Hybrid Flooring 101

Structures, Pros, & Cons

The world of rigid core flooring is expansive, and the amount of rigid core products in the marketplace is staggering. Flooring products containing a rigid, polymeric, or mineral core continue to grow and consume a share of traditional flooring market segments. The initial target for these structures was traditional luxury vinyl tile (LVT). The primary reason rigid cores were developed was to prevent the issue of telegraphing subfloor irregularities through LVT. Today, the key product attribute has shifted to water resistance. Most rigid core products are marketed as "waterproof" due to their material composition, but very few rigid core products actually meet this requirement. Each manufacturer markets this highly undefined attribute differently to gain their edge in the marketplace.

Since the arrival of rigid core products, polymeric cores (traditionally limestone-filled, unplasticized polyvinyl chloride [PVC]) have changed, and the world of acronyms has gone wild. You've surely heard of wood-plastic (polymer) composites (WPCs) and solid (or stone) polymer composites (SPCs). The primary difference between WPCs and SPCs is that WPCs are foamed and typically contain some wood flour, giving them a lower material density than an SPC of the same thickness.

More recent innovations have led to rigid, mineral cores resembling a more cementitious composite. There also are specialty rigid plastic composites (not using PVC as the binder) used to meet a specific consumer or customer need, primarily in the commercial flooring space. Polyvinyl chloride has raised human health questions and concerns for years in many consumer products, including resilient flooring. As a result, many architects and specifiers are requesting non-PVC containing flooring products.

The majority of the world's rigid polymeric products are being produced in China, Korea, and other Asian countries. There are two primary production methods: extrusion of rigid sheets using pre-pelletized components, and a double-belted press. Extrusion of rigid sheets using pre-pelletized components is by far the process of choice because it is a high-volume process that is relatively straight-forward. After extrusion, most producers anneal (stress relieve) the core, rip to width and then heat laminate a décor film traditionally made of PVC.

By Brian Beakler

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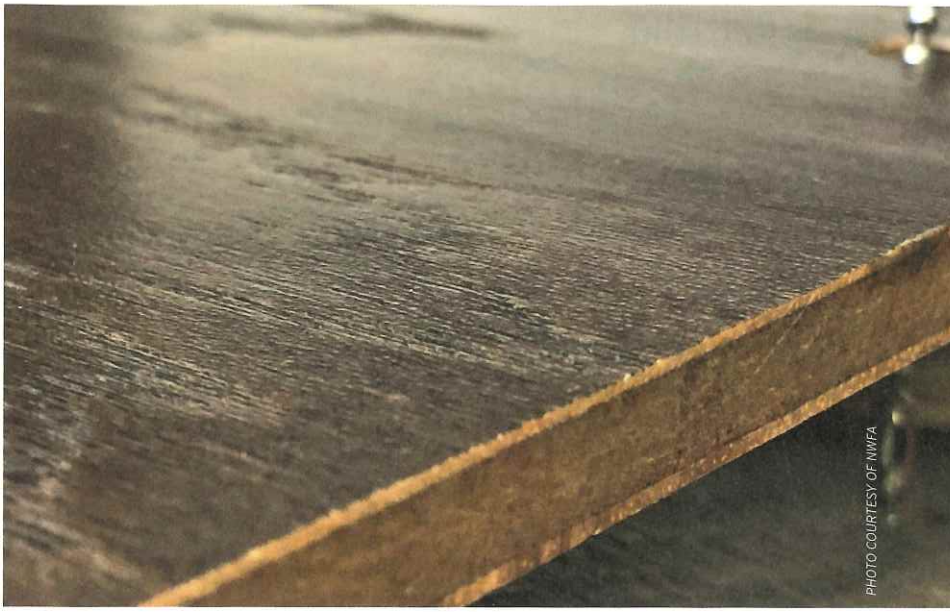

