THE CURBING OF END CHECKING IN THE AIR DRYING PROCESS

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Introduction

West Fraser, a primary manufacturer, located in the interior of British Columbia, experiences good climatic conditions for air drying during the months of April to October. Spruce, pine and fir for dimension lumber is produced at this site.

With fierce competition in the market place, this plant maintains a high grade recovery for their lumber. In order to achieve this goal, two approaches are used, (1) Initial moisture sorting, followed by kilning and (2) air drying high grade 2 x 6, 2 x 8 and 2 x 12 after initial moisture sorting Kiln drying the wider widths have often resulted in cupping and checking. The air drying process, although a slow one, appears to be an attractive alternative to ensure very few drying defects result.

The purpose of this study is to (1) quantify the initial end checking in green lumber and (2) to maintain the initial level of end checking after air drying by covering the end of the packages with plastic.

A number of factors were considered in this study:

Sorting the lumber according to moisture content classes before air drying

- Designing the air drying yard to ensure the best quality drying
- Preparation samples for the air drying yard
- Choosing the technology and material required for the study

Sorting the Lumber into Moisture Content Classes

Laser technology for sorting into moisture content classes has been installed and utilized at this plant for four years. Three sorts are handled both for kilning and air drying. The three categories are (a) under 30% (dry), (b) 31% - 50% and (c) above 50% (wet). Only the results from the mid sort will be reported in this paper since this group represents 50% of the mill production.

Preparation of Samples for Air Drying

The specimens for testing was divided into two categories, Series A (end covered) and Series B (end not covered). Each category contained only the mid sort and unsorted material. TABLE (1) outlines the number of specimens evaluated.

TABLE 1. Experimental designs.

Series A (Covered)	Series B (Uncovered)
Mid Sort – 225 pcs., 2 x 6 x 16	Mid Sort – 225 pcs., 2 x 6 x 16
Unsorted – 225 pcs., 2 x 6 x 16	Unsorted – 225 pcs., 2 x 6 x 16

Each specimen was labeled, graded and stickered with material measuring ¾" thick, 2 ½" wide and 6 ft long. The bottom five tiers were stickered every 2 feet and the rest of the bundle every 4 feet. The end checks were measured for each specimen and placed into the categories of 1/8" increments. The test specimens were located in the middle of the packages. This gave a good representation of the drying rate. The bundles remained in the air drying yard for five weeks before they achieved a final moisture content of 16%. This is the same moisture target used for the kiln dried charges. The specimens were then regraded and splits were measured for the test pieces. They were then planed and an in-line moisture meter measured each piece. Fifty specimens were selected randomly from the test package for initial moisture content determination. One inch samples were cut 6" from the end of a board thus ensuring the boards could still be repiled and used in the test. After the period of air drying was complete, the same specimens were used for final moisture content determination.

In the experimental design, the piles were spread out to increase the exposure to the wind, the packages were not piled too closely to avoid moulding and staining around the bottom of the piles. The top of the packages were covered to prevent rain from soaking the lumber and it was also weighted to reduce warping. The debris from the yard was removed to avoid discoloration to the packages.

Technology and Material Used in the Study

Plastic material (gengseng) capable of dissipating heat uniformly, allowing the lumber to breathe, thereby protecting it from fungal attack was utilized to cover the ends of the bundles in Series A. A Wagner hand held moisture meter served as an indicator of how the bundles were losing moisture. Readings were taken once per week and after three weeks they were taken twice per week.

A weather station was also installed close to the drying yard. It was interfaced to a computer. The relative humidity temperature and air velocity was recorded continuously. This information was useful in indicating the drying conditions which existed in the yard. It also assisted the mill in optimizing the drying yard. For example, the bundles were placed in the direction of the wind to ensure maximum drying.

Results and Discussion

After five weeks in the air drying yard, the test packages achieved an average moisture content of 16%. The time of year in which this study was conducted was in August 1997 to September 1997. FIGURE (1) indicates how the weather information was collected. The average temperature was 25°C, and relative humidity 45%, for the total time the packages were dried. FIGUREs (2, 3, 4, 5) give the initial and final oven dried moisture content of the fifty test boards (covered

and uncovered). The average moisture content of the initial and final moisture content, with their respective standard deviation, is listed in TABLE (2).

The tighter standard deviation in the sorted bundles reflect that sorting strategy achieved this result. This is crucial in air drying material for the added value industry. As shown from the data collected, the unsorted material contained over dried and under dried specimens after the air drying process was completed, in five weeks.

The measurements of the end checking before and after air drying indicated that some samples moved into other categories when the drying time was complete. FIGUREs (6, 7, 8, 9) show the level of end checking between the sorted and unsorted bundles as well as the impact plastic covers used for the ends. The results covering the end of the lumber with plastic wrap does curb the amount of end checking which results.

