Proceedings American Wood Preservers' Association. 98:122-124

1002

PROCEEDINGS

Ninety-Seventh Annual Meeting

of the

AMERICAN WOOD-PRESERVERS' ASSOCIATION

The Peabody Hotel
Memphis, Tennessee
April 21-24, 2002

VOLUME 98

AMERICAN WOOD-PRESERVERS' ASSOCIATION
P.O. BOX 5690 GRANBURY, TEXAS 76049

Alternative Treatments for Crossties: An Update on an In-Track MSU/RTA/AAR Project

Terry Amburgey, Ph.D.
Mississippi State University

Jimmy Watt, Consultant

Michael Sanders
H. Michael Barnes, Ph.D.
Mississippi State University

Dr. Terry Amburgey: Were going to have sort of the same theme that you just talked about, mixtures of boron or copper or some fluoride, basically the diffusible preservatives. We started a study about 15 years ago in conjunction with the Railway Tie Association and Association of American Railroads. We did different types of phases of this study, one, we used a series of dip treatments prior to air seasoning of ties because we had a very uneasy feeling that when you get this so called stack burn it equals decay and air drying ties it equates to difficulties in service. No proof of that but circumstantial evidence would say the probability is there

One big objective of this study was to make sure the ties reached the cylinder in good condition that meant protecting them from fungi and insect during air seasoning. If you're going to take a large piece of wood and you're going to try and protect that wholes cross section that means you pretty much need a diffusible system. We used various combinations of diffusible boron or fluoride in various studies. With diffusion you are trying to load up the surface of a wet piece of wood with biocide. If you keep that piece of wood wet the diffusible material will seek to equilibrate itself across the cross sections. You start with a high surface loading with nothing inside and it will eventually form a complete barrier through the piece if you don't let the stuff dry.

So diffusion is what we decided on and we decided diffusible borate dips as our initial treatment so that we could try and protect the interior of these ties, during air-drying and protect them from fungi and insects. We go high tech, we went out to Santa Fe and got their machinists to weld us up a tank and we dropped a water line in there and a steam line. With the help of a fork lift and a few other folks we started out dipping operation.

We used heated borates solution, we used a very high borates solution because with diffusion you need to go from a high concentration gradient to a low concentration. So we used a very high concentration of borate that required hot water. We used a three-minute dip in 30% boric acid equivalent, Timbor, heated. If you didn't heat that you'd have one big rock of borate. Six-week bulk stack and covered in the storage yard for diffusion storage to allow that diffusion gradient to be set up. Then we re-stacked and air-dried prior to creosote treatment by pressure or dip or, after that six weeks we tried as we were at the Santa Fe facility, some vapor drying. We tried vapor drying and creosote treatment of the borate treated ties.

In the bulk stacked stacks had a cover over and stayed there for six weeks then regular air-drying configurations. In Summerville Texas it's very dry so you don't space your ties too far apart in air-drying or you end up with all kinds of checks and splits. We then re-treated after air-drying, or after diffusion storage with vapor drying, with creosote treatments. Some of these were white oak and red oak. They were Santa Fe ties and we treated them just like Santa Fe would treat any other of their ties. There were also untreated ties that were treated as the same time, on non-borate treated ties.

We also got some mixed hardwood ties from the Norfolk Southern, shipped them out to Texas, treated them and then we shipped them back to Norfolk Southern for use in their regular treatment process. We tried to do everything that we could to not bias this from their standard ways of treating with creosote other than the fact that we pre treated with a diffusible material.

What we were anticipating that the creosote pressure or dip treatments would protect the outer portions from soft dried rot or other fungi hitting the surfaces, the oil in the creosote would reduce the leaching of the

borate but still allow the borate to be mobile inside. When checks and splits occurred rainwater got into those then the borate could be mobilized.

