TREATED WOOD COUNCIL

1101 K Street, NW
Suite 700
Washington, DC 20005
Phone: (202) 641-5427
Fax: (202) 463-2059

August 21, 2015

(Via email: johnson.barnes@epa.gov)

Mr. Barnes Johnson, Director
Office of Resource Conservation and Recovery
Office of Solid Waste and Emergency Response
U.S. Environmental Protection Agency
1200 Pennsylvania Ave., N.W.
Mail Code 5301P
Washington, DC 20460

Re: Supplemental Information Regarding Petition for Determination Identifying Non-Hazardous Secondary Treated Wood Biomass as a Non-Waste under 40 C.F.R. §241.4(a)

Dear Mr. Johnson:

On April 3, 2013, the Treated Wood Council (TWC) submitted a petition under 40 C.F.R. §241.4(b), seeking a determination that certain non-hazardous secondary treated wood biomass materials are, as a category, not a waste. Among those materials were rail ties treated with copper naphthenate (CuN), dual-treated CuN-borate (CuNB), and dual-treated creosote-borate (CB) formulations. TWC provided data showing that these materials meet the legitimacy criteria and are processed to produce a valuable fuel, consistent with the standards EPA set forth in its final rule on *Non-Hazardous Secondary Materials* (NHSM), 78 Fed. Reg. 9112 (Feb. 7, 2013).

As part of EPA's review of this petition, TWC responded to questions and provided additional data over the course of the next two years, including submissions on May 20, 2013, December 4, 2013, and May 28, 2014, and met with EPA several times, receiving assurances each time that the data were useful and complete, and that TWC's petition would be the subject of a proposed rule in the near future. On April 14, 2014, EPA proposed a rule recommending the addition of three types of secondary materials to those already categorically determined to be non-waste fuels in EPA's February 2013 final rule. The proposed new categories were: construction and demolition debris, paper recycling residuals, and creosote-treated rail ties.[1] In

[1] *Additions to List of Section 241.4 Categorical Non-Waste Fuels; Proposed Rule*, 79 Fed. Reg. 21006 (Apr. 14, 2014) (Proposed Rule).

support of the part of the rule relating to rail ties, EPA relied on data provided by TWC, which the Agency reviewed and clearly found credible.[2]

In the Proposed Rule, EPA specifically directed that comments be submitted only on creosote-treated rail ties, 79 Fed. Reg. at 21028. The notice stated that other treated wood materials identified in the TWC petition were under active review, and that if that review "supports a categorical listing of one or more of these other treated wood materials, the Agency would propose those materials in a future rulemaking," *id.* at 21010. Despite EPA's admonition, commenters urged EPA to expand the categorical non-waste determination to include CB-dual treated and CuN-treated ties. For example, one commenter noted that both these materials are regarded as valuable commodity fuels and pointed out data showing CuN ties would not add contaminants at levels that exceed those in comparable traditional fuels.[3]

The Proposed Rule is now in final form and currently at the Office of Management and Budget for interagency review.[4] At TWC's July 20, 2015, meeting with you and Agency staff, staff reported that on the basis of comments submitted in the creosote rulemaking, EPA was planning to take favorable action to add CB dual-treated ties to the categorical non-waste determination for creosote-treated rail ties. However, in an abrupt reversal of its longstanding previous position, EPA staff said that TWC's petition, covering both CuN- and CuNB-treated ties as well as other materials included in the petition, was too broad and would be denied in an "all or nothing" approach under which none of the materials could move forward unless all satisfied EPA's judgment. This approach is in conflict not only with EPA's previous statements to TWC about how it would proceed, but also with EPA's stated intention in the Proposed Rule, that if its review "supports a categorical listing of one or more of these other treated wood materials, the Agency would propose those materials in a future rulemaking."

As commenters on the Proposed Rule noted,[5] and as a recent survey conducted by the Railway Tie Association, Association of American Railroads, and American Short Line and Regional Railroads Association[6] reinforces, CuNB-treated rail ties are increasingly being used as an alternative to creosote- and CB-treated ties. As the survey also documents, in responses from all seven Class 1 railroads and an additional large short line holding company, railroads said that the ability to reuse ties as a valuable fuel is an important consideration in rail tie purchasing decisions.[7] EPA appears motivated to move quickly in response to these market realities in adding CB-treated ties as a categorical non-waste, to avoid their deselection in favor of alternatives that involve greater fossil-fuel consumption and consequently higher environmental

---

[2] See, *e.g.*, 79 Fed. Reg. at 21022 n.80, 21023 n.88.
[3] Comments of DTE Energy Services, EPA-HQ-RCRA-2013-0110-0083, at 10 (June 13, 2014).
[4] See http://www.reginfo.gov/public/do/eAgendaViewRule?pubId=201504&RIN=2050-AG74.
[5] See, *e.g.*, Comments of the Association of American Railroads , EPA-HQ-RCRA-2013-0110-0077(June 13, 2014), Comments of DTE Energy Services, EPA-HQ-RCRA-2013-0110-0083 (June 13, 2014).
[6] Stephen T. Smith, *2014 Railway Ties Survey,* at 3 (April 6, 2015, revised Aug. 12, 2015), available at http://www.rta.org/assets/docs/RTASponsoredResearch/Environmental/ties%20survey%20report%2012aug20151.pdf. CuNB ties accounted for 1.7% of the market in 2013, or 249,612 new rail ties.
[7] *Id.* at 3 n.4.

and greenhouse gas (GHG) emissions.[8] These adverse consequences apply equally to the railroads' purchasing decisions regarding CuN- and CuNB-treated ties and require urgent action on these materials that is consistent with a proposed categorical determination for CB-treated ties.

