Spent CCA Treated Wood from Residential Decks can be a Resource for Reuse and Recycling

Bob Smith, Dept. of Wood Science and Forest Products, Virginia Tech, Phil Araman, USDA Forest Service, Southern Research Station, David Bailey, Pallet One Enterprises, Matt Winn, USDA Forest Service, Southern Research Station

Abstract

The volume of CCA treated wood being disposed of in landfills is growing at an alarming rate. In order to reduce the demand on landfills and timber harvest, more environmentally responsible alternatives for spent CCA treated wood have to be addressed. The objective of this study was to determine feasible products that can be produced from CCA treated wood.

Several products were produced from CCA treated wood recovered from dismantled residential decks. The products chosen were practical to make and used in residential and public applications. The products made were a picnic table, trellis, trash container, pallets, patio chair and table, sawhorses, a deck, deck components, planter boxes, and a porch swing. All products made required little training or carpentry skills, low monetary investment in tools and hardware, and required a low amount of time to complete. Therefore, the spent CCA treated wood is feasible to be recycled by most landfills and recycling organizations. Pallets produced from recycled CCA treated wood were tested and their performance found to be similar to pallets using untreated virgin wood. From interviews with MSW and C&D landfills, recycling centers, and potential users, there appears to be a communication barrier between the groups. Many landfills managers and recyclers do not know of a market for the recycled CCA treated wood and do not feel they receive a large volume to make CCA wood recycling profitable. The potential users were found to be willing to use the recycled CCA treated wood, but did not know where to get the material. Awareness and partnerships are needed to recycle CCA treated wood from residential decks.

Introduction

The volume of disposed CCA treated wood from spent residential decks is enormous, and many investigators have predicted the rate of disposal to increase of the next several years, Recent estimates of CCA decking materials being or predicted to be disposed in landfills are between 1-5,000,000,000 board feet per year (Alderman, 2001 and McQueen and Stevens, 1998). The heavy burden of disposal is placed primarily on municipal solid waste (MSW) and construction and demolition (C&D) landfills (Alderman, 2001 and McQueen and Stevens, 1998). The large volume of spent CCA treated wood reaching landfills has instigated several studies on the environmental and safety impacts of this material in landfills (Townsend and Solo-Gabriele, 2000 and Cooper, 1993). Most research has suggested that alternative disposal practices need to be initiated in order to mitigate the possible detrimental impact that spent CCA treated wood disposed in landfills, especially unlined, will have on human health and environmental safety. If stricter disposal regulations are enacted then higher tipping fees will mostly likely follow. In order to reduce the demand on landfills and extend the useful life of CCA treated wood recycling practices need to be developed for this material.

Recycling is prevalent and successful in many industries. Metals, plastics, and several wood products have developed recycling programs that have helped decrease the potential of government regulations, negative public opinions towards the disposal, and increase social acceptance of the material. Wood recycling was 5% in 1997, but was projected to increase to 10% by 2000 (EPA, 1998). An increase in virgin wood prices and an increased consumer demand for recycled materials are main reasons for the increase (Sherman-Huntoon, 2001). The recycling rate will increase as more regulations are implemented and tipping fees are raised at landfills.

R. Marutzky (1996) stated the following preconditions for successful recycling of wood waste:

- The assortments are available continuously and in sufficient amounts
- The quality of the assortment is in accordance with the proposed recycling
- The recycled wood products have a market

- The recycling produces no new disposal problems

Meeting these criteria is important for successful recycling of CCA treated wood waste, and the industry has several barriers associated with these conditions to overcome. Research has suggested that the building contractors are important factors in recyclers receiving sufficient amounts of spent CCA treated wood from residential decks. Alderman (2001) suggested that in order to receive an adequate supply of spent CCA treated wood for recyclers, marketing campaigns and financial incentives need to he used to entice building contractors to bring in the material to be recycled. Also, the CCA treated debris must be separated from other wood debris. Townsend and Solo-Gabriele (2000) found that approximately 6% of C&D landfill wood debris is CCA treated. If CCA treated wood is not separated from untreated wood, than the quality of the material will not meet the needs of the proposed recycling.

