Opportunities In Hardwood Utilization

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Abstract

The range of products commonly manufactured from hardwoods is reviewed, along with an indication of the wood quality required. Reference is made to the deteriorating hardwood supply situation, and to two approaches to the problem: improved roundwood allocation, and more efficient processing techniques. The latter approach is discussed in some detail.

There are many opportunities for new forms of hardwood utilization, and there are many ways to improve hardwood utilization. As the inventory and the quality of our hardwood forests dwindle steadily, the development of more efficient conversion techniques becomes more important than finding new uses for hardwoods. We cannot use what we do not have.

Before dealing with improved conversion, however, I would like to review the many current uses for hardwoods, and to discuss substitutes, wood replacing other materials, and vice-versa. In terms of value, furniture is the most important use for hardwoods. In terms of function — who can say? Which is more important, the wooden floor, the wooden table, or the railroad tie? All can be replaced with substitute materials — at a price! Would you like to have nothing but chrome furniture and vinyl floor tiles? Hardwood is used in furniture in many forms — lumber, veneer, particleboard, and even fibreboard in the lower quality range. Plastic has a place here; the mar and stain resistant wood-grain plastic surface has vastly improved the serviceability of "wood" furniture for many purposes, such as hotel and motel furniture, and the kitchen table top. However, "carved" plastic decorative panels on the fronts of expensive cabinets are on the way out — the cost has gone up faster than the cost of wood panels, and many people prefer the feel and sound of wooden furniture.

In terms of lumber volume used, the pallet industry has rapidly grown into a giant. Roughly 40% of all hardwood lumber goes into pallets. Fortunately, lumber of fairly low quality is adequate for pallets, and therefore the requirements of this industry complement the requirements of the furniture industry, and the sawmiller can sell his entire output. This is also fortunate for the man who is managing a hardwood forest. It would be economically difficult to harvest much of our current, low-quality forest without the market for pallet lumber. About the only gainer would be the railroad — everyone would have piles of

ties for sale. Instead, the supply of hardwood ties is so low that the railroads are buying concrete ties and experimenting with laminated softwood ties.

In the same quality range as ties, we have mine packs and industrial blocking. The steel industry alone uses enormous volumes of low-quality 3 x 4-inch and 4 x 4-inch hardwood lumber for blocking steel on railroad cars and trailers.

Much lumber of intermediate quality goes into strip flooring, parquet, truck-trailer flooring, and boxcar flooring. The latter is often made of hard maple lumber laminated into panels (using spiral aluminum dowels) so that the edge-grain surface is exposed.

Innumerable small miscellaneous products are produced from hardwoods — handles, toys, cutting boards, and turnings for many purposes. And for many of these products wood is unbeatable. A well-known firm that switched to plastic blocks for their pushbrooms a few years ago, has just switched back to wood for all blocks over 14 inches long; the plastic just wouldn't stand up to the job, and its cost was rocketing.

Hardwoods are also important for veneer, plywood, and other products. For example, one can buy walnut wall paneling at \$20 for a 4 x 8-foot sheet, birch for \$9, or printed hardboard for \$7. For fruit baskets one can use wood veneer or cardboard. In both cases wood as a pulp has appeared at the lower end of the price range. Poplar waferboard has taken over a good part of the softwood plywood sheathing market; and much hardwood residue goes into particleboard.

Paper and cardboard manufacture consumes enormous volumes of low-quality hardwood; it filled the market void which developed when wood-burning stoves became a rarity in urban Canada. Without this market much of our hardwood forest would be economically inoperable. Many pulp mills that turned up their noses at dense hardwoods 10 years ago are now buying hardwood acreage because fibre yield per acre per year is so attractive.

