



Where's The Beef?

By Gene Bartlow

President American Wood Preservers Institute

“The Plastic Crossties Disconnect: Where's the Beef?”

By Gene S. Bartlow

Published in “Crossties”, the magazine for the producers and users of treated wood crossties and related products, in the September/October, 1995, issue, page 37-39, sponsored by the Railway Tie Association (RTA), Gulf Shores, Alabama.

In 1988, Rutgers University's Center for Plastics Cycling Research developed the first commingled plastic lumber from post-consumer plastics (that's old plastic milk containers and bottles from dumps and landfills). Since then, expectations for the product's success have been high.

To the treated wood industry, it meant that another competitor had arrived bearing the environmentally correct label, "RECYCLED", and plastic had joined steel and concrete in the marketplace in an attempt to pull customers away from the treated-wood sector.

Product claims for plastic wood continue to outperform the product. Manufacturers of recycled plastic lumber products tout the virtues of using "recycled" plastic and continually make performance claims that cannot be verified. While the plastics industry is beginning to develop product and performance standards, it has a long way to go. However, this has not deterred marketing departments from getting ahead of the research required to verify claims for plastic lumber products.

A recent story in *Crossties* is a case in point (News Scope, May/June, 1995, page 6). A Chicago newspaper reported that plastic made its "world-wide debut" on the Cicero-based Manufacturers' Junction Railway. *Crossties*, alert to the birth of the plastic-tie age, picked up the story from the February 20, 1995, issue of Traffic World magazine and ran it verbatim, without editorial comment. The story and its message caused a small stir in the treated-wood industry.

A Little Background on the Subject.

A brief account of how plastic ties came to be used illustrates how exaggeration and misinformation can distort reality. The Manufacturers' Junction Railway is not exactly the Union Pacific. It is a short-line railroad that hauls materials over short distances at low operating speeds (slower than 10 mph). The track is straight and there are no grades or curves to complicate the run. The plastic ties, 500 of them installed, span about 1,000 feet of track with three-car trains making four to eight runs a day.

According to newspaper reports, the railroad company was never in the market seeking to experiment with plastic railroad ties. OmniTrax, the Denver-based owner of Manufacturers' Junction Railway, received an Illinois-state grant of \$50,000 to try its plastic ties. OmniTrax originally went to the Illinois Department of Energy and Natural Resources seeking information on recycling of used wooden ties into wood chips for fuel. Instead, it got an offer it could not refuse-free rail ties, albeit plastic ones.

Expenses being what they are when you run a small railroad, getting free plastic ties saved the company a lot of money. The short line sometimes purchased used wood ties at \$3 to \$5 apiece because new wooden ties were too expensive at about \$27 to \$37 each. The experimental plastic ties, on the other hand, cost about \$70 each-but they were free to the railroad for this experiment to compare their performance with that of wood ties.

There is nothing improper in this transaction except the exaggerated performance claims made for plastic ties. Mr. William Turk, President of Manufacturers' Junction Railway, and perhaps still enthusiastic about the grant money, claimed plastic ties "hopefully" would last 75 to 100 years. The superintendent of the railroad, Mr. Roberto Ocon, asserted (correctly it turns out) that plastic ties were lighter than wood ties and took a rail spike with less effort. Lighter plastic ties also made them easier for employees to handle. But are these characteristics good from a long-term performance standpoint? Even Mr. Turk admitted that "no one really knows, because this is the first time they are being used."

Mike Dahl, President of Eaglebrook Products Inc., which manufactures the plastic ties, admitted that "The problem with making the plastic railroad ties was that no one had any experience making recycled plastic products of that thickness." This statement gets right to the point of this article: the industry has developed neither acceptable definitions of what constitutes recycled plastic lumber nor performance data for each of its products. The claims it makes, whether for plastic ties or plastic lumber, remain unproven speculation. The message to the industry is this: rein in the advertising departments, unleash the research teams, and get some real data to compare this with pressure-treated wood.

Science Redux: SUNY and Virginia Tech.

Research so far indicates that wood outperforms plastic lumber products in all of the important measurable engineering and construction criteria. There are no data on the performance of plastic ties, but plastic lumber has been studied. Two recent major studies have raised questions about the performance characteristics of plastic lumber, particularly regarding the tendency for plastic lumber to creep and the excessive flexibility (low stiffness) of the material. Researchers from both the State University of New York (SUNY) and Virginia Polytechnic Institute compared plastic wood with real lumber.

Dr. William B. Smith, an associate professor at the College of Environmental Science and Forestry, SUNY, in Syracuse, New York, produced a paper in 1994 that studied the strength and performance characteristics of "sustainable building materials." He compared wood (renewable) and plastic (recyclable) with respect to their strength, performance, and cost. Dr. Smith concluded that: Compared to real wood lumber, RPL [recycled plastic lumber] has been found to be clearly deficient from each of these perspectives. Its strength is low, its important structural performance characteristics are poor, and its cost is high. While further development of RPL technology, engineering standards, and performance is possible; it will probably come at a high cost. Lumber, coming as it does today onto markets from a sustainable natural resource, and with its long and successful history of structural and cost effective use, should continue to be a preferred product.

