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Ideas for Increasing Sawmill Profitability

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Several means for increasing sawmill profitability are presented in this paper. Each requires time and effort to implement; some require a large capital investment, while others require very little cash. With these ideas, you should be able to invest a little and make a lot!

SAWMILL PROFITABILITY

There are three general approaches to increasing profitability:

- ► Decrease expenses
- ► Increase income
- ► Improve efficiency

Ideas for improving profitability will seem most logical if we understand the profit equation. It tells us exactly where to look for savings opportunities. The profit equation can be written as:

PROFIT = PRODUCT VALUE - PRODUCT MANUF. COST (1)

But, remember that product value is more than the retail selling price of lumber, and product manufacturing cost is more than the cost of raw materials:

PRODUCT VALUE = final primary product value
+ residue value (chips, etc.) (2)

PRODUCT MANUFACTURING COST = raw material (log) cost
+ operating cost + broker's fee
+ cash discount + risk factor
+ shipping cost (3)

For a typical mill, therefore,

PROFIT = final product value + residue value
- log cost - operating cost - broker's fee
- discount - risk factor - shipping (4)

Consider an example of hourly profit using some realistic numbers:

Production = 2.2 MBF lumber/hour;
produced from 2 MBF of logs
Product value = $500/MBF
Residue value = $10/MBF of lumber produced
Log cost = $375/MBF
Operating cost = $261/hour
Broker's fee = $12/MBF of product
Cash discount = 1.5% of product value
Risk factor = 2.0% of product value
Shipping cost = $5/MBF of product

then,

HOURLY PROFIT = (2.2 x $500) {product value}
+ (2.2 x $10) {residue value}
- (2 x $375) {log cost}
- ($261) {operating cost}
- (2.2 x $12) {broker's fee}
- (2.2 x $500 x 0.015) {discount}
- (2.2 x $500 x 0.02) {risk factor}
- (2.2 x $5) {shipping cost}

= $35 (5)

Several conclusions can be drawn from this example:

- A 7-minute shutdown (with constant operating costs of $261/hour) reduces profit for that hour to $0.

- A 1% increase in product value or volume recovery increases profit by 30%.

- A 1% reduction in operating costs increases profit by 7%.

- A 1% increase in production volume (speed) increases hourly profit by 8%.

- A 1% decrease in log costs increases hourly production by 21%.

The most important point revealed by these data is that

an improvement in product value or efficiency nets 4 times more profit than the same percent improvement in production rate or the same percent reduction in operating costs.

This paper, therefore, concentrates on ideas for improving product value and mill efficiency.

IDEAS FOR DECREASING COSTS

Because processing costs adversely affect profit, decreasing costs will necessarily increase profits, provided the cost-reduction measures do not reduce product value. Equation 3 (page 1) shows a breakdown of the components that make up a typical mill's overall production cost. Several of these components can be further broken down and examined for cost-saving opportunities.

Log Cost/Quality. The most obvious place to look for savings is in raw material costs. Mills need to avoid paying high, or even moderate, prices for low-grade logs. Bacterially infected logs and logs from gypsy moth-killed trees should not command the same price as 'healthy' logs. Pay only for the uninfected portions of logs with bacteria present - bacterial infections usually affect only a portion of a log, but lumber from that portion is unacceptable. A Pennsylvania State University study showed that volume losses from gypsy moth-killed trees were substantial. Trees harvested immediately after death will suffer no lumber recovery loss (that is, will yield 100% of the lumber volume of a healthy tree). After standing dead only one year, however, the net lumber recovery volume can drop to 78%.

Equally important as "getting what you pay for" when purchasing logs, is not allowing the quality of the logs to deteriorate while waiting for processing.

The most widespread, yet most avoidable, problem is end checking. It is not uncommon to see that two inches at the end of every log in the yard has developed checks. This amounts to a 2 to 3% loss in usable lumber. End coatings are available, effective and efficient. Their cost is more than offset by the savings in volume loss. If an end coating was used in our example, the furniture or cabinet company would require 60 fewer board feet of raw material than if the logs were not coated -a savings of over $30! The cost of end coating? About $3/MBF. With it, hourly profit would jump 45% to $51! End coating on white wood species like yellow-poplar will also reduce the likelihood of end stain.

