

Making Dowel-Laminated Crossties With The Shaping-Lathe Headrig— It Should Be Profitable

By PETER KOCH

Railroads of the nation must soon install increasing numbers of cross-ties if rail-beds are to be maintained at an acceptable level. But the problem is that hardwood logs large enough to make one-piece 7- by 9-inch crossties will likely be in short supply. Fortunately, a process is available whereby plentiful small logs can be converted into the needed mainline ties.

In this process, a shaping-lathe headrig (Koch 1975) is used to produce half-ties for dowel-laminating into 7- by 9-inch mainline ties 8.5 feet long. The dowelled ties (Figure 1), components of which can be milled from logs only 8.3 inches in diameter, have given service equal to one-piece ties in 15-year track tests. Results indicated a 30- to 35-year service life (Howe and Koch 1976).

Where should a mill be located? An ideal site would be adjacent to an existing hardwood chip-mill that feeds an on-site fiber-consuming plant capable of using flakes 0.015- to 0.025-inch thick as well as conventional pulp chips of mixed species. A chip-mill feeding a medium-density fiberboard plant, for example, would be an ideal location.

Material Balances

Material balances for the proposed operation will be strongly affected by log-diameter distribution. In the

log yard of a typical Southern hardwood chip-mill, perhaps half the wood volume is in logs sufficiently large to yield a half-tie 4.5 by 7 inches in cross-section and 8.5 feet long. If these logs were diverted to the headrig, about 20 per cent of the total wood processed in the chip mill could end as crossties (Figure 2).

The shaping-lathe headrig should produce at least 1,320 half-ties per eight-hour day, or about 160,380 7- by 9-inch ties per year. The output should total about 10,425 tons (130 pounds per tie, oven-dry basis). It calls for a chip-mill annual through-

put of 52,125 tons of barky logs (oven-dry basis)—that is, about 215 dry tons or about 143 cords daily. Annually—on a one-shift basis—the operation would yield about 7,819 tons of bark and fines, 23,456 tons of pulp chips, 10,425 tons of flakes, and 10,425 tons of crossties.

Economics

Envisioned is a cooperative agreement between chip-mill owner and crosstie manufacturer whereby the crosstie manufacturer pays only for wood leaving the yard as crossties—but pays a relatively high price. Flakes would be returned to the chip-mill, and cull ties would be

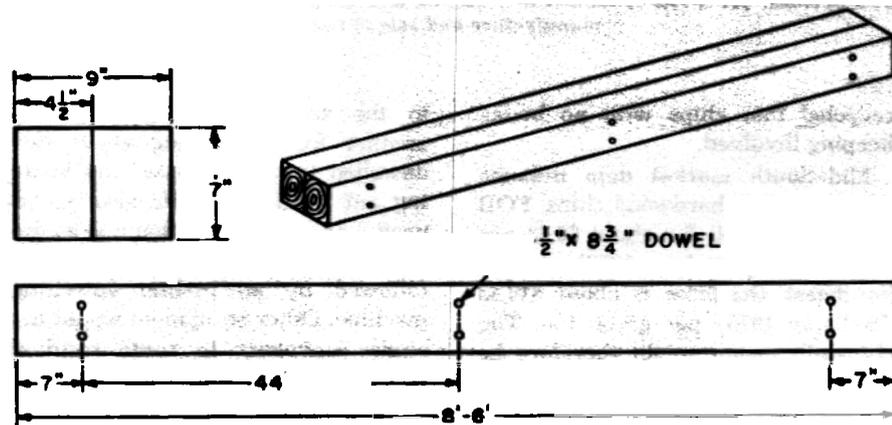


FIGURE 1.—Main line 7- by 9-inch crosstie laminated from 4.5- by 7-inch cants with six .5-inch spiral steel dowels.

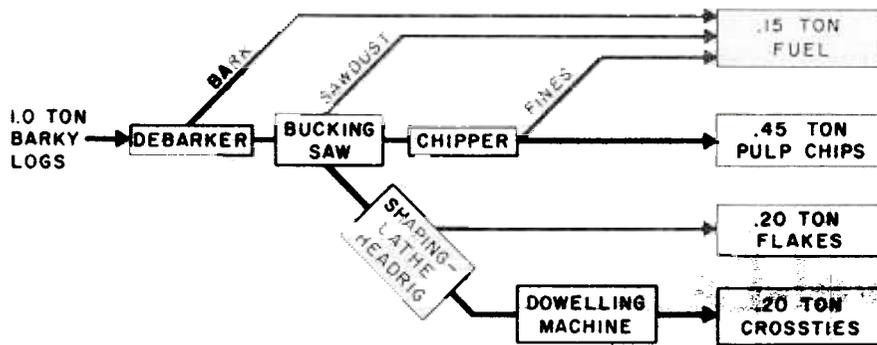


FIGURE 2.—Material balance (oven-dry basis) for hardwood chip mill in which bolts suitable for dowelled cross-ties are diverted through a shaping-lathe headrig. Flakes are returned for use as fiber, and cull ties are recirculated through the chipper.

