A Look at the Road Ahead for Structural Panels

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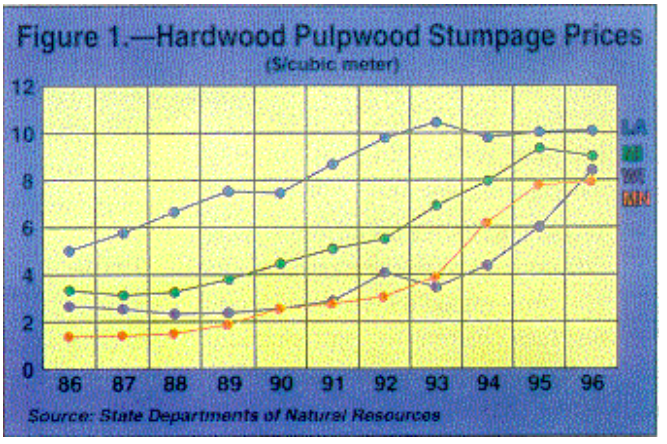
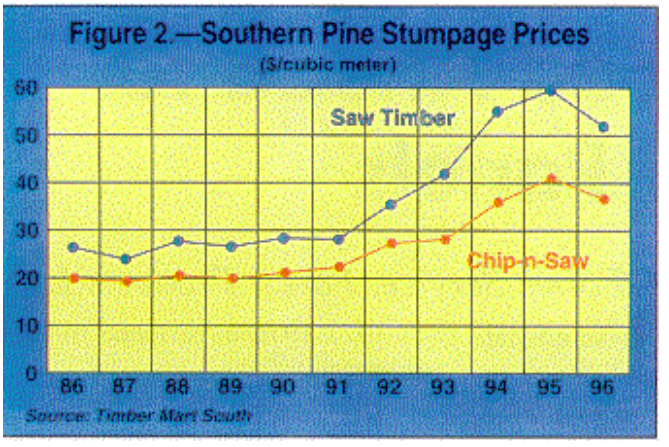
To what extent is market price a determinant in the future of the structural panels industry? Is OSB really preferable to plywood in sheathing applications, or is its growth simply a matter of market advantages? Can plywood be marketed as a premium sheathing product? In this article, Henry Spelter and Tim McKeever, of the USDA Forest Service Forest Products Laboratory, in Madison, Wisconsin, explore the relative costs of production and make some observations regarding market viability of various structural panels.

"The board industry's 'problem' last year was meeting demand. Demand outstripped supply to such a degree that almost every mill found itself in the position of having to turn down customers."

That commentary was written not about OSB, but about MDF and particleboard during 1973 when they were the vanguard of engineered wood products. In the spring of 1974, however, things changed. As inflation soared, so did interest rates, and the economy wilted. Demand for wood products sank and prices tumbled as manufacturers sought orders. In 1975, the situation worsened as housing stayed weak, while new plants arrived just as the immediate need for them vanished. Five new mills started in 1973, eight in 1974, five in 1975 and six more in 1976 before the spigot was turned off. The result was a deep slump, with capacity utilization dropping to about 60 percent in 1975. As new mills cranked up, older ones closed. Eventually, the economy recovered and the industry returned to profitability, but not before a shakeout caused 14 major and an unknown number of minor plants to close. The current rush to OSB invites speculation as to whether a similar scenario is about to unfold. In considering this prospect, there are some similarities, but also some differences, between the situations then and now that bear scrutinizing:

- Capacity expansion is one similarity. Between 1973 and 1976, the 24 new board plants represented an increase in potential supply of about 36 percent. The 24 new OSB and 2 plywood plants that have been built or are planned for the period 1994-1997 represent about a 27 percent capacity increase. When capacity gains from expansion of existing plants are added, the gain of nearly 30 percent is close enough to the 1973-1976 experience to raise warning flags.
- The economy, however, is one difference. Home construction is a key determinant of panel demand. The interest-rate-sensitive housing industry was vulnerable to fluctuations in the seventies because inflation was more rampant than today and interest rates were thus much higher. The present low-inflation, low-interest rate environment has allowed steadier economic activity and reduced the chances of the floor dropping from under housing, favoring the current situation.
- Status of market penetration is somewhat similar. By 1973, the floor underlayment and mobile home decking markets for boards had matured. Industrial markets, representing about 60 percent of the total, were still growing, but more slowly than in the sixties. Currently, sheathing of light-frame structures is the biggest application for structural panels and OSB and plywood dominate

