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Product and Market Opportunities for HYBRID POPLAR WOOD in Oregon

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Interest in hybrid poplar has exploded in recent years. Within the past 10 years, four pulp and paper companies have established hybrid poplar plantations in Oregon to help supply their mills.

The Oregon State University Extension Service and private landowners are conducting growth, yield, and clonal research in many parts of the state. Within 1–2 years, we'll be better able to determine which varieties perform best in any given region.

The big question for private landowners wanting to establish poplar plantations is, "Who will buy the raw material?" At the same time, buyers of the raw material (the wood products industry) are asking whether hybrid poplar wood is suitable for their products. From a product and market standpoint, the pressing questions are:

- What are the physical and mechanical properties of hybrid poplar?
- What products can be made from hybrid poplar, and what products should be avoided?
- Who will buy the resource? (Although poplar may be suitable for a company's products, there is no guarantee the company will buy poplar.)

First, a basic idea of the physical and mechanical properties of hybrid poplar is needed. Examples of physical and mechanical properties include machinability, shrink/swell characteristics, density, fastening (ease, splitting, etc.), strength, and finishing characteristics. The biggest hurdle to finding answers to these questions is that little publicly available research has been conducted on hybrid poplar.

To further complicate matters, the research that has been done provides evidence that "not all hybrid poplars are created equal." The term "hybrid poplar" refers to numerous varieties, and therefore it is impossible to describe the properties of hybrid poplar as a whole.

Varieties are crosses between many different species in the genus *Populus*. This genus includes 25 species, including black cottonwood, eastern cottonwood, quaking

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aspen, balsam poplar, white poplar, European black poplar, and Lombardy poplar. Not only are the properties of all these species different, but so are the properties of offspring produced by cross-fertilization.

Poplars, such as cottonwood and aspen, are used for a variety of products, including boxes, crates, core stock for plywood, pallets, food containers, upholstered furniture frames, and pulp and paper products. The new hybrid poplar plantations in the Northwest were established to supply pulp and paper mills.

If you want to sell hybrid poplar chips to pulp and paper companies, be sure to consider the haul distances to the nearest mills. Lockwood-Post's *1992 Directory of Pulp and Paper Mills in the United States* lists 7 mills in northern California (north of Sacramento), 13 mills in Oregon (all on the westside), 1 mill in Idaho, and 6 mills in southern Washington (south of Yakima). While these numbers are a bit out of date, they give a general idea of the number of potential buyers.

When chip prices are low, it may be uneconomical to haul poplar chips over long distances. For a crop that must be harvested within a set time, this limitation could be a problem. In other words, the landowner may not be able to "hold out" until chip prices rebound.

Some Oregon landowners interested in establishing hybrid poplar plantations are seeking markets other than pulp and paper. Hybrid poplar wood has potential for use in laminated strand lumber, oriented strand board, veneer for plywood, solid-sawn products (e.g., boards), and fiber products such as hardboard and medium-density fiberboard. This publication discusses each of these products, including the processes used and potential obstacles to using hybrid poplar.

Laminated strand lumber and oriented strand board

In Canada and the midwestern United States, aspen is used widely for laminated strand lumber (LSL) and oriented strand board (OSB), often called waferboard, flakeboard, chipboard, or a host of other names. LSL is a relatively new product used as a substitute for solid-sawn lumber and timbers. LSL can be produced in small sizes such as 2x4s, or larger sizes such as beams and headers. OSB is a panel product widely used as a substitute for plywood sheathing.

The processes used to produce LSL and OSB are very similar. Most plants feed logs (not chips or "junk" as often is believed) into a disk-type flaker (a vertical rotating disk). The flaker slices the logs into flakes or wafers approximately 1½ inch wide, 3 inches long, and 7/32 inch or less thick.

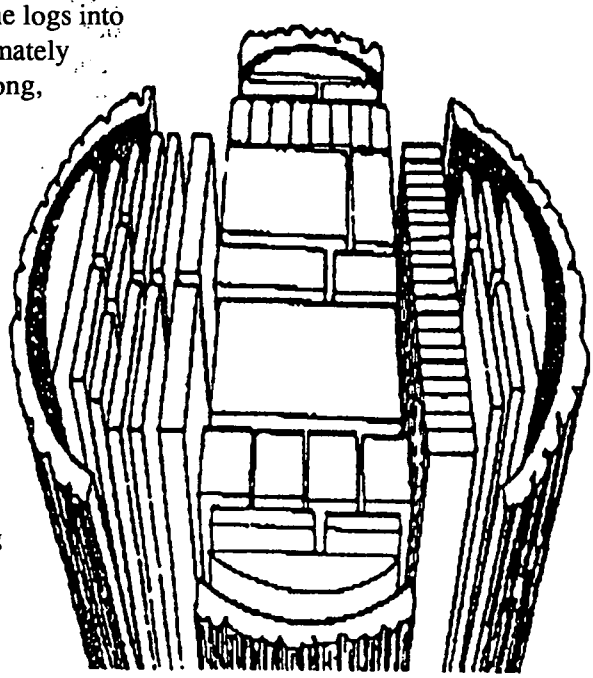
The wafers are dried, sprayed with adhesive, and formed into a mat. The mat is loaded into a press, where pressure and heat are used to densify the panel and cure the adhesive.

Wood density can have a pronounced impact on LSL or OSB production. Compressing the wood gives the final product a higher density than the wood's initial density. To work successfully, the original density of the wood must be sufficiently low that the wood does not resist compression and the final product is light enough to be moved by the end user. Wood species with a density of less than 39 lb/ft³ work well.

The density of most poplars, including hybrids, ranges from 25–30 lb/ft³ (Phelps). Therefore, hybrid poplars should work well for LSL and OSB. In fact, laboratory tests have shown this to be the case (Heilman, et al.).