For the reasons discussed below, TWC calls upon EPA to fulfill its stated intention to act on materials for which the record supports a categorical non-waste listing, and include CuN- and CuNB-treated rail ties at the same time as it moves forward on CB-treated rail ties. TWC is prepared to discuss with EPA as a separate matter the remaining secondary materials covered by the April 3, 2013 petition, and appreciates your commitment at the July 20 meeting to review additional information on the materials in the TWC petition on a priority basis.

CuN- and CuNB-Treated Ties Meet EPA's Requirements for a Categorical Non-Waste Determination.

The requirements for a categorical non-waste determination in 40 C.F.R. §241.3(d)(1) are: (1) the nonhazardous secondary material (NHSM) is managed as a valuable commodity; (2) the NHSM must have a meaningful heating value and be used as a fuel in a combustion unit that recovers energy; and (3) the NHSM must contain contaminants at levels comparable in concentration to or lower than those in traditional fuels that the combustion unit is designed to burn. In multiple submissions to the record, with data comparable or even identical to that relied on by EPA in justifying a proposed categorical determination for creosote-treated rail ties, and presumably CB-treated ties, TWC has provided ample data to satisfy these requirements for CuN- and CuNB-treated ties.[9] Despite this record, at the July 20 meeting, EPA staff raised several issues, which are addressed in turn below.

---

[8] As TWC and numerous commenters have repeatedly explained, misclassification of legitimate biomass fuels such as CuN- and CuNB-treated ties will force their diversion to landfills and increase reliance on fossil fuels instead. This outcome is doubly adverse in terms of GHG emissions: (1) instead of the well-recognized net zero carbon dioxide (CO_2) emissions associated with biomass energy recovery, substitution of fossil fuels will result in substantially increased CO_2 emissions; and (2) greater landfill biomass volume translates to higher emissions of methane, a GHG that has 28-36 times the potency of CO_2, based on the most recent International Panel on Climate Change (IPCC) assessment report, as cited in EPA's *Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills*, Proposed Rule, 80 Fed. Reg. ____, *prepublication version available at* http://www.epa.gov/ttn/atw/landfill/20150814egfr.pdf, at 27 and n.5 (Aug. 14, 2015). Concerns about methane emissions from landfills are serious enough that EPA recently proposed stricter methane controls for landfills (*id.*), and the federal government has developed a national strategy to reduce methane emissions by 17% by 2020. Executive Office of the President, "Climate Action Plan Strategy to Reduce Methane Emissions" (March 2014), https://www.whitehouse.gov/sites/default/files/strategy_to_reduce_methane_emissions_2014-03-28_final.pdf. The methane-increasing consequences of EPA's unwarranted consignment to landfills of a growing share of the 14.9 million rail ties currently purchased every year are sharply at odds with national policy.

[9] The second and third requirements are discussed more fully below. Regarding the first requirement, TWC has submitted substantial information showing that the materials covered by its petition are managed as valuable commodities. See TWC Petition for Determination Identifying Non-Hazardous Secondary Treated Wood Biomass as a Non-Waste under 40 C.F.R. §241.4(a), at 3-5 (April 3, 2013) (TWC Petition). Specifically with respect to CuN- and CuNB-treated ties, Attachment 3 to the TWC Petition is a Statement by Jeff Parrett, Vice President of Wheeler Lumber, L.L.C., which describes the growing use of those materials as an alternative to creosote, and their reuse for energy production in the same manner as creosote. A copy of Mr. Parrett's Statement is attached to this letter for convenience as Attachment 1. In addition, the August 15, 2015 letter from Ronald Silverthorn, Manager of

1. TWC's petition covers eight types of NHSM, and EPA is uncomfortable with the breadth of these combustion scenarios.

TWC submits that it has met EPA's requirements for all of the NHSM covered by its petition, but is willing to approach the materials in its petition in a disaggregated way. Because of the strength of the data in the record on CuN- and CuNB-treated ties, and their marketplace importance as alternatives to materials that are moving forward for determinations as categorical nonwastes, TWC urges EPA to consider these materials as a first priority. TWC will separately address with EPA the specifics of the other NSHM in its petition.

2. EPA needs additional sample data on CuN- and CuNB-treated ties to examine the range of variability of contaminants in discrete samples.

TWC has provided test data on CuN- and CuNB-treated ties, along with contaminant comparisons for creosote, creosote-borate, and untreated wood.[10] However, to provide further data for EPA's review, TWC has undertaken additional testing, and these laboratory results will be provided as soon as they are available, which is expected to be within the next two weeks.

3. EPA would like to see data on post-processing samples of CuN and CuNB ties. In particular, EPA seeks data on BTU value, moisture content and possible synergistic chemical changes when CuN and CuNB materials are processed with creosote and CB ties.

BTU Value. TWC has previously submitted data showing the high BTU per pound values of CuN- and CuNB-treated wood (7,107), compared to creosote (7,936) and untreated wood (5,667).[11] Consistent with TWC's data, EPA's Proposed Rule cites a BTU per pound value for clean wood of 3,440-5,150, based on EPA emissions data.[12] For creosote, EPA notes without citation that it is relying on "recent information that the heating value of processed CTRTs [creosote-treated rail ties] ranges from 6,000-8,000 BTU."[13] TWC also provided data-derived calculations of CuN (7,100) and CuNB (7,200) fuel BTU values, in its May 28, 2014 supplemental submission to EPA.[14] EPA's Proposed Rule cites its 2011 final rule to the effect that BTU values above 5,000 per pound are considered to have meaningful heating value.[15] These data should be sufficient, but in order to satisfy EPA's further requests, TWC has

---

Resource Recovery for DTE Stoneman, LLC, describes how DTE manages used CuN- and CuNB-treated ties in the same way as creosote- and CB-treated ties, as all four of these types of rail ties are managed, processed and used for energy recovery. The letter is attached as Attachment 2.

