Copper Naphthenate for Railroads

Historical Usage of Copper Naphthenate

- Late 1800’s in wood poles, timber, shingles, and lumber
- Textiles and cordage
- Creosote extender during WWII
- Standardized by AWPA (P8) in 1949 for brushed, dipped and remedial applications
- Added to AWPA Pressure Treating Standards in 1989
Why Copper Naphthenate?

- Creosote supply - ?
- Regulatory and consumer pressure for a cleaner end product
- Cleaner handling characteristics
- Less odor than Creosote or Penta.
- Less regulation at the treating plant
- FPL studies show it works as well as creosote and Penta
- Cost competitive in today's market
- Approved preservative by Federal and State agencies
- Same lubricating and waterproofing qualities as Creosote, Creosote-Petroleum and Penta.

Regulatory Status of Copper Naphthenate

- EPA non-restricted use pesticide
  - General Use Classification
- Non-hazardous waste
- Non-hazardous air pollutant
- No reportable quantity required
- Applicators do not have to be EPA certified
Regulatory Status for CuNap Treated Wood

- Non-hazardous waste by RCRA
- No TCLP regulations
- Disposal in Class II or III landfills – regulations vary state to state and may override Federal regulations.
- Incineration of used ties in permitted facilities is an option.

Copper Naphthenate Toxicity

- Low toxicity to mammals
- Toxic to wood-destroying fungi and insects
- Not on EPA’s Persistent-bioaccumulative-toxic (PBT) chemicals list
- Not listed as a carcinogen
- Readily biodegradable
Copper Naphthenate Treated Wood Properties

- Low acute mammalian toxicity by oral, dermal, inhalation routes of exposure
- Non-conductive: AAR/AREMA Test Show Less Conductivity Than Creosote
- Insoluble in water, low leaching rate

Performance of Copper Naphthenate Ties in Track

Lewistown, PA
Crosstie Performance

- Ties treated using copper naphthenate
- Treated by Burke-Parsons-Bowlby Corp., Spencer, WV plant, February 1988
- Harrisburg - Pittsburgh mainline, track #2
- Originally 34.3 MGT; Currently ~ 55 MGT
- 6° 49’ curve; 0.46 percent grade

Inspection of Ties

- Length and volume of splits/checks measured using RTA “TieGage”
**Ties in Test - Lewistown, PA**

- Copper Naphthenate (3.4 pcf of solution, or 0.03 pcf as Cu) - Air Seasoned
- Copper Naphthenate (5.0 pcf of solution, or 0.04 pcf as Cu) - Boulton Seasoned
- Creosote (7.8 pcf) - Air Seasoned
- Creosote (7.8 pcf) - Boulton Seasoned

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**Ties in Test - Lewistown, PA**

- Borate Dip Only (Timbor™ - U.S. Borax)
- Borate Dip / Air Seasoned + Copper Naphthenate (0.031 pcf as Cu)
- Borate Dip / Air Seasoned + Creosote
Ties in Test - Lewiston, PA

• 120 Air Seasoned Copper Naphthenate
• 100 Air Seasoned Creosote
• 402 Boulton Seasoned Copper Naphthenate
• 100 Boulton Seasoned Creosote
• 100 Borate Dip + Copper Naphthenate
• 91 Borate Dip + Creosote
• 10 Borate Dip only

General Comments from Crosstie Inspection

• Copper naphthenate and creosote tie performance, both air dried and Boulton seasoned, was not significantly different
• Plate cutting was slight in all cases, typically thickness of plate or less, and comparable with all preservative treatments
• Track curvature did not appear to influence the number of crossties that were replaced.
General Comments from Crosstie Inspection

- There were no ties replaced in Section 7 (Boulton dried creosote); performance of those ties was influenced by the proximity of the grease box.
- Replacement crossties were installed in July, 1998 but were not included in these ratings.
- Spike plate fasteners were being replaced with clips, with some ties having both types.

Average Rating after 13 Years

- Air Seasoned Copper Naphthenate 8.6
- Air Seasoned Creosote 8.9
- Boulton Seasoned Copper Naphthenate 8.7
- Boulton Seasoned Creosote 8.9
- Borate Dip + Copper Naphthenate 7.8
- Borate Dip + Creosote 8.6
- Borate Dip only 7.6

(10 = No degradation)
**Average Rating after 13 Years**

![Bar chart showing average ratings for different treatments](chart.png)

**Average Split/Check Volume, in³**

- Air Seasoned Copper Naphthenate: 25.7 in³
- Air Seasoned Creosote: 17.2 in³
- Boulton Seasoned Copper Naphthenate: 24.0 in³
- Boulton Seasoned Creosote: 28.8 in³
- Borate Dip + Copper Naphthenate: 39.7 in³
- Borate Dip + Creosote: 46.5 in³
- Borate Dip only: 9.1 in³
**Tie Testing at FAST**

