

Deck Boards to Floor Boards

Company to Make Hardwood Flooring from Used Pallet Lumber

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When you think of a pallet, you think of a warehouse workhorse that gets cracked by the weight of the merchandise it holds, splintered from errant forklift jabs as it goes through the supply chain.

The damaged pallet may be sent to a recycler and repaired or disassembled with the good lumber being used to make a 'new' pallet from the recycled lumber. It may wind up as the floor of an exotic fort built in the backyard by a creative and enterprising child. All too often a damaged pallet gets thrown onto a heap in the back lot or sent to a landfill.

However, if a group of creative forest products industry professionals is successful, the lowly used pallet could be transformed from an ugly duckling into a beautiful hardwood floor.

In what can only be called a classic private-public collaboration, North Carolina State University, the U.S. Forest Service and Waste Reduction Partners, a nonprofit organization in Asheville, N.C., are working together to transform lumber from used pallets into attractive hardwood flooring.

If successful, the project will have many conservation benefits. Research shows that discarded pallets account for more than 2% of the solid waste found in the nation's municipal landfills. In addition, more than 38% of hardwoods harvested in the country goes into the manufacture of pallets.

Used pallets can be effectively and profitably recycled – repaired or disassembled to recover lumber that is used to make 'new' pallets. Scrap pallets can be processed by grinding them into wood fiber that is sold for markets such as animal bedding, mulch and boiler fuel.

Researchers have investigated possible ways to use lumber from discarded pallets. However, there have been no economically feasible alternatives – especially for hardwood flooring.

For a number of years, a team of researchers from the Forest Service and Vir-



This beautiful hardwood flooring is made from recycled pallet deck boards

ginia Tech has been working on problems of pallet design and ways to recycle used pallet lumber.

"We've been working for years on testing different pallet and repair designs as well as the effect of disposing of pallets in landfills," said Phil Araman, a Forest Service researcher. "We've been able to insert our information into the Pallet Design System (computer software program) and to design pallets so they're stronger and have a longer use period. We've also been working on ideas for using recycled pallets for value-added products like flooring or paneling. We have some paneling up here at the department that has the nail holes in it, so you can see that it's recycled wood. In fact, if you take out the nail holes you would think that it was new wood."

With that foundation, it was only a matter of time before the idea of using recycled pallet lumber to make value-added wood products reached maturity.

It happened with the involvement of Dr. Urs Buehlmann, an assistant professor of wood products at North Carolina State University's Department of Wood and Paper Sciences. Urs started collaborating with Phil and his team, at the same time looking at the possibility of creating a new source of employment and economic opportunity.

"This project is a way that research and the collaborative efforts of others can combine to build what I believe will be a viable, sustainable and successful enterprise," said Urs.

In order to economically convert used pallet lumber into hardwood flooring, Urs knew that the network from pallet recycler to flooring manufacturer to flooring finisher had to be seamless. Without all the parties working together as a cooperative chain, it would never make economic sense. However, if that network were in place, it would represent one of the three cornerstones needed to make the project viable. There were two other critical factors: demonstrating that it was economically viable and that there was a potential market for such flooring.

"We knew that recycling pallets was already a big business, about \$3.5 to \$4 billion a year," said Phil. "But so much of these valuable hardwoods were being buried in landfills or being ground up into mulch or animal bedding or fuel. I knew that we could capture some of that waste and create flooring, molding and other hardwood products. We just needed a way to make it profitable."

One of the biggest problems had to do with equipment – machinery used by flooring producers to remanufacture lumber could not work with recycled

pallet lumber.

“There just wasn’t a way to remove the staples and nails from the deck boards so they could be run through the planers and be used for flooring,” said Urs. “The nail heads just stayed in the deck boards even after the nail had been cut off.”

Another problem was identifying a manufacturer that had the ability to work with the recycled wood and make it into a product. Even if someone could and would remanufacture it into hardwood flooring, there were still questions about whether or not consumers and builders would accept it.

Urs set up a small manufacturing operation inside N.C. State’s Department of Wood and Paper Sciences, and it produced a small amount of finished flooring.

Urs and Phil teamed with Dave Lowles, the lead retired industry volunteer for the Land-of-Sky Regional Council’s Waste Reduction Partners, to conduct a pallet recycling workshop in December 2002. The purpose of the workshop was to promote pallet part flooring with a factory finish as a ‘green’ building project. At the workshop, architects and designers looked at the flooring

produced by N.C. State and offered input into the finished product. Their reaction helped advance the concept further.

