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How Green Is It?
Composite Lumber for Consumer & Residential Applications

INTRODUCTION

The arrival of composite or 'plastic' lumber has provided consumers with a new choice for home building projects. These products typically emphasize the benefits of low maintenance and, in some cases, are offered as a 'green' alternative to the use of virgin wood. Composite products are likely to become much more prevalent in home and building construction therefore it's important to be cognizant of how these products fit into a sustainability design.

McDonough and Braungart's 'cradle to cradle' analysis technique is used to evaluate the relative merit of composite lumber as a sustainable building product. The 'cradle' model is adapted to evaluate product alternatives for a home project such as deck or fence installation.

ANALYSIS OF COMPOSITE LUMBER PRODUCTS

Composite lumber typically contains plastic resin combined with wood / wood fiber and other additives. In the diagram below, the resin and wood fiber components range from complete virgin product to100% post-consumer recycled products.

PLASTIC RESIN	WOOD FIBER	ADDITIVES
Polyethylene low density (LDPE) high density (HDPE) Polystyrene (PS) Polyvinyl (PVC)	Wood chips, sawdust, flour, remnants	Wax Fiberglass Preservatives

CRADLE to CRADLE EVALUATION for composite lumber

1. Product creation:

Fossil fuel use are present in both the transportation and manufacturing processes. For manufacturing, the best options are the use of locally recycled high and low density polyethylene resin. This resin typically comes from recycled food and personal care product containers which have a growing recycle rate in many urban communities (approx 30% in 2005).

Other resin options, Polystyrene (Styrofoam) and polyvinyl (PVC), are much less desirable as they emit harmful VOCs during the manufacturing and remanufacturing processes. The

addition of fiberglass and polystyrene will significantly enhance strength but further increase health risks during the manufacturing process.

2. Product installation

Again fossil fuels are used in the transportation to the retailer and the end user with both traditional and composite lumber.

Composite lumber has advantages, over traditional lumber, during the installation process. Sawing composite lumber doesn't release any VOCs or preservatives and there are generally fewer particles released in the air. For traditional lumber, VOCs are released during sawing. Handling the lumber also creates some risk, particularly with arsenic based preservatives.

3. Product use

Composite lumber can offer significant maintenance savings to the end user. Reasonably benign coloring agents are used during the manufacturing process – this eliminates the need for color stains and reduces the VOCs released with each application of stain or topical preservative.

Where wood is used in composite lumber, there should also be a preservative in the mix. Some manufacturers use a high percentage of wood fiber in their manufacturing process; without a wood preservative, the composite lumber will decay just as traditional lumber does. If a home owner applies a preservative on composite lumber products, it will generally void the product warranty.

Borax-based preservatives are emerging as a comparatively non-toxic wood preservative and flame retardant. As Borax is water soluble, current development efforts are focused upon making it more durable in wet conditions. Composite lumber is an promising area for these new preservatives since a resin base offers some fundamental protection from water.

A least one composite lumber product (GeoDeck) has issued a recall based upon product decay and failure

4. Product Re-use

Overall, mixing biological and synthetic product ingredients will result in a product with limited recycling options. The successive generations of product use will be limited to fewer applications because the pure biological material can't be reclaimed from the product.

Composite lumber, however, does have some positive recycling features. Products made solely from polyethelene OR where a borax based preservative has been included in the resin/wood mixture may have a very long life (30-50 years). These products are suitable for continued reuse in the original application of building and remodeling. In building applications with a very long life, green composite lumber has an advantage over traditional lumber based (longevity and no need for stains).

Interviews with two manufacturers and two retailers showed little progress in the post-consumer recycling of composite lumber. All parties were sympathetic and interested but commented only on very early steps in the considering recycling in the post-sales process. It will take considerable progress to get the maximum benefit from the long life expectancy of composite lumber.

SUMMARY

There is a significant amount of consumer information available to help with selecting a comparatively 'green' composite product. Understanding how to choose between traditional and composite lumber is a more complicated question. The answer depends upon balancing specific project requirements, regional product availability and recycling options.

