

Biomass Characterization

Physical, Mechanical, and Anatomical Composition of Biomass and Feedstocks



Knowing the physical, mechanical, and content properties of biomass feedstocks is vital for engineers, facility operators, and throughout the feedstock supply chain. Forest Concepts developed and published many of the methods and protocols in use today across the industry.

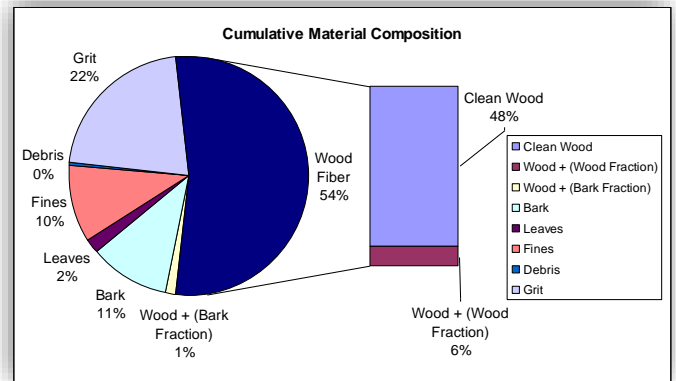
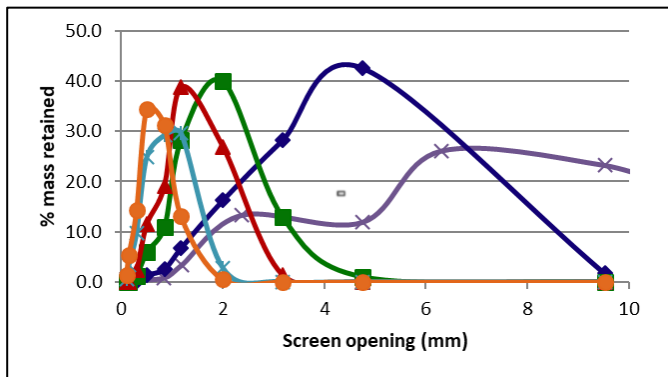
Particle size distributions, aspect ratios, moisture content, and bulk density are the traditional metrics for feedstock physical properties. As feedstocks became more complex, we developed new protocols for quantification of particle shape, anatomical content, and measurement of comminution energy.

Our methods for measurement of total ash, bulk density, geometric mean particle size, moisture, and other attributes are based on ISO, NREL, ASABE, and other standards. However, they are often adapted for the case of biomass feedstocks to provide more relevant and useful data.

Beyond physical properties and characterization, Forest Concepts has the capability to develop drying rate curves, dryer engineering design coefficients, and control properties using Forest Concepts' unique Research Drying Apparatus (RDA) an innovative test device developed in partnership with US DOE.

Flowability properties can be measured using simple tests such as angle of repose, Hausner Index, CARR Index, and compression ratio. Particle shape and size distribution data is useful for populating DEM models.

Today, Forest Concepts is able to quantify the mechanical properties of bulk biomass materials and feedstocks using a true Cubical Triaxial Tester (CTT) that was developed in cooperation with US DOE and Pennsylvania State University. This new device is specifically scaled for biomass materials.



Laboratory equipment:

- Convection drying oven to determine moisture content (2 each)
- Rapid Moisture Analyzer
- Online Infrared Moisture Sensor
- Precision bench scales with 0.0001g, 0.1g and 1g resolution
- Platform scale – 5,000 kg capacity
- Ashing ovens (up to 12 samples per day)
- Binocular microscope
- Digital microscope
- Electrical conductivity meter
- Magnetic stir and hot plate
- Desiccator
- Bulk density containers – ISO small and large
- Low temperature drying (45 C) cabinet
- Gilson RoTap 300 mm diameter particle size sieve set with 20+ sieves
- Research Drying Apparatus (RDA) to measure drying parameters and coefficients
- Cone-type terminal velocity and air-based biomass classification research device
- Flotation tank

Working with Forest Concepts' Characterization Lab

Raw biomass characterization – Quantification of what is “in the pile” to create a reference data set for a new biomass source, inform discussions about value and pricing, and/or to inform production planning to determine the level of preprocessing needed to convert the biomass into feedstocks.

Feedstock characterization to deliver engineering data, operational functional characteristics, and other physical/mechanical properties data.

Reference data for QA/QC within lots and over time across lots to ensure particle size, flowability, and other critical performance attributes do not vary outside of accepted ranges.

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