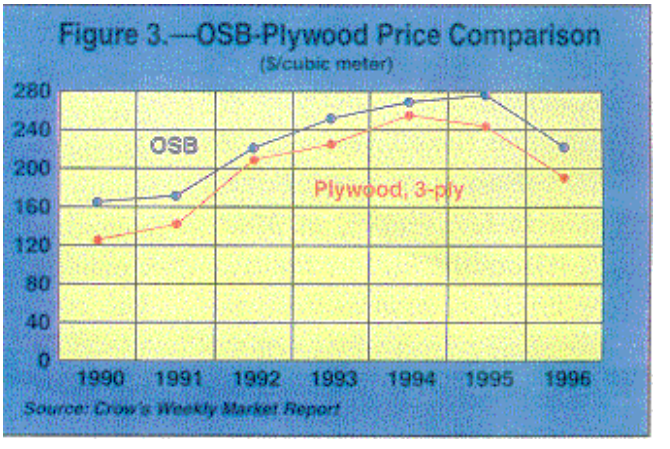




the market, leaving little room for growth except at each other's expense. However, OSB has already captured a large share of this market. A forthcoming study by the Wood Products Promotion Council and the FPL shows that in the Midwest and Northeast the OSB share of sheathing markets is close to 100 percent; In the South and the West, where the plywood industry is entrenched and some building codes restrict OSB use, the split is about even. There are other opportunities, such as overseas and specialty markets, (i.e. I-beam webs), but these are relatively small compared to the amount of new capacity. Overall, the potential of OSB to grab market share is declining compared to the eighties and early nineties.

- Wood cost increases are somewhat different The energy crisis of the seventies raised the value of wood residues, increasing particleboard costs even as demand weakened. While wood prices dropped for plywood, particleboard plants faced generally steady to rising furnish costs. Today, the value of smaller logs used in OSB manufacture is also rising (figure 1), but the increase has been more or less proportional to the increase in larger log costs (figure 2) so that the relative status of OSB has not deteriorated significantly vis-á-vis plywood.

Thus, although the effect of the new capacity on prices has begun to be felt (figure 3), the outlook for structural panels is not altogether bleak, given prospects for steady demand. To illustrate the evolving demand/supply situation, we expanded upon our previous studies of structural panels by considering current manufacturing costs at each plant. When these costs are sorted in ascending order, and plotted against cumulative capacity, the resulting graph forms an industry cost-of-supply schedule. Matching this against expected demand gives some indication of the likely direction in production and price that can be expected as the new capacity comes on line.



Several comments should be made about our data. First, we use metric units partly because it is the Forest Product's Laboratory's policy, but also because it seems like a desirable thing to do in its own right, given the variety of nonuniform and inexact units of measure used in the United States. A table of factors is given to help those unfamiliar with metric units make conversions.

Second, our data were obtained mainly from public sources. Development of this study benefited greatly from the comprehensive mill reports published over the years by the various trade journals. The US Bureaus of the Census and Labor Statistics, the Department of Energy and the Environmental Pro-

Table 1—Conversion factors from metric to U.S. measures

To Convert:	To:	Divide by:	or Multiply by:
Centimeters	Inches	2.540	0.394
Cubic Meters	M. sq. ft. (3/8")	0.885	1.130
Cubic Meters	Cords*	2.410	0.415
$\$/m^3$	\$/msf (3/8")	1.130	0.885
$\$/m^3$	\$/msf (7/16")	0.969	1.032
$\$/m^3$	$\$/100\ ft^3$	0.353	2.833
$\$/m^3$	\$/cord	0.415	2.410

**Based on 85ft^3 solid wood per cord. If another vaule (x) is used, then x/35.5 gives the divisor, the inverse the multiplier.*