The guidelines below will help to tailor the choice to specific projects and geographic regions:

Qregarding the project application:

- Is either traditional or composite lumber appearance needed to preserve the 'sense of place'?
- Does the site have severe environmental conditions that will make traditional lumber maintenance demanding?
- Is site installation unusually difficult, making a 30-50 year life is highly desirable?

If the project assessment points toward use of composite lumber, continue evaluation with:

- Consider proximity to the materials being considered. Western, northwestern and southwestern area may have access to certified sustainably farmed lumber.
- Consider products that use only polyethelene without additives or wood fiber. This product type has high probability of good recycling options.
- Identify products that use only 100% post-consumer ingredients. Many urban areas have recycling centers that create polyethelene resins for local manufacturing use. If a resin/wood product must be used for the sake of appearance, identify a manufacturer that uses a local source of reclaimed wood product.
- Consider the likelihood of "self recycling". If the product that could be reused on the same property, it should be a consideration

PRIMARY REFERENCES:

Cradle to Cradle: Remaking the Way We Make Things, William McDonough & Michael Braungart, 2002.

www.healthybuilding.net A broadly based organization with primary interest in shifting current building materials to green and non-toxic materials.

http://www.greenbuilder.com/sourcebook Sourcebook and explanation of traditional and emerging building materials.

www.consumeraffairs.com GeoDeck product recall

Companies interviewed: Trex, Correct Deck, Home Depot, Big Creek Lumber (Half Moon Bay), Bruce Bauer (Mountain View).

APPENDIX: Plastic Lumber Product Ratings

Brand (Company)	Composition Plastics / Other	Recycled Content (%) Post-consumer	Total	Notes
Most Environmentally Preferable				
Bear Board (Engineered Plastic Systems)	HDPE	100	100	A
Millennium Lumber (BJM Industries)	HDPE, LDPE	100	100	A
Orcaboard (Durable Plastic Design)	HDPE	100	100	A
PlasTEAK (PlasTEAK)	HDPE	100	100	A
Select (Bedford Technology)	HDPE, LDPE	100	100	A
HDPE lumber (U.S. Plastic Lumber)	HDPE	90	90	A
Leisure Deck (The Plastic Lumber Company)	HDPE	80 to 95	100	A
Everlast (Everlast Plastic Lumber)	HDPE	80	100	A
Eco-Tech (Eco-Tech)	HDPE	75 to 100	95 to 100	A
Ameriwood (American Plastic Lumber)	HDPE, LDPE	75 to 95	85 to 95	A
Enviro-Curb (Enviro-Curb Manufacturing)	HDPE	75	100	A
MAXITUF (Resco Plastics)	HDPE	60	100	A
Perma-Deck Advantage+ (Cascades)	HDPE	50	100	A
Eco-Tuff (Eco-Tech)	HDPE	50	90	A
BreezeWood (Aeolian Enterprises)	HDPE	50	50	A
Environmentally Preferable				
Perma-Deck Elegance (Cascades)	HDPE / wood	50	100	B
Rhino Deck (Master Mark Plastics)	HDPE / wood	50	100	B
Plasboard (Northern Plastic Lumber)	HDPE, LDPE, PP / R	75	100	C
Less Environmentally Preferable				
Evolve, Perma-Poly (Renew Plastics Division)	HDPE	NA	90	D
Four Seasons (Delmarva Industries)	HDPE	0	100	D
WindRiver Fence (Aeolian Enterprises)	HDPE	0	0 to 30	D
Dream Composite Deck (Thermal Industries)	HDPE, LDPE / rice hulls, paper pulp	33	100	E
ChoiceDek (A.E.R.T., Inc.)	HDPE, LDPE / wood	30	100	E
CorrectDeck (Correct Building Products)	PP / wood	1 to 20	70	E
Trex Origins (Trex)	HDPE, LDPE / wood	some	100	E
Geodeck (Kadant Composites)	HDPE / cellulosic fiber, minerals	0 to 35	40 to 85	E
fiberon (Fiber Composites)	HDPE, LDPE / wood	NA	50 to 100	F
Latitudes Decking (Universal Forest Products)	HDPE / wood	NA	75 to 88	F
Veranda (Universal Forest Products)	HDPE / wood	NA	75 to 88	F
Monarch (Green Tree Composites)	HDPE / wood	0	75 to 80	F
WeatherBest Select (Louisiana-Pacific)	HDPE / wood	0	60 to 95	F
CrossTimbers (Elk Composite Building Products)	PP / wood	0	66	F
Evergrain (Epoch Composite Products)	HDPE, LDPE / wood	NA	NA	F
Oasis Composite (Alcoa Home Exteriors)	HDPE / wood	NA	NA	F
TimberTech (TimberTech)	HDPE / wood	NA	NA	F
Polywood nonstructural (Polywood)	HDPE, PS	50	100	G
Not Environmentally Preferable Except for Structural Applications				
Ameriwood-Plus (American Plastic Lumber)	HDPE, LDPE / FG	75 to 95	85 to 95	H
Trimax (U.S. Plastic Lumber)	HDPE / FG	65	65	H
FiberForce (Bedford Technology)	HDPE, LDPE / FG	50	95	H
Polywood (Polywood)	HDPE, PS	30	100	H
Not Environmentally Preferable – Avoid				
Boardwalk (CertainTeed)	PVC / wood	0	45 to 50	I
Country Estate (Nebraska Plastics)	PVC	0	0	I
Deck Lok (Royal Crown)	PVC	0	0	I
Deck/Dock (Wastech Fencing)	PVC	0	0	I
Dream Deck (Thermal Industries)	PVC	0	0	I
EverNew, Bufftech (CertainTeed)	PVC	0	0	I
Forever-Wood (Forever Wood)	PVC	NA	94	I
Oasis PVC Deck (Alcoa Home Exteriors)	PVC	0	0	I
Procell (Procell Decking Systems)	PVC / flax	0	<20	I
Sheerline (L.B. Plastics)	PVC	0	0	I
Synboard (Synboard America)	PVC	NA	NA	I
VEKAdeck (VEKA)	PVC	0	0	I
vinyl decking (Poly Vinyl Creations)	PVC	0	0	I
eon (CPI Plastic Group)	PS	0	0	J
XPotential (Xpotential Products)	Many types	30	100	K

