

VOLUNTARY PAPERS

EVALUATION OF MOISTURE GRADIENTS DURING DRYING OF SLASH PINE SAWN WOOD USING GAMMA RAY TECHNIQUE

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Wood is a very heterogeneous porous material when considering size and arrangement of its components. This should be taken into account when drying and impregnation processes are under study. The apparent volume of a wood piece is formed by wood itself, air, free and bounded water. Due to a large difference in porosity (density) the amount of water accumulated in the earlywood hence a living tree is quite different from the amount of water found in latewood. On the other hand, openings on the cell walls of latewood are smaller, so that removal of water in this region is not as easy as in earlywood. This study was carried out to evaluate the initial moisture content distribution of freshly cut timber and to study water when drying relatively small samples. Evaluation of moisture gradients was accomplished by using gamma attenuation technique. Samples of slash pine with an initial moisture content of 180% (dry basis) were dried under different temperature. Drying was interrupted several times in order to examine the samples. The process was completed when fiber saturation point was achieved. Evaluation of the freshly cut samples showed that 75% of all existing moisture was concentrated in the earlywood portions. The average initial moisture content of latewood was as low as 35% and in some parts of latewood, free water was almost absent. Latewood of slash pine has a large quantity of air, and this can be an important factor in restraining free water flow. In the radial face of the samples, drying started along the earlywood layers. This is associated with larger pits and openings on the cell walls of this type of wood. In earlywood layers, drying started at the surface and moisture content was gradually reduced up to the center of the sample. In sequence, drying proceeded from springwood layer towards latewood layers. This was observed for all rings in sample drying at different temperatures. It is interesting to note that in all tests the moisture gradient formed during drying process was significantly different from those reported in the literature.