Table 2—Avg. Structural Panel Costs, By Product ($/m³)

	OSB	South Plywood	West Plywood*
Labor	21	42	54
Wood	54	124	150
Adhesives	26	11	14
Energy	17	11	9
Supplies	27	21	22
Depreciation	16	4	3
Overhead	11	10	11
Tariff	—	—	2
By-products	(—)	(23)	(27)
Total	172	199	238

*Including Canada
Source: Forest Products Laboratory

tection Agency (EPA) were key sources of information. Provincial and state forestry services provided timber cost data where private sources were not available. We were also aided by many industry personnel who generously shared their knowledge about recent industry conditions. Finally, our own published data on panel industry capacities form the core of this analysis.

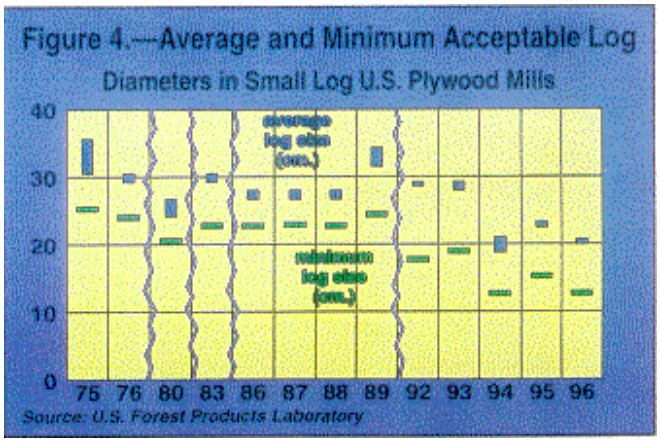
Third, the costs represented here are meant, to the extent allowed by the information we could gather, to portray costs for "sheathing," not for the entire mix of grades made in an OSB or plywood plant. Also, the costs are based on prices and wages for the second quarter of 1996 as described below and summarized in table 2. All values are in US dollars, so Canadian data were converted and applicable tariffs applied.

LABOR

Costs vary by region and product. Wages in the US South are generally 20-30 percent lower than in the US North and Canada, and unit labor costs are generally twice as high for plywood as for OSB which averaged $21/m^3$, but were as low as $13/m^3$ for some plants. The large size and variability of veneer in contrast to the compactness and relative homogeneity of strands is the main reason why veneer processing is more labor intensive. Close coupling of dryers to lathes has not proved practical, so the peeled veneer has to be clipped, stacked and stored before it can be dried. Likewise, lay-up and pressing require more handling than the automated OSB process. We note, however, that there are other labor costs in plywood plants (i.e. for plugging, patching and sanding) that are not assignable to sheathing. When plywood manufacturing costs are apportioned according to grade, the labor component of sheathing can be 1.5 percent or more lower than the average for the plant. Our data on the staffing of plants were not so detailed as to allow us to make such adjustments, however, and this should be borne in mind when making product comparisons.

WOOD

We based our estimates of wood costs on pulpwood prices for OSB and on sawtimber and chip-n-saw log prices for plywood. Since the advent of OSB, plywood mills have either refocused their product mix on higher grade specialties that are less in competition with OSB (and where sheathing is almost a by-product) or refitted their plants to handle smaller, less expensive logs. The latter requires that the lathe be speeded up to keep the downstream work centers adequately supplied. Generally, a rate of 10 blocks per minute seems to be necessary to make small log peeling feasible. Indicative of the adoption of such equipment are the declines in the block sizes among some small log mills, both in the averages being peeled and in the minimums being accepted (figure 4).



Accordingly, for those plywood plants focused on specialty and sanded items, we used local sawtimber prices for costing wood; For small log, sheathing oriented mills we used a combination of sawtimber and chip-n-saw log prices. Wood cost estimates ranged as low as $108/m^3$ for some southern mills

which gave net wood costs of $88-90 per m^3, after deducting revenues for residues. OSB wood costs ranged from the upper $40's to the upper $60's per m^3.