How is the supply of hardwoods in relation to the many markets just outlined? Poor and getting poorer! In British Columbia many companies are looking forward to high-quality, second growth fir in 25 years; in the Southern States companies like Georgia-Pacific and Champion are already harvesting vast plantations of good-quality pine, and some "plus tree" plantations are almost ready. On the hardwood scene we are looking forward to residual hardwood junk that would

make today's forest look good. Although most furniture companies feel a lack of incentive to invest money in the management of hardwood forests, a few furniture companies are buying appreciable acreage.

The immediate problem is to make the best of what we have, and the solution must take two paths: more efficient allocation of roundwood to the available markets, e.g., veneer, lumber, or pulp; and more efficient conversion of this roundwood to the desired secondary product. Improved allocation can be a private arrangement between two companies, or it can be imposed by the provincial government (and this is very common). If the first doesn't take place, the second must. I recall an operation 65 miles from Halifax in 1951. I was standing on a magnificent, felled red spruce tree-length, 30 inches in butt diameter and 80 feet long, and holding in my arms a 16-foot balsam fir log with a 4-inch top diameter. The red spruce was going to the pulpmill and the fir log was being sold to a sawmill, something that would not happen today. So, you can see, we are making progress.

Improved conversion efficiency is the hardwood utilization opportunity with which I am most concerned, and my comments will deal with the production of lumber for furniture, rather than with timbers, veneer, or pulp. Many operations are involved: tree felling, log making, log protection during storage, sawmilling, lumber piling, lumber seasoning, lumber cut-up. Vertically integrated furniture companies, i.e. those operating their own sawmills, and possibly their own hardwood forest as well, are involved in all these operations, whereas lumber companies sell their product before or after seasoning.

Tree felling and bucking is itself an extensive topic, and I refer you to an excellent instruction manual entitled, "Felling and Bucking Hardwoods — How to Improve Your Profits" by F. J. Petro of the Eastern Forest Products Laboratory (EFPL). The concept of log grades is vital to proper bucking — it does not matter whether you actually intend to sell the logs by grade. If you want to maximize the yield of lumber or furniture components from the tree-length, you must buck to grade. A second manual by Petro, "How to Grade Hardwood Logs for Factory Lumber", will become available this summer.

The EFPL also has some publications dealing with log protection, and a comprehensive report is now in preparation. The worst case of non-protection that I ever encountered occurred about three years ago when the bottom suddenly fell out of the market. At one operation whole decks of prime yellow birch logs, 18 to 26 inches in top diameter, were left in the bush to rot. Two years later they were not worth touching.

Before discussing sawmilling, I want to explain the conversion benefits of vertically integrated processing. If a board is edged to maximize its value according to the National Hardwood Lumber Association (NHLA) Rules, a lot of perfectly clear furniture components are edged or trimmed from

Birch bolt sawn around on a band bolter to produce 2-inch stock, which is then ripped into squares on a circular-saw bolter. (M.553)

Birch bolt being carried through a circular gang saw by overhead carriage. Moderate kerf and high productivity. Live-sawn flitches go to a 4-saw circular gang with hold-down rolls for conversion into squares in one or more passes. (M.548).

the board, and consigned to pulp chips. The use of light edging in the sawmill (to remove the horns and bulges) can easily result in a 5% volume yield increase in the furniture plant (compared to that which would have been available had the lumber been edged to maximize value according to the NHLA Rules).

On the other hand, if the lumber is to be sold on the open market, optimum edging and trimming (which requires well-trained, intelligent operators) can easily increase the value (not volume) recovery per gross cubic foot by 10 to 25%, particularly in low quality logs. This value-versus-volume problem is a paradoxical situation which can only be resolved through vertical integration. The large value loss that often occurs through unintelligent edging and trimming cannot be over-emphasized. It can easily run to \$1500.00 per day in a large mill running two shifts.

