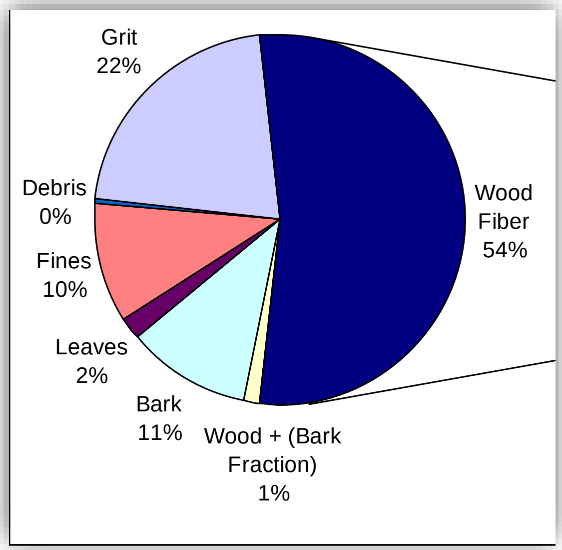
Capabilities

forestconcepts

Biomass Beneficiation

Technologies to upgrade biomass resources, remove ash and debris, etc.



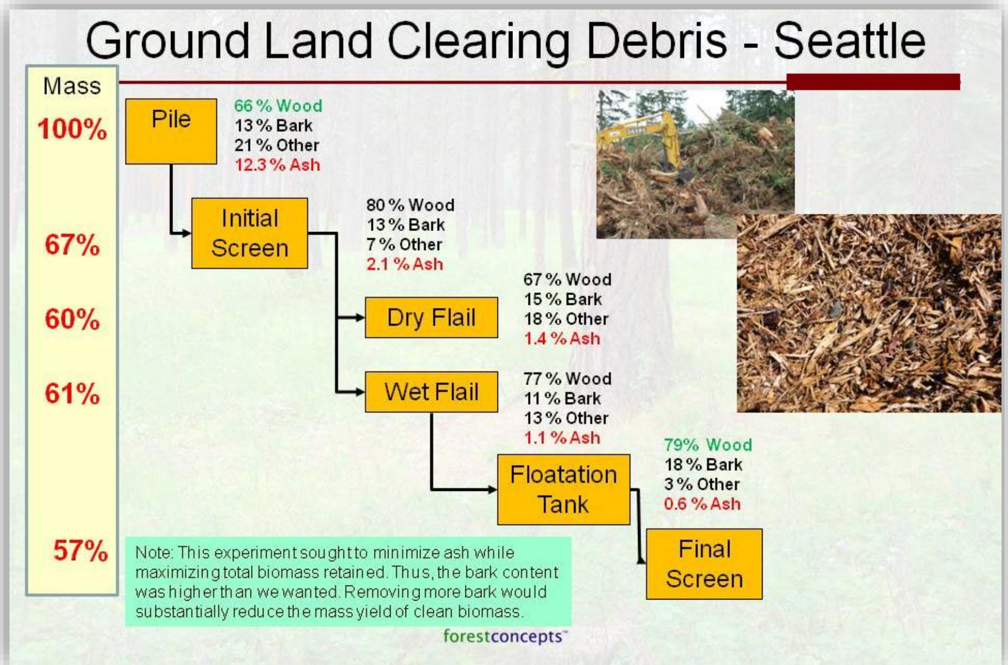
High-quality, clean wood fiber is the primary raw material for a wide range of bio-based products such as particleboard and medium density fiberboard used in cabinets, furniture, commercial fixtures, and building panels. Conversion from plywood and dimensional lumber to composite panels and engineered wood products is increasing the demand for clean wood fiber within the forest products industry.

Feedstock compositional quality is among the more important issues that emerge as second generation biofuels and bioproducts move from laboratory toward commercial scale production. Compositional quality, including anatomical content (wood, bark, needles … in the case of woody feedstocks – leaves, cobs, stalks, root wads, … in the case of corn stover), biogenic ash (aka physiological ash), and environmental ash (aka entrained ash) are known to have significant negative effects on yields, catalyst life, hot gas and liquid separations, acid consumption, and a myriad of other cost components at conversion and downstream processing facilities.

Forest Concepts developed a set of protocols and laboratory techniques for characterizing the compositional content of bulk biomass materials. Additional lab methods are used to estimate the potential to upgrade raw biomass to meet quality specifications for environmental ash and anatomical composition.

Beneficiation tools include wet and dry screening, impacting and abrasion, flotation with liquids and air, and various combinations. Technoeconomic models are used to optimize processing lines for materials and objectives.

Forest Concepts' engineers designed and built a set of demonstration-scale (one ton per hour) machines that can be mixed and matched to test various fuels and feedstocks and determine how best to clean them to nearly any ash or bark content specification. We can test and process most materials that are delivered to us in bulk bags (supersacks) or pallet bins (Gaylord containers). In some cases, the equipment can be relocated to client facilities for more extensive experiments.



Raw Baled Corn Stover						
	Ash Content Percentage					
	Rep 1	Rep 2	Rep 3	Rep 4	Total Ash Average	Average Approximate Environmental Ash
retained on 1/4" screen	4.70%	5.55%			5.13%	1.13%
retained on 20 mesh screen	7.17%	8.17%	6.93%	6.45%	7.18%	3.18%
fines passing 20 mesh screen	32.76%	34.85%	31.15%	27.82%	31.64%	27.64%

Beneficiation techniques need to be optimized individually and in combinations to reliably process low-grade biomass into on-spec materials.

The graphic at the top of this page portrays a fairly complex processing chain to upgrade dirty land-clearing debris into low-ash gasifier fuel. The pathway to achieve less than 1.5% ash involves only dry screening and flailing. However, if the fuel must be less than 1% ash, then the only plausible pathway involves wet flailing and washing. This type of experimental study is invaluable for those designing and operating biomass-consuming facilities.

The second chart shows the benefit of screening debaled corn stover to reduce the ash content for a biorefinery. In this case, most of the environmental ash can be removed with a 20-mesh screen.

Working with Forest Concepts' Beneficiation Lab

Successful specification and design of a beneficiation system involves technoeconomic modeling supported by experimental data from a client's actual biomass. Multiple samples that span the expected natural range of variance improve the robustness of recommendations. Selection of an optimal pathway include tradeoffs of mass loss in exchange for higher purity. Potential revenue-positive co-product markets often factor into the decisions.

Forest Concepts, LLC
3320 West Valley Hwy. N.
Ste. D-110
Auburn, WA 98001
Ph: 253.333.9663
www.forestconcepts.com