TechLine

Forest Products Laboratory

Attractive, Durable Roofing Made From Recycled Plastic and Wood Fiber

Research and development by the Forest Products Laboratory (FPL) and Teel-Global Resource Technologies (Baraboo, Wisconsin) have resulted in the creation of a molded composite roofing system made entirely from recycled natural fiber and recycled plastic. A panelized roofing system is an ideal use for this recycled composite technology because (1) panels can be easily molded to resemble traditional roofing materials, such as cedar shakes, Spanish tiles, or slate, and (2) the aesthetic quality of the panels provides an opportunity to showcase recycled material in a product that looks expensive but costs much less than the traditional product it replaces.

Studies of this composite roofing system have shown several advantages over existing manufactured roofing systems:

- *Low cost*—Using recycled materials and a shorter molding time, these composite roof panels can be manufactured at a cost substantially less than that of clay, slate, or fiberglass roof tiles.

- *Zero manufacturing waste and fully recyclable*—Scrap from manufacture or from tiles that are trimmed during installation can be directly remolded into new roof tiles.

- *Enhanced dimensional stability*—Expansion and contraction due to temperature changes are significantly less than that of pure plastic roof tiles.

- *Ease of use*—Conventional woodworking tools can be used to trim the tiles during installation, and there is virtually no breakage.

- *Labor savings*—The composite roofing system is easy to install, and the panelized nature of the design speeds the process two-fold. Highly trained installers are not needed.

- *Lighter weight*—Composite panels are lighter in weight than clay or concrete tiles, resulting in reduced transportation costs and structural requirements for roof framing.

Roof shingles on FPL's research demonstration house are made from recycled plastic and wood fiber and are expected to last several decades.

Background

Homeowners want building products that are low maintenance but provide high performance. At the same time, builders are looking for lower cost, labor-saving materials. The development of composite products from natural fiber and recycled plastic could help meet some of these demands. However, there is a lack of data on the durability and performance of the composites, and builders are reluctant to use untested products.

Objective

The objective of this project was to further develop and refine the technology of creating a molded composite roofing system from natural fiber and recycled plastic. This research and development project measured the durability, installation advantages, time savings, and builder's acceptance of a new class of building product.

Approach

Researchers conducted tests to improve the formulation of recycled plastics and fiber, including alternative natural fibers such as kenaf and jute. The geometrical design was refined to ensure that the product is builder friendly. Researchers also determined the most effective layout of the panels for easy cutting during installation.

Environmental chambers were used to expose the panels to intense ultra-violet (UV) light to evaluate their long-term durability. Researchers also conducted strength tests and fire tests of the composite material.

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Forest Products Laboratory • Technology Marketing Unit
One Gifford Pinchot Dr. • Madison, WI 53726–2398 • 608–231–9200 • 608–231–9592 (fax)
mailroom_forest_products_laboratory@fs.fed.us • www.fpl.fs.fed.us

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The complete composite roofing system has been installed and monitored on four structures. The information collected will be used to compare this composite system and conventional materials on the bases of labor and material costs, ease of construction, and waste generated.

Outcomes

The results of this research project have verified the durability, installation, engineering, and performance of a low-cost, high-performance composite roofing system manufactured from recycled materials. Continued collection of field data will demonstrate the durability of this system in various environments and evaluate the overall acceptance of the product. Acceptance of composite building materials has the potential to open up large markets for recycled plastic and natural fiber materials.

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