Date	Time PC	Date	Time WS	Temp-erature	Relative Humidity	Wind Speed	Wind Direction
8/18/97	8:00:01PM	8/18/97	8:00:00 PM	27	21	3	4
8/18/97	9:00:01PM	8/18/97	9:00:00 PM	25	24	5	4
8/18/97	10:00:01PM	8/18/97	10:00:00 PM	23	29	0	7
8/18/97	11:00:01 PM	8/18/97	11:00:00 PM	21	34	0	7
8/19/97	12:00:01AM	8/19/97		19	41	1	0
8/19/97	1:00:02 AM	8/19/97	1:00:00 AM	17	48	0	2
8/19/97	2:00:02 AM	8/19/97	2:00:00 AM	15	51	0	1
8/19/97	3:00:02 AM	8/19/97	3:00:00 AM	14	57	0	6
8/19/97	4:00:02AM	8/19/97	4:00:00 AM	13	63	1	5
8/19/97	5:00:02 AM	8/19/97	5:00:00 AM	12	63	2	6
8/19/97	6:00:03 AM	8/19/97	6:00:00 AM	12	69	2	6
8/19/97	7:00:03 AM	8/19/97	7:00:00 AM	11	68	2	5
8/19/97	8:00:01 AM	8/19/97	8:00:00 AM	12	70	1	7
8/19/97	9:00:00 AM	8/19/97	9:00:00 AM	16	62	1	7
8/19/97	10:00:00 AM	8/19/97	10:00:00 AM	18	58	1	4
8/19/97	11:00:01 AM	8/19/97	11:00:00 AM	21	47	3	7
8/19/97	1:00:00 PM	8/19/97	1:00:00 PM	28	27	3	7
8/19/97	1:31:59 PM	8/19/97	1:32:00 PM	28	22	6	7
8/19/97	1:32:58 PM	8/19/97	1:33:00 PM	28	22	6	7
8/19/97	1:33:58 PM	8/19/97	1:34:00 PM	28	23	3	0
8/19/97	1:34:59 PM	8/19/97	1:35:00 PM	28	23	5	7
8/19/97	1:35:59 PM	8/19/97	1:38:00 PM	28	23	7	7
8/19/97	1:59:59 PM	8/19/97	2:00:00 PM	28	22	5	7
8/19/97	2:34:00 PM	8/19/97	2:34:00 PM	29	21	4	5
8/19/97	2:35:00 PM	8/19/97	2:35:00 PM	29	21	5	5
8/19/97	2:36:00 PM	8/19/97	2:38:00 PM	28	21	5	5
8/19/97	2:37:00 PM	8/19/97	2:37:00 PM	29	21	4	5
8/19/97	2:38:59 PM	8/19/97	2:39:00 PM	29	21	5	5
8/19/97	2:39:59 PM	8/19/97	2:40:00 PM	29	21	2	4
8/19/97	2:40:59 PM	8/19/97	2:41:00 PM	29	21	2	6
8/19/97	2:41:59 PM	8/19/97	2:42:00 PM	29	20	6	6
8/19/97	2:42:58 PM	8/19/97	2:43:00 PM	29	20	6	6
8/19/97	2:43:59 PM	8/19/97	2:44:00 PM	29	21	4	7
8/19/97	2:45:00 PM	8/19/97	2:45:00 PM	29	21	4	7
8/19/97	2:50:58 PM	8/19/97	2:51:00	29	21	4	5
8/19/97	2:51:58 PM	8/19/97	2:52:00	29	21	4	5

FIGURE 1. Weather information.

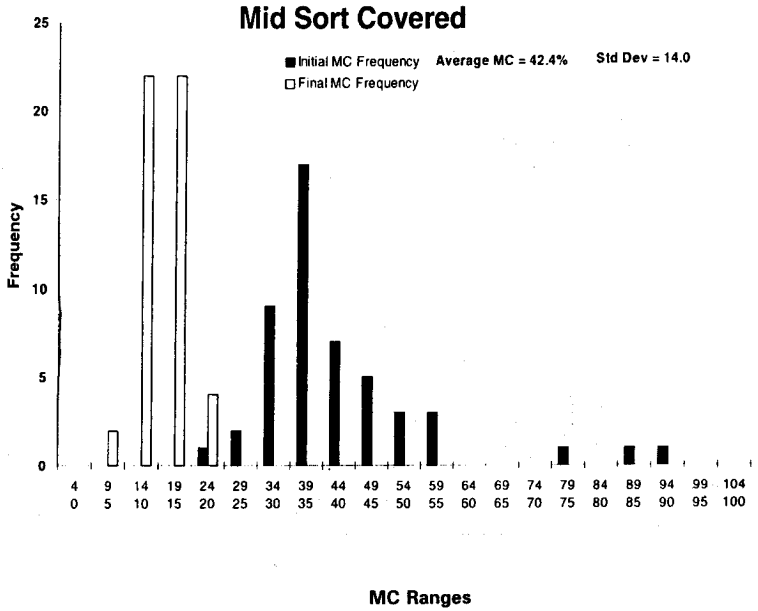

FIGURE 2. Initial and final MC before and after air drying.

