



WESTERN JUNIPER COMPOSITES

By

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Introduction

The goal of this project was to produce two types of composite boards using western juniper (Juniperus occidentalis). One was a woodfiber/plastic composite made from fiberized juniper and post-consumer plastics, the other a standard particleboard made using hammermilled juniper and urea formaldehyde resin. All of the research was conducted at the USDA Forest Products Laboratory (FPL), in Madison, Wisconsin.

The juniper used for this research was obtained through Larry Swan, Winema National Forest. Prior to shipment to FPL, the juniper had been chipped for use as fuel or mulch. Both clean (debarked) and dirty (un-debarked) material was supplied.

Woodfiber/Plastic Composite

With the current high interest in recycling, it was decided to make a woodfiber/plastic composite using a post consumer plastic. Granulated low density polyethylene (LDPE) derived from garbage bags was used as a binder (25%). Fiberized high density polyethylene (HDPE) was used as a matrix fiber (10%). The juniper made up the remainder (65%).

Both the dirty and the clean juniper was hammermilled using a 20 mm hole size in preparation for refining. The refiner used was a single disc pressurized lab refiner built by Sprout-Bauer. The initial fiber load was pre-steamed for 20 minutes at 420 KPa. Plate setting was .25 mm for the clean juniper and .2 mm for the dirty. One point of interest was that the dirty material used about 40% less energy to refine. This is probably due to the low energy needed to refine the bark portion of the dirty material.

After drying, the juniper was mixed with the LDPE and the HDPE and air-laid into a continuous low-density needle punched mat. The mats were then cut, weighed, and stacked to provide the correct amount of material for board production. Board production was carried out on a steam heated hydraulic press. The boards were pressed for four minutes at 190° C to a thickness of 3 mm and a specific gravity of 1.0.





Most of the boards were fabricated into clipboards, the remainder were tested for bending stiffness and strength. Average bending stiffness for the clean juniper was 2.08 GPa, and for the dirty material, 1.98 GPa. Bending strength for the clean was 27.6 MPa and for the dirty, 26.1 MPa. The differences in the values for the clean and dirty material are not statistically significant. These values are very similar to those obtained with other woodfiber composites made using LDPE as a binder.

Particleboard

Like the fiberboard production, the first step in the production of the particleboard was to hammermill both the clean and the dirty juniper using a 20 mm hole size. The juniper was then dried and hammermilled again using a 3 mm hole size. The hammermilled material was then screened, with material over 3 mm and under .4 mm being discarded.

CASCO-RESIN RM-36, a Borden Inc. brand urea formaldehyde resin, was applied to the hammermilled and screened material at the 6% weight level. The material was then hand-laid to make a mat for pressing into boards. Board production was carried out in a steam heated hydraulic press operating at 180° C. The boards were pressed for 10 minutes to a thickness of 12.5 mm and a specific gravity of .65.

Most of the boards were cut to 300 mm x 300 mm samples. The remainder were tested for bending properties and water absorption. Bending stiffness for the clean and dirty material was 3.6 GPa and 4.2 GPa respectively. Bending strength for clean material was 15.4 MPa and 17.4 MPa for the dirty. The differences are not statistically significant. These values exceed most commercial standards for medium density particleboard.

After 24 hours of immersion in water, boards made from clean material absorbed 87% moisture and increased in thickness by 24%. Boards made from dirty material absorbed 96% moisture and increased in thickness by 27%. The differences in values are not significantly different. While these values seem high, they are on par with other wood composites made using 6% urea formaldehyde resin.

Conclusions

This study was very preliminary. Not enough samples were tested to give it full statistical validity. However, from a purely technical standpoint, there seems to be little reason why juniper could not be used in the production of satisfactory wood composites. Other considerations, though, must be considered. Price, availability, proximity to market, etc. all play large roles in success of materials in the production of composites. These factors are beyond the scope of this brief study.

