MOISTURE DETECTORS AS AIDS TO BETTER DRYING

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In-Line Moisture Detectors

It is time to optimize. The high cost of stumpage, increased freight costs, increased labor costs, increased fuel costs, and the other operating costs have risen rapidly. Competition has increased, so it is no longer possible to merely raise the price of our products. We must consider every possible way to make our operation more efficient. We now must consider using the optimizing edger, optimizing trimmers, optimizing headrigs, etc.

One of the more neglected areas of optimizing is the area of moisture control. Hundreds of thousands of dollars are spent in other areas such as mentioned above, but the area of moisture optimization often goes neglected. Spending a few thousand dollars in the area of moisture control can be much more profitable in the return on investment. Many mills do not know what their kilns are doing and could not tell you the moisture distribution. Changes of a few percent in moisture content can mean thousands of dollars in profit or loss. There is an optimum moisture content for each operation.

I would like to bring to your attention several research papers considering the subject of degrade versus moisture content. I have included references to a few of those researches in my talk. One paper was done for the Weyerhaeuser Company by K. Bassett. It indicated that degrade would amount to $1.25 to $4.50 per thousand board feet for each percentage point the moisture content is lowered. We will pick a figure somewhere between the two extremes, such as $2.00 per thousand. Therefore, the degrade loss lessens by $2.00 per thousand per each percentage of moisture you raise your moisture content. If you raised your moisture content 4% and ran 100,000 feet per day, your increased profit would be $800.00 or $832,000.00 per year. Could it be that you are losing an amount similar to this?

Another research paper on Ponderosa Pine by the Western Wood Products Association indicates that if you increased your moisture content from 9 to 13% it would amount to savings of $3.15 per thousand. By now savings should be much greater since prices have nearly doubled since the time of these studies. There is an ultimate moisture content for each species. Western Wood Products Association has done studies to show the moisture content with its relation to degrade for several different species. Some of the papers are listed below.

Research Note Number 4.5211 for Ponderosa Pine
Research Note Number 4.5212 for Idaho White Pine
Research Note Number 4.5213 for White Fir
Research Note Number 4.5214 for Douglas-fir and Larch
Other research papers along similar lines are "Drying West Coast Dimension to Meet the New Lumber Standards," by E. M. Williston, Forest Products Journal Vol. 21, No. 3. "An Example of Operation Research in the Dry Kilns," was published in Wood and Wood Products, August, 1967.

Figure 1 illustrates some of the possible savings you might make immediately.

As previously stated, each operation has an optimum moisture content. Moisture detectors can aid greatly in the process of moisture optimization and better drying.

The panel meter of the continuous Moisture Meter calibrated in moisture content is an aid in a simple form. The operator can observe the moisture content of a particular run and determine if it is close to the proper moisture content. Figure 2 shows a typical end to end planer system.

The most common sideways sensor mounts one inch below the material to be measured, Figure 3.

Moisture detection can aid by marking the materials over preset limits. You may wish to mark at 14% for laminating stock or at 19% to meet the 19% legal limit. The moisture detector could have any number of wet marking levels perhaps using different colors, or location on the board, to indicate the different moisture levels.

Conversely, the moisture detector may have a dry level and can mark or indicate what is below preset levels, such as marking the material below 10%. Such a circuit we call a dry level.

Marks of several types are available. Clear water is used for surfaced material and is the most popular mark used after the planer. A colored mark is usually required for rough material. Foam or fadeout ink marks are available where no permanent mark should be left on the wood.

A moisture detector can operate a dropout gate to increase ease of handling. Material with excess moisture content may be returned to be redried or can be marked as a non-standard product and placed in with the rest of the run.

Figure 4 shows a typical installation showing sensors and swing dropout gate. With a swing dropout gate, part of the conveyor is hinged. This portion lifts, letting the board drop. The board is then taken out sideways, usually by a belt conveyor. Another option would be to use a signal from the moisture detector to operate an air solenoid which pushes a board sideways. Then, a sweed puller can take the board out of the flow.

Perhaps, the most important function of the continuous moisture detector is gathering data. When the moisture detector is equipped with a moisture category readout, Figure 5, the kiln operator can tell at a glance what his kiln is doing. If a record is kept from what part of the kiln the lumber is coming from, problem areas in the kiln can be pinpointed immediately.

The most common readout center counts the number of pieces below 10%, 10-15%, 15-20%, 20-25% and 25% and over. The limits are adjustable. It is possible to count in smaller intervals such as 1% if desired.

The readout center gives the kiln operator and management a continuous report on moisture conditions occurring within the kiln. This new awareness will generally result in improved drying either by grade improvement, because of less degrade, or
improved customer relations since shipments of wet material is minimized. Grade stamp moisture tolerances can also be met. Improvement in schedules usually comes about because of this new awareness. To summarize the discussion of the in-line meter we see that it is then one of the more important tools to aid in better drying. We have found that a company may wait for years to install a continuous moisture detector, but once they install it they don't wish to be without it for one day.

In-Kiln Moisture Detector

The in-kiln meter can take much of the guesswork out of kiln shutdown times. Improved schedules generally result. In many instances, the kiln meter will keep you from having to open the kiln door letting out heat and preventing the necessity of having to lose valuable drying time. It can help you prevent over-drying. Most of all, it can help establish the correct pullout time and can automatically shut the kiln down when the operator is not present.

In-kiln meters consist mainly of two types—the field type and the resistance type. The resistance type is mainly a resistance handmeter with long leads. Its main advantage is that it can readily be calibrated in moisture content. Its main disadvantage is that sometimes the pins in the wood lose good contact with the board, due to heating and drying around the pin. Another disadvantage is that samples must be carefully chosen. Only if you carefully choose the correct sample will you get a true indication of the moisture content in the kiln. Therefore, the results obtained are greatly dependent on the skill of the operator.

The field type in-kiln meter measures a much larger number of samples obtaining a better average of the lumber stack. A metal strip is placed in the stack of lumber to be measured. The field from each strip passes through many pieces of lumber. Since several strips (generally three to a track) are placed in the kiln, a very good sampling is provided. By using a selector switch, individual readings for each strip or an average reading of all the strips can be readily monitored. The individual reading allows the operator to spot trouble areas of the kiln. Generally, the average reading of the sensors is used to control the shutdown of the kiln. The reading desired for shutdown can be controlled by a knob on the front panel of the instrument.

The green lumber moisture detector (sorting before the kiln) is becoming popular. Better technology has improved the results obtained. Also equipment is available that will sort green frozen lumber.

New pinless handmeters are available that will measure rainwet materials with little effect from the surface moisture.

By using a green lumber moisture detector before the kiln, an in-kiln meter, and a dry lumber moisture detector with readouts, the dry kiln operator and management can obtain the optimum moisture content and will no longer be guessing what their kiln is doing.
The on-line moisture detector of the future will have an increased emphasis on data gathering equipment. Management will be able to get closer to their goal of optimizing the moisture content of their lumber.

PROFITS YOU CAN REALIZE FROM THE FIRST DAY!
(Calculated at 1.25 per thousand)

Figure 1. Illustration of possible savings.
Figure 2. Typical end to end planer continuous moisture meter.

Figure 3. Typical sideway continuous moisture meter.
Figure 4. Typical installation showing sensors and swing dropout gate.

Figure 5. Moisture detector with category readout