[10] See Letter from Jeffrey T. Miller TWC, to George Faison, EPA (Dec. 4, 2013) Tables 1, 3, and 4; TWC Petition, Tables I, III, and IV.

[11] See Comments of Treated Wood Council, EPA Docket EPA-HQ-RCRA-2008-0329-0772, at Table 1 (Aug. 2, 2010).

[12] Proposed Rule, 79 Fed. Reg. at 21024 n.94.

[13] *Id.* at 21024.

[14] TWC, "Estimates of BTU Value and Quantity of Treated Wood Biomass Recycled for Energy" (May 28, 2014), submitted to EPA during May 28, 2014 meeting with Barnes Johnson, George Faison and staff, and transmitted to George Faison via electronic mail by Jeffrey T. Miller, TWC, on May 30, 2014.

[15] 79 Fed. Reg. at 21024.

undertaken additional sampling of the BTU value of post-processing CuN and CuNB ties. TWC expects to submit these results within the next two weeks.

Moisture Content. TWC's April 3, 2013 Petition noted that treated wood is drier than virgin wood or milling by-products, such as chips or bark, with a moisture content of approximately 20 percent, compared to virgin wood's 50 percent.[16] TWC previously submitted data supporting these values.[17] It does not appear that moisture content is a factor on which EPA relied in its Proposed Rule, but TWC will submit additional, post-processing data on moisture content shortly.

Hypothesis of Post-Processing Synergistic Changes. Because the processing that recycled rail ties undergo is physical and not chemical,[18] EPA's concern about the possibility of synergistic chemical changes from combining CuN or CuNB with creosote and CB ties must relate to some theoretical potential for a differing chemical reaction once a combined fuel is introduced into a boiler. TWC has conducted laboratory tests to address EPA's request for information on potential synergistic changes. The results are attached as Attachments 3 and 4.

Attachment 3 is a technical report on the assessment of chemical reaction, including analysis, of samples of solutions of creosote, both with and without borate, and CuN, conducted by analytical chemist Karson Lurie. Ms. Lurie's Statement discusses the steps she followed in her laboratory work and her observation that, when solutions of these chemicals are combined, no chemical reaction occurred, disproving a hypothesis of negative synergistic reaction.

With similar results using treated wood in extensive and state-of-the-art laboratory tests of separate and mixed post-processing fuel samples of creosote- and CuNB-treated used rail ties conducted at the University of Tennessee Center for Renewable Carbon, Prof. Nicole Labbé and researcher Dr. Pyoungchung Kim exposed separate and mixed samples to combustion temperatures comparable to those of commercial boilers. The results show that there is no chemical interaction between creosote and CuNB-treated wood when processed together and combusted. As Drs. Labbé and Kim's report concludes: "The chemicals produced from the wood itself, creosote-treated wood, and CuNB treated wood were observed in samples tested separately. The same chemicals were also observed in a blended sample (containing wood treated with creosote and wood treated with CuNB), and no new additional chemicals were observed due to the blending. These results confirm that there is no chemical interaction between creosote and CuNB treated wood when processed together as a boiler fuel."[19]

Accordingly, it appears there is no basis for concern regarding potential post-processing synergistic changes relating to CuN- or CuNB-treated rail ties.

4. EPA seeks additional information on how CuN- and CuNB-treated ties are processed.

---

[16] See TWC Petition at 5.
[17] See Comments of Treated Wood Council, EPA-HQ-RCRA-2008-0329-0772, at Table 1.
[18] See 79 Fed. Reg. at 21024.
[19] Attachment 4 at 3.

CB, CuN and CuNB treatments for rail ties are relatively new, compared to creosote, and given the long initial useful life of crossties, large volumes of these ties are still in place and not yet transitioned into their secondary use as fuel. But the use of these alternatives is of growing interest to the railroads, as documented in the 2014 Railway Ties Survey.[20] As Jeff Parrett, Vice President of Wheeler Lumber, LLC, explained in a Statement previously submitted for the record: "Copper naphthenate has…more recently found a growing market acceptance as a treatment product on its own or with borate for railroad ties. Wheeler Lumber currently specifies, and treats with Copper Naphthenate for the state of New York, many other state DOTs, USFS, Railroads, along with many other customers nationwide."[21]

At least one electricity-generating facility – DTE Stoneman, LLC, of Cassville, Wisconsin – is specifically permitted to use CuN- and CuNB-derived fuel, and its Manager of Resource Recovery has described how that facility manages the four types of ties it receives through contracts with the railroads:

> Through contracts with the railroads, DTE (WI) receives ties of four specific chemistries, namely, creosote, copper naphthenate and both of these dual-treated with borates. DTE does not separate these chemically-treated ties, as they are virtually indistinguishable from each other after use and DTE's permit allows all of them to be combusted as a mixture. DTE does not accept wood products treated with pentachlorophenol or arsenical preservatives. Whole ties arrive by railcar. DTE contracts out all shredding/chipping operations, which are done either on-site or at the contractor's facility. Metal is removed and ties are shredded to a mulch-like consistency prior to burning. All ties are handled and processed in the same manner for size reduction and metal removal, and become part of the final mixed fuel.[22]

More broadly, many commercial boilers and co-gen facilities are permitted to burn "railroad ties" generally, and the attached letters from Josh Wagner of National Salvage[23] and T.C. Taylor of T.C. Taylor Co., Ltd.,[24]make clear that if these alternative secondary materials were classified as non-waste fuels, they would be processed in the same way as creosote-treated

---

[20] See note 6 above.

[21] Statement of Jeff Parrett, Wheeler Lumber, LLC (March 26, 2013), Attachment 3 to TWC Petition and Attachment 1 to this letter. Mr. Parrett added: "Like other forms of treated wood such as those using creosote, copper Naphthenate treated wood ties are desirable as fuel to electricity generators and others because of these materials' high BTU value, attractive economics, and superior greenhouse gas characteristics compared to fossil fuel that would otherwise be burned for energy generation if these valued secondary materials were not available."

