TRYING TO GET THE MOST OUT OF YOUR KILNS

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I was asked to speak at this year's annual kiln association meeting by our president. I wondered what I could share that would be of interest at this meeting. I thought back to the last time I gave a talk here in 1997 about factors that influence drying red alder. I noticed we had a few issues with color variation in our finished product. Definitely not good for an end product that is going to have a clear finish put on it in our high end products. Most of the color issues were with blue stain in our logs, because of high saw log inventory. The color issues from the kiln department were primarily sticker stain and to a lesser extent cart stain. These color issues resulted in another sort to pull at the planer chain. We called it a paint grade, because the only way to hide the defects was by painting over them. This product was sold at a lesser value and was also harder to move by our sales people. The primary reason for the sticker stain was we had too high of a rough green inventory in front of the kilns. The amount of time it took to get into the kilns was taking too long.

We had to work out our sawmill's predicted capacity and line that up with our kilns' production capacity and what would be an acceptable green stickered lumber inventory in front of the kilns. Going from there we could work out what percentage of lumber would need to be dried by other custom dryers. This varied throughout the year, with more outside drying during the winter due to slower drying times because of the obvious issues between winter and summer conditions. Working our schedule ahead we could predict when we needed to put the sawmill's production on our outside dryers package sizes. The issue of kiln cart stain has been an ongoing fix. We have been in the process of replacing the steel I-beams with rectangular tubing. The I-beams loose their rigidity from use and tend to start bending and dig into the lumber that's placed on it. You can bend back, or straighten them out, but you can do that just so many times. To remove the lumber to cart contact, we've been using old belting cut into strips and using a Hilti gun to fasten the belts to the carts, with pins. This is an ongoing process, not all carts are done, but we'll get there. For the year 2001 we had a paint grade of 0.59%, or a 58% reduction from when I last spoke in 1997. We are looking at eliminating the paint grade from our list of grades altogether.

The next thing we looked at was our actual kiln drying efficiency. We started tracking up time in the kilns for each month. A program was made where we list the amount of time a kiln is down and why. Looking back at this program you can see what were the major causes for each kiln being down and not running. One of the reasons we saw for down time was kiln dried lumber blocking the charge that needed to be pushed out of our track kilns. The kiln dried storage area we had, was on the dry end of our 5 track kilns. The holding capacity was roughly 500 MBF. We have 9 kilns, 5 track kilns and 4 side loaders. The total kiln capacity is 706 MBF. Lumber being dried on the outside had to go onto the kiln tracks.

To complicate issues more, our sander was being run to maximize throughput. We basically have 2 lengths to run 10' and 8'. As of right now, we run 4/4 alder and 6/4 alder in our production mix. We do run to a lesser extent, 5/4 maple in our production. When the production schedule is set for the sander, they'll run all the 10' on the tracks first and then do a change over and run all the 8'. This of course minimizes changeovers, or

down time. However, this doesn't line up with the kiln turnover and you'll have kiln tracks with 8' lumber on them and the kiln needs to be shoved out. The kiln department moved a lot of lumber from one track to the next to accommodate for this. There were times where we just had no where to move the lumber. We acquired downtime due to this. In the year 2000 we had 352 hours of downtime due to lumber on the back end of the kilns. We do have 3 storage sheds on our mill site, but they are used for finished lumber storage. Every once in a while, we could store lumber in one of those sheds. Finally in 2001, everybody put their heads together and came up with a plan to clear out around 1/3 of a finished lumber shed and dedicated that area for kiln dried lumber. This area holds approximately 200 MBF of lumber and has helped us immensely. We did have to go out and get an outside storage building to store some of our finished lumber inventory. However, that just wasn't due to the allocated kiln dried storage area. We needed an outside storage area for the finished lumber anyway. The results of better scheduling between sawmill, kilns and the planer have resulted in 3 % more kiln production through our kilns.

We did look at other possibilities to try and increase our kiln production, or decrease costs. The first thing we looked at was electrical costs, mainly our fan motors. Our track kilns have a steel disk lineshaft fan system with the air velocities in the 500-600 ft./min range. These kilns were not feasible to look at reducing fan speeds, either by a VFD, or piggyback a smaller motor. The side loader kilns have cross shaft fan systems with variable speed drives on them. The drives were bought back in 1992 and were subsidized by the local P.U.D. A variable speed drive was put on one kiln and then it was metered with the fans at 100%, as it was run before the drive. Then we had a manual switch put on the drive that dropped the frequency down. We verified air velocities with a thermal anemometer to determine when to drop the drive down to on the manual switch. We ended up getting drives put on all four kilns with the P.U.D. paying for 80% of the project costs. At that time we had pneumatic controllers on our kilns. In 1996 we changed out our control to a PLC to PC controller. Having this computer now enabled us to change fan speeds with each drying step if we wanted. We started working with the fan speeds and verifying at what percent we had what fan velocity. We ended up using a step down approach during the drying schedule. The computer controller manufacturer then came up with an auto fan speed control for use when the lumber charge is below 30% moisture content. This auto fan speed control function would check the TDAL at a preset time interval. If the TDAL stayed consistent, it would start dropping the fan speed 10% of the speed. Depending on what the TDAL did, it would either ramp up, or down, with the changes. The computer has a fan speed control screen that the operator can change the control variables, to their liking. The main variable that we set, is the minimum fan speed percent. The best results that we found out to use, is a manual set fan speed above fiber saturation point and then switch to the auto fan speed control when under the fiber saturation point. We had a couple of kilns metered by the P.U.D. again, and compared the electrical usage. There wasn't a substantial difference, but there was a small difference, and any little bit of cost cutting is helpful. We are still trying to figure out just how much airflow we need to use above the fiber saturation point.