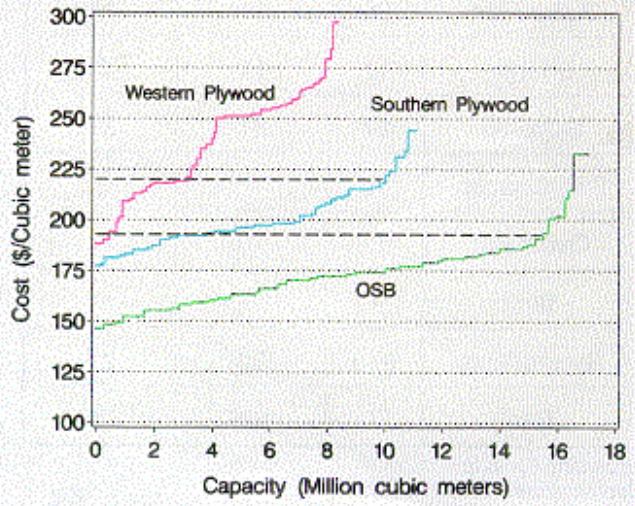
ADHESIVES

Adhesive costs among OSB mills vary according to the type of resin used. There are three principal categories: phenol formaldehyde (PF) powder, PF liquid, and diphenyl methane di-isocyanates (MDI) in the core and PF (usually liquid) on the surfaces. For plants where straight PF powder is used, rates of 1.9-2.0 percent are typical for sheathing grades and such use rate yielded costs of about $16/$m^3$. For those that use straight PF liquid, use rates of 3.2-3.3 percent are normal, yielding a cost of $ 17/m^3. We assumed similar rates of use for the handful of mills that use a mix of PF liquid and powder resins. The usage rate for MDI was assumed to be 2 percent which produced the highest costs at around $26/$m^3$. Wax is generally added at a rate of 1.5 percent and adds about $6 per m^3. We calculated plywood adhesives costs on the basis of three ply construction for the South and 4 ply for the West. These yielded $11 and $14 per m^3, respectively.

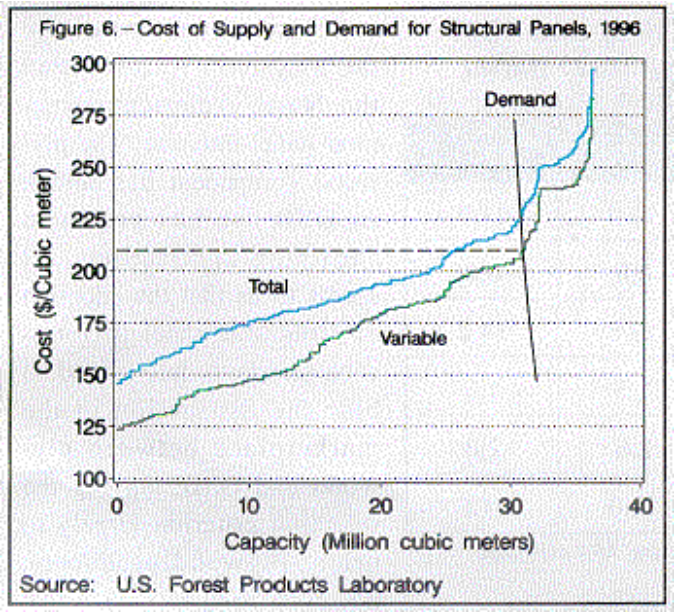
ENERGY

Over the years, the structural panels industry has made much progress toward greater energy efficiency. Plants are mostly self-sufficient in meeting their process heat needs, and fossil fuels were generally needed only as backup and for powering rolling stock. Thus, mills' energy costs derived primarily from purchased electricity. One of the

Figure 5.—Cost of Supply for Structural Panels, 1996



Source: U.S. Forest Products Laboratory



bigger changes within the past few years, however, has been the stepped up regulation of emissions of volatile organic compounds and other pollutants. This has had a considerable impact on the newer OSB segment. The technology chosen for most plants has been Regenerative Thermal Oxidizers (RTO's) which cost from 0.2 to 0.3 million dollars per year to operate and can increase a large plant's energy bill by more than one million dollars. Plywood mills have not been as greatly affected because, as an older technology, they are grandfathered. Should new equipment that increases emissions by more than 40 tons per year be installed, however, they would be obliged to conform. With one exception, those plywood plants that have installed such equipment have chosen Regenerative Catalytic Oxidizers (RCO's), which are regarded as less expensive to operate. Overall plywood energy costs were estimated at around $11/m^3$ for southern plywood and, because of lower electricity costs, at $9/m^3$ for western plywood. For the OSB segment, we estimated $17/m^3$.