- TTCI study at FAST includes copper naphthenate-treated ties (0.08 pcf Cu) made from various wood species, including softwoods and PSL composite wood ties.
- Major focus is on fasteners and mechanical properties of ties treated with alternative preservatives under heavy axle loads rather than a preservative efficacy test.
- More than 85 MGT loading on Heavy Axle Load circuit to date.
- Less conductive than creosote-treated ties in standardized AAR/AREMA tests.
### USDA Forest Products Lab Post Tests (1977)
**SYP Fence Posts - Harrison, MS**
*Posts planted in 1949*
*These retentions are $\frac{1}{2}$ of AWPA recommendations*

<table>
<thead>
<tr>
<th>Preservative</th>
<th>Retention</th>
<th>Avg. Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated</td>
<td>0.0</td>
<td>1.8</td>
</tr>
<tr>
<td>Fuel Oil</td>
<td>5.9</td>
<td>33</td>
</tr>
<tr>
<td>CuNap</td>
<td>.03</td>
<td>42</td>
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<tr>
<td>Penta</td>
<td>.30</td>
<td>42</td>
</tr>
<tr>
<td>Creo</td>
<td>5.9</td>
<td>37</td>
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</tbody>
</table>

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#### CuNap Standardized Uses

- ASSHTO – Approved for any commodity standard as listed in AWPA
- State DOT – Most DOT list CuNap as an approved preservative for Highway use or refer to ASSHTO and AWPA
Newly Adopted AWPA Standard for Copper Naphthenate-Treated Crossties

• U1-03 Section 7, commodity specification C, crossties and switchties, in corresponding tables for UC4 (formerly AWPA Commodity Standard C-6: Crossties and Switchties)

Section 3.0 RETENTION SPECIFICATIONS – UC4
PRESERVATIVE RETENTIONS (by gauge)

<table>
<thead>
<tr>
<th>Preservative</th>
<th>Copper Naphthenate</th>
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</thead>
<tbody>
<tr>
<td>Preservative Code Number</td>
<td>107</td>
</tr>
<tr>
<td>UC4, Species</td>
<td></td>
</tr>
<tr>
<td>Oak and Hickory</td>
<td>0.88 kg/m³ or Refusal (0.055 pcf or Refusal)</td>
</tr>
<tr>
<td>Mixed Hardwoods</td>
<td>0.96 kg/m³ (0.06 pcf)</td>
</tr>
<tr>
<td>Southern Pine and Ponderosa Pine</td>
<td>0.96 kg/m³ (0.06 pcf)</td>
</tr>
<tr>
<td>Coastal Douglas-fir</td>
<td>0.96 kg/m³ (0.06 pcf)</td>
</tr>
</tbody>
</table>
Who is Using CuNap?

- Several Shortline Railroads
- DOT Bridge projects nationwide
- USFS bridge projects nationwide
- Utilities & phone companies nationwide
- Fence posts and ag lumber
- DOT salt storage structures
- Major pole barn fabricators

Copper Naphthenate Treated Ties and Bridge Timbers
Copper Naphthenate-treated Ties and Bridge Timbers

Section 3.0 PENETRATION SPECIFICATIONS – UC4

Preservative Penetration – Crossties and Switchties
mm (in.)

<table>
<thead>
<tr>
<th>Type</th>
<th>Requirement</th>
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</thead>
<tbody>
<tr>
<td>Oak and Hickory</td>
<td>White Oak, 95% of Sapwood</td>
</tr>
<tr>
<td></td>
<td>Red Oak, 65% of annual rings</td>
</tr>
<tr>
<td>Mixed Hardwoods</td>
<td>38 mm (1.5 in) or 75%</td>
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<tr>
<td>Southern Pine and Ponderosa Pine</td>
<td>63 mm (2.5 in) or 85%</td>
</tr>
<tr>
<td>Coastal Douglas-fir</td>
<td>13 mm (0.5 in) and 90%</td>
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</tbody>
</table>
Clean to Work With
Stringer & Tie Repair
Copper Naphthenate-treated Ties
Merichem Tie Treating Study

Copper Naphthenate Products

- Treated Timber Bridge
- Utility Poles
- Treated Glued-Laminated Beam
- Treated Lumber
In Summary

Copper naphthenate is a viable preservative for crossties, switchties, bridge timbers and remedial treatments.

- An EPA unrestricted use pesticide
- Demonstrated performance/efficacy in hardwoods in lab, field stake and in-track tests
Thank You

For more information contact:

www.merichem.com
or
1-800-795-4980