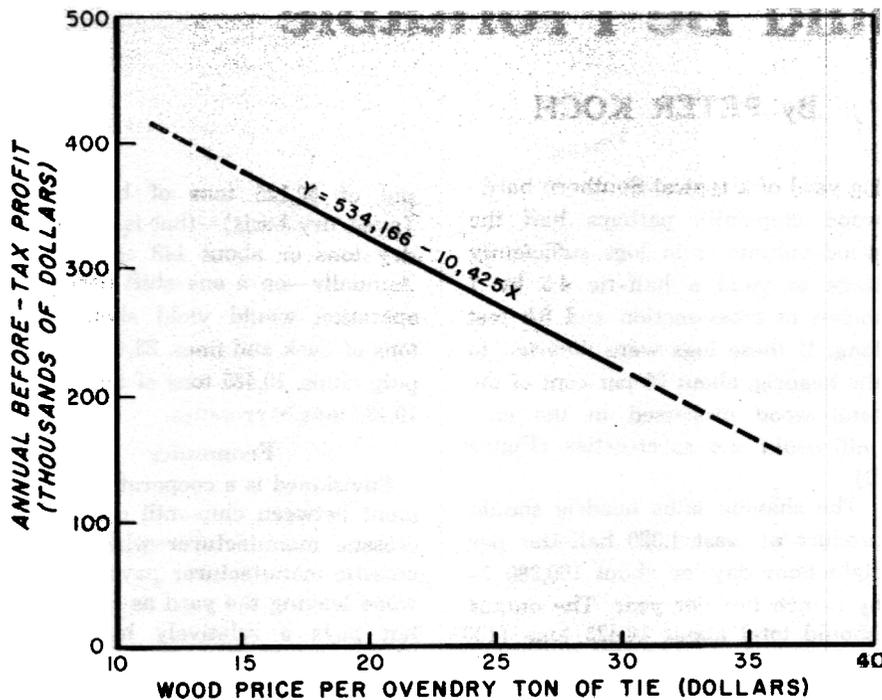


FIGURE 3.—Relationship between price paid by the cross-tie manufacturer to the chip-mill operator for wood contained in cross-ties, and estimated before-tax profit from manufacture and sale of ties.

recycled into chips with no book-keeping involved.

Mid-South market data indicate that bark-free hardwood chips, FOB chip source, sell for about \$9.73 per green ton (Bertelson 1976); in the Southeast, the price is about \$10.45 (Bellamy 1975) per green ton. The chip-mill owner might therefore be willing to accept \$15 to \$30 per ton (oven-dry basis) for wood ending as cross-ties.

The cross-tie manufacturer would need to install a bucking station in the chip-mill flow line, and storage facilities for a working supply of 8.5-foot logs suitable for half-ties. He would need a forklift capable of bringing four or five logs per minute

to the shaping-lathe headrig and another for off-bearing about two dowelled ties per minute, and loading out air-dry ties. He also would need an 8.5-foot shaping-lathe headrig, preceded by a log deck and followed by an in-line dowelling machine. Other equipment would include conveyors to route residual flakes to the fiber mill and cull ties to the chipper. In all, the capital investment would amount to about \$650,000. Ten-year straight-line depreciation of this investment might be assumed.

Direct labor required to run the cross-tie operation (distinct from the chip mill) would total about seven men, that is, log bucker, forklift

driver, headrig operator, headrig filer, dowelling-machine operator, off-bearer-shipper, and maintenance man. Total cost to employ each of these men might be estimated at \$15,000, annually for a total annual labor cost of \$105,000.

Overhead, including power costs, insurance, supervision, and sales costs is estimated at 200 per cent of direct labor, or \$210,000 annually.

Air-dry 7- by 9-inch, 8.5-foot-long dowelled cross-ties should sell at a price equal to one-piece ties. A net sales price of \$6.70 each (\$150 per MBF, FOB mill) is perhaps reasonable for the year 1978—the earliest date by which the proposed mill could be in operation. Half-inch dowells, 8.75-inches long, made of merchant quality M 10/20 hot-rolled steel, fluted one turn per 2.5 inches were quoted October 7, 1976, at 13.5 cents each FOB Akron, Ohio. Thus, the six dowels needed for each tie would cost 81 cents, plus freight to the tie mill. Since the dowels required to fabricate each tie will cost about \$1, the tie manufacturer should recover \$5.70 per tie exclusive of dowel costs. On this basis, the annual statement might be approximately as follows:

Net sales (160,380 x \$6.70)		\$1,074,546
Expenses		
Cost of material		
Wood (10,425 x \$22.50)	\$234,562	
Dowels	160,380	
	\$394,942	
Labor	105,000	
Overhead	210,000	
Depreciation	65,000	
	774,942	
Profit before taxes		\$299,604

Conclusion

Profitability of the proposed cross-tie facility is strongly affected by the price of wood. Within the likely range of wood prices during the near term, the operation appears to be viable (Figure 3).

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