Mill Operation. Inside the mill, there are several opportunity areas. Can we produce the same end product using lower-grade, lower-cost logs? We probably cannot efficiently process low-grade logs with our conventional equipment and conventional practices. But, there are several modifications that can be made to an existing mill to permit efficient utilization of lower grade logs. One is to add a chipping slabber to the headrig. Another is to use more efficient sawing procedures - consider the effect of sawing pattern on lumber grade. If we compare the random positioning of logs on the carriage to a selected positioning procedure (see Table 1), there is a 15% improvement in the value of the lumber produced in the selected positioning procedure. It's like raising the grade of the log without spending extra money for logs or equipment. And, better grade logs produce higher value lumber. A new UW-Madison Sawyer Video is available for training sawyers in best positioning procedures.

Finally, a second, specialized headrig line can be added to handle low grade logs. This would allow the primary headrig to be more profitable by processing only medium and high quality logs. Developing a new product line that can use low grade material - for example, low grade 4x4s for landscape timbers - can also be profitable.

Employees. Certainly, raw materials are a major expense - 70% of total cost for many mills; how employees affect yield of products is, therefore, critical. It is often profitable to institute management techniques that improve employee motivation and morale, and thus, increase productivity. Some simple motivational tools include using a name sign at the operator's station, clothing with the mill logo, and free dinner for two at a local restaurant. The latter two could be used to reward good performance.

Energy. Another easy target for cost-savings consideration is energy use. Understanding energy usage patterns as they relate to a mill's total electric bill is so important, it is treated in a separate publication, *Forestry Facts #61, "Energy at the Sawmill: Conservation and Cost Reduction."* Reducing peak electric demand usually results in much greater savings than reducing the total amount of electricity used. Energy savings, however, will be harder to achieve than value or efficiency savings.

Table 1: Comparison of two sawing patterns for medium quality logs (from a Purdue University study).			
	%FAS & Sel.	% No. 1 & Better	Lumber Value[2]
Random Position	18	52	$694/MBF
Selected Position[1]	30	61	$795/MBF
[1]Log is rotated so defects are on the edge of the faces; the log is open on the worst face with no taper set used.			
[2]Based on 1993 average lumber prices; rising prices will increase the differences.			

IDEAS FOR INCREASING INCOME

Another approach to increasing profitability is to increase the value, or price, of the product. Product value is correlated positively to profit - an increase in value increases profit, provided the cost of improving the product does not exceed the increase in value.

Customers' Needs. Product value can be increased either by improving the quality of a product or by making and marketing a different product. A key component of developing new products and improving quality is to visit the customers' plants to learn what happens to the lumber or lumber product after it leaves your mill. By knowing the nature of subsequent manufacturing, you can tailor your product to the exact specifications your customers' desire.

One example of knowing your customers' needs is illustrated by a recently completed study, in which unedged (except for the large bumps), untrimmed lumber yielded 24% more furniture parts (worth over $2200 per MBF) than the same pieces would yield if manufactured into conventional lumber. If your customer is cutting lumber into parts, aren't you edging and trimming away useful material? You could arrange with your customer, for example, to provide lightly edged lumber that is marked with a grading crayon where it would normally have been edged, and agree to grade the marked area instead of the entire piece.

Quality Improvement. Study and learn the quality characteristics that customers think are important. According to a Virginia Tech survey, accurate grading and thickness consistency are at the top of the list of quality expectations. Other important characteristics included absence of surface checks, straightness of lumber, and consistency and accuracy of moisture content. Improvements in sawing (see next section) can improve thicknesses; strict adherence to kiln schedules and approved drying procedures will improve the others.

New Products. Producing a new product, which usually means increasing the amount of manufacturing done at the sawmill, can be as simple as adding a kiln for producing dried lumber instead of green lumber, or as complex as reworking the entire mill to produce milled products instead of kiln-dried lumber. The closer a mill takes wood to its final product form, the higher the profit per board foot of lumber.

Consider several examples of new products. One firm remanufactures dried lumber into tongue-and-groove wall paneling by resawing, planing and molding 4/4 lumber. Another remanufactures kiln-dried lumber trim into wooden pencil boxes that sell for the equivalent of $4000/MBF. Another makes molding and other millwork products used for refurbishing corporate jets. Yet another makes millwork for fast-food restaurants. Another makes small pieces of wood for plaques.

In short, specialty markets are very profitable for a mill. It is axiomatic that the harder the market is to find, the greater the profit. Perhaps begin looking for new markets by scanning home and remodeling magazines. Appreciate that, in the U.S., we have 50 million homes over 25-years old.

Perhaps scan the yellow pages or local industrial register (available from state economic development offices) for potential wood users.

