

Grinding drying, and densification characteristics of lodgepole pine and eucalyptus biomass

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Woody biomass is used to produce products such as lumber, composites, paper and pulp, furniture, housing components, round wood, ethanol and other liquids, chemicals, and feedstocks for energy applications. Woody biomass is available in two forms hardwood and softwood. In the current study grinding, and densification behavior of lodgepole pine and eucalyptus was evaluated. Tests on grinding and pelleting were conducted using the grinders and densification equipment available at Biomass National User Facility, Idaho National Laboratory. Briquetting studies on both hardwood and softwood were carried out using a laboratory scale continuous hydraulic briquette press. The results indicated that eucalyptus and lodgepole pine take the same amount of energy (85.4 kWhr/ton) in stage-1 grinder using a 2 inch screen whereas in stage-2 with a 3/16 inch (4.8 mm) screen the energy consumption of eucalyptus (45 kWhr/ton) was higher compared to lodgepole pine (39 kWhr/ton). Drying both lodgepole pine and eucalyptus from initial moisture content of about 30 % (w.b.) to 10 % (w.b.) consumed 340 kWhr/ton and 401 kWhr/ton respectively. Further pelleting the dried and ground lodgepole pine and eucalyptus using 3/16 inch screen took about 48.94 and 124.13 kWhr/ton respectively. The bulk density of the lodgepole pine and eucalyptus pellet were about 712 and 672 kg/m³ whereas durability was about 96.5 and 95.5%. Studies on briquetting using lab scale hydraulic briquette press indicated lodgepole pine has slightly higher bulk density (435 kg/m³) compared to eucalyptus briquettes (429 kg/m³) at 10% feedstock moisture content. The measured durability of the briquettes produced at 10% moisture content was about 45% for eucalyptus and about 90% for lodgepole pine. At higher biomass moistures, the bulk density of the briquettes was found to decrease. The study indicated that lodgepole pine has better grinding, drying and densification characteristics compared to eucalyptus.

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