A lot of people have been trying to lock borate into materials. One problem with that is when you do that you don't get this migration, which tends to be very important. If you don't have water you're not going to have decay. If you do have water and you've got something in there that can't be mobilized to the wet area you're still going to have to decay, so this becomes very important.

We took the ties that were not air-dried, put them in a cylinder, treated them and then we put them in systems in California, Illinois, two sites in east Texas, two sites in Georgia. That was fourteen years ago. Now we have gone back to the Georgia sites.

In addition to that phase where we took untreated ties and pre-treated them prior to air drying, we looked at the beneficial effects of a series of remedial treatments, treatments of ties already in place that had been treated with creosote, had performed for some period of time. Now we were going to try to sweeten the pot and increase their services life. Once again we chose diffusible treatments.

If you have decay in a system or the potential of decay there will be water. If there's water, diffusible systems will diffuse. So we formulated borate and fluorides into pastes, pads and rods. We had various people cooperating with us on this. Osmose did the Fluoride pads, ISK Biocides the boric pastes, Pandrol the rods and so fourth. We had all kinds of people giving us a little assistance. Our objective was to have something that would treat the interior past the creosote zone in ties in service. Now we know some of those would already have some decay in them. We were hoping to at least arrest that decay.

It was a little easier getting these supplemental treatments done. We didn't have to contend with tie plates and rails and all that other stuff.

Now we're going to fast forward 14 years. We got a crew that came in and took out a sampling of ties from all these groups we have been talking about. Then we set them up and what we decided to do is the most logically place to have a comparative treatment between the untreated end and the treated end would be to cut them right through the inner two spike holes on each side. That's what we did and they where our test areas right where the innermost spike holes were in place.

After 14 years borate exists in above threshold retentions throughout the cross section. When we started this project people would say that borates is going to leach out faster then you put them in. I'm here to tell you it doesn't happen. And these ties were still very well protected after 14 years. There was no deterioration around the spike holes, none at all. All spikes were tight so we had no spike kill. This is what we would expect because borate is a corrosion inhibitor.

Looking at one that was incised and had a dip treatment with Creosote. We didn't really dip them, what we did was put the ones we dip treated on a cart, put it in the cylinder filled up the cylinder, drained the cylinder. That was our dip treatment. There was no pressure and it was only in there momentarily at any rate. Even with a dip treatment with creosote after 14 years we have complete cross sectional levels of borate above the threshold. And no spike kill.

Looking at a tie that had a borate rod through the spike hole -- no spike kill, wood starting to defibrate around the spikes.

Inaudible Question:

Dr. Amburgey: Oh, the ties that were in service. We don't know particularly because they're always periodically replacing a tie here and there but I think there was somewhere between 6 and 16, wasn't it Jimmy? Or they could be older than that. We just went down and we took say 20 ties, whatever was there and did a treatment on it and then the next 20 or the next 30 or whatever it was. We didn't pay any attention to whether it had been there 20 years or 10 years.

Borate spray is just a spray about a quart with a 30% BAE heated solution. We were treating it and it was a legal treatment, but we really didn't think it would last 14 years but, after 14 years, that's where Borate was getting in, we were spraying and getting it into those exposed checks and splits in these older ties. It was going in but then being solubolized in water as it rained and being spread throughout the cross section. Now that's pretty amazing to me. I just couldn't believe it when we started seeing this.

These analysis are still being processed, we don't have that data now it will be presented at the RTA annual meeting in the fall. So you can look forward to that data at the RTA meeting, but that's, that's our sampling procedure right there.

What's the benefits of all this? If the railroads aren't willing to pay another nickel or dime a tie there's no benefit, we've done nothing. If people are interested in extending the service life of ties and they're willing to pay a little bit extra for it there's one heck of a lot of benefits for it from this pre-treatment with borates followed by creosote treatment. We can greatly reduce decay from happening or perhaps eliminate it or,

from a series of supplemental treatments that can be applied periodically to ties and track. Now we only applied these once in 14 years, what would have been the benefit if we had applied them every 5 years? Once again that's a matter of economics I'm not an economist, I don't pretend to be people that are bean counters can figure out what the benefits are of all this. If your objective is to keep those ties in track for a maximum period of time with minimum damage this is the way to do it and greatly replacing ties up and down the track when the inspector says you have a dangerous situation so we can keep the trains moving.

