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Opportunities for Wood Plastic Composites in the Highway Construction Sector

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Description: An assessment of market opportunities for wood plastic composites (WPCs) in the U.S. highway construction sector. Annual consumption was estimated for three highway products: *tubular markers, in-road reflectors, and guardrail posts.*

Methods: Mail survey

Data Source: Highway contractors in **eight** western states (>10 employees)

Key Findings:

- 1) Highway contractors are responsible for a significant portion of highway-related purchasing in western U.S.
- 2) Overall, familiarity with WPCs amongst highway contractors is relatively low.
- 3) WPCs are rated favorably in comparison to other materials based on key material properties.
- 4) WPCs must be included in a qualified product list if they are to be considered by contractors

Introduction

Wood plastic composites (WPCs) can be described as composite products containing wood (in a variety of forms) mixed with thermoplastics or thermosets.¹

Common Uses

Products made from WPCs have experienced tremendous growth in recent years, predominantly in the United States. In particular, WPCs have gained a significant share of the residential decking market, a trend due in part to the CCA ban. It is suggested that WPCs will command a greater share of the US decking market than softwoods by 2010. Additional residential products such as siding, fencing and roofing are also emerging.²

Four factors are thought to be responsible for the recent surge in the WPC residential market: the adverse effect of treating chemicals on the environment, effective marketing, the quality/cost ratio, and, perhaps most importantly, the acceptance of WPCs by builders. Demand for WPCs has also developed in the automotive in-

dustry for use in both interior and exterior components. The automotive industry considers WPCs to be a promising green material that may be able to achieve durability without the use of toxic preservatives.³

Opportunities in the Highway Sector

There is a growing interest in 'greening' the US highway and road construction sector. Typically, this movement is led at the state level by the Department of Transportation (DOT). Government agencies in charge of highway construction in the US are showing interest in using more sustainable products and avoiding potentially harmful preservative-treated products.⁴

According to DOT officials, purchasing in the US highway construction sector can be the responsibility of two entities; the DOT itself, or the highway construction contractors hired by the DOT⁴; however, it is suggested that the majority of the purchasing for large construction projects is conducted by the contractors.

Regardless of the purchaser, any products used in highway or road applications must be approved and published in a Qualified Products List⁵. These product lists are updated regularly and indicate that a product has been tested and found to be suitable for use in a specific category. To be included in a Qualified Products List, a product must undergo a series of testing which, depending on the product, can include the testing of impact effects, mechanical properties, color requirements, and durability.

Methods

Highway contractors in eight western states were sent questionnaires by mail. Potential respondents included contractors with ten or more employees. Estimates of sector wide purchasing were achieved based on a comparison of respondent employment and sector wide employment.

Questionnaires aimed to measure the following:

- Annual purchases of three test products (*tubular markers, in-road reflectors, and guardrail posts*)
- Familiarity with WPCs
- Perceptions of WPCs in comparison to other materials
- Importance of product attributes when purchasing
- Attributes used to measure product sustainability

Results

Based on annual purchases reported by respondents, it is estimated that over 4,000m³ of material is used in the manufacture of the three test products each year (in western states) (Table 1). Respondents reported that guardrail posts, representing the greatest opportunity for substitution, are typically made of treated wood (73%) with the remainder made from steel, plastic and aluminum.

Table 1. Annual Procurement of test products by highway contractors

Product	Respondents	Eight States (est.)
Quantities (# of units)		
Tubular Marker	68,195	454,633
In-road Reflector	185,096	1,233,973
Guardrail Post	8,313	55,420
Total Volume		
	601 m ³	4,005 m ³
	254,689 bf	1,697,000 bf

Overall, familiarity with WPCs was quite low amongst respondents. However, overall perceptions of WPC as compared to other materials based on sustainability, durability, strength, aesthetics, and environmental friendliness was quite good (Tables 2 & 3). WPCs did not compare favorably based on cost.

Table 2. Sustainability rankings for six highway construction materials.

Material	Sustainability Ranking					
	1	2	3	4	5	6
Wood	17	3	14	10	2	17
Recycled Plastic	12	8	11	12	13	7
Steel	11	8	9	10	9	16
Recycled Steel	10	18	6	10	13	6
Plastic	5	6	10	14	12	16
Wood-Plastic Composites	3	15	16	12	13	4

1 = most sustainable, 6 = least sustainable

Respondents suggested that cost, trust in quality and availability were the most important considerations when making purchases. Location of manufacture, environmental friendliness, and recycled material content were least important. Overall, highway contractors do not frequently evaluate the sustainability of their products according to responses to this survey.

Table 3. Perceptions of WPCs vs other materials

WPC vs.	Property	Mean
Virgin Plastic	Durability	3.2
	Strength	3.4
	Aesthetics	3.5
	Cost	2.8
	Environmental Friendliness	3.9
Steel	Durability	2.5
	Strength	2.2
	Aesthetics	3.3
	Cost	2.9
	Environmental Friendliness	3.6
Treated Wood	Durability	3.8
	Strength	3.5
	Aesthetics	3.7
	Cost	3.0
	Environmental Friendliness	4.0

Measured on 5-point scale (1=worse, 5=better)

Conclusions

WPCs will face four key challenges as manufacturers attempt to penetrate the highway sector. First, costs are clearly a priority. WPC manufacturers will have to reach a competitive price point in order to appeal to contractors in the sector. Second, manufacturers will need to convince purchasing agents that the quality of WPC products is equal or superior to traditional products. Third, manufacturers must ensure that WPC products are readily available to highway contractors. Fourth, and perhaps most important, WPC products engineered for highway applications must meet the rigorous testing requirements necessary to gain inclusion within a state-level qualified products list.

The differentiating qualities of WPCs (e.g. sustainability, locally made, etc) will not support entry into the highway product market. Competitive pricing, quality, availability, and DOT approval will be essential.

Literature Cited

¹Clemons C. 2002. Wood-plastic composites in the United States: The interfacing of two industries. *Forest Products Journal* 52(6): 10-18.

²Principia Partners. 2007. Market Opportunities for Plastic Building Products: North American Residential Construction 2006. Principia Partners.

³Ashori A. 2008. Wood-plastic composites as promising green-composites for automotive industries. *Bioresource Technology* 99(11): 4661-4667.

⁴Dunning M. 2008. Personal communication. Product Evaluation Coordinator, Oregon Department of Transportation, USA. 03 November 2008.

⁵ODOT (Oregon Department of Transportation). 2008. Qualified Products List. Published online. www.oregon.gov 07 July 2008.



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