

A COMPUTER PROGRAM YOU CAN USE: EDGING AND TRIMMER TRAINER

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ABSTRACT

We present a computerized training tool designed to help hardwood sawmill edger and trim saw operators improve their processing performance. It can also be used by managers to understand the affects of processing decisions such as limiting wane beyond standard grading rule restrictions. The program helps users understand the relationships between lumber grade, surface measure and price/grade. It is a simple to use, point and click PC windows based program.

INTRODUCTION

Converting waney edged flitches to boards is not easy and most of the time it is done by people not trained in lumber grading. This situation can result in lumber volume and value losses. Previous studies showed lumber value recoveries as low as 62 percent of optimal when converting waney edged flitches to lumber. This indicates a great potential to increase mill performance and profitability y by improving edging and trimming practices. Training with an easy to use tool could be an answer. We have developed a tool, the Edging and Trimming Trainer, to fit this need.

The Edging and Trimming Trainer program is designed to help hardwood lumber edger and trimmer operators and sawmill managers better understand how lumber grade, surface measure and price interact to affect lumber value and processing decisions. The Edging and Trimming Trainer can be used as a trainer or a tester. As a training tool, the program allows the user to practice edging and trimming waney edged flitches to lumber. User decisions can then be compared to an optimum edging and trimming solution determined by the program. As a testing tool, the user's learning progress after various training sessions can be tested. Another section of the Trainer provides the user with a lumber grade testing program which allows users to test their knowledge of lumber grading rules. To use all parts of the program you just simply point and click a computer mouse.

In the following sections we briefly present information about the hardwood lumber Edging and Trimming Trainer.

COMPUTER AND SOFTWARE REQUIREMENTS

The Edging and Trimming Trainer is written to run on an IBM or compatible computer with Microsoft Windows. Hardware requirements include a math coprocessor, 640 KB of system memory, a hard disk drive with at least 8 MB free, VGA color display, and a mouse. Software requirements include MS-DOS or PC-DOS version 3.1 or later and Microsoft Windows 3.0 or later. In general, the Trainer can be run on computer systems ranging from older 386-based systems to current Pentium® based system running Windows 95.

EDGING AND TRIMMING TRAINER OVERVIEW

The Edging and Trimming Trainer hosts over 70 files containing data collected from actual unprocessed, waney edged red oak boards. Each data file contains information for both faces of a single board including coordinates for the board edges as well as all board defects. The user is able to manipulate manual edging and trimming lines located on each board edge to simulate processing the boards. The computer determines the lumber grade and value for each particular cut.

The Edging and Trimming Trainer also contains a grade testing program which tests the user's knowledge of grading hardwood lumber. This program uses the same board data files but only displays optimum boards (highest dollar value) after edging and trimming.

Lumber Sample

The lumber data used in the Edging and Trimming Trainer was collected from 3 Appalachian hardwood sawmills. The sample includes over 70 unprocessed, waney edged red oak boards that we will call "boards" for ease of explanation. The distribution of optimum lumber grades is shown below.

<u>Grade</u>	<u>Number of Boards</u>
FAS	7
FAS 1-Face	30
1 Common	29
2A Common	5
3A Common	1

Lumber Grading and Grading Rules

The lumber grading component of the Edging and Trimming Trainer uses the 1994 NHLA rules for grading hardwood lumber. The potential grades for the current version of the program include FAS, FAS 1-Face, 1 Common, 2A Common, and 3A Common. Any board not meeting the criteria for these grades is considered Below Grade.

Lumber Grading Defects

The Edging and Trimming Trainer supports the following lumber defects:

Wane - Bark or lack of wood; found on boards containing portions of the outer parts of a log.

Stain - Color abnormality in wood representing initial evidences of decay in hardwoods.

Unsound Knot - A knot not solid across its face or else softer than the surrounding wood, due to decay or other defects.

Sound Knot - A knot that is solid across its face, as hard as the surrounding wood, and shows no indication of decay.

Hole - May extend partially or entirely through the piece of wood and be from any cause.

Decay - A disintegration of the wood substance due to the action of wood-destroying fungi.

Pith - The small soft core occurring in the structural center of the log.

Split - A lengthwise separation of the wood, due to the tearing apart of wood cells.

Check - A lengthwise separation of the wood that usually extends across the rings of annual growth and commonly results from stresses set up in wood during seasoning.

