WASTING DOLLARS IN THE SAWMILL

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Most sawmills waste hundreds, if not thousands, of dollars each day. Most of this waste is lumber degrade created in the manufacturing operation, or it is lumber that could have been recovered but wasn't. Frequently the circumstances creating this waste are very obvious yet overlooked by the mill management or employees. Mill personnel who are very familiar with their jobs or operations look at conditions causing dollar loss but do not see and react to them. Five to ten years ago, such oversights had less impact on a mill's livelihood than they do today when wood is a major cost in operating a sawmill. In fact, a mill's livelihood may depend on optimizing lumber and grade recovery from its operation. Unfortunately, many of the poor manufacturing practices prevalent 5 to 10 years ago still occur. Today these practices are the biggest waste of dollars in a sawmill.

Woods Operations

Even though logging operations are separate from the sawmilling, decisions made in the forest can greatly affect the lumber and grade recovery at the sawmill. Consequently, the sawmill should give each falling and bucking crew, whether contract loggers or company loggers, a precise set of cutting instructions including desirable log lengths, diameter break points, minimum top diameters, and knot and defect sizes and distributions. Each item on the cutting instructions should be references to the log's end use. Any actual falling and bucking practice that deviates from cutting instructions can waste the mill's dollars. The most common errors include log damage, unsquare cuts, and bucking to incorrect lengths. One-foot eleven-inch lily pads or trim do not optimize log volume.

Log Yard Operations

Log yard operations may vary from large sorting yards supplying multi-product facilities with a fairly rapid turnover of logs, to sawmill log yards supplying only the mill with logs held for a year or more.

In the large sort yard, sorting errors can result in thousands

of dollars in grade loss if, for example, logs intended for the plywood plant are channeled to the sawmill. Channeling small logs to a large log sawmill, or the opposite, causes manufacturing problems.

In addition, improper handling physically damages and contaminates the logs, creating losses in volume and grade and contributing to machine damage. For example, bark heavily contaminated with dirt and rock can greatly shorten the life of debarking equipment and, if the bark is to be used for fuel, the lives of fuel hogs and boilers.

Other physical damage can occur during log rotation, even in log yards serving one sawmill. Whereas a shorting yard holds logs a few days to several months, a mill may keep logs in inventory a year or longer. Whether mill management practices a first-in first-out system or a first-in last-out system, numerous logs will be in the yard a considerable length of time. These logs must be protected from degradation--checking and staining--as much as possible. In some areas, end checking may be severe enough to warrant the installation of a sprinkling system. For species such as the pines which are very susceptible to stain, a log sprinkling system is a must. A good sprinkling system to keep the ends of the logs wet can save a medium-sized company as much as $300,000 per year from stain losses.

Both the sorting yard and the log yard at a mill can have problems with inventory accountability and control. Only when the logs available to the mill have been accurately inventoried can a mill manager make decisions on log usage and future log acquisitions.

Debarking and Bucking

Debarking loses money if too much bark is left on the log or if too much wood fiber is removed from the log. Leaving excessive bark will lower the quality of wood chips which are sold primarily to the pulp and paper industry. Because lumber is five to ten times more valuable than chips, removing too much wood fiber from the log can be very expensive. Excessive wood removal reduces the log diameter which, in turn, may decrease the recovery in both grade and volume. Regardless of the type of debarker used, its mechanical systems (such as hydraulic, air, electrical, and lubrication) should be checked regularly as part of a preventive maintenance program, and the knives or abradors should be checked for wear.

In the sawmill, poor log bucking practices can lose up to 6-percent of potential recovery. This includes production time lost in processing over-length logs and lumber which will be trimmed.

Failure to buck logs to their longest straight lengths also can decrease lumber recovery. One of the best solutions to problems with log length is an automatic bucking system with operator override for logs with excessive sweep. Either a mill will have a real bucking problem, or it will not. Mills using positive stops generally fare better than mills that do not.

Primary Log Breakdown

Log breakdown, lumber sizing, and machine maintenance--if poorly done--can waste hundreds of thousands, if not millions, of dollars annually by decreasing the potential board-foot and grade recovery. Log breakdown decisions depend on the type of sawmill. For example, a large log mill will base most of its cutting decisions on the optimum grade that can be recovered, whereas a small log operation will try to maximize board-foot recovery.