The last thing that we did to increase kiln production was discovered by day to day monitoring of our kilns on the computer controller screens. The side loader kilns were the kilns that we noticed, while monitoring the kilns during their production runs. I'll first give you a little history on the kilns. The first two were put in 1986 and had a common wall. They were each 40 MBF capacity. The third kiln was put in 1988, and its capacity was 60 MBF. All three of the kilns were loaded with 6' wide packages 2 deep, on each side of the center swing coils These kilns had pneumatic controllers on them with one zone control. The one heat valve fed steam headers for both the overhead and center coils. The two temperature bulbs were located up above the false ceiling by the overhead coils. This

was done to keep the bulbs out of the forklift's way, when loading and unloading. The wet bulb is located against the back wall of the kiln, about 5 feet up the wall. The kiln operators noticed that there was a difference in moisture content between the loads in the plenum area, and the loads by the center coils. It was a big enough difference in the 60 MBF kiln that the manufacturer piped in a separate valve for the center coils and put up a separate controller for set points for that center coil control. They had another pen added to the main controller to show and record its temperature on the chart. The last side loader was put in 1990 and it was another 60 MBF kiln with two-heat zone control. In 1996 when we switched all the kilns to the PC control, we had two of the 40 MBF kilns piped in with another valve for independent center coil control. However, there was still a difference in drying from the front plenum loads, to the center coil loads. The difference in drying made us change how the kiln was loaded. The back of the kiln has the steel columns that run from the false ceiling to the floor. The lumber loads can go up to them. This gives a 6-½ foot plenum space for the back of the kiln wall. The back row goes in with the second row put in next, with a 4" separation between them. The center coils are then closed and the next row is put in. However, the last row has a 2-2 ½ ' spacing between it and the front center coil row. This was done so the kiln operators can do a hot check on the center coil loads, as well as the front loads. This way the kiln operator could be sure the center loads were dry. In doing this, we lost 2 ½ feet of front plenum area. This had been standard practice since the late 1980s.

We had tried in the past to shove the two rows together in the front and dry them. We still came up with the same results. The center loads were wetter than the front loads. During day to day monitoring of these side loader kilns we did notice that there was a difference in the signals for the overhead heat coils and the center coils. The overhead coils would be at set point and backed off from 100% on. The center coils would be at 100% and either just on set point, or not even there, yet. We then checked temperatures in the kiln at the plenum area and at the center coils, with humidikes. It always seemed like the overheads were anywhere from 2-4 degrees reading higher on the computer, as opposed to the humidikes. We inspected where all the RTDs were located in the kilns. The overhead RTDs were located about 3 feet from the heating coils, up in the false ceiling. We wondered if there could be radiation heat from the heat coils, giving a false high reading where the RTD was. What we ended up doing was moving the RTDs for the overhead coils, down into the floor plenum area. The RTD for the back of the kiln was located on the bracket that was holding the wet-bulb RTD. The front RTD was mounted on a stainless steel channel piece, which could be slid into one of the sticker openings, on the plenum packages. We did this first in one kiln and checked the temperature readings with the humidike. The RTD and the humidike were reading pretty much the same temperature. The next thing we did was load the front of the kiln like how we loaded the back of the kiln and that would give us that 6' plenum space. We dried a number of charges that way and noticed that the front and center loads were now drying evenly. We also noticed that the overhead coil's output signal was matching up with the center coil's output, or that they were working much harder than how they were before. The nicest change was we were drying kiln charges faster than before. We decided to change the RTD location and loading pattern in all 4 of the side loader kilns. The results of this are 10% reduction in 4/4 alder drying times and an 8% reduction in 8/4 alder drying times.

What we've learned from the experiences that I've mentioned, is we can increase our kiln production, without doing any sort of upgrade to our kilns. The better communication between sawmill, kilns, and planer has made us more efficient in our production. The more information you have to work with, like a computer controller, as compared to a pneumatic controller, enabled us to see an opportunity to improve some kilns capacities.