[22] Letter from Ronald Silverthorn to Dr. Jeff Lloyd (Aug. 15, 2015), Attachment 2.

[23] Letter from Josh Wagner, National Salvage & Service Corp., to Jeff Miller, TWC (Aug. 10, 2015) (attached as Attachment 5).

[24] Letter from T. C. Taylor, T. C. Taylor Co., Ltd., to P. H. Haroz, Conversion Technology, Inc. (Aug. 11, 2015) (attached as Attachment 6).

rail ties currently are, which EPA has concluded meets the definition of processing under 40 C.F.R. §241.2.[25]

5. While a commenter sought to add CB ties to the proposed categorical determination for creosote ties, EPA claims no parallel request was submitted for CuN- and CuNB-treated ties.

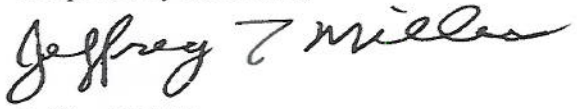
This assertion is not factually correct. As noted above, one commenter specifically requested that EPA add CuN- and CuNB-treated ties to the categorical determination for creosote- and CB-treated ties immediately.[26] Other commenters supported the addition of CuN- and CuNB-treated ties, relying on their understanding that EPA was moving forward in a timely way on TWC's petition.[27] Given that EPA specifically discouraged comments on materials other than those in the Proposed Rule, it is surprising that any commenters at all urged EPA to add CB and CuN ties, and it would be disingenuous for EPA to argue that it shows a lack of interest if only a few made such a request. Beyond that, the Association of American Railroads and Railway Tie Association have now urged EPA to proceed expeditiously to act favorably on CuN- and CuNB-treated rail ties,[28] and TWC supports these requests.

Conclusion

For the reasons explained above, TWC urges EPA to act promptly to determine that CB-, CuN- and CuNB-treated rail ties are non-waste fuels under 40 C.F.R. §241.4(a). These materials meet the standards EPA has established for a categorical non-waste determination. While, as the statements of industry observers and the 2014 Railroad Ties Survey indicate, railroad interest is increasing in purchasing CuN- and CuNB-treated rail ties (as well as CB ties), in the words of the Association of American Railroads, EPA's "failure to act expeditiously on crossties treated with copper naphthenate or copper naphthenate and borate could impact current railroad purchasing decisions" and produce an "environmentally counterproductive" outcome.[29]

We would be pleased to meet with you or respond to any questions you may have.

Respectfully submitted,



Jeffrey T. Miller
President & Executive Director

Cc: George Faison
Attachments (6)

---

[25] 79 Fed. Reg. at 21023.
[26] Comments of DTE EnergyServices, EPA-HQ-RCRA-2013-0110-0083, at 10 (June 13, 2014).
[27] See Comments of the Association of American Railroads, EPA-HQ-RCRA-2013-0110-0077, at 3 (June 13, 2014).
[28] See Letter from Michael J. Rush, Association of American Railroads, to Barnes Johnson, EPA (Aug. 14, 2015); letter from James C. Gauntt, Executive Director, Railway Tie Association, to Barnes Johnson, EPA (Aug. 20, 2015).
[29] Letter from Michael J. Rush, at 2.

ATTACHMENT 1

Wheeler Lumber, LLC

March 26, 2013

STATEMENT OF JEFF PARRETT

1. My name is Jeff Parrett. I make the following statement in support of the petition of the Treated Wood Council for a determination that non-hazardous secondary treated wood biomass materials, as described in that petition, are not a solid waste when used as a fuel in a combustion unit.

2. My title is vice president of Wheeler Lumber, L.L.C. In the course of my work spanning 26 years in the wood treating business, I have gained familiarity with various types of wood products used as railroad ties, utility poles and bridge timbers then beneficially reused as a valuable commodity fuel.

3. While creosote treated wood products are the best known types used for railroad ties and reused for energy production, I am also familiar with copper Naphthenate treated wood products, and dual treatments using creosote with borate and copper Naphthenate with borate, that are used the same way. Copper Naphthenate has been used off and on since the early 1900s but usage became a commercial proposition during World War II, when it was applied to railroad ties in conjunction with creosote due to creosote shortage. Copper Naphthenate has also been used for many years for utility poles, railroad ties and bridge timbers treated and sold by Wheeler Lumber and have more recently found a growing market acceptance as a treatment product on its own or with borate for railroad ties. Wheeler Lumber currently specifies, and treats with Copper Naphthenate for the state of New York, many other state DOTs, USFS, Railroads, along with many other customers nationwide.

4. Like other forms of treated wood such as those using creosote, copper Naphthenate treated wood ties are desirable as a fuel to electricity generators and others because of these materials' high BTU value, attractive economics, and superior greenhouse gas characteristics compared to fossil fuel that would otherwise be burned for energy generation if these valued secondary materials were not available. One example of which I am aware is the DTE plant in Wisconsin, which is permitted to burn copper Naphthenate, borate, and creosote treated wood secondary materials.

Jeff Parrett

Dated: March 26, 2013

12127 Whitewood Service Road, Whitewood, SD 57793
Web Address: www.wheeler-con.com
E-Mail: info@wheeler-con.com

Phone: (605)269-2215
Toll Free: (800)843-8304
Fax: (605)269-2497

DTE Stoneman, LLC

414 South Main Street, Suite 600
Ann Arbor, Michigan 48104
(734) 302-4800 Fax (734) 302-4802

ATTACHMENT 2

August 15, 2015

Dr. Jeff Lloyd
Vice President Research & Development
Nisus Corporation
100 Nisus Dr. Rockford, TN 37853

Dear Mr. Lloyd,

Per our discussion here is the information about how we handle railroad cross ties at out DTE Stoneman Facility located in Cassville Wisconsin.

