Bridge To Success...

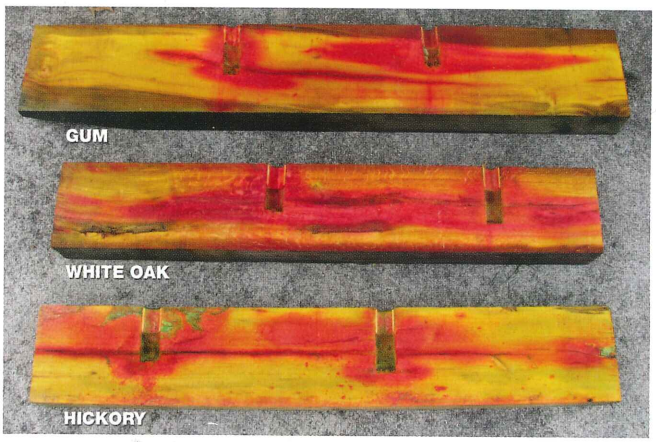
Extending The Life Of Wood Transportation Structures

A Conference Follow-Up From Dr. Jeffrey Lloyd

Editor's Note: At the recent RTA Conference in Incline Village, Nev., Nisus Corporation presented information about a new experimental research project being conducted in conjunction with a Class 1 railroad. The specific area of interest was improving the performance of bridge ties and timbers in high-decay areas. The following describes the scope of the work, what information has been gleaned to date, and the unanswered questions that remain in the quest for continual improvement options for wood ties and timbers in railroad applications.

In 2010, a hypothesis was formulated that could lead to the expanded use of borates and other standardized treatments, other than creosote, for bridge timbers and ties. In 2013, Nisus Corporation developed a protocol for an in-service research project to prove the hypothesis and worked with Norfolk-Southern Corporation & Mellott Wood Preserving Company to install the test. The theory behind it is by utilizing borates and copper naphthenate in a Boulton-cycle treating process that improvement in hardwood bridge tie and timber performance could be achieved.

Considered parameters for improvement include the reduction of preservative bleeding after installation coupled with improvement in in-service and life-cycle performance. While proof of either postulate has not been published yet due to the ongoing investigation, the initial observations suggest that both goals may be ultimately achievable.



Several species of hardwood were treated for installation and testing.

Some railroads report that bridge ties and timbers, Boulton treated with creosote to current standards, fall below the average service life for established system-wide of 33-45 years for railroad crossties in some high-decay areas. Such reports are documented in varying ways, and thus the hard data for actual service life must be tempered by the inexact science used for collecting and reporting the data.

However, if the reported service life of bridge materials is accurately described ➤

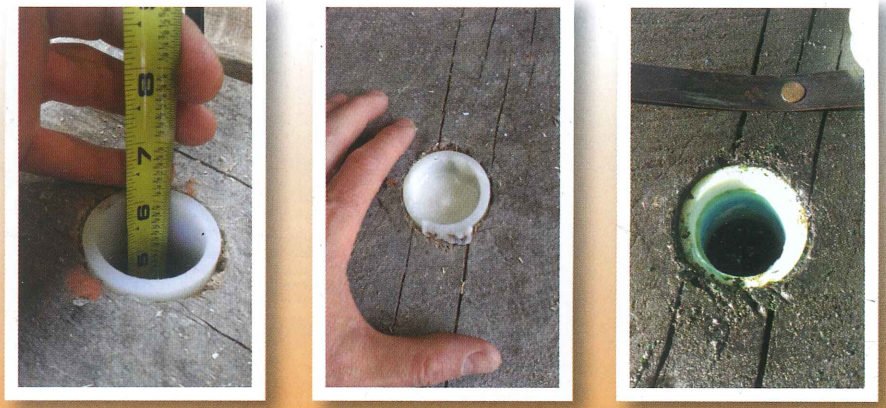
Dr. Jeff Lloyd kneels next to a bridge timber that was cut in half, sectioned longitudinally, and sprayed with curcumin to show the borate penetration (red areas) immediately after treatment. Also note the vertical BTX ports that were used to inject the borates at initial treatment.

as less than optimal, the problem created is the significantly increased railroad maintenance costs associated with safe bridge operations. Is it worthwhile to seek improved performance even at increased costs? That is a fair and reasonable question given what some railroads have done in bridge material replacements with even more expensive non-wood alternative materials.

The research project was designed to investigate if an increase in the service life of wooden bridge timbers could be achieved, at only nominal additional cost, with the latest dual wood preserving technologies utilizing DOT borate and copper naphthenate.

Green hardwood bridge ties (10" x 10" x 10') were ported, (holes drilled and filled with Nisus-patented BTX™ sleeve inserts) borate treated and capped, and then Boulton treated in copper naphthenate for 18 hours. Following an initial report on the treating process at the RTA Conference, the timbers were longitudinally sectioned and sprayed with curcumin, after the method of Smith and Williams 1967.

The photo above shows that following the Boulton cycle, all of the borates applied to the ports had diffused into the ➤



Pictured above are images of BTX ports. *Left:* A BTX port installed prior to injection. *Center:* A BTX port prior to capping filled with DOT borate (Cellutreat™). *Right:* A BTX port empty after the Boulton cycle using Copper Naphthenate.

center of the untreated heartwood and traveled much of the length of the ties. In this specific test, both copper naphthenate and DOT borate gauge retentions met AREMA guidelines and AWPA Standards.

Diffusion of borate within the wood was significant. The results suggest that this occurred and was facilitated by both the elevated temperature employed during the Boulton cycle and the live steam generated and will only be further enhanced with continued diffusion in service.

Should the final research results confirm the initial sampling, one could expect the performance of bridge ties and timbers treated in this manner to match that found by Dr. Amburgey and reported in *Crossties* in 2010 and 2011. A paper on the installation and initial results with conclusions will be presented at special session on Protecting Rail Ties and Timbers at the International Research Group on Wood Protection meeting in May in St. George, Utah (www.irg-wp.com). Since some railroads are looking for at least an additional 10-year service life in bridge ties and timbers, the hope is to soon be able to report this goal can be achieved with this approach to wood preservation.

One additional note is important about the porting of the timbers using BTX sleeves. One advantage over other methodologies of this dual-treatment system is that *in situ* preservative "top-up" after installation can occur much more easily with associated cost efficiencies when BTX ports/sleeves are installed at time of initial treatment. Remedial treatments with either DOT borate only, Nisus developed propriety pastes, or liquids containing copper and DOT borates or DOT and glycol can be injected into the uncapped then re-capped BTX ports with ease should a railroad desire to keep the loadings of preservatives as high as possible throughout the life of the structure. ■

Jeffrey Lloyd, Ph.D., who designed this research project and provided slides and the materials for the RTA conference report, is vice president of Research & Development for Nisus Corporation. He is also president of the International Research Group on Wood Protection and serves on the Railway Tie Association's Research & Development Committee and on the Executive Board for the American Wood Protection Association.