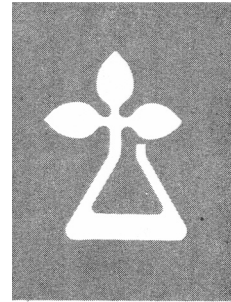


U.S. FOREST SERVICE
RESEARCH NOTE

FPL-069
September 1964



LOSS FROM VARIATION IN SAWING PRECISION¹

Forest Products Laboratory, Forest Service
U.S. Department of Agriculture

A major loss sustained by small mills results from inaccurately cut lumber. Such lumber sells only at reduced prices and encounters stiffer sales resistance than lumber from the more accurately cutting band mills. A less apparent loss is the excessive loss of material that results from inaccurate cutting.

Studies by the Forest Products Laboratory indicate that operators of portable mills, in sawing for thickness, cut only about 22 percent of the boards within 1/32 inch of the thickness set for. The remaining 78 percent may vary in thickness from as much as 8/32 inch on the thin side to as much as 5/32 inch on the thick side (fig. 1, upper pile). Consequently the operator must set to cut most boards too thick so that too many will not be excessively thin. Each 1/32 inch thus added to avoid thin boards reduces the possible output exactly as if the saw kerf were increased 1/32 inch. This loss can be minimized by keeping the equipment in good condition.

The main causes for inaccurately cut lumber are: (1) Faulty condition of the saw, such as uneven filing of saw teeth, excessive or uneven swage, teeth dull on one side, uneven tension; (2) untrue or worn collars, (3) worn bearings in mandrel, carriage wheels, and particularly in the setworks; (4) poor installation of carriage track and saw, chips between log and headblock or on track; (5) careless setting, inadequate manipulation of dogs, miscalculation resulting in the last board cut from each log being either undersized or oversized; and (6) frozen timber, unusual stresses in wood.

By adjusting the saw, carriage, and track for the most accurate work possible, sales advantages result from the more accurate cutting of lumber. The second

¹ This Note is a revision of Forest Products Laboratory Report No. 899-2 entitled "Waste from variation in sawing precisians," written in 1953 by C. J. Telford, former Small mill specialist at the Forest Products Laboratory.

advantage, an increased yield through reduction of oversizing, is obtained by setting to cut all boards thinner. Note that two steps are essential: (1) Adjusting to improve cutting accuracy and then (2) setting for thinner lumber. The number of thin rejects will not be increased because the effect of truing up equipment is to bunch boards closer to the intended size and thus to decrease the number of extremely thick and thin boards. In figure 1, the effect of improved cutting accuracy shows in the middle pile. If 28/32 inch is taken as the thinnest rough dry thickness that will produce the softwood standard 25/32 S2S, the networks can be moved three 1/32-inch intervals or, where the intervals are 1/16 inch, a metal shim can be placed in the back stop so that the entire cut is 3/32 inch thinner, as in the lower pile. Allowing for a 5/16-inch kerf, the 100 boards in the top pile require a total thickness of 141.97 inches, while those in the lower pile require only 134.19 inches, a saving of 7.78 inches in thickness or 5.48 percent of the raw material, or nearly 1.9 percent gain for each 1/32-inch reduction in either kerf or average board thickness.

The ideal setting does not attempt to qualify every board but rather to set for thinner boards until a point is reached where further increase in yield is offset by increased loss from thin rejects. This point is reached when a 1.9 percent increase in rejects results from setting 1/32 inch thinner. Set should be reduced by 1/32-inch intervals until the number of thin rejects increases by more than 1.9 percent over the previous setting. The ideal adjustment is 1/32 inch thicker than this setting, assuming that no rejects can be salvaged as 3/4-inch lumber, shorter boards of full thickness, or for use around the mill or yard.

Thin rejects for each setting can be determined by measuring to the nearest 1/32 inch at the thinnest place, exclusive of the terminal foot, on one or two hundred freshly sawed, nominal 4/4-inch boards. The number of boards per hundred that have less than standard thickness plus the allowance for shrinkage in drying is the total percentage of thin rejects. Consequently, when the rejects from setting 1/32 inch thinner increase 1.9 percent or more boards per hundred, the set should be increased 1/32 inch.

Softwoods

An allowance of 1/32 inch must be made for shrinkage of inch softwood lumber from a green to the equivalent of a thoroughly air-dry condition. Moreover, most softwood grading rules admit 20 percent 28/32-inch rough dry lumber; hence the 29/32-inch green lumber group is the thinnest to qualify. A mill cutting lumber as in the upper pile in figure 1 should therefore set 1/32 inch thinner, since the 1.9 percent increased yield is but partly offset by the 1 percent increase in rejects. For a mill grouping its cut as in the lower pile in figure 1, a 1/32-inch thinner set, although gaining the 1.9 percent increased yield, results in an increase of 3 percent in rejects.