Research has been performed on finding markets for spent CCA treated lumber. There has been a large amount of research in using spent CCA treated lumber in wood-based composite products (Vick et al., 1996; Mengeloglu and Gardner, 2000; Munson and Kamdem, 1998). The researchers varied with their results, depending on the wood based composite made and the amount of CCA treated lumber used, but in most of the research it would be a viable option for spent CCA treated lumber. Composite manufacturers have been evaluated to see if they are a viable option in using spent CCA treated wood, but most research has found that they are reluctant to consider spent CCA treated lumber as a possible raw material source (Smith and Shiau, 1996 and Falk, 1997). The main reasons found were concerns with the health and safety of mill workers, residual chemicals that the material may still have, and products made from recycled treated wood may not have the same resistance to decay and insects as the original treated wood product. Therefore even though wood-based composite products could be produced from spent CCA treated lumber it does not seem to be a practical option for manufacturers in the near future.

Research has also been performed to remove the treating chemical from the spent CCA treated wood. If this process can be performed successfully then the CCA treated wood can be mixed with other wood waste for recycling. Clausen and Smith (Wilson, 1997) and Glasser (Alderman, 2001) have experimented with this method. Clausen's work has been successful in removing 92% of the copper and 42% of the arsenic, but there has been no success of removing the chromium because it is bond tightly to the lignin (Wilson, 1997). Shiau, Smith, and Avellaer (2000) were successful in extracting over 80% of CCA chemicals in the wood particles with citric acid. Another barrier associated with removing the treating chemical from the wood is that it is currently more expensive to do this than it is to dispose of the treated wood in a C&D landfill (Avellar and Glasser, 1995). As stated previously, incentives need to be developed for building contractors to bring spent CCA treated wood to recyclers. This will only happen if recyclers find economic viable products and markets for the recovered CCA treated wood. The following research examines potential products and market barriers associated with the successful recycling of spent CCA treated wood from residential decks.

Objectives

Determine feasible products that can be produced from recovered CCA treated wood.
Recognize barriers that exist for landfills, recycling centers, and organizations in reusing CCA treated wood from residential decks.

Products From Recovered CCA treated wood from residential decks

Methodology

The products manufactured were chosen because they were practical, easily fabricated, required little carpentry training or skill, a small number of inexpensive tools, and effectively utilized the recovered CCA treated wood from the residential decks. This will aid recycling centers in hiring and training qualified employees, and also easily produced products can be performed by people or organizations that acquire the recycled wood for do-it-yourself (DIY) outdoor projects. The designs of the products made for this research were from DIY outdoor wood furnishings designs, taken from published books or over the Internet. The tools used to produce the products was a 12" compound miter saw, a 12" table saw, a 10" circular saw, cordless drill (with several different drill bits), a reciprocating saw, and other miscellaneous tools such as hammers, tape measure, and wrenches. The hardware used were different sizes of galvanized decking screws, galvanized lag bolts and screws, and galvanized nails. It should be noted that strict safety procedures were followed when handling and machining the CCA treated wood. Proper dust masks, clothing, safety gloves, glasses, or goggles, and hearing protection was worn by at all times while working with the

CCA treated material, and all exposed areas were thoroughly washed after work was completed. For each product, the worker-hours required, amount of hardware and cost, and type and volume of material were documented.

Products Manufactured

Several products were made that fit the criteria of being practical to use and make, cost feasible, and required little previous experience and training in wood carpentry. Table 1 displays the products made from recycled CCA treated lumber, along with the type of CCA treated wood used, volume, type of hardware, cost of hardware, and the worker-hours needed to create the product.

