A FOREST SERVICE PROGRAM OF WOOD DRYING RESEARCH APPLICABLE TO THE PACIFIC NORTHWEST

By Douglas L. Hunt

The basic aim of wood-seasoning technology is to uniformly condition wood to a desired moisture content, with a minimum of degrade, and to do so at a cost commensurate with its improvement for further processing or improving its in-use serviceability.

The wood-drying equipment employed in modern industrial processes--including lumber kilns, roller or jet veneer dryers, and drum dryers for wood particles--have been brought to a relatively high degree of refinement. It is true that many processors do not employ the latest types of equipment or the best operating procedures, due to limitations of capital or technical knowledge; but adequate equipment and know-how are available to satisfactorily season wood for practically all current uses. New size standards, maximum moisture-content requirements, and the increased emphasis on drying lumber products to their end use means kiln operators must practice the best drying technology available.

However, those engaged in drying research are often discouraged by the fact that the best drying technology is not always applied. Our experience in the Pacific Northwest indicates an urgent need to further implement the application of drying technology to commercial operations. In appraising the role of the Forest Service in the Pacific Northwest toward this aim, we have concluded that: (1) seasoning courses are effective and should be expanded, and (2) that research should be done in cooperation with the mills at the mill location.

Considering the number of men to be reached throughout the country, it is necessary that universities and State laboratories offer seasoning courses. However, these courses need the support of the U. S. Forest Products Laboratory through contributed literature and participation of Laboratory staff members.

In our opinion, the Forest Products Laboratory could be more effective by supporting seasoning courses in the Pacific Northwest than by providing courses at Madison. Such an approach would reach more operating personnel each year, and enable the Laboratory staff to become more familiar with lumber-drying needs of the Pacific Northwest. This, in turn, could result in a type of Laboratory publication that would be extremely valuable to kiln operators in this region. The Forest Products Laboratory could then devote additional time to a short course of broader scope. This course, held at Madison, would acquaint industry personnel--at the managerial level--with the staff and facilities of the Laboratory.

This pattern of instruction would be more effective because the kiln operator would benefit by learning better techniques on a familiar species, and management would benefit by increased knowledge in several new areas of wood technology.

Research can reach deeper into the level of mill operation in several ways. One way is through the improvement of lumber-drying schedules. Because of the wide variety of schedules in use, we hesitate to offer more schedules. We do, however, suggest that a method be developed to determine which schedule is best. We believe a method can be developed under the usual production conditions and by using the present means of measuring degrade and moisture content.

There will be considerable work involved in developing a procedure for selecting schedules. However, we believe the necessary tools and knowledge are available to develop such a method. The knowledge is available--through your experience, as kiln operators, in drying various sizes and species of lumber. You, better than anyone else, know the problems in lumber drying. The tools can be provided for you to use--through those of us who are engaged in research.

Statistics is one of the important tools available to a researcher and one not extensively employed in seasoning research. The proper use of this tool requires that the variable under consideration be measurable and, fortunately, extraneous variation, or experimental error, can be reduced to a point where definite conclusions can still be reached. As Cochran and Cox state, "Whatever the source of the experimental error, replications of the experiment steadily decrease the error associated with the difference between the average results for treatments."

Lumber drying offers an extraordinary opportunity for statistical analyses in that (1) relatively large volumes of material are available, (2) the important variables can be measured, and (3) replications are already a part of the production process. Therefore, as a start toward putting this tool to work for better knowledge of lumber drying, and using schedules as an example, we suggest that kiln operators and researchers cooperate in the following steps.

Schedules such as those presented in the Kiln Operator's Handbook and those developed by industry, should be critically reviewed in the light of the best experience and information available. This information and experience could come from such organizations as Western Pine Association, Oregon Forest Research Laboratory, the University of Washington, dry kiln clubs, and individual companies. Tentative schedules would evolve from this type of activity. Companies would be urged to try one or more of the tentative schedules in comparison with their presently used schedules.

To determine the effect of schedules on degrade and moisture content, we would take measurements at the appropriate time and place. For the first variable--degrade--this would consist of a rough green grade on any given volume of lumber for each schedule. After drying and surfacing, the same material would be regraded and the value loss recorded, by cause. Measurements for the other variable, average moisture content, would be taken only after drying and surfacing. If, for this example, 3 replications of 3 schedules were thought to be sufficient, a total of 9 measurements for each variable would be needed.

By replicating our measurements and schedules, we can compare our results by a statistical test known as analysis of variance. Without explaining the details of how the test works, it will enable us to separate the effects of various treatments on each variable. Conversely, if there is no difference among treatments on each of the variables, we will know this. In other words, regardless of the experimental error introduced by the inherent variability of lumber and the inability of the kiln operator to standardize his experimental techniques, we are still able to reach definite conclusions as to the effects of the three schedules.

It is entirely possible that no single schedule will result in a minimum of degrade at the desired average moisture content and with a minimum of variation from the average. However, management could determine the variable which was most important to their operation and then could choose the schedule that best met with their requirements for that variable. For instance, if degrade were the most important consideration, the schedule that resulted in a minimum of degrade could be chosen over other schedules even though the other ones may have resulted in more desirable average moisture content and/or a smaller index of variation.

This type of experiment could be expanded. For instance, different time-temperature relationships within each schedule could be included as part of the experiment. However, by including a large number of variables, the experiment could rapidly become unwieldly. At first, it may be more desirable to determine which schedule is the most favorable and then, in a separate experiment, further determine the minimum time in the given schedule at which minimum degrade occurs.

While I have used schedules as an example for this type of research program, there is no reason to limit ourselves to schedules. There are innumerable problems that exist in our lumber drying process that might yield to this approach.

This, then is our concept of a drying research program applicable to the Pacific Northwest: kiln courses conducted within Oregon and Washington reaching as many operators as possible, with the best available instructors, to provide industry with technically trained kiln operators; and research designed to help the kiln operator by combining his knowledge and experience with statistical techniques.

Gentlemen, the problems of lumber drying are with us--now. There is also a wealth of knowledge and experience in industry and in research orgainzations that could go far towards solving those problems. We, at the Pacific Northwest Station, suggest that now is the time to combine our forces and overcome these problems.