BEFORE THE KILN: FACTORS CONTRIBUTING TO DRYING DEFECTS IN SECONDARY MANUFACTURING

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The primary focus of this talk is the secondary manufacturing industry. Whether you call our mills value-added or remanufacturers, we all, for the most part, are not involved in primary breakdown. The majority of secondary manufacturers must purchase raw material from primary producers. This raw material can be in a variety of forms:

Rough, Green, or Dry
Commodity products such as #2&Btr or Economy
Specialty products such as Shop Grades

For most of us, this material will need kiln drying in order to meet the requirements of our individual mills' programs. It is the kiln drying process that, for many of us, has the greatest impact on our bottom line. I have identified three factors, which I believe exert the greatest influence on the drying process and drying related defects. They are cash flow, the geographical location of the lumber, and differences in primary mill philosophies. I believe it is possible to develop a program that will deal effectively with all three of these factors in any secondary manufacturing plant.

Geographical Location of the Lumber

West Hill lumber purchases rough SPF lumber from all over Western Canada. We purchase lumber from Northern Alberta and Saskatchewan, the Southern Yukon and Northwest Territories and most of British Columbia. The wood from these areas often has characteristics that are unique to the area.

Lumber from the far north of BC, Alberta, Saskatchewan and lumber from the Territories generally comes from smaller and slower growing trees that have been subjected to fairly constant and strong winds. Standing timber in these areas has a pronounced general lean towards the southeast. The lumber sawn from these trees generally has a high percentage of compression wood. The result is a much higher risk of warp, twist and crook occurring in the drying process.

For the rest of the areas from which we purchase rough lumber, the differences are caused less by climate, and more by species, insects, fire, or man's influence. Lumber we are purchasing from the Mackenzie area tends to be coming from small pine with a much higher percentage of juvenile wood content than we get from any other area. Juvenile wood, as we all know, can have a tendency to warp and twist during the drying process. In the Prince George area there is a high percentage of alpine fir and the lumber

is more often cut from side cuts of large spruce logs. The alpine fir has high moisture content in comparison to the lumber cut from the large spruce. West of Prince George, the Mountain Pine Beetle is devastating timber. Lumber from this area is mostly sawn from beetle killed trees and has fairly low moisture content. Much of it is very close to 19% before it reaches the kiln. We also purchase lumber that has been sawn from logs harvested from the bottom of Ootsa Lake. The trees standing on the bottom have been there for about forty years. The moisture content of this wood is so high that water actually runs out of the logs as they are being sawn. My biggest concern with this product is cell collapse during the drying process. Letting the lumber air dry for a couple of months before putting it into the kiln helps reduce the risk and reduces the drying cost. Lumber that is sawn from logs harvested from a forest fire burn can come from anywhere. The greatest problem with this type of material is inconsistent moisture content. Moisture contents can range from 12% to over 35%.

Differences in Primary Mill Philosophies

Every mill has a different method of dealing with its rough green lumber. Strip and package sizes are used that most suit the requirements of their individual systems and processes. Some mills have gone to species separation where the alpine fir is sorted and dried separately. Other mills have gone to moisture sorts to separate the lumber into a range of moisture contents. In both cases, the objective is to increase the efficiency of the drying process with kiln schedules that best suit the moisture content of the lumber being dried.

Lumber that we purchase already stickered will have different sticker and package sizes depending upon the producing mill. One of our suppliers uses a sticker size of 1" x 2" with a package size of 4' x 8'; one uses a sticker size of 5/8" x 4" with a package size of 5' x 7'; and one uses 3/4" x 2 ½" strips with a package size of 5' x 5' and three lengths per package.

Block piled lumber that we purchase is where we tend to run into problems which I consider more of a quality issue with the primaries. Most of the primary mills that we deal with are very careful to ensure that any block piled green lumber is sold quickly to ensure that staining problems do not occur. Others don't seem concerned. I have seen lumber come into West Hill that was so moldy the lumber piler could not pull two boards apart.

Cash Flow

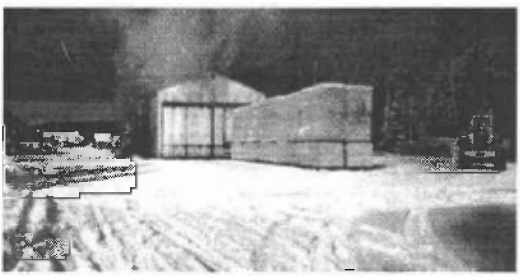
Some of you are probably thinking that I have been spending too much time inside the kiln while its running to suggest cash flow as a kiln drying problem. It is my belief and my experience that this is probably the largest factor contributing to drying defects in secondary manufacturing. Drying decisions that are prompted by cash flow are rarely good decisions. They are expedient.

Maintaining positive cash flow is essential to the survival of any business. Positive cash flow is usually a sign that the business is healthy while negative cash flow could be an indication that the business has an illness. It is also important to ensure that supplier and customer relationships are also positive.