Discussion

Mr. Sedillo: Any questions for Dr. Amburgey.

Mr. Wesley Wall, Genics: Thanks Terry that was a good presentation. The question I have is the word supplemental versus deposits both Paul Morris and myself have talked about deposit treatments being put in advance putting them in in advance of instillation or during the front end instillation so it's a lot cheaper to do then and their than to do the job later.

Dr. Amburgey: What we were doing was on a shoestring and we were trying to keep out of the ties guys way as much as possible. We didn't want to mess with their actual plan. We chose this way. There are ways to do this same thing during tie processing but we didn't get into that. You should get the same result.

Mr. Wesley: Would you see any advantage to doing it at the front end versus supplemental trying to catch it later?

Dr. Amburgey: Well I think that the tie people have to be thinking like the utility line folks that you need to look at your material periodically and refresh these treatments on a regular basis. The ground line treatment program that many people are going with utility poles now is paying big benefits to the utilities. The same program would pay big benefits for the railroads in my opinion.

Mr. James Gauntt, Railway Tie Association: What you're showing on the pretreatment side of things is that after 14 years you still have efficacy levels of the borates from the pretreatment. It would indicate that you probably don't have to re-new all that often if you do the pre-treatment because its still there.

Dr. Amburgey: That's correct. It looks like if you do the pretreatment you could, you could do your supplemental treatments perhaps every 15 years. We don't know.

Inaudible Question:

Dr. Amburgey: With diffusion it doesn't matter how you get there, you need to get the surface loaded and if you can load the surface while those ties are still green, put them in diffusion storage. It doesn't matter if, like we did, you use a dip tank or you could use a heated sprayer, a heated cross chain tank like those used in a lot of lumber mills. You just need to load up the surface by whatever means. You can pressure treat them if you want to, green and then put them out to in storage. You need the diffusion storage, you have to bulk stack them and cover them for about six weeks.

Dr. Douglas Crawford, Forest Products Laboratory, USDA: You cited benefits based on supplemental treatments and pretreatment. Can you give us some type of extension of life expectancy by doing that over a period of not doing it.

Dr. Amburgey: After 14 years there was no decay above threshold levels of preservative throughout the cross section and virtually no spike deterioration. I don't know how much longer they would last, but I'm willing to bet that 15 years from now they'll still be in very good condition, but I don't know.

Mr. James Gauntt, Railway Tie Association: Terry could I make a comment on that?

Doug, I think one of the things that you would see the greatest benefit in extension of life is in the lower usage track. Obviously we have two failure mechanisms with cross ties, we have mechanical and we also have decay and biological. Where the mechanical decay rate is faster than the biological decay rate you're not going to see as great a benefit. But in those areas of track and, the railroads basically only operate about somewhere in the neighborhood of 10 to 15% of their track at those high density levels, so there's a lot of room for improvement on the biological side below that.

Dr. Amburgey: Even on the high, high density lines what you're going to find is that those spikes are going to hold a lot longer, you're going to get much less movement of track because of spike looseness

Mr. Sedillo: Any other questions? Thank you Dr. Amburgey.

Dr. Amburgey: Thank you.

Mr. Sedillo: Our next paper, "Creosote – 43 Years of Experience as a Ground Contact Preservative," is co-authored by Mr. David Webb of David A. Webb Inc., Mr. Randall T. Baileys of J.H. Baxter & Company, Mr. G. Paul Merrick of Trus Joist and Mr. Russell G. Pfeiffer of Koppers Industry, our presenter will be Randy Baileys.