SUMMERHILL BIOMASS SYSTEMS
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Energy Yields with Summerhill Biomass Systems Fuel

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Energy yields of biomass fuels are not answered with just one number, as there is primary dependence on the water content of the starting material (feedstock) and secondary dependence on the toughness of the material used in the grinding process.

For the drying case at one extreme, freshly cut wood waste will contain 45% water, therefore, to obtain one dry ton it will require evaporating 900lbs of water.

For a reasonably efficient drying system, this will require approximately 1500btu/lb. of water to obtain 7500btu/lb of biomass in a combustion application, or 900x1500/7500/2000x100=9% of the energy stored in the biomass by photosynthesis. With use of a less efficient dryer this figure could be much higher.

If locally produced corn stalks are the biomass source, they could contain 25% water and 5% of the energy would be required to dry the material.

Geographic location play a role in the water content even within the same type of feedstock. For example, if the corn stalks are harvested in California, they will be completely dry with no drying energy costs.

Grinding energy costs depend on the material being ground and the design of the grinder. To produce a fine powder the kwh/ton can be as high as 500kwh/ton. Cedar wood is among the toughest, soft wood is easier, and corn stalks can be in the range of 50 kwh/ton. Torrefied wood may be even easier to grind.

Assume 500x3400/7500/2000x100=11% of the stored energy and 50 kwh/ton=1%

Thus, grinding energy requirements in the range of 100kwh/ton are a trivial fraction of the stored energy.

Other energy costs are trivial relative to the drying costs, i.e. even the harvest of green wood chips and their transportation at 200 miles adds up to only 70kwh/ton.

These numbers say that the yield will be in the range of 75% and could be as high as 95% when using dry corn-stalks.