The key to improving drying quality and reducing drying time and energy consumption lies in understanding and controlling moisture movement during drying. As wood dries, strains and stresses develop as a result of restraints imposed by moisture gradients and differential shrinkage in wood. So accurately measuring the moisture gradient in wood during drying will be helpful to improving drying quality.

In this project, moisture gradients in red oak will be measured through four different techniques----bandsaw slicing, Forstner bit layering, flaking and razor blade slicing. The first two techniques are found in the literature. The last two are developed in this study. The results obtained with these four techniques were compared, and it was found that the newly developed techniques could get moisture gradients that were closer to the true value.

The thickness of the slice was assumed to affect measuring the moisture gradient because of the environmental influences. So a thickness series was tested with the two new technique----flaking and razor blade slicing. The results showed that there was no slice or flake thickness effect on the moisture gradients. And an optimum slice and flake thickness was determined for the wood industries and research studies.

Finally, the directional effect on transverse moisture movement during kiln drying was examined through measuring moisture gradients in the tangential and radial directions of wood. The results showed that moisture moved slightly faster in the radial direction than in the tangential direction during kiln drying and the moisture gradients in the tangential direction were slightly steeper than those in the radial direction.
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