Lumber Values

The object of the edging and trimming portion of the program is for the user to determine the placement of the edge and trim lines which yield the highest monetary value for each board. Value is calculated using the formula:

$$\frac{\text{Value}}{\text{Board}} = \frac{\$}{\text{MBF}} \times \frac{\text{MBF}}{\text{Board}}$$

Since all boards in the program are 4/4, the surface measure of the board also represents the board foot value. Lumber prices (\$/MBF) differ between grades and can be changed in the program to reflect current prices.

EDGING AND TRIMMING TRAINER WINDOW AND MAIN DISPLAY

The Edging and Trimming Trainer Window is displayed after opening the program. When the program is started, a board will appear on the screen along with its length, width, and surface measure. Also shown are the main menu items, a *Flip Board* button, a *Zoom* button, and manual edging and trimming lines (Figure 1).

The main menu items are located in the narrow white bar located at the top of the screen just under the Edging and Trimming Trainer title bar. From left to right the menu items read: *File*, *Next Board*, *Grade*, *Colors Key*, and *Options*. The *File*, *Grade*, and *Options* items will show additional options when clicked. All aspects of the program can be reached from these main menu items.

Manual Cut Lines

Along each edge of the board appears a straight black line with a black rectangle attached to one end (Figure 1). These lines represent the manual edging and trimming lines, with the horizontal lines representing the edging lines and the vertical lines representing the trimming lines. The user can click on any of the black rectangles and drag the edge or trim lines or saws anywhere across the surface of the board. The resulting length, width, and surface measure of the board is updated on the display whenever the edging and trimming lines are moved.

Defect Identification

All board grading defects are shape and color coded. For example, sound and unsound knots appear as red and black ovals while all other defects are rectangular. These are shown by clicking the *Colors Key*. To identify an individual board defect, the user would position the mouse arrow over the defect until it becomes a vertical arrow. By holding down the left mouse button, the name of that particular defect will temporarily be displayed above the board (Figure 2).

GRADE

The *Grade* option in the main menu allows the user to grade the current board using different edging and trimming line placements. It also has the ability to show the user the line placement that produces the board with the highest dollar value. The *Grade* option has two sub-menu items: *Current Cut* and *Optimum Cut*.

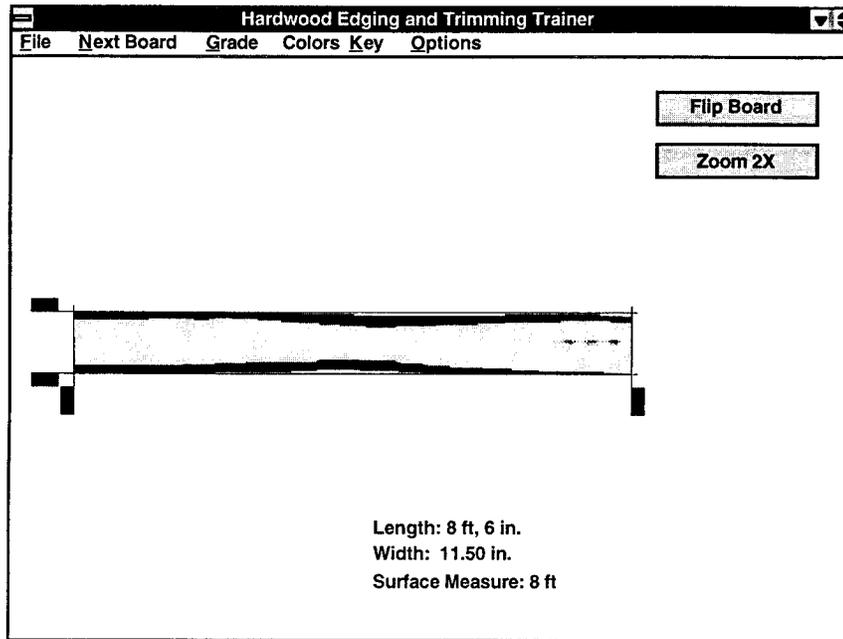


Figure 1. Opening screen and main menu display.