Through contracts with the railroads, DTE (WI) receives ties of four specific chemistries, namely, creosote, copper naphthenate and both of these dual-treated with borates. DTE does not separate these chemically-treated ties, as they are virtually indistinguishable from each other after use and DTE's permit allows all of them to be combusted as a mixture. DTE does not accept wood products treated with pentachlorophenol or arsenical preservatives. Whole ties arrive by railcar. DTE contracts out all shredding/chipping operations, which are done either on-site or at the contractor's facility. Metal is removed and ties are shredded to a mulch-like consistency prior to burning. All ties are handled and processed in the same manner for size reduction and metal removal, and become part of the final mixed fuel.

Please let me know if I can be of any other assistance to you.

Sincerely,

Ronald Silverthorn
Manager of Resource Recovery
DTE Stoneman

ATTACHMENT 3

STATEMENT OF NO REACTIVITY BETWEEN CREOSOTE, COPPER NAPHTHENATE AND BORATE SOUTIONS

I, Karson Lurie, make the following statement in support of the Treated Wood Council's August 2015 Letter on Supplemental Information Regarding Petition Identifying Non-Hazardous Secondary Treated Wood Biomass as a Non-Waste under 40 C.F.R. §241.4(a).

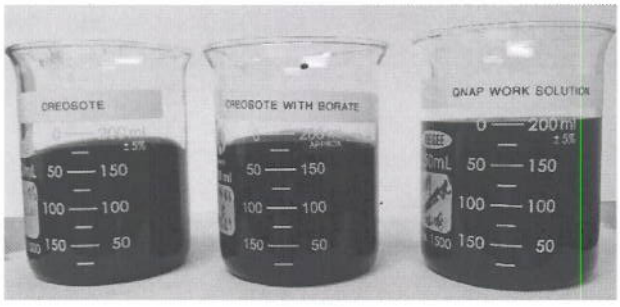
1. My title is: Analytical Chemist, Nisus Corporation, Rockford, TN. I received a B.S. degree in Chemistry from the University of Tennessee. I have extensive chemistry and laboratory experience with a primary focus on analytical techniques involved with wood analysis and chemical synthesis. My professional experience includes quality control of pesticide formulations using standardized chemistry analytical methods, formulating new products for treating wood, and improving current products by developing new treatment methods and their physical properties.

2. I was asked by Dr. Jeff Lloyd of Nisus Corporation to test samples of creosote, both with and without borate additives, and copper naphthenate (QNAP™) work solutions to determine QNAP and creosote chemical compatibility, as follows:

a) Nisus QNAP2 (2% Cu content) formulated in a #2-diesel solution was diluted to an estimated 1% work solution strength in a 1:1 weight dilution and analyzed for exact % copper (Cu) content via an automated complexometric (EDTA) titration, equivalent to AWPA Standard A88. The prepared lab batch was assayed as 1.2% Cu.

b) pH of the prepared QNAP solution and two creosote samples was determined, the latter being creosote alone and creosote containing a small (<1%) amount of borate. The pH of all 3 individual solutions was between 5.6 and 6.1.

c) Initial photos were taken of each solution prior to blending and physical characteristics of each sample were noted. Both creosote blends are coffee brown in color with tiny micro brown particulates. The QNAP work solution is blue-green with no particulates.



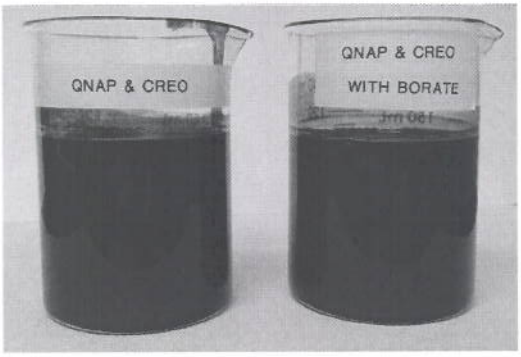
d) The initial temperature of all 3 beakers was measured and recorded. All initial temperatures were 22-23°C

e) 50 g of QNAP work solution was measured into a 140ml glass beaker. While stirring the QNAP solution on a stir-plate, 50 g of creosote solution was added to the beaker to give a 1:1 w:w blend by weight. This step was then repeated for the other creosote blend containing borate additives. Once homogenous, the beakers stirred for an additional 10 minutes to wait for any signs of a reaction.

f) No visible signs of reaction were noted, and the final temperature of each beaker confirmed no endothermic or exothermic reaction had occurred. The final pH was also measured to note any changes between the mix and the individual components. The final pH of the each blend was between 5.4 and 5.6 with the slightly higher pH belonging to the sample containing borate additives, which are known buffering agents.

g) The final Cu content of each blend was also assayed to compare with the concentration expected from a 1:1 w:w dilution of QNAP with Cu-free creosote samples. A manual colorimetric titration was used since the small fines in the creosote interfered with auto-titration. The samples contained 0.61% for the QNAP-creosote blend and 0.56% for the QNAP-creosote blend containing borates. Both of these values are within the method error range for half of the original 1.20% Cu value, suggesting no reaction with the active ingredients occurred and all copper remained in solution upon mixing.

h) A final photo was taken of each mixed solution.



3. My conclusion from the test is that QNAP is completely compatible with creosote, and the two materials are unreactive with each other.

Karson Lurie

Dated: August 19, 2015

Center for Renewable Carbon
The University of Tennessee Institute of Agriculture

2506 Jacob Drive • Knoxville, TN 37996 • P 865.946.1130 • F 865.946.1109 • renewablecarbon.tennessee.edu

Assessment of chemical interaction of mixed railroad tie fuel containing wood treated with creosote and copper naphthenate with borate.