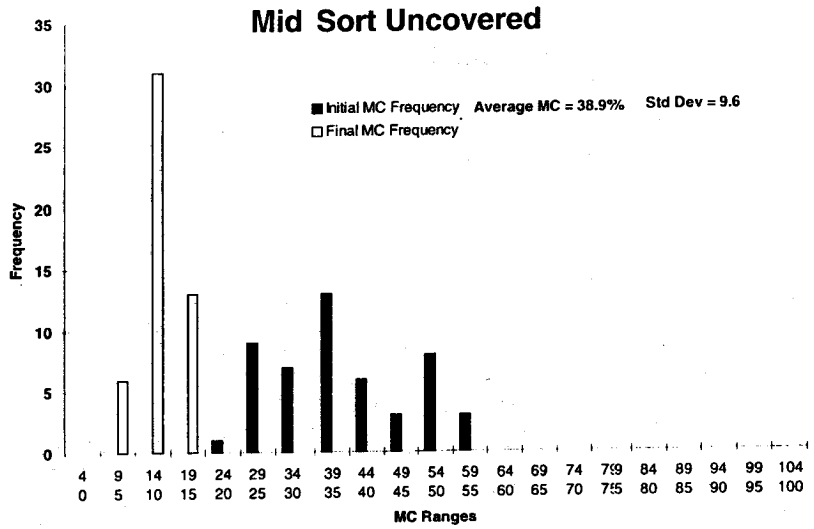

FIGURE 3. Initial and final MC before and after air drying.

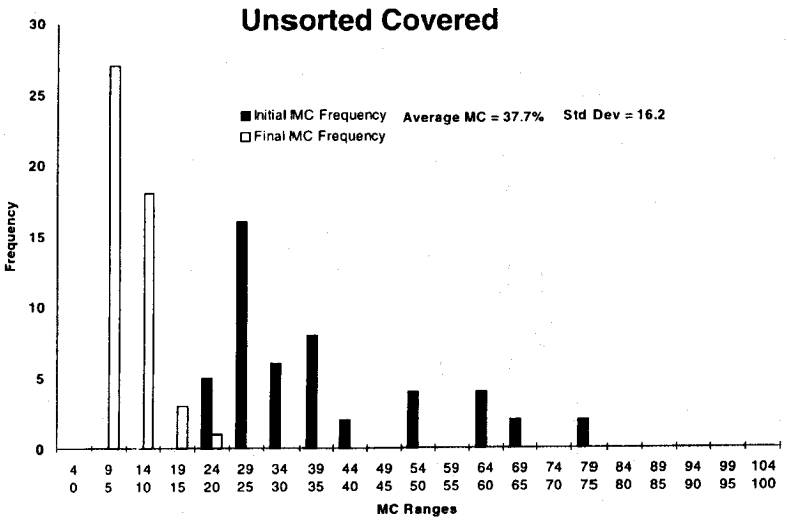

FIGURE 4. Initial and final MC before and after air drying.

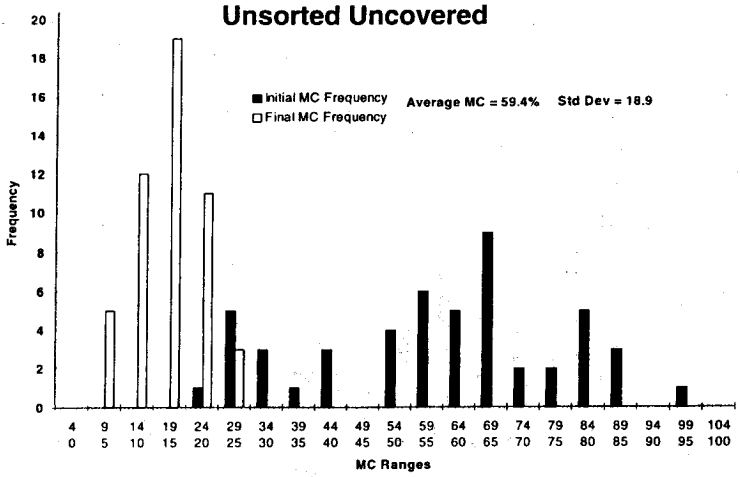

FIGURE 5. Initial and final MC before and after air drying.

