

LESSONS ON TURNING **LOGS INTO LUMBER** FROM THE GREAT PORTABLE SAWMILL **SHOOT-OUT** 1999-2005



BY IRWIN POST

Calling the event a Shoot-Out does not do justice to all that can be learned from viewing it. The name Shoot-Out implies that the event is a race to see which entrant can saw the fastest—and that IS a part of it. But in reality, sawing speed is just one of many criteria to consider when selecting a sawmill (see “The ABC’s of Selecting a Sawmill, Parts I and II” (Issues 4 and 5; April/May, June/July 2000), and there is far more to successfully operating a mill than turning logs into lumber quickly. Here are some highlights of lessons from past Shoot-Outs concerning safety, operating methods, lumber quality, yield, and production rates.

MILL OPERATION AND WOOD FLOW

The handling of logs, lumber, slabs, edgings, and sawdust is an integral part of turning logs into lumber. The Shoot-Out offers an opportunity to observe how all of these are handled with any given mill.

How easy or hard is it to:

- ▶ Load logs onto the mill?
- ▶ Rotate logs and cants?
- ▶ Clamp or dog logs?
- ▶ Set toeboards for log taper?
- ▶ Adjust the mill for the next cut?
- ▶ Pull slabs?
- ▶ Deal with edgings?

And consider:

- ▶ Where does the sawdust go—and how frequently will it need to be shoveled?
- ▶ How much lifting is involved and at what heights.
- ▶ How good a view does the sawyer have of the sawing process and the cut surfaces?

The answers to these questions vary for different types of mills and for different mills of the same type.

It is important to remember that getting a blade to go through wood is only part of a sawmill operation. All the handling takes time and work. The big advantage to hy-

draulic log handling, etc., is that it reduces the amount of physical work needed to perform various tasks, and in some cases, reduces the time it takes to do the tasks. Trade-offs in selecting a mill include the number of workers you will have available, the size of the logs you will saw, the size of the products you plan to saw, how frequently you plan to run the mill, how hard you are willing to work, what support equipment you have or will acquire, and, of course, the cost of the mill.

LUMBER QUALITY

The quality of lumber and how easy it will be to use for its intended purpose are directly related to how much it is worth. For the purposes of the Shoot-Out, boards are not evaluated for lumber grades based on knots and other defects. Boards are, however, evaluated to determine whether or not they (or a scaleable portion) are within the specifications for acceptable lumber for the Shoot-Out.

Acceptable board sizes, allowable amount of wane, and width and thickness tolerances are set for each Shoot-Out. Each board produced during the Shoot-Out is evaluated to determine what portion, if any, is within the specifications, and the total scale of the acceptable lumber is computed for each mill. This figure enables calculation of the production rate (board feet produced per hour) and yield (board feet of lumber divided by the board feet predicted by a log rule).

LOGS INTO LUMBER • LESSONS

Every mill entered in the Shoot-Out is capable of sawing excellent lumber, just as every mill can produce lumber that doesn't meet specifications. The reality is that whether or not any given board meets specifications has more to do with the sawyer and tailer than the mill.

- ✓ Is the mill properly adjusted?
- ✓ Is the blade sharp?
- ✓ Is the feed rate appropriate so that the blade does not deviate too much and produce miscut lumber?
- ✓ Do the sawyer and tailer understand the scaling rules so that they can identify boards with too much wane?
- ✓ Do they have an eye for picking out errors so that, for instance, under- or over-width boards can be re-edged?
- ✓ Does the sawyer take the time to stop and make adjustments or change or sharpen the blade when needed?
- ✓ And can the team do this under the pressure of a ticking stopwatch and hundreds of watching eyes?

Once all the mills have finished sawing and spectators are allowed into the sawing area, a group of people always forms around the scaler and his assistants—a note keeper and one or more lumber handlers. These people learn what the scaler is looking for and can see how boards are evaluated and measured. Many comment on how valuable it is to watch the scaler in action, and how that will help them improve their own sawing.

In the real world of sawing lumber, it is important that every board sold to a customer meet the specifications. Otherwise, the customer will find that good money has been paid for unusable (or difficult to use) lumber. This makes for an unhappy customer who will likely go elsewhere in the future, and who may tell others about their unsatisfactory experience. Therefore it is important for mills to have excellent quality control to ensure that all orders are filled with lumber that meets specifications, and to produce a minimum amount of lumber that doesn't meet specifications.