August 20, 2015

Report prepared by:

Pyoungchung Kim (pkim1@utk.edu) and Nicole Labbé (nlabbe@utk.edu); Center for Renewable Carbon, The University of Tennessee

1. Summary

Railroad tie samples treated with creosote or copper naphthenate with borate (CuNB) were tested at elevated temperatures to determine the chemicals present and those released at combustion temperatures. The chemicals produced from the wood itself, creosote-treated wood, and CuNB treated wood were observed in samples tested separately. The same chemicals were also observed in a blended sample (containing wood treated with creosote and wood treated with CuNB), and no new additional chemicals were observed due to the blending. These results confirm that there is no chemical interaction between creosote and CuNB treated wood when processed together as a boiler fuel.

2. Material and methods

2.1. Materials

Used railroad wood ties treated with creosote (red oak) or CuNB (sweetgum) were obtained from Nisus Corp. (Rockford, TN, USA). The wood ties were ground into less than 0.4 mm particle sizes with a knife mill before testing. In addition to testing separately, the two samples were mixed by weight ratio of 1:1 (wt. %) and pyrolyzed and the vapor composition analyzed.

2.2. Methods

Pyrolysis-gas chromatography/mass spectrometry (Py-GC/MS) was used to thermally decompose the used wood tie samples and the mixture at 450 °C for 12 seconds. A Perkin Elmer Clarus 680 Gas Chromatograph, coupled with a Clarus SQ 8C Mass Spectrometer and fitted with

a micro-pyrolyzer and an autosampler that loads samples for pyrolysis (Frontier EGA/Py-3030 D), was used to perform the analysis. Each sample pan was layered 0.4 mg of material and dropped via the autosampler into the pyrolysis furnace that was directly attached to the injection port of a GC/MS instrument. The vapor produced from the pyrolysis was swept into the injector port by the GC carrier gas that passes through the furnace, separated by an Elite 1701 MS capillary column (60 m x 0.25 mm ID x 0.25 micron film thickness), and analyzed using a MS (source temperature 270 °C, 70 eV electron ionization).

3. Results and discussion

The creosote- and CuNB-treated wood samples and their mixture by weight ratio of 1:1 (wt. %) were thermally treated at 450 °C for 12 seconds. Figure 1 shows that the pyrograms of the mixed sample contained all chromatographic peaks including creosote and alkane hydrocarbons that are detected separately in the pyrograms of the creosote- and CuNB-treated samples, and wood-decomposition components from both red oak and sweetgum.

Figure 2 shows the fragments of m/z values that represent mass divided by charge number. The m/z value is often considered to be the fragment mass of compounds. For example, the fragment mass values (m/z) of 76 and 71 represent creosote- and alkane hydrocarbons-derived compounds, respectively. Figure 2a shows the fragment m/z value of 76 representing creosote compounds found in creosote-treated red oak and the mixture. Creosote compounds, such as naphthalene, biphenyl, acenaphthene, phenanthrene, anthracene, fluoranthene and pyrene, were detected in both samples and did not disappear in the mixed sample. Figure 2b showed the fragment m/z value of 71 representing alkane hydrocarbons present in CuNB-treated sweetgum and the mixture. Alkane hydrocarbons were also detected in both samples and did not disappear in the mixture sample. It was also found that no new or additional peaks were produced in the mixed samples. This result confirms that both chemicals, creosote and alkane hydrocarbons, do not react with each other during pyrolysis to produce new chemicals or otherwise change the fuel materials. It can be concluded that mixed fuels containing wood, with creosote and borate, copper naphthenate or copper naphthenate with borate or mixtures thereof, can be combusted as fuel in the same way as creosote treated wood alone, without chemical interaction or any potential for negative interaction.