“The feedback we got was extremely valuable,” said Urs. “For example, I always thought we needed to produce product from all the same species. Doing it that way was going to be expensive, with separating the woods and all, so we took out the red oak and then used mixed species in our production samples. It was very well received, and the only request we got was to use darker stains, so that the differences in the woods were not so visible. Even the holes the nails caused were perceived as giving the wood a rustic look. In fact, we just had a historic renovation where the guy in charge wanted to use those types of flooring because it was more realistic to the period. He told us not to sell the recycled floors without the nail holes because it looked more authentic. So we filled the holes and then simply finished over them.”

The input from Waste Reduction Partners did not stop with just suggestions, however. The group — which includes retired engineers and other professionals who are interested in conservation issues

— was intrigued by the idea of working on a commercial pallet recycling project that would reduce waste and improve the use of natural resources.

“They said, ‘Why don’t we all work together to get some sort of commercial project going here in Asheville?’” Araman recalled. “That’s where the whole commercial project started. The Land-of-Sky Regional Council applied for and received an EPA grant to help support some of the expenses for the project.”

Enter Joe Pryor. Joe is the owner of Oaks Unlimited, a hardwood lumberyard in Waynesville, North Carolina. Oaks Unlimited produces kiln-dried Appalachian hardwoods — red oak, white oak, poplar and cherry — for forest products businesses in the area. Joe read an article about making flooring out of recycled pallets and got interested in the efforts of Phil, Urs and the Waste Reduction Partners.

“Waste Reduction Partners...was working on the project,” Joe recalled. “I contacted them and decided to try to pick up the idea and commercialize it.”

In order to make flooring, Oaks Unlimited had to ramp up a completely differ-

ent production line, which meant investing in new equipment. Joe set up a small custom wood flooring shop on the premises that will run full time, allowing him to ease into the project.

"We got a grant from the state that encouraged me to put in equipment and hire employees," he said. "I was able to use some equipment that I already have in place, such as the dry kilns, the planer and the rip saw, but we had to put in nail removal equipment and a Weinig moulder that I use to put the tongue and groove on and finish the flooring."

Dave developed a relatively inexpensive machine for removing nail fragments from recycled pallet lumber, Joe explained. It is an air-powered punch that processes one piece of wood at a time.

Now, Oaks Unlimited is on the cusp of beginning commercial production of hardwood flooring made from recycled pallet lumber. "We're going to begin this month (July)," he said.

There are some significant differences between the recycled hardwood flooring and traditional hardwood strip flooring. For instance, hardwood flooring made of recycled pallet lumber is only 3/8-inch

thick, and it tends to be shorter.

"We'll have a couple of different widths, and as our production increases and we learn what the market needs, we'll develop what kind of sorts we'll make," Joe said. "But initially we're starting out with one pre-finished product."

Putting a finish on the flooring is the only process that Oaks Unlimited does not do in its own plant. First, the lumber is kiln-dried to 6%-8% moisture content. Then it is processed by nail removal equipment, cut and planed to its finished dimensions. Forming the tongue and groove is the final process. Joe is going to contract with area companies that have wood finishing capabilities for the pre-finish coatings. Oaks Unlimited will handle sales and distribution.

"The distribution hasn't been totally worked out," said Joe, "but I won't be selling on a retail level," Joe said. "We'll supply it to other distributors."

Recycling pallets into flooring will have many conservation benefits, said Joe. "I think it's a worthwhile project because of the recycling aspect," he said. "Plus, it's a great story. A number of people have contacted me about trying to buy the

flooring once we do get up and going. And a few people have been interested in distributing it once we get up and going."

Hardwood flooring made from recycled pallets will be more expensive than hardwood flooring made from new wood. Phil and Urs at first thought this would be an obstacle, but as consumers and architects have become aware of the product, Joe has found that it seems to add to the flooring's cachet.

"It's going to be a premium product," Joe said. "We're going to try to keep it as low as we can, but I can't compete with the high volume of large producers. We supply those companies in the lumber business that we're in now, and they have all kinds of price advantages from the way they're doing it. But hopefully the story that goes along with the lumber and the character of the wood will generate a sufficient premium to justify all the handling we're having to do."

The biggest challenge will be producing the flooring at a price point the market will accept, said Joe, and promoting it.

"When people know the background and know the story, that's where their enthusiasm comes from," he said. 