Hardwoods

The setup for hardwood differ in that $\frac{2}{32}$ inch usually is allowed for shrinkage ($\frac{3}{32}$ for beech and hickory) and the grading rule base is $\frac{32}{32}$ inch for rough dry lumber so that $\frac{34}{32}$ inch is the thinnest green hardwood board to qualify. A mill grouping its cut, after adjusting, as in the middle pile in figure 1, should set $\frac{2}{32}$ inch thicker, so that the 1 percent shown in the $\frac{31}{32}$ -inch group would be in the $\frac{33}{32}$ -inch group.

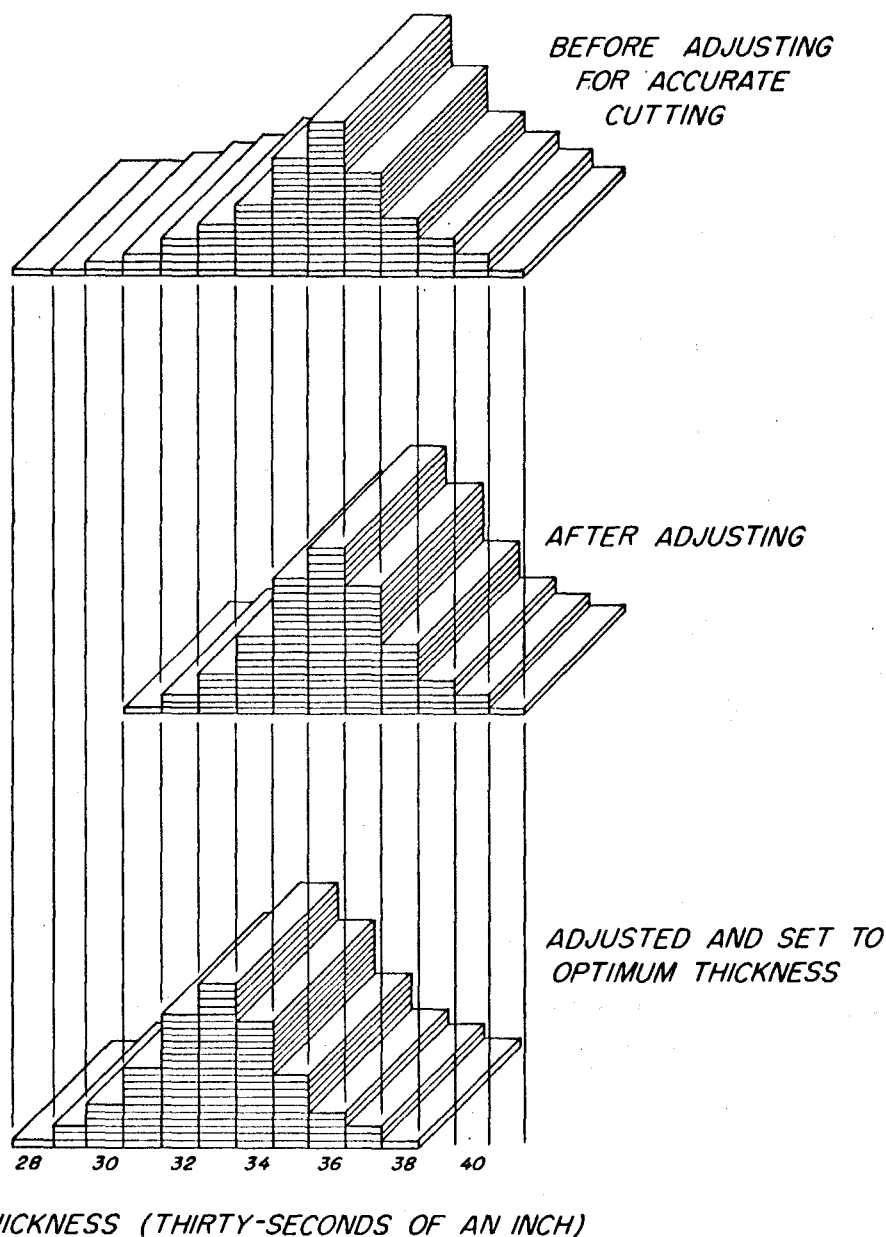
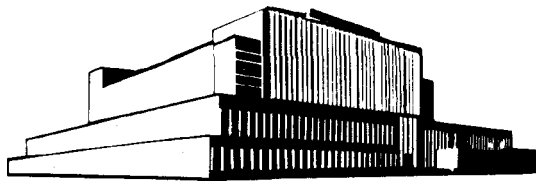


Figure 1.--Example of variation in thickness of each 100 boards of inch lumber as cut at portable mills.

ZM 96 146 F



FOREST PRODUCTS LABORATORY