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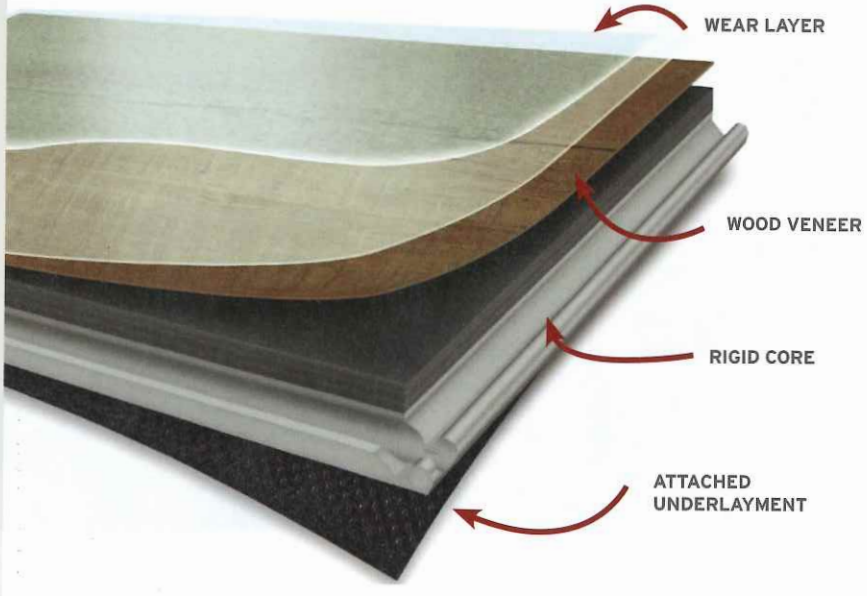
On the other hand, a double-belted press is more apt for the use of alternate plastic feedstocks. Dry raw materials are mixed and dispersed onto a moving belt. The material is then consolidated with a second belt that applies pressure with heat. A continuous sheet then is produced and slabs are cut to length. Décor layers or films can be heat or adhesive laminated, depending on the core composition.

The obvious aesthetic values of real wood have organically led to the desire of consumers to have a core with water-resistant properties and a real wood veneer face, known as hybrid (or engineered composite) flooring. During the past few years, several producers have developed and launched these types of hybrid flooring structures. There are several challenges in producing a structure with a real wood layer laminated to a rigid core.

As many of you know, balance is a key structural requirement for most engineered wood flooring products. The same can be said for a wood veneer to rigid core product. The real keys to

STRUCTURE



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balancing these structures lie in a combination of veneer thickness and width, core stiffness (how the material resists permanent deformation), and core thickness. Very thin face veneer laminated to thick, highly-rigid core material may not require a back layer to help keep it flat. The core and the adhesive interface must be strong enough to resist the strength of the wood veneer when it moves in the tangential direction. If the product is subjected to a severe wet or dry moisture gradient, the wood will move and either deform the product (cup or crown) or pull itself apart when exposed to severely dry conditions.

Wood reacts primarily to moisture changes in the environment, while the polymeric cores react primarily to temperature changes. It is imperative that the core is designed to not only have the rigidity to hold the wood from moving and causing deflection, but also be temperature-stable up to 115° - 120°F. The glass transition temperature range of PVC compounds is lower than many other plastics, meaning they transition from a solid state to a soft, flexible state at a lower temperature. Real examples of where temperature becomes an issue are in areas with large windows concentrating sunlight or packaged products being transported in the back of an unconditioned truck or shipping container moving across the Southern United States in the hottest summer months. Not only will the PVC start to soften, but depending on the equilibrium moisture content conditions of the environment, the wood will have a higher propensity to move. The result is a badly deformed product out of the box.

Another challenge to construction and performance of hybrid structures is adhesion of the veneer to the core. Each core composition will have different surface characteristics, which can affect the ability of the adhesive to bond to the core. Wood is a porous material and relatively easy to bond with many kinds of industrial adhesive chemistries. The type of plastic binder system and manufacturing process used to make the core determine the material's surface energy. Materials with high surface energies can make it very difficult to bond using common industrial adhesive systems. Hot melt polyurethane technologies are effective, but they also need modification depending on the properties of the core. Many sawn face engineered producers can laminate hybrid structures with hot-melt polyurethane technology. A draw-back to using this type of chemistry is the time

required to achieve a full cure, which is usually 8 hours before any machining can occur. Hot melt technology that could reduce this time would be a benefit for manufacturers. Emulsion polymer isocyanate (EPI) adhesives are used in large-batch, cold-press processes by many Asian producers. EPIs contain a significant amount of water, which can cause flatness issues due to moisture transmission through only one of the two adhered surfaces.

Most consumers now expect rigid core flooring products to be waterproof. Another challenge for hybrid flooring is how to keep moisture away from the veneer. Veneer moisture protection has been attempted through powder adhesives, specialized coatings, thermal treatments (which typically alter the color of the wood), and veneer stabilizing and modifying solutions. Efficacy of these treatments against moisture gain is dependent on many factors and none of them are able to make the wood 100 percent resistant to water.

I have focused on many of the challenges associated with hybrid structures, however, if hybrid products are developed with care and understanding of the materials, life cycle environments, and expectations, quality products can be produced. Today, there are several quality hybrid products in the marketplace that provide super performance attributes. Expect to see more hybrids in the marketplace, but know it's not as easy as gluing a wood veneer to a piece of plastic. ■

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NOTE FROM THE EDITOR: With the ever-changing flooring category options in the flooring industry, including engineered composite wood flooring, NWFA opted to lean on a subject matter expert on the subject with the intention of helping educate those who have included this product category in their portfolio.