Railway Tie Association Response to Wood Preservation Chronology Request

prepared for

Burlington Northern Santa Fe

by

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Submitted by RTA Executive Director James C. Gauntt – April 2015

Introduction

Pursuant to a March 27, 2015 an inquiry received from BNSF's Chad Rolstad and David Smat, RTA was asked to provide an independent brief history of wood preservation techniques and a current overview of the marketplace. The goal of this response is to outline how the railroads arrived at this point in time with a status quo that creosote or creosote/borate dual treatments are used for approximately 98.5% of the treated wood tie market and with other AWPA standardized wood preservatives now accounting for 1.0-2.0% of that market.

The driver for this review is recent and ongoing regulatory initiatives at the federal, state and local levels, which have been common for decades, coupled with the current concern that wood treatment options, and ultimately the recycling and/or disposal of certain treated wood products, could be impacted negatively.

Examples of the more recent federal regulatory issues include the Non-Hazardous Secondary Materials Rules, The Clean Power Plan and future re-registration mandates for heavy-duty wood preservatives. On the state level, past initiatives such as New York State's and New Jersey's restrictions on creosote treated wood for applications other than utility poles and ties, plus a recent State of Washington – Department of Ecology proposed study of PAH migration from railroad track in the Puget Sound area are examples of local review of wood preservatives.

The wood preservative industry has enjoyed several historical and also recent success stories not only in the regulatory defense of wood preservatives, but also in legal efforts to require fair treatment of wood preservatives. These will be discussed in further comments below. In fact, the wood preservative industry is arguably in one of the best positions it has enjoyed in many years in this regard. Nonetheless, RTA views an examination of the current marketplace and the history of wood preservation of wood crossties as an important and worthwhile effort for future business planning efforts.

Given the long history of wood preservative use in the United States (over 150 years), a comprehensive review of this subject is not possible in a summary style report. However, the following condensed synopsis was developed in such a way as to provide web-based embedded resources with which to dig deeper if required.

Overview and History of Pressure Treated Wood Tie Preservative Systems

For 150 years, the combination of wood treated with creosote and it solutions have provided a foundation on which American railroads were built. This brief summary will describe the use of this renewable resource – wood – and its treatment with creosote and other systems. There will also be mention of additives/supplemental materials used in treating solutions used for ties.

- 1716 patent for Spirit of Tar (creosote) awarded Dr. William Crook
- 1848 Bethell Process for treating wood with creosote patented
- 1865 first treating plant to treat ties with creosote erected in Somerset, MA
- 1875 Louisville & Nashville RR builds tie treating plant in Pascagoula, MS
- Between 1865 and 1880 new, more environmentally friendly, and cost effective empty-cell methods for creosote treatment of ties were developed (Rueping-Lowry Processes) – these methods (with further modifications and inclusive of best management practices) are still employed today.
  Around the turn of the 19th century (~1902), experiments were conducted with many various additives to creosote: Coal Tar, Water-Gas Tar and Petroleum Oils. Coal Tar and Water-Gas Tar are no longer in use but Petroleum Oils remain important blending components for creosote systems.

- 1929 - Creosote and its solutions reaches peak use (203 plants treating 60 million+ wood crossties). For a short period of time, zinc-chloride was added to creosote (discontinued in 1934).

- During WWII, shortages of creosote developed, so heavier oils and Copper Naphthenate were used as creosote extenders – these practices were discontinued for a variety of production related issues as available creosote supplies returned to normal near the end of the war.

- During the late 1940s, pentachlorophenol (penta) was approved for use with wood crossties. Penta is an excellent wood preservative that is still in use in the wood utility pole industry. During the next decade, or so, penta was either added to creosote for ties (proving to be highly corrosive) or used as a standalone treatment by railroads in small quantities, in various methods of application, for wood ties (Cellon process, heavy oil carriers, etc.). The practice of using penta for ties fell out of favor with RRs in the early 1960s.

- Chromated Copper Arsenate (CCA), a highly effective waterborne wood preservative in softwoods, was investigated for ties in the 1970s and 1980s but was found to be ineffective against certain decay fungi in hardwoods. Thus, even though it remains an important commercial product for softwood utility poles, its use in crossties has never been a major factor with only specialized use exceptions in softwood bridge ties.

- Numerous other non-efficacious products have come and gone, including waterborne sodium-silicate based products that were examined in US Naval shipyard tests and found to have no merit whatsoever.

- Since the early 1980s, creosote and its solutions have been the exclusive preservative for all wood tie applications.

- 1987 in-railroad-service experiments were begun by RTA/AAR /MSU into dual treatments using borates as a pre-treatment followed by standard creosote treatment.

- After the 1992 initial follow-up to the 1987 study, in which dual treated ties were found to be performing well, a shift in AAR priorities at TTCI led to AAR releasing this research project to industry. RTA and MSU continued to follow the ties in test and in 2003 produced a follow-up research report outlining the favorable performance of dual treated ties in high decay areas (see all dual treatment research).

- In 2004, both Norfolk Southern and then Canadian National helped commercialize the dual treatment process for widespread railroad use.

- In 2010, further follow-up to the 1987 test yielded additional positive results, which eventually lead to all Class 1 RR's employing the technology in some manner.

- Since 2010 other wood preservative systems have been standardized for wood tie use. Copper Naphthenate (CuN) with oil carriers (AWPA Proceedings from 2000) has seen some use with Norfolk-Southern using approximately 250,000 ties annually in Northern and Mid-Atlantic States, and for bridges in general. Other railroads, including UPRR, have also approved CuN for bridge tie applications. CuN may also be used with borates in a dual treatment process.