IDEAS FOR INCREASING EFFICIENCY

Mill Assessment. It is often advantageous to have a professional analysis of the mill and its management. Make sure the analysis covers both production efficiency and marketing practices. As a start in this effort, begin by looking at the mill in terms of processing locations and ask yourself how each process affects profits.

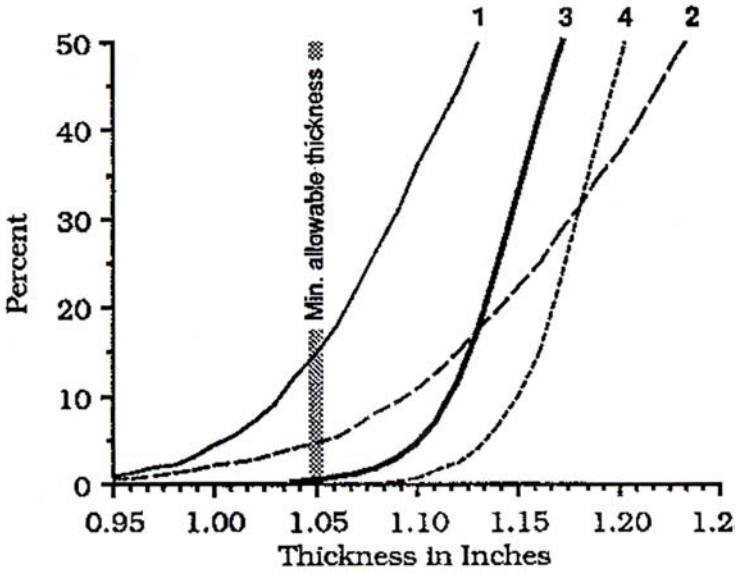
In Wisconsin, UW-Extension staff will assess mill performance and provide advice on plant expansion. The assessment covers volume and grade yields, and includes a thickness analysis and a comprehensive, overall evaluation. Another very good tool for assessing the benefits of mill changes is a computer program called MICROSIP, which will calculate returns on investments.

Thickness Control. One strong payback area for many mills is in thickness control (which is also a major concern of customers). The best mills' lumber will vary no more than ±0.06 inches from the average thickness, while typical mills vary by ±0.18 inches. Without much expense, improved thickness control can save up to 8% per year. Specifically, a 4% volume gain can be achieved with linear positioners on the carriage, yet another 4% with computerized setworks. Many old mills

without linear positioners can achieve a 4% gain by installing a computer on an old headrig. Others can gain 2 to 4% merely by "tightening-up" the mill and fine-tuning the target sets.

Consider the variation data in Figure 1. The graph represents four different mills supplying the same producer with the same lumber product. The curve shows the percent of the lumber at or thinner than a given thickness; 50% (the top of the graph) represents the average thickness. Mill # 1 probably has good yields, but 15% of the lumber is too thin (under 1.061 for the customer. Mill #2 has a high average thickness and is producing much thicker lumber, on the average, than its competitors. The higher the average thickness, however, the lower the yield and the lower the profits. Mill #3 is the best - a low average thickness, yet no thin lumber. Mill #4 is nearly as good as #3, but is needlessly producing lumber 4% thicker (0.04 inches) than mill #3 - 4% thicker means 4% less yield. (Dr. Wengert will analyze individual thickness data upon request. Contact LTW-Madison for details.)

Figure 1: Outputs of four mills supplying the same producer the 'same' product: 1.05-inch minimum thickness lumber.



Edging and Trimming. Consider the potential for improved edging and trimming. At several representative hardwood mills, unnecessary volume loss at the edger averaged over 10% (One mill had a 17% loss!) and unnecessary value loss was over 30%. If only 1 in 4 pieces goes to the edger, this is a 4% volume loss overall, or about $15,000 lost per million board feet produced. The grade loss is even larger--$35,000/MMBF of production. At one mill, however, the edger operator was acquainted with the grading rules, and he was achieving 83% of the value and 100% of the volume! Education can pay off! (Consider sending edgermen and trimmermen to edging and trimming classes and/or grading short courses.)

Kerf. Another idea is to narrow the kerf. With surface roughness, sawing thickness variations, and the actual thickness of the teeth, a conventional circular saw removes over 0.3 inches of wood - 14 to 19% of log volume is converted to sawdust. The smaller the log, the higher the percentage volume loss. Newer carbide and Stellite saws frequently cut only a 0.14-inch kerf, some only 0.102 inches. With improved saws, the lumber surfaces also come out smoother, reducing planer allowances for furniture, mill-work, and cabinet plants. The changes can easily net a 50% reduction in wood volume lost to sawdust.

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