A 1992 study by the Department of Wood Science and Forest Products at Virginia Polytechnic Institute in Blacksburg, Virginia, tested performance characteristics of plastic pallets compared to wood pallets. The researchers found plastic pallets to be heavier than wood pallets but less stiff, subject to creep under loads and tending to fail at mid-span. The plastic pallets did not hold nail fasteners as well as wood either, and they were more susceptible to damage from dropping when empty. Moreover, the Virginia Tech study said, plastic wood "exhibit[ed] significant variation in properties."

Plastic Ain't What it Used to Be.

These research studies raise a key issue for recycled plastic products-product uniformity. Despite manufacturers' claims, the industry has yet to solve this problem. In order to produce a consistently-sized, uniform product, the plastic tie industry must establish defined product performance characteristics and grades, such as criteria for heat resistance, compression set under load, modulus of elasticity in flexural and compression strength, flammability, impact resistance, thermal stability, dimensional tolerance, composition, buoyancy, color stability, friction coefficient, temperature effects on stiffness and strength, and fastener withdrawal.

From a retailing and an engineering viewpoint, however, product consistency and uniformity are critical. The ability to deliver and safely use a uniform product that performs consistently within a known and given range of specifications is what defines a superior product.

The plastics industry, working through the D-20.20.1 Committee of the American Society of Testing & Materials (ASTM), an impartial standards-setting organization, wants to resolve this issue. For example, the D-20 Committee and the Plastic Lumber Trade Association (PLTA) decided that plastic lumber must contain 50 percent plastic, by mass. "Recycled" plastic lumber, on the other hand, must contain over 90 percent (by weight) post-consumer recycled plastic (those plastic milk cartons and bottles). But how are fillers, additives and reinforcing materials defined? How will consumers and end-users know that the product will live up to the claims made for it if manufacturers use different recipes to concoct their plastic brew? How is a product such as Mobil Corporation's TREX categorized when it is composed of 51 percent wood fiber and 49 percent plastic?

Plastic Economics or Voodoo Economics?

Other issues that hinder development of uniform plastic lumber products focus on economic and distribution assumptions that could prove to be incorrect. Given current market conditions, supplying raw materials to plastic-lumber producers is not a real problem. Corporations frequently find secondary uses for materials used in the production process. Plastic wrap becomes recycled plastic lumber. The question then is, "will the supply of raw materials continue to keep pace with demand?" The assumption that plastic just needs to be collected from landfills and recycling centers and turned into plastic lumber may be incorrect but is certainly not the whole story. In truth, only a small percentage of plastic waste materials will ever be recycled into plastic lumber or other products. And while recycling is one positive way to manage plastic waste products, recycling also becomes the rationale for some companies to continue producing plastic wastes. Moreover, it is not safe to assume that prices paid for plastic raw materials will remain low. Competition among "recyclers" and producer companies for the raw materials, coupled with an increase in demand, could spike up prices for raw materials and make the retail product even less price competitive in the market place. Given doubts about a secure supply of recyclable plastic, it is dangerous to assume that production costs will decrease as demand and volume increase. Price will remain an obstacle for plastic lumber, and those products currently cost 2-to-3 times as much to produce as treated wood.

Take construction pilings as another example. James E. Graham of the National Timber Piling Council (NTPC), a geotechnical engineer with extensive hands-on experience in the business, has estimated that the average cost for a typical timber piling is around \$10 per liner foot; concrete and steel each about \$20; and plastic anywhere from \$50 to \$75 (depending on the reinforcing materials used).

The choice of piling material depends, of course, on the purpose of the structure and the loads it will bear. But, Graham's estimates illustrate the point: plastic products simply cost more.

The notion that "recycled" is better does not apply to plastic lumber. Consider the true impact on the environment if plastic ties were widely used throughout the US. Plastic lumber requires three to four times more energy to make and has 20-50% less strength than wood. The University of Washington's Center for International Trade in Forest Products calculated that replacing a billion board feet of wood with a manufactured substitute would increase annual energy consumption by about 270 million gallons of oil. Carbon emissions would also increase by 7 million tons. Trees don't use oil to grow, and trees clean the air rather than pollute it. Therefore, using plastic may not be as "environmentally correct" as once assumed. The bottom line is that consumers and producers should recognize that there is no special magic to the words "environmental" or "recycled." There are many negative environmental tradeoffs when industry or the public chooses plastic lumber.

So, where's the beef?

Whether plastic lumber is used in railroad ties, poles, pilings, bulkheads, decks, or playground equipment, it has a long way to go to measure up to the proven performance standards of pressure-treated wood. Using 500 lightweight plastic railroad ties on a short line railroad and hyping it, as a watershed event does not make it so. This is a non-event in wood tie and railroad history. It is another version of selling the sizzle instead of the steak. But plastic tie makers and the rest of the plastic lumber industry will someday have to face the public and answer the really tough question: **Where's the beef?**