RESEARCH in Progress

Forest Products Laboratory

Effect of Processing Conditions on Retention Variability in Treated Lumber

Lumber used outdoors is often pressure-treated with preservatives to resist fungal and insect attack. It is important that the lumber contain sufficient preservative (called "retention") to provide long-term protection. Early failures caused by inadequate retention can foster a negative perception of treated wood and cause consumers to choose alternative materials. Reducing the variability in retention resulting from pressure treatment may help to ensure that more pieces are adequately treated.

Background

The amount of preservative needed to protect wood from biological attack (minimum effective retention) is determined from years of laboratory and field testing. Standard-setting bodies, such as the American Wood Protection Association (AWPA), then set a standard minimum average charge retention that is above the minimum effective retention. The average charge retention is confirmed by removing increment cores from 20 pieces in each charge and combining them for a single analysis (Fig. 1). If the charge average is above the standard minimum charge retention, the charge passes. However, wood is a variable material (Fig. 2), and a single charge may have hundreds or even thousands of pieces. Individual pieces in each charge will have retention levels above or below the charge average. A passing charge with high variability may have many pieces with a retention below the minimum effective retention, and others that are treated to an unnecessarily high retention (Fig. 3). Reducing within-charge variability will lower the frequency of both under-treated and over-treated pieces in a charge. In this study we will evaluate how changes in processing conditions might be used to alter or lower within-charge retention variability.

Figure 1. The retention in a charge of treated lumber is determined by removing increment cores from 20 pieces and combining them for a single assay value.

Figure 2. Example of preservative distribution in 2 by 6 lumber (nominal). The brown color is the preservative and the red color is heartwood.

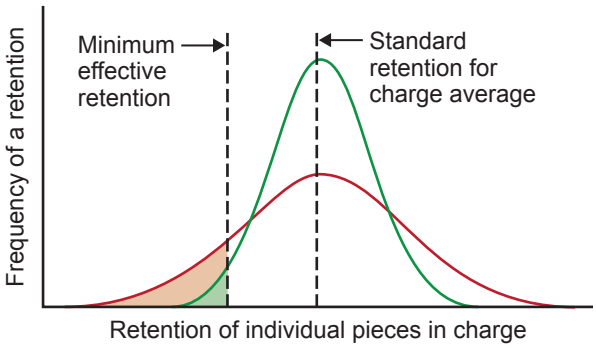

Figure 3. Hypothetical example of individual retentions in two passing charges with either higher (red line) or lower (green line) within-charge variability. The charge shown by the green line has fewer under- or over-treated pieces.

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Objectives

The objectives of this project are to (1) determine if changes in processing conditions can significantly reduce within-charge retention variability and (2) evaluate how changing treatment parameters affects weight gain and processing time.

Approach

A series of pressure-treatment procedures will be conducted with various vacuum and pressure conditions. A noncommercial waterborne copper solution will be used to represent a typical wood preservative. To minimize the effect of wood variability, treatments will be conducted on end-matched specimens cut from longer pieces. Each specimen will be weighed before and after treatment to determine solution uptake and then individually assayed for preservative retention using an increment borer. Preservative penetration will also be measured on individual increment cores and on a cross-section cut from each specimen. Resulting data will be statistically analyzed to determine if changing treatment conditions significantly affects within-charge retention or penetration variability. Potential negative consequences of changing treatment conditions (such as increased time, increased weight gain) will also be quantified.

Expected Outcomes

Results of this study will be published, presented at an AWPA meeting, and made available to the AWPA Technical Committees. This information will assist treaters in determining whether to change treatment conditions in an effort to lower within-charge variability.

Timeline

The project will begin in May 2017, with treatments conducted during the summer. Retention and penetration will be measured in fall 2017, followed by statistical analysis and report writing in 2018.

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