OTHER COSTS

Other costs consist of taxes, insurance, administrative overhead and depreciation. The biggest difference among plants within this category is depreciation. Older plants that have been largely written off carry mainly the cost of retrofitted equipment. New plants, costing as much as $100 million, thus carry a heavier burden.

Combining all the above gives total costs as displayed in figure 5. Each plant's production cost is rep-

resented by a horizontal line segment which is proportionate to its capacity. Stacked together, they provide a rough map to the relative economics of each plant compared to its peers and across the OSB, southern and western plywood spectrum.

From the viewpoint of pricing, however, the critical measure is variable cost, since the decision to cease operating in the short run is generally triggered by prices falling below out-of-pocket expenses. In figure 6, we combined all the plants into one continuous total cost "curve" and added another representing variable costs. By superimposing a projection of demand, centered on 1996 data contained in table 3, we obtained the equilibrium price at the point where the demand and variable cost lines meet. This occurred at $210/m^3. Applying to this historical differentials between the prices of OSB and plywood yielded projections of $220/m^3 for plywood and $193/m^3 for OSB.

Returning to figure 5 and tracing these prices to their respective total cost of supply curves, it is evident that 1996 was fairly profitable for most of the southern plywood and OSB industry. But only about 40 percent of the western plywood segment would have been profitable at these levels, indicating the importance of specialties (concrete form, siding, decorative panels and other upgraded products) to this portion of the plywood sector. Likewise, high cost OSB plants are now largely engaged in the manufacture of specialties, a diversification which has had a mixed record.

Table 3—Projected 1996 and 1997 North American structural panel demand (million m^3)

	1996	1997
U.S. Housing	12.2	11.7
Canadian Housing	0.8	0.8
U.S. Other	13.8	14.2
Canadian Other	1.5	1.5
Offshore	2.6	2.8
Total	30.9	31.0

Source: Forest Products Laboratory and APA estimates

We repeated this exercise for 1997. To keep the focus on profitability, we kept underlying costs constant. We only changed capacity to reflect five new OSB mills scheduled for startup in 1997 and one western plywood mill that burned as this was written, used the slightly higher 1997 demand projections and factored in the scheduled duty reduction on plywood from Canada. An equilibrium price of $203/m^3 resulted, $7 lower than in 1996, suggesting the likely drop in profit margins due to these changes.

In summary, the near-term increase in new structural panel capacity is likely to exceed the near-term growth in demand. The discrepancy should exert downward pressure on structural panel pricing in 1997, continuing the trend begun in 1995. However, at the projected robust level of demand, 1997 should still provide acceptable profits for most plants. But the risks in the market have increased. Unexpected economic shifts causing a housing recession would also leave the panels industry vulnerable to the kinds of disruptions, closures and losses that occurred in 1975.

Of greater importance are the long term trends within the North American structural panel universe. The plywood component has shrunk as OSB use has grown in sheathing applications. It seems to us that the adoption of structural panel performance standards has tended to blur the distinction in the marketpiace between plywood and OSB, leaving the selection criterion largely to price. Plywood producers, however, need to realize that it is probably beyond their capability to match mega-OSB plants on costs. The fundamental question they should ask themselves is, "To what extent is plywood a premium product for sheathing applications?" Are there basic advantages in physical properties and performance, justifying a premium for panels made out of 3-5 large "strands" as opposed to thousands of small ones? If yes, then this should be vigorously asserted in the markets to maintain a separate product identity. Letting price alone dictate product choice risks continuing the hemorrhage of veneered panels' market share as newcomers, who have the advantage in knowing what cost levels will achieve a favorable market position and can design and locate plants to attain such levels, continue to enter. ■

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