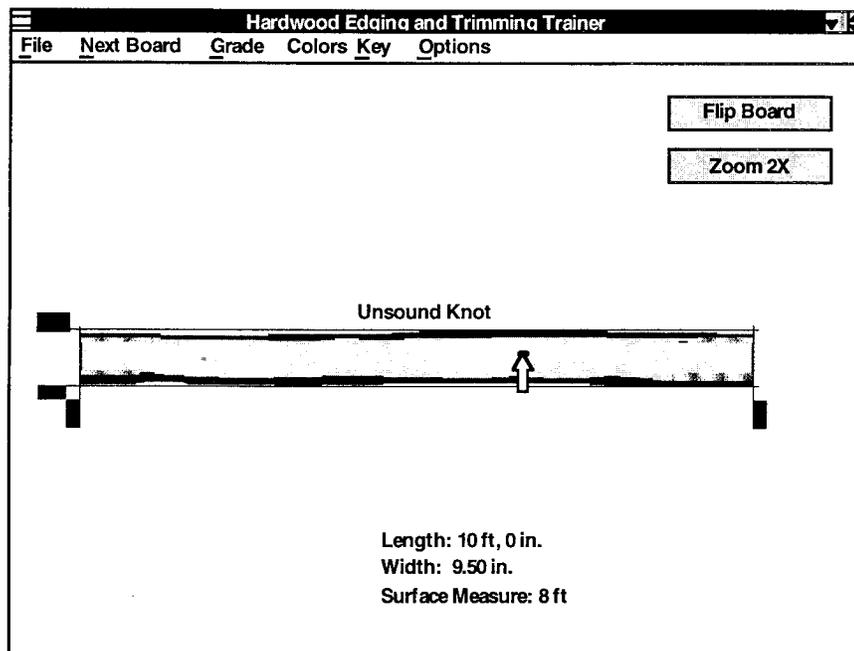


Figure 2. Identification of board defect using mouse arrow.

Current Cut

The *Current Cut* option allows the user to grade the selected edging and trimming line solution and determine the grade and value for that particular cut. More than one solution can be tested. Using the mouse, drag the

edging and trimming line black boxes to the desired cutting locations. When an edge or trim line is selected, red text will appear beneath the board showing the surface measure for that line placement and either the board length or width (depending on the line selected). These values change as the lines are moved.

After moving the lines to the desired locations, the *Current Cut* option is selected from the *Grade* option in the main menu and the program will determine that cut's grade and dollar value and display them in blue beneath the board (Figure 3).

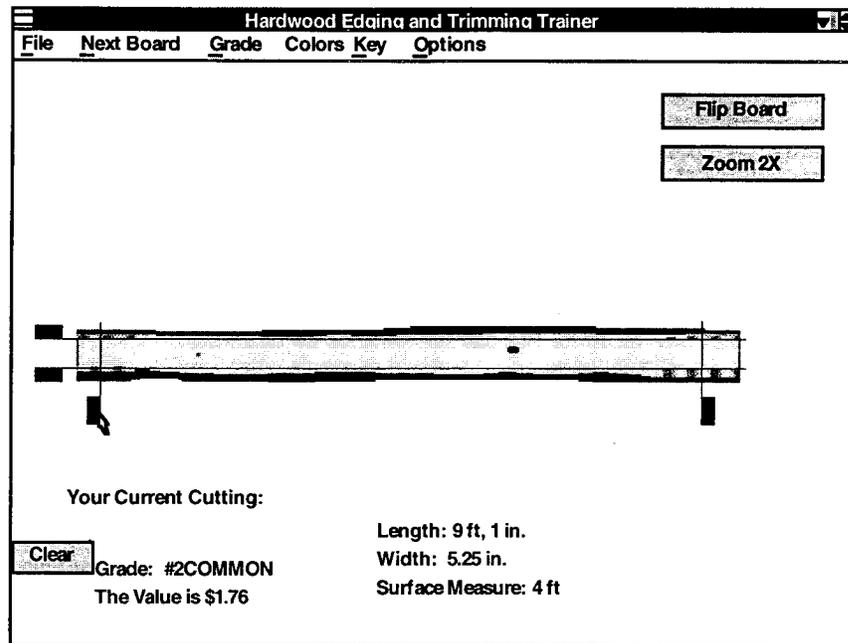


Figure 3. Screen display after performing current cut.

Wane Rule Violation

If too much wane is left on the board when positioning the edging and trimming lines, an error message will inform the user that the cut violates the 50/50 wane/wood ratio rule. This means that the total length of wane on one or both edges for a given cut is greater than half the length of the board. This rule is based on the wane limitations for FAS and FAS 1-Face lumber specified in the NHLA's grading rules for hardwood lumber.

