GREEN MOISTURE SORTING AT ROSEBURG FOREST PRODUCTS

Ron Van Handel
Roseburg Forest Products
Dillard, OR

My presentation to you today deals with a subject that, in my opinion, represents one of the most important factors in achieving lumber drying quality. That factor is sorting green lumber for moisture content prior to kiln drying. Most of the mills on the West Coast that make a moisture sort are predominately mills that cut a fairly large amount of various species of pine. There may be some Douglas-fir and hemlock mills that make a sort, but I do not personally know of any. The method that has been used for years to sort for moisture has been eyeball and feel. Look for heartwood and sapwood and pick one end up and see how heavy a board feels. If the person who marks the lumber for moisture content does his or her job right and if the green chain pullers or the sorter operator interpret the marks right, a reasonably good two-moisture sort can be achieved. In the case of some species, a three-moisture sort is much more desirable. Attempting to make three sorts using the manual method presents some real problems.

We have always attempted to make a manual two-moisture sort in our pine lumber. Sugar pine really requires a three-moisture sort. Getting the corky or floater-type wood sorted isn't too difficult, but getting two sorts in the sap is quite a problem. Trying to maintain a low percentage of overdry without getting too high a percentage of wet or redry has been an ongoing problem.

In the past few years, a mechanical method for moisture sorting has become available. This method consists of weighing each piece of lumber contained in a lug space as it passes over load cells. A computer, taking input from width, thickness, and length sensors, calculates the cubic volume of each piece of lumber and determines the amount of water present based on the total weight of the piece of lumber. This appears to be a much better method of determining moisture content than the eyeball method providing that:

1. The load cells always weigh accurately.
2. The width, thickness, and length sensors are extremely accurate.
3. The lumber is all of the same species and the same relative density.

A little over two years ago, another system for sorting green lumber for moisture became available. This system was developed by Forintek's Western Laboratory in Vancouver, B.C. Their experiments started in 1984 and culminated in real world mill tests in late 1986 and early 1987 in a couple of sawmills in Canada. The right to develop and market this system was acquired by Novax in late 1987. The technique used in this system is to apply a given amount of heat to each piece of lumber as it passes under radiant heaters and with the use of infra-red sensors compare the temperature of the heated part of the board to the temperature of the unheated part. The difference in these two temperature readings indicates the amount of water present in the board. The wetter the board the less temperature rise and, conversely, the drier the board the more temperature rise.

A few years ago, we started to seriously consider the weight system as a better alternative to our eyeball sorting system. We talked to various mill

personnel who had installed this system on their sorters. This type of equipment was relatively new at the time and this may be why we got mostly negative responses as to the reliability and accuracy of these systems. At the machinery show in Portland in 1988, we picked up some information on the Novax system. We did a little research on it and had some Novax representatives come down for a couple of visits to look at our sorters and answer our technicians' questions. After our labor strike in 1989 and after talking to sawmill personnel in Canada who were using the system, we made the decision to install one on one of our sorter lines at Dillard.

This brings me to the main purpose of my presentation, namely a discussion of our experience with the Novax moisture detector at our large-log sawmill at Dillard. Up to this point, our experience with the Novax system has been in moisture sorting sugar pine. Of all the species that we cut at Dillard, this one is the most difficult to dry. Our logs come from a fairly large area containing several types of growing sites. The logs are of all age classes ranging from fairly young and small second growth to very large old growth. The condition of the logs range from green fresh cut to older fire-kill salvage to dead snags and windfalls. Because of operational constraints in the log yard, these logs are all intermixed and processed together. It goes without saying that this kind of lumber mixture presents some drying difficulties and when the lumber species is sugar pine, it gives the kiln operators a real challenge.

The physical installation of the system was basically the same as the Canadian installation. The Cal-rod heater units, the shrouds that enclosed the heaters, the infra-read sensors, and the overhead support structure were identical to the Canadian installations. We installed two spray units to apply two different dye colors for the sorts with the third sort being a no-mark. The sorter is a conventional J-bar sorter with WGBM control. A small amount of programming was necessary to enable to sorter computer to take the information from the Novax computer.