Pictures of the products made are located in Figure 1. It should be noted that the worker-hours needed to complete each product will be much lower than the ones shown in Table 1 if they are mass produced, because the learning curve and time to produce each product will reduce after several of the same product is produced. The only products that required unused CCA treated wood was the deck that used new 5/4x6 decking, and the trash container that required treated plywood for the lid. Table 2 shows the volume of material used to make the 13 products shown in Table 1. The 2x8, 4x4, and 2x6 material was the most utilized dimensional material. In this study we found that 2x6 and 2x8 were the most successfully recovered material and the highest volume from spent CCA treated residential decks. Therefore, it is beneficial that 2x6 and 2x8 lumber was utilized in the manufacturing of the products. All products were uncomplicated to make, and required a small investment in hardware (from Table 1 only the deck, trellis, patio table, and picnic table required hardware that cost $10.00). Other material used in the making of the products included: latex stain ($18.99/gallon), white latex paint ($10.99/quart), white sealer primer (6.99/quart), deck stain (17.99/gallon), sandpaper ($0.40/sheet), and paint brushes ($3.99/brush).

Market Assessment

Six C&D and six MSW landfill managers, six recycling companies, and four potential users of the recovered CCA treated wood were interviewed. Several barriers exist in the reuse of recycled CCA treated wood. Landfills stated that they receive little CCA treated wood, and believed that separating it from other waste would not be cost effective because there are no markets. Recycling centers also claimed it would not be possible to recover the material, most citing that there are no markets and not a consistent supply of spent CCA treated wood. Several potential users stated that they could use the material, but did not know where to get it. From the personal interviews it appears that the biggest barrier in the recycling of CCA treated wood waste is lack off communication between all interested parties.

What needs to be done

The objectives of this research were to make products that could feasibly utilize recycled CCA treated wood from residential decks, and to determine barriers that may exist in the reuse of spent CCA treated wood. Several products were made from recovered CCA treated wood. The products produced, in this study, included outdoor home furnishings, landscaping products, pallets, and residential decks and components. Those produced were uncomplicated designs that allowed researchers with limited knowledge or skill in wood carpentry to complete successfully. The products were also inexpensive to produce, requiring a small amount of monetary investment in tools and hardware. The products also utilized the highest volume of CCA treated wood coming from spent residential decks, which are 2x6s and 2x8s. This study made only a few products that could be made from recovered CCA treated wood, several other items can be made, including but not limited to, benches, raised walkways, walking bridges, trail guides and paths, and in residential and commercial landscaping. Pallets made from the recovered CCA treated wood were found to perform similar to that of untreated wooden pallets, of the same species and similar quality. The recycled CCA treated wood can be used in several different above ground applications as effectively as new CCA treated wood.

Several groups will influence the success of recycling CCA treated wood from residential decks. These groups include manufacturers of CCA treated wood, building contractors, or other "waste" producers, government organizations, and landfillers/recyclers. Many manufacturers have not evaluated the effect their product has on their profitably after it has been sold. This has already occurred with the ban of CCA treated wood in residential applications at the end of 2003. The environmental groups and media attack on the use of CCA treated wood, though questionable, has forced the industry to spend millions of dollars on new chemical development and treatment processes, and also a loss of market share which might have been avoided if the issue was confronted earlier. The industry is currently facing another negative attack on its products with the possible adverse safety and environmental side affects on the disposal of spent

CCA treated wood. Therefore the industry must be proactive and support the development of recycling programs and markets, through financial incentives or other forms of support in order to keep CCA wood markets sustainable.

Building contractors currently dispose of CCA treated wood in landfills because it is less expensive than to recycle and there are no other alternatives. Therefore, the development of recovery programs for landfill and recycling centers are needed, and also required is support by the local government. Incentives need to be giving to CCA waste producers that bring separated CCA treated wood waste into the facility. This can be. achieved by lowering tipping fees for sorted CCA treated wood waste, or by raising the fees to accept unsorted C&D wood waste. The CCA treated wood waste producers will only make an effort to recover the waste if there are no cheaper alternatives.