YIELD

Yield is a measure of over-run or under-run. As mentioned earlier, yield is calculated by dividing the board feet of lumber sawn by the board feet contained in the logs as predicted by a log rule. Over-run indicates more lumber was sawn than the log rule predicted, under-run that less was sawn.

The yield is affected by the log rule used, the biases contained in the rule as a function of the log sizes being sawn (many log rules significantly underestimate the volume that can be sawn from small logs), the products being sawn, characteristics of the mill, and the skill of the sawyer.

Since the logs and lumber are carefully measured and similar-sized logs are given to all participants in the Shoot-Out, it is expected that differences in yield are attributable mainly to characteristics of the mills and the skill of the sawyers.

Almost everyone is familiar with the argument that the thinner the kerf (the "slot" of wood that is turned into sawdust during the cutting process), the higher the yield should be. Additional factors need to be considered when determining the theoretical difference in yields from different mills, however:

- any limitations inherent in the mill and log-holding method that might require one or more overly thick slabs, and

- the sawing accuracy, which is a factor in determining the target thickness

If sawing accuracy were 100% dead-on every time, the target thickness (the thickness the sawyer tries to cut) would be the minimum thickness allowed by the lumber specifications. In the real world, however, every saw deviates somewhat from the ideal line of cut, and there are

growth stresses in every log that cause the cant to bend slightly as boards are removed, resulting in thickness variations within boards. The sawyer needs to account for these by determining a target thickness that will enable virtually all the boards to have adequate thickness, without wasting wood by cutting boards thicker than they need to be. In other words, the poorer the cutting accuracy, the larger the target thickness will need to be. It is therefore possible that a blade with a thicker kerf could cut more accurately, allowing for a significantly thinner target thickness than a blade with a smaller kerf, and thus give a higher theoretical yield. (Note that if there is too much saw deviation from a perfectly straight cut, the problem(s) needs to be identified and fixed, or much wood will be wasted.)

Sawyer skill is probably the single greatest factor in determining yield at the Shoot-Out, as well as in everyday sawing. The opening cuts on each face of the log are critical: Making a slab that contains a 1 x 4 or larger piece of lumber will reduce yield. For instance, a 12-



foot-long 1 x 4 contains 4 board feet, and, given that the sum of the log scale at the Shoot-Out has usually been just a bit over 400 board feet, each missed 1 x 4 x 12 would reduce yield by about 1%.

Sawyer knowledge of the mill and appropriate feed speeds for the cutting conditions are also critical. For instance, if the blade is dull or fed too fast and therefore deviates too much around a knot or sloped grain, resulting in a cant too thick or too thin for the width tolerance of boards, all the boards sawn from that cant will have a section that is too wide or too narrow. Depending on the length of the boards and location of the problem, some or all of each board will not meet the Shoot-Out lumber specifications.

Sawyer and tailer knowledge of the wane and width specifications is critical in determining which boards need more edging. If a board has too much wane along one edge or is too narrow for the specifications, it will be scaled as 0 board feet, so such boards need to be edged in order to have good yield. On the other hand, edging a board that doesn't need it is a loss of wood: With 2-inch board width intervals, unneeded edging on a 12-foot-long board wastes 2 board feet, or approximately 1/2% yield each time this is done at the Shoot-Out.

At times, big errors—such as mills that have been misadjusted (perhaps having arrived at the Shoot-Out after being rushed from the factory with no time to be checked out), or sawyers who didn't fully comprehend the scaling rules, or sawing errors that resulted in much lumber being miscut—have caused very low yields. Other times, small errors have added up and have also resulted in disappointing yields. Yet over the years, the skill of the sawyers and tailers working under the pressure of the event has generally improved, with more consistently high yields becoming the norm.

In everyday sawing, yield is tremendously important. The cost of logs, whether purchased or harvested from one's own woodlot, is a sunk cost by the time the log reaches the mill. Thus every board wasted by a sawing error or problem with the mill represents lost resources and lost money, whereas every extra board "squeezed" out of a log represents that much better utilization of resources and money. All sawmills are capable of consistently high yields, with some mills better suited to some products and log sizes than others. It is up to the sawyer to realize those yields by making good sawing decisions and maintaining the blade and mill so that the sawing is always accurate.



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period of time, whereas sawing all day, day after day, requires finding a pace that can be maintained for the long term.

It is also important to note that sawing rates are very dependent on the size of the logs, the sawing pattern used, and the size of the products being sawn. Different mills shine under different conditions, and the conditions at the Shoot-Out can be quite different from the conditions on a job.