Secondary manufacturers do not often have the luxury of picking and choosing the lumber they will purchase or when they will purchase it. A decision to wait for a week before purchasing an offered block of raw material could mean that a competitor will end up with it resulting in a scramble to find raw material to keep the plant running. Raw material is purchased as it becomes available unless you have a large inventory ahead. In that kind of a situation you may pass on an offering. If it is material of a high quality that you are passing up, then you may be allowing a competitor a foot in the door with your supplier. The end result is that you have purchase files with a number of suppliers who, all expect to have the product picked up in a timely manner.

In order to maintain supplier satisfaction, I find myself continually in a position of picking it up a little slower from all of my suppliers at the same time. At any given time I may have lumber from three or four mills in my yard ready for the kilns. Cash flow rears its ugly head at this point. In order to pay for the raw material, the lumber must be dried and processed and an order file generated. Based on past experience with these suppliers, an available for sale is forecast, our customers contacted, and an order file is generated. Customer A wants a super B of random length and Customer B wants a regular of straight 14 foot. Customer A's terms are 1% discount 10 days. Customer Bs terms are 2% discount courier 3 business days. Cash flow says that we want Customer Bs order out right now, preferably yesterday. The problem here is that I have some 14 foot material from Mill 1, Mill 2, and Mill 3, but not enough from any one of them to develop a kiln charge or the order. If I combine their wood I have more than enough, so into the kiln it goes. Mill 1 sent their wood in as block form and we stickered it by hand. Package size is 5 foot wide by about 4 foot high and it is dead green. Mill 2 sent us their wood already stickered. The package size is 5 foot wide by 7 foot high and it is mostly juvenile wood. Mill number 3 sent their wood already stickered as well. Their package size is 4 foot wide by 8 foot high. Their produce comes from side cuts and has been sitting in their yard for most of a month. Oh, and their stickers are 1 inch thick in comparison to 5/8-inch thick on the rest and 2 inches wide in comparison to 4 inches wide on the rest. This all ends up in a single kiln charge. Would anybody like to try and figure out the air flows on this one?

The end result is poor quality. Some wood is over dried. Some wood is under dried. There is warp, twist, crook, and the occasional airplane propeller. Recovery is down, production is down and cash flow is down. We did get the order out, however, so short term cash flow looks good. A decision influenced by cash flow is an expedient one, not necessarily a good one.



Drying

The example I have just given you was a bit exaggerated. Mixed kiln charges are the most common charges that I dry. If I can load a kiln with wood from just one supplier it is likely that the packages will have sat in his yard from a day to a month. So, while packages, stickers, and species are all consistent, the moisture content ranges from dead green to almost dry. Drying it all together is still a major problem.

Drying degrade was the primary problem encountered during production at West Hill. Recovery into higher grades was low and trim loss was high. The major problem at the planer was warp, twist, and crook. Before the product went through the planer we had a 5% trim loss due to boards that were too warped and twisted to go through the planer. The material that made it through the planer then needed trimming to grade, another 5%.

Looking through our historical order files, two things became apparent. We had never had a moisture claim. In fact, out customer preferred a lower moisture content since his process involved gluing. In every case where there was a problem with the quality of our product, it was related to warp and twist.

I tried for a couple of years everything I could think of to eliminate that particular problem. I tried lower temperatures, higher temperatures, and increasing and decreasing the spread between the wet and dry bulbs. I tried opening and closing the vents at different times during the cycles. A couple of times I tried a combination of swearing at and kicking the kiln. If the lumber came out of the kiln straight, it was too wet. If it came out dry it was warped. A couple of years ago I attended the Forest Products Society Kiln Drying Conference in Seattle. While having a cigarette and chat outside with one of the other attendees between talks, it was suggested that since my kilns were fairly old, I should try keeping the vents closed throughout the cycle at a lower temperature. Let the normal leakage of the kiln do the venting. The lumber inside the kiln would be drying and equalizing through the entire cycle. When I got back to Prince George, I tried it at 180°F on the wet bulb and 160°F on the dry bulb. Production at the planer went up by 39%. Recovery went up by 20%. Trim loss dropped by 6%. The idea worked so well that I have been terrified to try anything else since. I have also discovered that this is a fairly common practice in mills that have older kilns. The only thing that changes in my drying schedule right now is the length of the cycle. I find that I can get away with between 36 and 48 hours in the summer and winter when the relative humidity of the outside air is low. During the spring and fall when relative humidity is high, the charges take between 60 and 72 hours.

Conclusion

In my experience there is no hard and fast rule for kiln drying. Every mill is going to have different kiln drying problems: different lumber, different customers, different kilns and priorities. The bottom line is that our kiln drying must deal with those problems in the most effective manner possible.

One of the greatest resources for the kiln dryer, especially for the small secondary manufacturer, is conferences such as this one. I have learned more at kiln drying conferences by listening to people talk about their problems and solutions, and chatting with other kiln operators, than I could in a lifetime of operating a kiln. I would like to thank the Western Dry Kiln Association for giving me the opportunity to give back some of what I have taken away in the past.