Many industry people feel that the only way to maximize recovery is a thorough knowledge of both diameter distributions of the logs handled by a mill and the cutting pattern for each diameter. However, the number of possible sawing patterns becomes too large for a single sawyer to know if a mill handles logs of diverse diameters. In addition, the decisions made by a sawyer during the first hour of a day shift may be much better than the same decisions made by a sawyer 7 hours into a swing shift.

Others in industry feel that recovery can be optimized by electronic aids that scan a log. Such equipment can greatly benefit the sawyer who, from a distance, must determine the number of cuts available for each turn of the log. Such a device helps the sawyer maximize the grade and volume recovery. For small log mills, electronic equipment can scan the log, then set the saws by computer. If properly engineered and well maintained, such automated scanning and computer breakdown with a manual override will yield better and more consistent decisions.

Regardless of the sawmill, sawing accuracy must be maximized to yield maximum board-foot and grade recovery. Lumber thickness can vary along the length of a board, usually from instability in the sawing machine, or between boards from setwork

problems. In a mill cutting 120,000 board-feet per day, reducing sawing variation can save up to $500,000 in lumber per year which would otherwise be wasted. A reduction in sawing variation will permit reductions in green target thicknesses and still provide enough thickness for drying and planing or, for surfaced green lumber, planing only. Systematic and regular board measurements of each machine center is an essential part of an effective quality control program. Some mills have reduced target size by 0.070 inch on some machines with no loss at the planer. Systematic lumber measurements can be invaluable when determining if end-to-end or edge-to-edge wedging is a problem. Also, problems with the sawing system can be isolated from problems with the setworks.

Besides correct cutting decisions and sawing accuracy, machine maintenance also is a key factor in reducing waste at the primary breakdown center. Each mill should have a program of systematic maintenance scheduled for each machine. Such things as general carriage conditions, rails, log positioning systems (knees, headerblock, dogs, flippers, tapers), setworks, and general systems (air, electrical, hydraulic, lubrication) should be checked. Systematic maintenance by dedicated personnel not only can increase grade and fiber recovery, but also can reduce major repairs.

Secondary Breakdown

Secondary breakdown primarily occurs at the edger or resaw. Band resaws and pony rigs, although considered secondary breakdown machines, create the same type of waste as in the primary breakdown systems. Cutting decisions made by the edger operator can greatly affect lumber and grade recovery. Consistent overedging wastes fiber; consistent under-edging and poor ripping decisions reduce grade recovery.

Here improving sawing accuracy has the same positive effect as at a primary breakdown system. Likewise, systematic scheduled maintenance is also a must. Important areas to check include press rolls, feed rolls and bearings, slat beds, guides, saw spacing (fixed edgers), setworks (selective edgers), shadow or laser lines aligned with saws, linebars aligned with saws, and general systems (air, hydraulic, electrical).

Drop Sorters

The drop sorter routes lumber from one machine to another or,

if it is unmerchantable, to the chipper. Large losses in both grade and lumber recovery can accrue when a drop sorter is not operated correctly. Mill personnel who have little knowledge of lumber grades or who do not pay attention to their job responsibilities can route large amounts of otherwise merchantable lumber to the chipper or to machines not equipped to handle the material in its present form. Compounding this are mechanical problems with the drop sorter itself. All drop sorters should have regular maintenance, and all operators should be adequately trained if drop sorting is to be done correctly.

Trimmers

A trimmer operation can dramatically affect grade and boardfoot recovery in a mill, yet it is often overlooked as a source of lost dollars. Often waste at the trimmer is the result of pushed production rates and poor machine maintenance.

Operator errors can include many things. By not routinely checking lumber lengths, the operator can miss overlength or underlength boards. Improper use of the fence and not crosscutting for grade can create losses. Placing more than one piece per lug on the chain results in inaccurate trimming and loss of grade. Consistent overtrimming or undertrimming obviously affects recovery.

Some maintenance areas which must be checked routinely include lug speeds and alignment, saw spacing and alignment, saw lift systems, lumber hold downs, fence position and alignment, ending rolls, limit switches, and general systems (electrical, hydraulic, air, and lubrication).