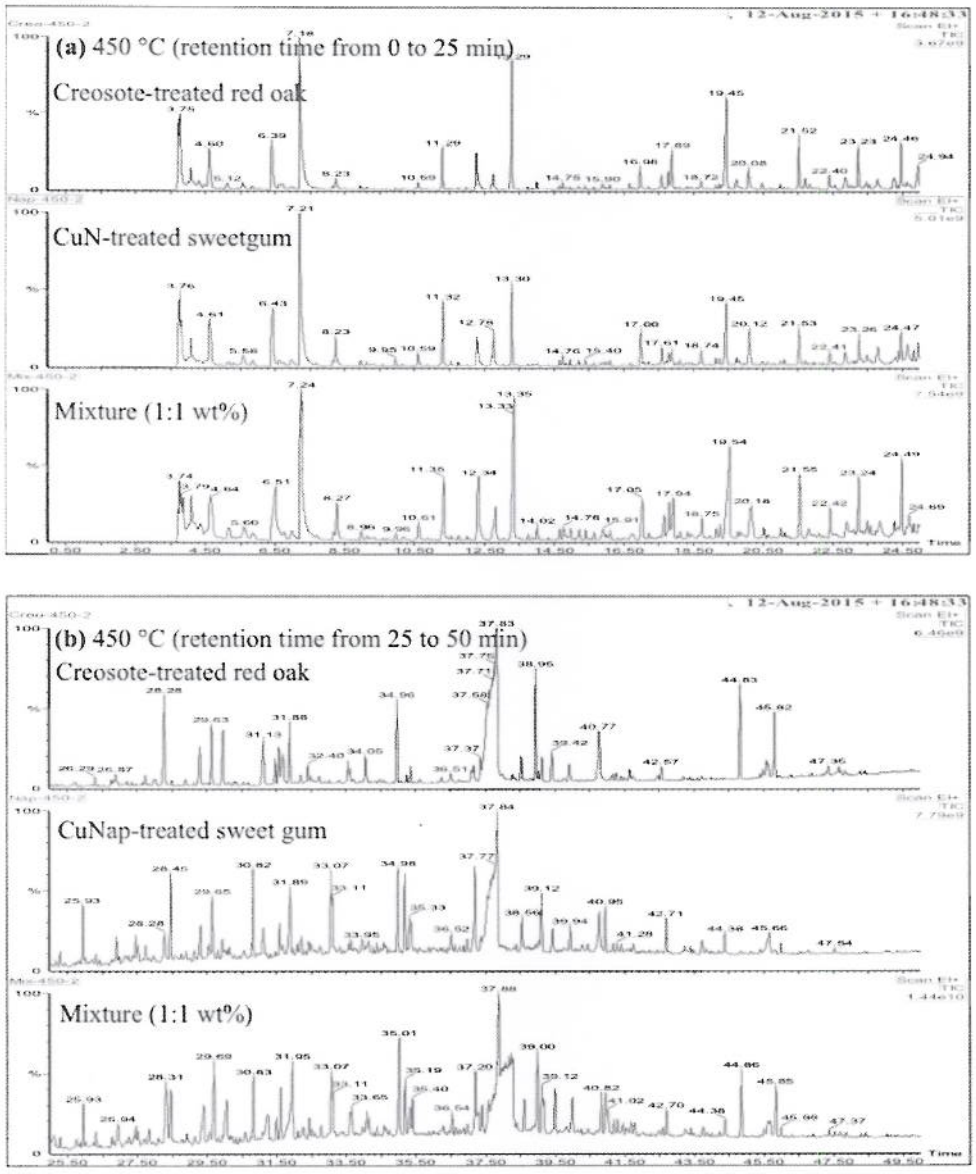


Figure 1. Py-GC/MS pyrograms produced from treated wood tie samples including creosote- and CuNB-treated ties, and mixed sample (1:1 wt. %) via fast pyrolysis at 450 °C for 12s.

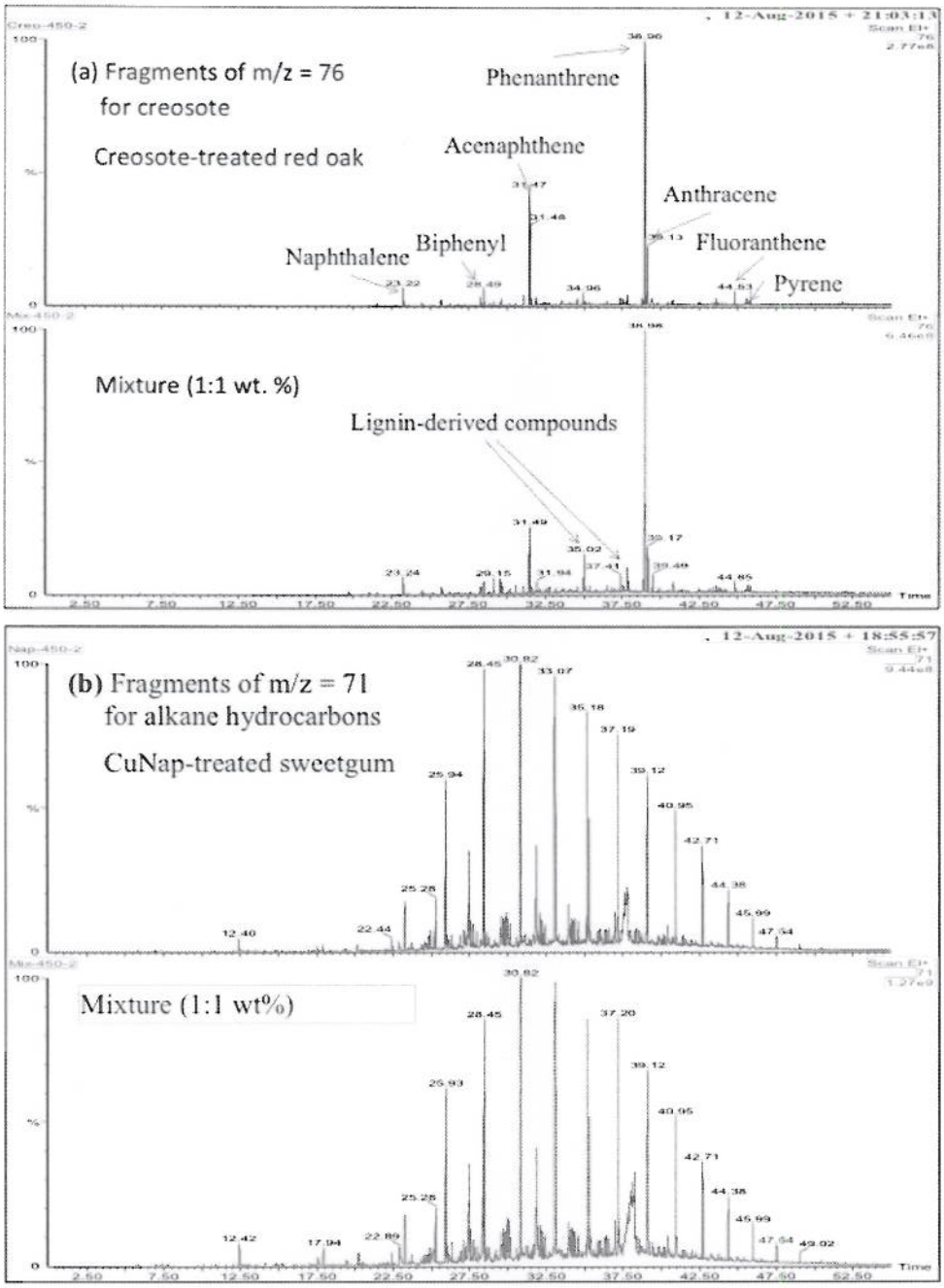


Figure 2. Fragments of m/z values 76 for creosote and 71 for alkane hydrocarbons in the creosote- and CuNB-treated ties, and mixture sample (1:1 wt. %) from the pyrograms. (a) Fragments of m/z =76 for searching creosote compounds in the creosote-treated sample and mixture and (b) fragments of m/z = 71 for searching alkane hydrocarbons in the CuNB-treated sample and mixture.