Optimum Cut

To view an optimum edging and trimming line placement, the user selects the *Optimum Cut* option under *Grade* in the main menu. Red and white dashed lines will appear on the face of the board representing the cuts producing the highest dollar value for that board (Figure 4). There usually is more than one optimal solution, but only one is displayed. Above the board, displayed in red, will be the length, width, and surface measure of the optimum cut. To the left of that, also in red, will be the grade and dollar value for that board.

Running Modes

There are two running modes in the Edging and Trimming Trainer: training and testing. By selecting *Running Mode* under *Options* in the main menu, the user can switch between the two.

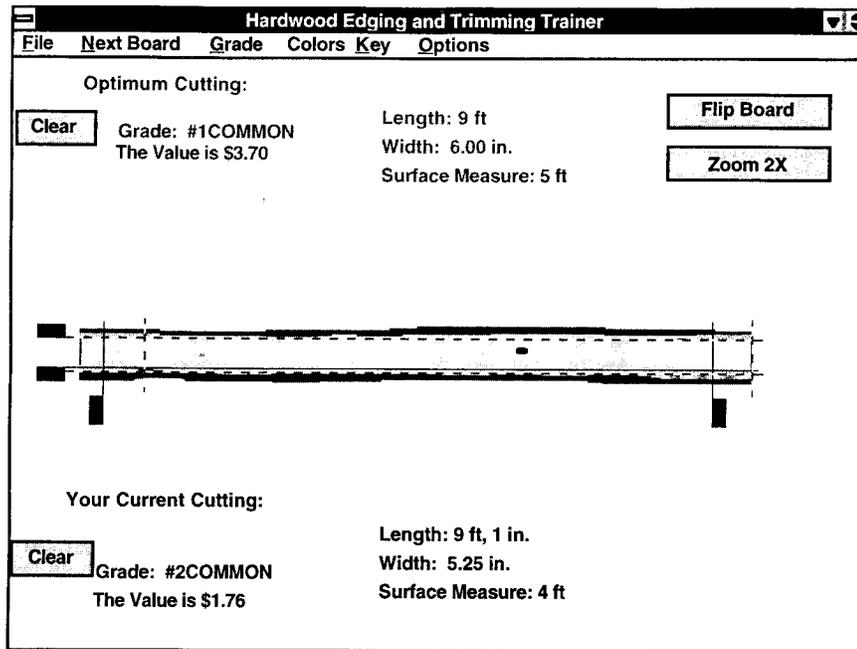


Figure 4. Screen display after performing optimal cut.

Training

The purpose of the training mode is to teach the user proper edging and trimming line placement. After performing a manual cut, the user can compare the results with the optimum cut and determine how improvements in lumber grade and value can be made. This mode is strictly for training and does not monitor the user's performance.

Testing

The testing mode is used to test the speed and accuracy of optimal edging and trimming line placement. When the testing mode is entered, a blue bar appears at the bottom of the screen (Figure 5). All other screen attributes remain the same. There are two sets of information on the bar. The information beside *This Board* relates to the current board being viewed and to the right of that, is information on the averages of all boards that have been processed.

As soon as the testing mode is entered, a timer begins at the bottom of the screen. This monitors the time it takes from loading aboard to performing the *Current Cut*. Once the *Current Cut* option is selected, the timer stops and the grade and value are shown for that board (just as in the training mode). Beside *This Board* at the bottom of the screen, the score is shown for that particular cutting as well as the time it took to perform it. The score is a percentage of the optimum cut value. For instance, if the current cut yielded a value of \$7.50 and the optimum cut had a value of \$10.00, the score would be 75% ($7.50/10.00 \times 100$).

One difference between the testing mode and the training mode is that the user is allowed only one chance to process each board. After two or more boards have been processed, the average score and time for all boards are displayed at bottom right of the screen.