The unit was installed over a weekend, and the final electrical and computer connections were completed while the mill was operating. Our first "test" was on a run of approximately 1 million board feet of sugar pine. This system reads moisture content from 0% to 200%. Our first problem was to figure out at what moisture percentage to set for the three sorts that we wanted. We started out using 0-39 as the corky or floater sort, 40-89 as the regular sap sort, and 90 and above as heavy sap or sinker sort. After observing the lumber produced for about one shift, it was apparent that we had set the percentages too low. We changed the sorts then to 0-50, 51-124, and 125 and above. The general appearance of the lumber indicated that this was a better combination, and we completed the run at these settings.

At this point, I need to discuss how the Novax system interprets the moisture content. It can take the total of all the sensor readings on each board and average them or it can take the highest individual reading from any of the sensors as the moisture reading. We chose to use the highest individual reading. Our reasoning was that since sugar pine is prone to contain pockets of high moisture at random locations, if one of these pockets was present directly under one of the sensors, we wanted to use that reading as the moisture content of the board. Our unstacker chain is equipped with a Wagner moisture meter. The pads cover about 13 lineal feet of distance and are capable of detecting practically any wet spot present in any board. That is the main reason we elected to go with the highest reading that the Novax system detected.

Our kilns at Dillard are conventional Moore kilns of concrete construction. We have 13 double-tracks, 2 single-tracks, 1 three-track, and 1 four-track, all 104 ft. long. Two of the double-tracks are equipped with individual motorized fans and all the rest are conventional line shaft equipped. The heat source is low-pressure steam, maximum about 14 pounds. With the exception of one single track, all kilns are equipped with Lignomat controllers.

Our main purpose in trying to achieve a good moisture sort in the green state was to save kiln time. Better grade recovery should automatically result if the sort is made accurately. Our drying capacity ranges from a low of 8.5 million per month to a high of 12 million with the annual average being a little more than 10 million per month. A month with a high volume of sugar pine with a normal amount of Douglas-fir will be a lower volume month. An increased percentage of ponderosa pine will increase the volume dried. Weather is another important factor and also the thickness of the pine shop being cut at any given time. The bottom line is that we don't have quite enough capacity to dry the volume that we want to dry. We hoped that a good moisture sort would give us this added volume.

After drying the firs sugar pine run, we looked at the results and decided that we needed to change the moisture parameters on the next run. We set the low-moisture sort at 0-74%, the sap sort from 75% to 139%, and the sinker sort from 140% to maximum. This resulted in a better corky or floater sort, but the medium sort was too high. We had a higher percentage of redry than we wanted, especially in the 4/4 boards. I apologize for not having charts and graphs to show but, with the uncertainty we had on where to set the limits, we decided to wait until we had dried more. We also want to follow a given run through the planers and check grade recovery. Doing this at Dillard is a challenge because of the volume and variety of items that we run each day and because of the limited amount of storage area that we have. The one thing that we did learn was that we were able to save on drying time. Comparing total time required to dry these two runs to a like volume sorted manually to a floater/sinker sort, the time saved amounted to over 9%. I have no doubt that as we refine our moisture parameters, we will improve on that.

In addition to the problem of determining where to set moisture sort percentages, we had another problem with heater enclosure design. As I stated earlier, our system was identical to the systems operating in Canada. The Canadian mills cut strictly dimension, whereas we cut a variety of thicknesses in fir and at least two thicknesses in pine. The heater units need to be mounted as close to the surface of the lumber as possible. The units were hung by cables from the overhead frame and were able to float over the thicker pieces of lumber. After a period of 2 or 3 days, the porcelain ends on the heaters began to fail because of the continuing shock and vibration. We had to go back to the drawing board and figure a different mounting arrangement. The Novax engineers went to work finding a different heater that was shorter overall and that would give the same results with the existing program. They redesigned the mounting brackets for the heaters, and we redesigned the overhead support structure. Each heater unit and each infra-red sensor are mounted between two pieces of UHMW approximately 48 inches long with the leading and trailing ends shaped in a curve on the bottom side. This configuration allows an easy rise as a thicker piece of lumber forces under the unit and the curve on the downstream end allows an easy letdown. This minimizes the amount of shock to the heater unit.

In summary then, we feel that the Novax system will do what we are looking for. As we get to the point of being able to refine the sort parameters further, we should save even more drying time than experienced thus far.