To make CCA treated wood recycling successful, local governments need to support and initiate programs that foster communication and awareness of the amount of CCA treated wood reaching landfills and the potential reuse of the material. Landfills, recyclers, and potential users (individual citizens, parks and recreation, non-profit organizations) need to be informed how each sector can benefit from the recovery of CCA treated wood. Government officials should help develop markets for the material, and aid recyclers in developing business opportunities in making recycled CCA wood profitable. Government officials and recyclers should develop easy drop off and purchase sites for CCA treated wood.

In summary, the recycling of CCA treated wood from residential decks can be achieved if all affected parties are aware of the issues and potential reuse of the material. If the industry, builders, governments, recyclers, and users associated with the use, disposal, and recycling of CCA treated wood understand the needs of each party, and response accordingly, then the barriers in the reuse of spent CCA treated residential decks can be diminished.

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Table 1. Products manufactured, material and volume used of CCA treated wood, type and cost of hardware, and worker-hours need to complete.

Product	Material (bd.ft.)	Total Board Feet	Hardware	Cost of Hardware	Worker-Hours
Porch Swing	2x4 (8.4), 5/4x6 (14.8)	23.2	3-1/2" & 2" screws, 3-1/2" lag screws, 3-1/2" lag bolts	$8.68	2.5
Chair	2x4 (6.7), 1x4 (4.4)	11.1	2-1/2" screws, 3-1/2" lag bolts, 3-1/2" lag screws	$8.71	3
Trash Container	1x4 (5.1), 2x2 (1.8), Lattice (14 ft^2)	6.9	1-3/4" screws, 1-1/4" nails	$2.00	4
Trellis	2x6 (22), 2x4 (7), 4x4 (81.7), 2x8 (15.4), 2x2 (7.5)	133.6	corner bracket, 5-1/2" lag screws, 3-1/2 lag bolts, 3" & 2-1/2" screws	$28.70	27
Planter Box	5/4x6 (4.5)	4.5	1-3/4" screws, 1-1/4" nails	$1.20	1.5
Planters	2x4 (12)	12	3-1/2" & 2-1/2" nails	$0.60	2
Patio Table	4x4 (18.4), 2x2 (3.8), 5/4x6 (12.4), 1x6 (5)	39.6	2" & 3" screws, 6" lag screws	$18.00	8
Picnic Table	2x6 (65), 2x4 (6.2)	71.2	2-1/2" & 3" screws, 3-1/2" lag bolts	$18.31	8.5
Porch Railing	2x2 (10), 2x4 (8.1), 4x4 (8.2)	26.3	all tread, 2-1/2" nails	$6.75	8.5
Deck	2x8 (108.8), 5/4x6 (100.8), 4x4 (36.8)	246.4	joist hangers, 2-1/2" screws, 1-1/2" nails	$26.18	22
Saw Horse	2x6(10.3), 1x6 (2.2)	12.5	3-1/2" & 2-1/2" nails	$0.35	1.25
Block Pallets	1x4 (3.8), 1x6 (5), 5/4x6 (9.7), 4x4 (4.8)	23.3	2-1/4" and 1-5/8" spiral shank nails	$4.83	2.25
Stringer Pallets	2x4 (5.3), 1x4 (5.1), 1x6 (4)	14.4	2-1/4" spiral shank nails	$2.52	1.75

Table 2. Volume and percent of recovered CCA treated wood used to manufacturer products.

Material	Volume (bd.ft.)	Percent Volume
2x6	97.3	18.6
2x4	53.6	10.2
2x8	124.2	23.7
2x2	23.1	4.4
5/4x6	41.4	7.9
1x4	18.4	3.5
1x6	16.3	3.1
4x4	149.9	28.6
Total	524.1	100

Figure 1. Products Made From Spent CCA

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