 9-10 vans of biomass per day.



The nature of the forest operations in Montana is different due to the species and utilization. More marketable, small diameter logs will have already been removed from the slash piles than generally seen in the Black Hills. The grinder is processing all material that can be effectively piled and processed at the landing.

A log loader scoops and piles debris for the grinding operation and enables processing of very small material. A modified brush-forwarder with a dump bed is used in sensitive areas to collect biomass and move it to the landing. Kevin estimates that, every time logging slash is handled, it adds \$5 to the cost of the biomass. His operation sells biomass by weight (green ton) so each full truck has the same value. This has been shown to be easier accounting.

Grinding biomass complements logging operations very well. It is easier to pile for grinding as opposed to burn piles. Biomass utilization saves the logger time he would have spent establishing fire breaks, not to mention the cost to burn and reseed.

John Jump Trucking also has a yard to receive and grind wood biomass that come from surrounding communities and small tree clearing projects. The company charges one-half the landfill tipping fee of \$32-38/ton.



### Discussion Points



- The technical capability and equipment are clearly available to harvest and transport forest biomass. Large markets are not yet established. The next workshop should focus on markets.
  - Kevin Jump estimates that a \$2.5 million investment would enable someone to get into the biomass business. Some good used equipment is available.
  - Diesel prices are a serious concern to all operations and threaten business viability.
- Agencies are spending money burning and reseeding after logging. It is very difficult to move biomass to market without the turning some of that “cost” into incentive for the biomass harvester. The market value alone is currently not sufficient to make it profitable to harvest biomass on its own. Agencies will have to reconsider this point as they set up timber sales.
  - The operator may need to prove that the forest residue product is cost effective for the industrial co-gen customer.
  - Chipping biomass for high quality (clean) chips may be important for some industrial markets. Clean chipping will cost the logging operation time to sort and dry slash. In addition, 30% of the logging residue will still need to be burned.
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- Grinding biomass, with bark and needles, enables the logger to avoid most burning and uses all the small material. This approach is ideal for co-gen markets.
  - “Fuels-for-schools” has market potential but one needs to remember that schools may have more demanding specifications for biomass size and quality.
  - Wyoming State Forestry Division is conducting pilot studies in two communities to test the viability of fuels-for-schools.