Green Chain

In recent years, many mills have replaced the manual green chain with an automatic lumber sorter, but the green chain is still the rule. The green chain primarily is used behind the trimmer to sort lumber by size and sometimes by grade. Missorting can create problems in planer set-up when lumber is surfaced green. When lumber is kiln-dried, poorly segregated lengths, if not box-piled, can severely end-check during the drying process and cause the kiln to operate inefficiently. Although not a great problem on the green chain, lumber breakage can and does occur due to mishandling.

Automatic Lumber Sorters

Missorting by automatic lumber sorters can create the same problems in planing and drying. In addition, lack of systematic mechanical maintenance can lead to excessive lumber breakage, jackstrawing, and missorting. Such lumber degrade can be especially costly when an automatic sorter is used behind the planer.

Rough Green Storage

Improper stacking techniques, environmental conditions, and inventory control cause most of the loss during rough green storage.

All loads should be placed on bunks, and all stickers (when used) should be properly aligned in the load. Loads should be square, not leaning, so they do not spill; even infrequent spills of 10 to 20 boards worth $10 each can be expensive because the spilled boards get run over and ground into the dirt and mud of the mill yard. Physical damage due to poor use of lumber-handling equipment can also be costly.

Both the environment and length of storage can cause degradation of rough green lumber, particularly those species tending to stain. In addition, poor inventory control may lead to inefficient processing of orders and poor utilization of the dry kiln or planer.

Lumber Drying

Proper stacking--whether lumber is air dried or kiln dried--is a must. Stickers must separate each course of lumber from the next. Often five or **six** stickers may be placed correctly between courses, but the one which is omitted will create warpage of the lumber and poor air flow through the load. When stickers are not vertically aligned and placed over a supporting bunk, the lumber can warp severely. For optimum drying with minimal end checking, lumber of equal length should be stacked together. If lumber of unequal length due to a limited number of length sorts must be stacked together, it should be box-piled.

Air Drying

In addition to proper stacking techniques, air-dried lumber requires adequate spacing between stacks for even air flow. Whenever possible, stacks should be situated to take advantage of

prevailing winds. In some locations, a panel should cover the stacks to protect them from rain.

Dry Kiln

The dry kiln is very complex, requiring more operator skill than air-drying, plus more attention to the kiln and its component systems. If the kiln is malfunctioning, if the operator is poorly trained, or if the mill management burdens the operator with other jobs as well, hundreds of thousands of dollars in lumber and production time can be wasted. Unfortunately, many mill managers do not realize the importance of a properly trained operator and *a* properly maintained kiln. Besides keeping a watchful eye on all the systems of the kiln, the operator should have a basic understanding of how and why wood dries. Loads should be scheduled into and out of the kiln, so that kiln loads are not over dried by remaining in the kiln after completion of the drying schedule. The operator should know how rapidly each species of wood dries and make sure the kiln schedules reflect that drying rate. Kiln samples can be used to determine if drying schedules could be modified to reduce kiln residence time without degrading the lumber.

In addition to the kiln building, a dry kiln consists of an air circulation system, *a* heating and humidifying system, and a control system--and all of these must be well maintained.

Kiln Building - A kiln building in disrepair wastes excessive amounts of energy in the drying process. The interior should be uniformly and adequately covered with a coating material; the surfaces of the walls, roof, and floor should be checked periodically and well maintained. The roof should be sealed around vents and edges, and all flashing should be in place. The doors should seal properly.

Air Circulation System - If any part of the air circulation system is malfunctioning, it will not remove moisture-laden air which collects on the lumber surface between courses of lumber during drying. To efficiently move the heated air through the piles of lumber, the fans, fan motors, fan walls, and shrouds of this system must be in good repair. The system should be lubricated regularly. Air passages should remain clear and unrestricted. Baffles should be in good condition and correctly placed when the kiln is loaded. Improperly used baffles can create nonuniform air flow through the kiln so lumber overdries and checks, which reduces its value.