FG = fiberglass HDPE = high-density polyethylene LDPE = low-density polyethylene
PP = polypropylene PS = polystyrene PVC = polyvinyl chloride R = rubber

Notes to Appendix

Total recycled content may include scrap generated from manufacturing. For wood-plastic composites, the total recycled content includes wood and plastic. These composites are typically 50 to 75 percent wood.

Avoid products from companies not listed on this chart until they provide product information.

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A	High post-consumer recycled content, high potential recyclability, AND made from resins associated with fewer environmental health hazards throughout their lifecycle.
B	Good recycled content but end-of-life recyclability hampered by wood-plastic mixture.
C	High recycled content but made with a mixture of recycled resins which could limit applications as well as end-of-life recyclability.
D	Low or unknown post-consumer recycled content; similar products with higher post-consumer recycled content available.
E	Some post-consumer recycled content but end-of-life recyclability still hampered by wood-plastic mixture.
F	Zero or unknown post-consumer recycled content AND combines wood or other cellulosic material with plastic hampering end-of-life recyclability.
G	Made with recycled pre-consumer polystyrene. Virgin polystyrene is a material associated with a hazardous production process.
H	Made with polystyrene or fiberglass, materials associated with greater health hazards during their lifecycle. These products have added strength for demanding structural applications and their use may be justified for these situations; otherwise avoid.
I	Made with virgin PVC, a material associated with greater environmental health hazards throughout its lifecycle and that has few recycling options.
J	Made with virgin polystyrene, a material made with known and suspected human carcinogenic materials.
K	Contains auto-shredder fluff, which can contain brominated flame retardants and heavy metals.

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