- Also, ACZA (Ammoniacal Copper Zinc Arsenate) has been standardized for both hardwood and softwood ties with limited use to date, predominantly on the west coast with Douglas-fir (AREMA Paper 2010). ACZA may also be used with borates and oils in single/dual treatment process.

- In 2008, RTA, in conjunction with MSU, Class 1 RR's, wood treaters and wood preservative manufacturers, initiated PHASE 1 of a comprehensive side-by-side full size tie comparative research project into all known alternative wood preservative products for potential wood tie use. PHASE 2 of this study was initiated in 2012 for products that were AWPA standardized after PHASE 1 was initiated. PHASE 1 of this study is now in the 7th year of the projected 20-year study. PHASE 2 of the study is in its 3rd year. PHASE 1 & PHASE 2 Dorman Lake test sites visits are included in 2015 RTA Field Trip agenda.

- A review by AAR in 1989 (R-744) covering the time period of 1900 to 1989 revealed that contact was made with 18 railroads, the U.S. and Canadian Forest Products Laboratories, the American Wood Protection Association, the Railway Tie Association, the National Technical Information Service and the Transportation Research Information Service. This resulted in locating records on 305 individual wood tie tests. These tests covered alternative wood preservatives and creosote related research plus comprehensive wood species research.

- The most comprehensive 156-page USDA handbook "Preservative Treatment of Wood by Pressure Methods" provides an all-encompassing review, through the early 1950s, of much of the material referenced above.

- Other historical research documents on wood preservation are available. Of particular note is the paper by D.L. Davies on treating plant operations. This review covers different tie seasoning methodologies including a very helpful historical review of Air-Drying and Boultonizing, which are the only seasoning methods employed by railroads today.

Recycling/Disposal

End-of-useful-life-in-track considerations are significant factors for used crossties no matter how they are produced or from what components. The lifecycle of the treated wood crosstie is explained in the RTA presentation From Tree to Track. In this outline one will note for wood ties treated with creosote that burning or other pyrolysis provide a closed loop carbon and energy use cycle. Used creosote ties contain roughly 8-12,000 BTUs of recoverable energy per pound and a peer reviewed Environmental Life Cycle Assessment (ELCA) has been performed for creosote treated wood crossties. Other ELCAs may have been performed for other wood preservatives. One such ELCA is for ACZA treated ties

An RTA/AAR 2015 survey of Class 1 and other railroads on disposal practices show that most Class 1 wood ties are treated with creosote or creosote/borate (98.2%) and most are disposed of through cogeneration for energy production (81.3%). The final report detailing use and reuse of wood ties is attached as an addendum (or as an email attachment depending on the format of this document).

Regulatory Comments

The author of this report has been fortunate to work in the wood preserving business since 1979 (36-years). Throughout that entire time period, ALL wood preservatives have been under some manner of environmental scrutiny or outright attack. The only course of action for the producers and users of treated wood products is the unfailing defense of wood preservation and the products manufactured with wood preservatives. There has never been a case in which the opponents to wood

preservatives, after damaging one preservative system on environmental grounds, did not then turn their attention to the next wood preservative product, no matter how benign and/or safe that system may be. Failure to defend these products, or rather yet acceptance that a ban on one or more preservatives is inevitable, is simply not an option for users or producers.

Recently, railroads, wood preservative manufacturers and wood treaters have been successful on several fronts in this regard. For example, the Army Corps of Engineers has relaxed its ban on treated wood use in Massachusetts and an industry lawsuit on the West Coast against the Corps has yielded a "win":

In March of 2015, the U.S Army Corps of Engineers (ACOE) withdrew Regional Conditions in their Alaska and Portland Districts relating to the use of preserved wood in aquatic environments. The Regional Conditions, published in 2012, prohibited preserved wood products from being placed over or coming in contact with waters or wetlands.

Under litigation brought by WWPI, and several other plaintiffs, the Corps of Engineers was forced to reconsider their blanket prohibition against the use of preserved wood products. In a complete reversal of policy, the Corps has now determined that the best approach for reviewing projects with preserved wood is on a case-by-case basis without any restrictions. Even more telling is the decision by the Corps to include alternative materials in their case-specific review process as well.

This policy change signifies that the trend against using preserved wood is shifting toward industry. Especially coming from the Portland District, one of the most environmentally conscious areas of the country, the placement of preserved wood on a level playing field with alternative materials marks significant evidence of such a change in ACOE practice. Industry's success against arbitrary rules such as these will help ensure the longevity of preserved wood in all applications.

As far as disposal is concerned, if the industry is not successful in the debate on Non-Hazardous Secondary Materials Rules, and the definition of which boilers may or may not burn ties, industry is prepared to activate its lawsuit against EPA to achieve judicial relief.

Finally, it should be noted that at the federal level there are NO restrictions to the labeled uses of any currently approved wood preservative system, including all preservatives used for wood tie production. This means that the defense of treated wood products is not only possible, but also comes with the likelihood of success, given the federally sanctioned approvals for wood preservatives under FIFRA labeling and registration requirement.

Summary

This overview of the history of exhaustive research into and understanding of treated wood crosstie preservative systems, industry action on continued research into new alternative wood preservatives, recycling and disposal practices and regulatory comments is helpful in understanding some of the reasons why pressure treated wood ties have remained a primary component chosen for most railroad track applications.

It should also provide some reassurances that the wood tie industry is remarkably proactive in providing the resources and tools necessary to ensure pressure treated wood ties will continue to serve the railroad industry for a very long time to come.

There will always be challenges to preserving wood and using treated wood crossties. With diligent pursuit by all parties (users and producers) of all means available for the advancement and defense of the safety of wood crosstie use, the treated wood industry is prepared to partner with railroads to provide services and products for the next 100 years.