Heating and Humidifying System - The heating and humidifying system supplies the heat energy to the wood surface, and it controls the rate of drying by the amount of humidity present in the kiln. Any malfunction in this system can create either overdried or underdried lumber. Overdrying degrades lumber. Underdried lumber must be either redried, thus tying up vital kiln space, or degraded if it is found to be too wet after going through the planer. Several items in this system should be checked for proper operation if results from the dry kiln are to be optimized. All feed lines and headers should be checked to ensure proper steam flow and proper insulation. All coils should be heating evenly; all traps, valves, spray lines, and vents should be operating correctly.

Control System - The control system or controller is the nerve center of the dry kiln. When it malfunctions, the drying conditions in the kiln cannot be controlled, and much lumber can degrade. The controller regulates the heating and humidifying system, so it must be calibrated at all times. The dry-bulb and wet-bulb thermometers must accurately read the conditions in the kiln. The water line and drain line should be open, and the wick on the wet-bulb thermometer should be replaced frequently, The air supply should be kept clean, and any moisture meters in the kiln should be correctly calibrated. Kiln scales should also be checked for condition and accuracy.

Rough Dry Storage

Potential problem areas in the rough dry storage of lumber are very similar to those in the rough green storage area. However, the importance of keeping the lumber dry should be emphasized. Redrying material not only ties up kiln or yard space, but results in more drying degrade and mishandling.

Planer Mill

The greatest sources of dollar loss at the planer result from improper planer set-up and improper trimming for grade improvement. The planer should be checked for correct feed, roll pressure and height, and front roll pressure. Also, the clearance and pressure of the chip breaker should be checked. Correct feed rate based on the number of knives in the cutterhead and its diameter and rpm will assure a specified number of knife cuts per inch. Correct cutting angle and clearance angle should be adhered to for all top, bottom, and side cutterheads. All rotating parts should be lubricated on a regular basis. Planer

allowances should be based on sawing variation and vice versa for minimum fiber removal. The breakdown hoist or crib unstacker should be functioning properly and, if a moisture meter is used, it should be checked for accuracy. At the grading table, lighting should be adequate and the chain speed appropriate. The board turner should be operating correctly, and all grade stamps should be legible. Any trimmers used in the planer mill should be maintained and operated as outlined for the sawmill trimmer. Lumber should be sorted by length, width, thickness, and grade. Board damage should be kept to a minimum.

Any species that tend to stain should pass through singly or be dipped, ensuring adequate coverage, in an antistain chemical mixture. Sapstain after lumber shipment can be a major source of claims, especially in export grades.

Finished Lumber Storage and Shipping

Even if nothing has happened to degrade the lumber from log breakdown to planing, carelessness in storing or packaging finished lumber can create serious degrade problems. Finished lumber should be stored in a 'clean, dry area. When it is packaged the package should be square and snug with tight banding and edge protection on high-grade material. Any package coverings should be watertight, neat, and accurately labeled. When lumber is loaded on rail cars or trucks, stickers and bunks should be aligned; bands should not be placed over stickers or bunks. An accurate inventory system is a must.

People

People problems occur in companies of all sizes. In the sawmill, they create as much dollar waste as any other factor. Managers with a no-care attitude toward their employees, plus employees with poor attitudes and no job satisfaction, perform poorly and take no pride in their work. When an employee only wants to put in time and collect pay, that person cannot be very company-oriented or care about minimizing dollar waste. A mill manager who can motivate employees to a high degree of job satisfaction and pride can make great strides toward reducing waste in the sawmill.

Additional Reading

1. Conway, Steve. 1973. Timber cutting practices. Miller Freeman Publications, San Francisco. 192p.

2. Harpole, G.B. and H. Hallock. 1977. Investment opportunity: best opening face sawing. U.S. For. Serv., For. Prod. Lab., Madison, WI. Res. Pap. FPL 291. 8p.
3. Hallock, H., A. Stern, and D. Lewis. 1976. Is there a "best" sawing method? U.S. For. Serv., For. Prod. Lab., Madison, WI. Res. Pap. FPL 280. 12p.
4. Irvington Moore. Undated. Heating, humidifying, and ventilating dry kilns. Mimeo. Irvington Moore Co., Tigard, OR. 10p.
5. Rasmussen, E.F. 1961. Dry kiln operators manual. U.S. For. Serv., Washington, D.C. Agric. Handbk. 188. 197p.
6. Williston, Ed. 1976. Lumber manufacturing. Miller Freeman Publications, San Francisco. 512p.