4. Research Team

Dr. Nicole Labbé is an Associate Professor of Biomass Chemistry in the Center for Renewable Carbon at the University of Tennessee-Knoxville. She received her B.S. in Chemistry from University of Poitiers, France, M.S. and Ph.D. in Wood Sciences from University of Bordeaux, France. Her research interest focuses on understanding properties of biomass –its appearance, variability, and potential for conversion to various products such as fuels, chemicals and value-added products. She is investigating new biological, thermal, and chemical routes to fractionate biomass and provide detailed understanding of plant cell walls, their roles in plant function, and factors controlling their recalcitrance and optimization of processes. In addition, she is developing high throughput techniques such near infrared, pyrolysis gas chromatography/mass spectrometry, and laser induced breakdown spectroscopy to rapidly assess biomass from laboratory to biorefinery scale.

Dr. Pyoungchung Kim is a research scientist at the Center for Renewable Carbon at the University of Tennessee-Knoxville. He received his B.S. and M.S. in Environmental engineering from KonKuk University, South Korea, and Ph.D. in Environmental Engineering from the University of Tennessee, USA. His research interest lies on thermochemical conversion of biomass and various organic materials such as bioenergy crops, plastics, used railroad ties and agricultural wastes into biofuels, chemicals and value-added products. He is investigating optimization of pyrolysis processes for maximizing bio-products, upgrading and fractionation of bio-oils, and application of biochars as a soil amendment and environmentally friendly materials for pollution control.

The Center for Renewable Carbon, in the University of Tennessee, Institute of Agriculture, is an internationally recognized leader in the development of new and/or improved bioenergy sources, biorefinery processes, bioproducts, and biomaterials that coordinates the science, knowledge transfer, and trains the workforce required to develop a sustainable and economically viable bioeconomy.

ATTACHMENT 5

NATIONAL SALVAGE & SERVICE CORPORATION
REMOVE • RECOVER • RESTORE

August 10, 2015

Mr. Jeff Miller
Treated Wood Council
1101 K Street NW, Suite 700
Washington, DC 20005

Dear Mr. Miller,

National Salvage and Service Corporation maintains contracts with multiple Class I, II and III railroads for the collection and processing of used railroad ties as boiler fuel for use in plants which produce electricity or steam. At present, National processes approximately seven million Creosote treated ties per year for this use. Over the last three years, National has delivered significant amounts of tie fuel to twelve electricity or steam producing plants. We do not currently process Copper Naphthenate or Copper Naphthenate Borate treated ties. If these plants had the necessary permits to burn Creosote, Copper Naphthenate, and Borate, we expect the handling process for this material would be the same as that of Creosote treated railroad ties. If you have any questions, please do not hesitate to contact me.

Regards,

Josh Wagner

Josh Wagner

▶ P.O. Box 300 ~ Clear Creek, IN 47426
▶ Phone: 812.339.9000 ~ Fax: 812.331.8235
▶ Toll-Free Phone: 800.795.3722

T.C. TAYLOR COMPANY, LTD

CROSSTIES UNLIMITED
A T.C. TAYLOR COMPANY

RAILROAD MAINTENANCE & SERVICE COMPANY OF AMERICA

RAILCAR MAINTENANCE
A T.C. Taylor Company

Ti-Fuel, LTD.
A T.C. Taylor Company

Mr. P. H. Haroz
President
Conversion Technology Inc.
2190 N. Norcross Tucker Road
Suite 202
Norcross, GA 30071

August 11, 2015

Re: Crosstie Processing

Dear Mr. Haroz:

The purpose of this communication is to provide you with an overview of our "Ti-Fuel" handling process. This process involves multiple steps which I have outlined below:

1. Our crews work in conjunction with the railroad's tie production gangs to pick up the spent ties after they are removed from the track. We utilize our on track machine "The Right of Way Handler" to pick up the ties and stockpile them in accessible areas along the right-of-way or in railroad yards.

2. Once the spent ties are stockpiled, we load the ties into railroad gondola cars for transport to our tie processing facility. The ties are loaded into the gondola cars with off track grapple trucks.

3. At the tie processing facility we unload the ties from the gondola cars. During the unloading process we presort the ties. During the pre-sorting process we are looking for any material that would not be appropriate to put into the grinder or that would not be acceptable by the end user as a cogeneration fuel. Currently, the end users we provide fuel to will only accept creosote treated ties, so we sort out any other ties. If we were to process Creosote with Borate or Copper Naphthenate or Copper Naphthenate with Borate, the processing would remain the same. We also separate out any composite ties, concrete ties and utility poles etc. The materials that are not able to be used in our processing are loaded into gondola cars for special handling by the railroad.

4. After the ties have been unloaded and presorted each tie is inspected for metal contaminants. Metal is harmful to the grinding equipment and must be removed from the ties prior to grinding. Once the ties have been inspected and the metal is removed they are loaded into the grinder. The grinder reduces the ties to -3 inch size grinds (size is specified by the end user). The grinds are loaded into open top trailers for transport to the cogeneration facility.

We have over thirty years of experience processing crossties and selling them to cogeneration facilities as a recycled alternative fuel. There have been many attempts to recycle ties in an environmentally friendly manner but the most consistently successful use has been as a recycled alternative fuel. We continue to experiment with new and innovative ways to recycle crossties. We are optimistic about our future endeavors in this field.

With Respect

T.C. "Tim" Taylor
President

2440 Sandy Plains Road • Building 25 • Marietta, Georgia 30066
Office: 770.874.8200 • Fax: 770.874.1984