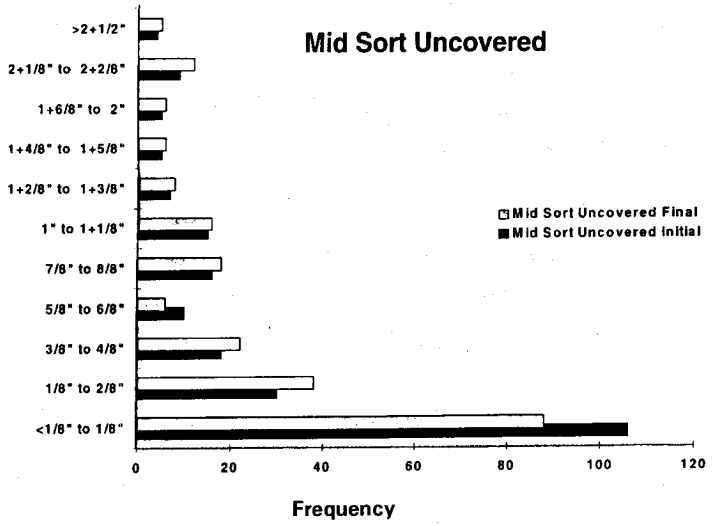

FIGURE 6. Measurements of end checks before and after air drying.

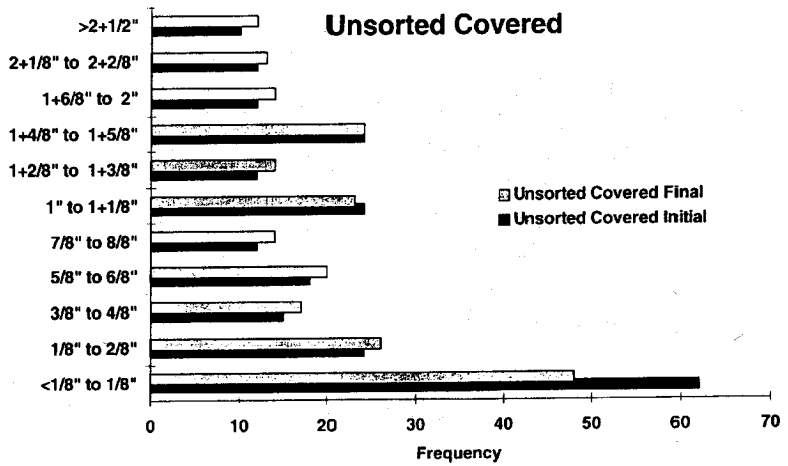

FIGURE 7. Measurements of end checks before and after air drying.

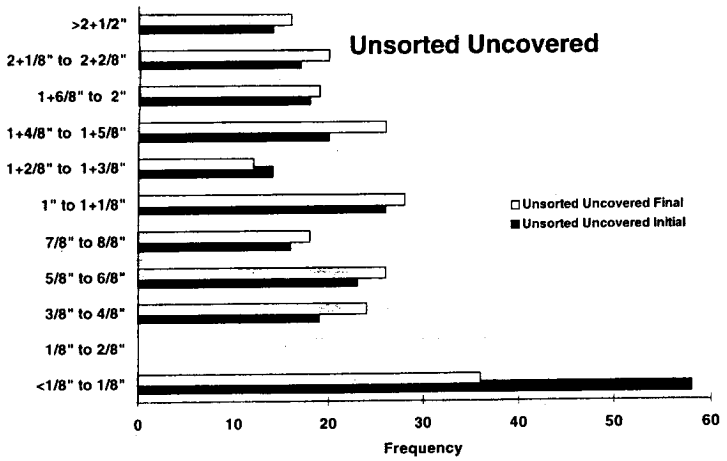

FIGURE 8. Measurements of end checks before and after air drying.

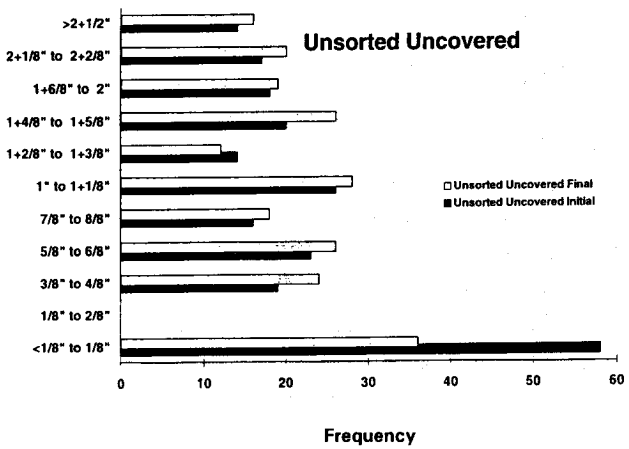

FIGURE 9. Measurements of end checks before and after air drying.