The interaction between lumber quality and yield with the production rate as measured at the Shoot-Out is another thing to consider. Since boards that are outside of the size specifications aren't counted in the total board feet sawn, mis-manufactured boards lower the production rate: Time was spent sawing them, but that time

PRODUCTION RATES

It is easy to focus on production rates. People like to brag about how fast they can do something, and sawmill manufacturers and sawyers certainly partake in this sport.

The first thing to remember is that the conditions of a public event like the Shoot-Out do not reflect normal sawing conditions. First, the Shoot-Out shows only a part of the whole system needed in a sawmill operation. Handling logs and lumber, and the byproducts of slabs, edgings, and sawdust, is part of normal sawing but is minimized at the Shoot-Out. Second, the Shoot-Out is like a sprint: The sawyer and tailer can really put out energy for a short



was, in effect, wasted. Taking heavy slabs, while lowering yield, would tend to increase production rates, because the production rate when cutting wide boards from a cant is intrinsically higher than the production rate when cutting narrow boards from the outside of the log. Thus, a sawyer at the Shoot-Out has to weigh the trade-off between maximizing production rate and maximizing yield. A sawyer on the job has to evaluate the same trade-off.

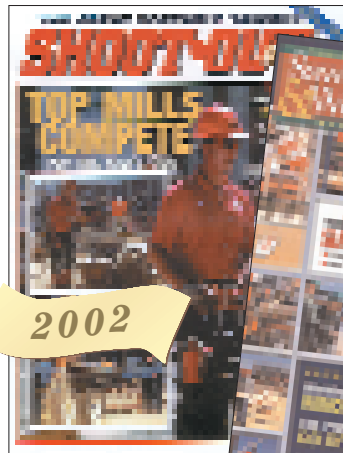
The production rates achieved at the Shoot-Out therefore depend on many factors, including the characteristics of the mill, the skill of the sawyer and tailer, how well the sawyer and tailer work together, the decisions the sawyer makes on production rate vs. yield, and the vagaries of luck.

One of the fascinating stories to come out of the Shoot-Out is the impressive production rates and yields often achieved by the lower horsepower mills that lack fancy log handling systems and computer-controlled setworks. While the sawyer and tailer may have worked a bit harder, their impressive performance demonstrates that excellent lumber can be sawn quickly with a relatively small investment, and that such mills have a place in many operations.

SAFETY

Statistically, sawmilling is dangerous work, as evidenced by workers' compensation rates—check the rates in your state if you want a scare! Safety continues to be a big concern for the sponsors of the Shoot-Out for two reasons: It would be tragic if anyone got hurt, and an important goal of the event is to demonstrate safe practices. With experience, the safety rules have been refined and a Shoot-Out safety official is designated for each Shoot-Out. The official reviews the safety rules with the teams prior to the event and asks teams to stop and remedy any unsafe activity that might be observed during the event. The safety official may shut down any mill where safe practices are flagrantly abused; fortunately, this has never happened.

Safety is mostly a matter



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of common sense and always assuming that anything that can go wrong just might. Thus, appropriate personal safety gear (hard hat, long trousers, steel toe boots, eye and ear protection, and, for some mills, chain saw chaps) are required to preclude (or at least reduce) injury if something does go wrong. Walking—not running—is a requirement. “Housekeeping” is also important: Lumber, slabs,

and edgings must be placed in their designated locations to reduce the probability of tripping. Of particular importance is the position of the sawyer and tailer: They should never be in a pinch point, or in a place where if one tripped, he or she might land on a moving blade or other moving part. Good communication between the sawyer and tailer is also essential. For instance, if the tailer is holding boards in position to be clamped for edging, the sawyer must not operate the clamping mechanism without first being sure that the tailer has indicated he or she is in a safe position and ready.

The Shoot-Out is a great opportunity to observe how the teams work together effectively and safely, and to pick up ideas on how to work more safely yourself. You can also observe how intrinsically safe—or potentially dangerous—different mills might be.

When looking for a new sawmill, whether a first mill or a replacement, the Shoot-Out offers a rare chance to see many different models operating at the same time. With its many opportunities to observe and learn, attending the Great Portable Sawmill Shoot-Out can be an excellent investment for both the new and seasoned sawyer. ■

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GO THROUGH WOOD,
IS ONLY A PART OF THE
SAWMILL OPERATION.**



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