COMPUTER TECHNOLOGY AS A TOOL IN LUMBER DRYING

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Computers have swept every industry in the nation due to their practicality, consistent processing, and ease of modification. Today I hope to show you the economic, consistent, and adaptable advantages of this new state of the art in kiln drying.

We are in business to turn a profit and try to do so by cost cutting, high production, and higher grade recovery. Few people have studied the entire cost of drying, but we all recognize that degrade, overdry, redry, and steam all add up to big money. Computers can not solve poor maintenance or poor kilns, but it will control very precisely by EMC, wood moisture, or hours. Controlling by wood MC or EMC of the kiln can increase grade recovery by maintaining conditions in the kiln which facilitate continuous drying. If the kiln is set for 12 hours of drying at a 20°F spread and the lumber is dry in 8 hours, those 4 hours could have been saved, and reduced production time. Hence, when the computer senses inefficient drying, it responds by stepping up the drying rate. Redry is reduced by in-kiln monitoring of MC. Thus, the computer will consistently and immediately respond to lumber conditions in effort to preserve the load while drying as fast as possible.

So, let's suppose that we purchase a computer which has been designed to control a kiln. It usually has blinking lights, switches, and a snazzy control panel, and the Hildebrand 8000 is no exception. But inside is a carefully controlled set of electronic hardware suitable for the job. What does all of that do?

Due to the complex things that computers do, most of us think that it is too complex to understand, but a computer is a device which uses a simple, organized approach to solving tasks. It "thinks" just like we do. We use our five senses to detect our environment: sight, smell, touch, hearing, and taste. Our brain needs these as inputs. The brain then goes to our memory to recall past experiences and interpret the inputs. The brain then decides how to react and sends a signal to your body parts to solve the situation. Your computer does the same things in solving kiln situations.

During drying, the computer receives continual messages from the kiln about its environment. These inputs include: wet and dry bulbs, MC probes, and special instructions. Then the computer consults memory about its experiences like schedule, steam pressure, valve rates, charge history and programming steps. These will cause the computer to interpret and respond to the conditions. If the wet bulb depression is growing too fast, the computer consults its instructions and reacts accordingly. The response is a signal that opens and closes valves for spray, heat, and vent control. These are outputs. And, like your

brain, the speed of the transaction is less than 1% of the speed of mechanical devices.

Now, let's take a closer look at the devices currently available for kiln computer inputs, memory, processing, and outputs. Indicators of moisture in the kiln include devices which measure relative humidity directly or indirectly. EMC fiber wafers are used to directly measure relative humidity in Lignomat and Brunner. Most systems presently find humidity using wet and dry bulbs.

There are two electronic devices which are used. Thermocouples which require considerable hardware and thermistors which require much less hardware to sense temperature.

Sensors of wood moisture content are basically of two groups: resistance and capacitance. Resistance systems usually measure a random sample of individual boards in all zones of the kiln which can accurately read MC to within 10% of MC, i.e. 20% ± 2%. Capacitance systems measure several tiers of boards and provide a more relative MC range rather than a specific number.

Other inputs available include: Steam metering devices, keyboard entry, and telephone modems.

There are a variety of storage or memory devices that store information for permanent record. Floppy disks, magnetic tape, paper tape, and central storage facilities at computer companies.

After checking inputs, processing data, and deciding what response is correct, the computer sends output signals to valve controlling devices. If the present system is pneumatic, the computer activates solenoids which open or bleed air to or from motor control valves. If new valves are installed or replacement is desired, electronic actuators may be installed as motor valves in place of diaphragm. Fan reversal is accomplished through computer prompted relays. Fan speed may be regulated as well.

Other outputs might include: a continuously updating video screen, hardcopy printer, or strip chart recording.

Through combinations of analog steps or digital software, the computer will interpret kiln conditions and react as it has been programmed to do.

Here are some of the solutions computers offer to many of our control problems.

1) During heat-up, the spread between the dry and wet bulbs gets too big and drying becomes too rapid. The computer can regulate the rate at which both bulbs climb. If your initial setting is a 10°F spread, the computer will control the spray and heat to maintain the spread, thus preserving the load.
2) Steam pressure drops due to boiler going down. The computer can be programmed to set each kiln on a priority system and cut back or route steam to specific kilns.
3) With the price of fuel so high, monitoring BTU and steam consumption are innovations which the computer can monitor and record for cost references.

4) Cutting back schedules. Using a schedule based on MC, the computer can speed up the drying on drier loads and lengthen it for wet sinker loads.

5) Frequency of fan reversal. The computer compares the dry bulb on the upwind side with the dry bulb on the downwind side. During drying, the heat is lost to the board and its moisture, so this side to side temperature change is a large one. When drying is nearly finished, the difference is only 10% and further drying is slow. This difference, the thickness, and MC of the boards determines reversal times of between 1 and 12 hours.

6) Proportional venting--Present systems either open or close the vents. With the computer and minor adjustments on the vents, if the vents need to be opened three inches or two, etc., to release just enough moisture, they will. Steam loss, etc., is solved, and cost reduced.

Finally, let's compare Pneumatic Control with Computer Control.

	CHARACTERISTICS	MICROPROCESSOR	PNEUMATIC
1.	Response Time	10 Seconds	5-15 Minutes
2.	Precision	± 1°F	± 2.5
3.	Control Options	Temperature or MC	Temperature
4.	MC Monitoring	Continuous	No
5.	Priority of Control	Charge Preservation	Schedule Time
6.	Schedule Progression	Automatic with Manual Override	Manual or Cam by Manual Override
7.	Overdry Protection	Automatic	None
8.	Problem Diagnosis	Automatic with Visual Printout	None

With precision, consistency, and economy going with it, electronic technology represents the opportunity for greater control of the "black box" known as the dry kiln, and will provide each of us with a tool with which to produce better quality, and cheaper dry lumber.