So why aren't we growing thousands of acres of hybrid poplar in the Northwest for LSL and OSB mills? The answer is that there are no LSL or OSB mills in the Northwest.

The problem is raw material supply. These mills require an enormous supply of raw material to operate economically. Assuming a yield of approximately 91 tons/acre for a hybrid poplar plantation (Heilman, et al.), a "typical" OSB mill can use the equivalent of more than 2,400 acres/year (Spelter).



Until producers of OSB and LSL see hard evidence that this volume of raw material will be available over a long period of time in the Northwest, there is little chance they'll take the risk of building a new mill.

We have the chicken and the egg problem here. One possible answer is "if we grow it, they (the mills) will come." However, it's also possible that OSB and LSL producers fear pulp mills will outbid them for the raw material. Therefore, even "if we grow it," raw material supply still may be a problem.

Plywood

There are a few mills in the Northwest using Oregon's native poplar, black cottonwood, as core material for plywood. Like the OSB and LSL processes, plywood manufacture involves compression of the wood, although the amount of compression is far less in plywood than in OSB and LSL.

Again, low-density woods such as poplars work well for plywood core. K Ply, of Port Angeles, Washington, tested TxD hybrids (hybrid poplars produced from crosses of *Populus trichocarpa*—black cottonwood—and *Populus deltoides*—eastern cottonwood) for plywood manufacture. They found that TxD hybrids make excellent plywood (Heilman, et al.). There is some concern, however, about warpage of cottonwood veneer as it dries (Carroll, Hatch & Associates, Inc.).

Northwest plywood mills find it difficult to acquire hybrid poplar logs large enough to test. To date, most commercial hybrid poplar plantations aren't old enough to provide logs large enough for testing.

Unlike OSB and LSL mills, there are over 85 veneer and plywood mills in northern California, Oregon, and Washington (*Directory of the Wood Products Industry*). Therefore, a market for plywood should exist, providing logs are grown to an "adequate size."

With regards to the issue of adequate log size for plywood and veneer mills, Baldwin (1995) stated, "The definition of small underwent an evolutionary change during this period [1980 to present]. Small meant a 12 to 14 inch diameter in 1980. By 1990, six or more producers were successfully peeling southern pine in diameters as small as seven inches."

Clearly, the trend for the plywood industry is to be able to use smaller and smaller logs. How this translates into a rotation age for hybrid poplar plantations still is unclear.

Solid-sawn material

Much discussion has centered on the use of hybrid poplar for lumber production. As mentioned previously, other poplars are used for solid-sawn products such as boxes and crates, upholstered furniture frames, and lumber.

However, poplar wood has a tendency to warp during drying. In addition, there is a problem with grain fuzzing during machining due to the presence of tension wood ("abnormal" wood formed in leaning stems of hardwoods).

Interestingly, Heilman, et al. (1990) report that TxD hybrid poplars had ". . . 3) fewer defects affecting lumber quality and 4) straighter boles with less tension wood, a feature yielding more usable wood and better lumber quality." It will be interesting to see how hybrid poplar performs as more solid-sawn product trials are conducted.

There may be opportunities for hybrid poplar to be used as core stock for door and window parts. Manufacturers of these products overlay high-quality veneer over lower-quality core material.

In recent years, central Oregon mills have supplemented their raw material supply with radiata pine from as far away as Chile and New Zealand. It certainly seems, at least at first glance, that locally grown hybrid poplar could help alleviate the industry's supply woes. Again, product tests need to be conducted to determine whether hybrid poplar will be suitable for the millwork industry.

Last, but not least, is the export market. Heilman, et al. (1990) stated that "a potential market for hybrid poplar is lumber for export. Limited sawmill tests show hybrid poplar wood equals or surpasses black cottonwood, which is currently being exported for lumber."

There are reports that many Japanese buyers prefer light-colored wood lacking distinctive grain patterns. Most poplars fit this description.

Fiber products

Hybrid poplar also may be used for fiber products such as medium-density fiberboard (MDF) and hardboard. There are approximately 11 mills in Oregon producing MDF and hardboard (*Directory of the Wood Products Industry*).

The manufacturing process for fiber products is similar to that for LSL and OSB. A key difference is that fiber production uses **chips** instead of logs. Also, the chips are "ground" into individual wood

fibers and small fiber bundles versus the much larger flakes or wafers used for OSB and LSL.

Fibers are sprayed with adhesive and formed into a mat. The mat then is loaded into a press, where pressure and heat are applied to densify the panel and cure the adhesive.

Myers and Crist (1986) compared hardboard made from one hybrid poplar (No. NC-5260, or "Tristis No. 1") with hardboard made from native aspen stands. One disadvantage of the poplar was that, when chipped whole-tree, it produced more *fines*, an industry term for wood particles smaller than the desired size for the process. A high percentage of fines often results in reduced strength of the final product as well as increased use of adhesive and, therefore, higher manufacturing costs.

Using the dry-formed process, Myers and Crist found the strength properties to be about the same for panels made from hybrid poplar as those for panels produced from aspen. In summary, the researchers stated, "Tristis [the hybrid poplar clone tested] appears to be a suitable raw material for the manufacture of high- and medium-density hardboards by both the wet and dry forming processes."

One southern Oregon company recently experimented in its fiber operation with hybrid poplar chips purchased from James River Corporation in Clatskanie, Oregon. They found the material to work quite well. Their future plans for growing and/or buying hybrid poplar are unclear.

Conclusions

As interest grows in using hybrid poplar for producing wood products, so will the information base. As the wood products industry in the Northwest continues to suffer from raw material supply problems, interest in experimenting with hybrid poplar is certain to increase.

For more information

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