A somewhat similar situation exists with

Live-sawing hard maple logs. (S-714)

Pallet load of finished hardwood dimension stock ready for shipment. Bundles are fastened with fibreglass tape. (M-95)

regard to the type of headsaw, Lumber recovery will be about 5 to 7% greater with a band headsaw than with a circular saw (due to the difference in saw kerf), but a small hardwood mill (sawing perhaps 2 MMbf per year) may make more profit with the circular saw because the capital cost is much less and the saw maintenance is much easier. This is particularly true of a mill sawing low-quality logs and producing a lot of

ties or mine packs (the difference in per cent recovery is less due to fewer sawlines).

One thing is true of all mill types; inaccurate sawing, from inadequate equipment or poor maintenance, leads to volume waste and dollar loss. In this connection the importance of a solid foundation for the tracks, proper alignment, and a sturdy carriage cannot be overemphasized. Less obvious but equally important is good visibility for the sawyer. He needs a shadow line (or light line) for guidance, and adequate lighting. In many small mills the investment with the largest potential return on investment is a coat of whitewash on the walls and ceiling.

Lumber piling is important, both for air-drying and for kiln drying. There is no point in bucking a log properly, sawing it accurately to produce a FAS board, and then converting it into a roller-coaster through poor piling. One of the biggest hardwood mills in the country has atrocious piling that is glaringly evident as you drive into the yard. Lumber seasoning is also important. In air-drying, it is hard to go wrong provided that you have a good pile foundation, proper piling, and a roof over the pile. In kiln drying, on the other hand, a full charge of lumber can be ruined in a few hours through some combination of operator incompetence and equipment malfunction. The importance of the kiln operator in a furniture plant is often grossly underestimated, and consequently a man of very limited ability is hired. As a result, the kiln is operated with all the finesse of a microwave oven heating hot dogs. One large company promoted its kiln operator to yard foreman; the new man took over the kiln controls at 5 p.m. on a Friday, and at noon Saturday we received a call for help. Two-inch lumber of a valuable species was hopeless honeycombed, to the tune of \$30,000. In my opinion the kiln operator is the next man below the plant superintendent in importance. Sometimes the undesirable effects of improper drying do not show up until the furniture is finished, or even until it is in the customer's home. Improper control of moisture content in furniture lumber causes more problems and dollar loss than all other factors (adhesives, machining, finishing, etc.) combined.

What does all this have to do with "opportunities in hardwood utilization"? Simple! Many people are aware of the dwindling volume and quality of our hardwood inventory. Few people however seem to be aware that much of what we do harvest is wasted, for one reason or another. And when lumber is wasted through improper drying, for example, not only is the raw material wasted but also the costs of felling, bucking, hauling, saw-milling, piling, and drying! It adds up!

There is another type of waste which is closer to the forester, and that is the waste that often takes place during the logging operation. We have just completed a productivity and yield study at a short-log carriage operation producing maple, beech, and birch squares from 5-foot bolts salvaged from a one-year-old cut! About 75% of the bolts came from standing residuals, and

the remainder came off the ground. This was some of the best roundwood I have seen in the past 10 years. Most of it was 12 to 20 inches in diameter, and had at least two clear faces. The pre-cut inventory indicated 22 cunits per acre, including 15 cunits of softwood. There is no market in the area for hardwood pulpwood. The original contractor removed only 2 Mbf/acre (just under 4 cunits) of hardwood in logs 8 to 16 feet long. The salvage logger removed 1.66/Mbf/acre (just under 3 cunits) of boltwood, 4 to 8 feet long. A survey after the salvage cut indicated that there were still 5 to 7 cunits of hardwood pulpwood

available, including material already felled. The mill was small and inexpensive, and yet it was turning out squares worth \$600/Mbf green, f.o.b. sawmill; at least twice the average lumber value for most sawmills. This took place in an area that has been periodically high-graded for years, and at a time when many small hardwood mills were being forced out of business due to lack of wood.

If you will try to reduce the hardwood waste involved in under-utilization and improper utilization of hardwood sites, the EFPL will try to help you avoid the waste involved in inefficient processing from roundwood to furniture.

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