Lumber Grade Testing

By selecting *Go Into Grade Testing* under *Options* in the main menu, the user is transferred into the grade testing portion of the Edging and Trimming Trainer (Figure 6). When in the program, a board will be displayed which has already been edged and trimmed. Beneath the board are buttons representing each of the five lumber grades:

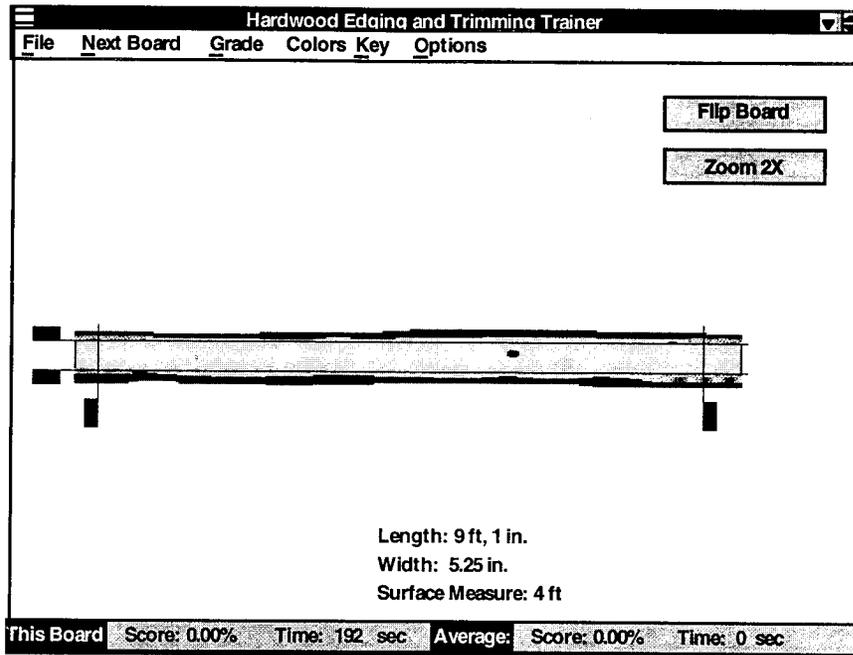


Figure 5. Testing mode of the Edging and Trimming Trainer.

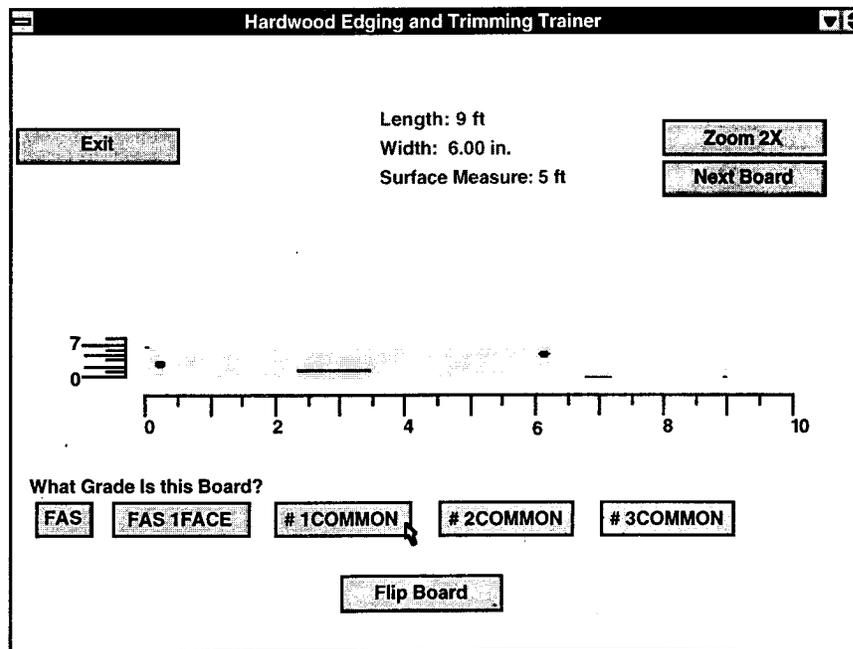


Figure 6. Grade testing feature of the Edging and Trimming Trainer.

FAS, FAS 1-Face, #1 Common, #2A Common, and #3A Common. There are also buttons for flipping the board and zooming in on the board as in the edging and trimming program. After examining the board, click on the grade button which you think represents the grade of the board. A message at the lower left of the screen will tell you if your guess was correct or incorrect.

POINT, CLICK AND DO IT

The Edging and Trimming Trainer is a simple point and click computer training program that can be used by all sawmill workers and management. It will teach workers the possible affects of their decisions in the sawmill. Decisions that could be causing dollar and material losses. Previous studies have shown that hardwood lumber value recovery can be as low as 62 percent. Please contact the senior author for more information about the Edging and Trimming Trainer.

RELATED LITERATURE

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