Ongoing Work Proves Moisture Is Key Factor In Impedance

By Jim Gauntt

Over the past three years, more data on the electrical impedance of treated wood crossties has been collected than has ever been collected before. The reason? Even though there have been no reported problems in track with dual-treated ties in more than 20 years, there have been some who worry that wood ties pre-treated with borates and subsequently dual-treated with creosote will perform differently regarding electrical impedance than creosote-only treated ties.

The most current research that has been performed by TASKpro and Osmose on ties treated by Seaman Timber Company for Norfolk Southern should go a long way to put any such concerns to rest. Over the past few years, 151 dual-treated and creosote-only ties have been monitored for electrical impedance properties. The results are three very significant conclusions.

First, using a sophisticated independent statistical analysis of this year's data set it can be stated that moisture content (MC) of treated wood ties—any treated wood ties—is the primary driver for changes in electrical impedance properties.

Second, borate pre-treatments have no discernable impact on electrical impedance once moisture content falls below the threshold at which ties are normally processed. When MC exceeds normal processing levels, the data readings are too erratic to draw specific conclusions. This also means that you cannot get good test results from freshly treated ties as MC is too high to get useful data.

Third, you cannot analyze the electrical impedance properties of wood ties using small sample sizes and achieve good confidence levels. You need data from an absolute minimum of at least 25 replicates of the same species matched as closely as possible to begin to have confidence in what the data is saying.

In general, wood ties are treated at around 40 to 50 percent MC depending on species. But, as The Wood Handbook states, any time that MC exceeds the fiber saturation point (generally between 28 and 30 percent) increases in electrical conductivity (which is inversely proportional to impedance) becomes erratic. Plus, the relationship of MC to electrical impedance is non-linear, making the erratic behavior even more pronounced as MC increases above 40 percent.

That is why one needs multiple replicates when testing wood ties, so there are enough data points from which a multiple regression based statistical analysis can be performed and generate results with good confidence levels.

The work remains under review, and even more data may be collected over the next couple of months. The Railway Tie Association (RTA) has a goal of presenting the results and conclusions to American Railway Engineering and Maintenance of Way Association Committee 30 at the 2007 Annual Conference and Exposition, scheduled for Sept. 9-12 at the Palmer House Hilton Hotel in Chicago. §