

# New Coating Technology Expands Color Choices for **Vinyl Building Products**

## *Solar Reflective Coatings Prevent Warping of Vinyl*

**S**ince the mid-1990s, composite materials have made substantial inroads across the building products industry in the manufacture of windows, doors, trim and siding. The unprecedented strength and resilience of these materials, and their low maintenance, has made them too good to

ignore. They also offer another advantage important in today's building industry: "green" appeal. While they are produced using petrochemicals, composites may be comprised of recycled materials and, therefore, reduce the harvesting of lumber.



One example of the success of composites is in the trim marketplace. Over the past decade, cellular PVC trim boards have emerged to displace wood and capture 10% market share, according to a recent article in *Plastics Technology*. The article quotes a 2006 study from Principia Partners predicting 13% annual growth for PVC trim board through 2010.

The vinyl siding market – which comprises 40% of the market for exterior siding – is evolving as well. New product technologies are entering the siding market. Pre-finished, cellular PVC siding is emerging as an alternative to fiber cement siding for customers who want a higher-end, more "wood-like" siding appearance.

While cellular PVC siding has been available in the U.K. for 30 years, it just debuted commercially in the United States this year. A coatings breakthrough has played a significant role in making commercialization of cellular PVC siding possible.

### **Siding with PVC**

Fiber cement, or prefinished siding made from cellulosic composite and polymeric materials, makes it possible to marry the ease of maintenance pioneered by vinyl and aluminum sidings with the look of wood lap, shake and clapboard sidings. Production involves the use of non-cellulosic materials including Portland cement or polymers blended with cellulosic fibers to yield durable products that are less expensive than solid wood or injection-molded polypropylene siding.

The cellulosic materials incorporated into these composites with a high-quality finish must be protected. Primer/sealers are applied to help minimize moisture penetration and prepare the surface so the siding is ready for topcoat application in the field.

Typically, cellulosic composite siding materials are coated with waterborne primer/topcoat systems. These force-dried, self-crosslinking coatings offer durability and block resistance to maintain finish appearance through years of service. High-quality finishes are a major factor in the growth in popularity of this segment of the siding market.

**New Market Entrant**

Siding milled from an extruded cellular PVC polymer is emerging as a new alternative to fiber cement and cedar lap siding. While it captures the aesthetics associated with authentic cedar lap, cellular PVC can be factory-finished and is virtually maintenance free. Another advantage is that it is not subject to degradation from moisture exposure and microbes. However, cellular PVC must be protected from sunlight and excessive heat to prevent warping after installation. Since dark coating colors absorb solar heat, often enough to cause significant expansion of plastics, an advance in coatings technology was required to meet this need.

**Polyurethanes and Composites**

One of the most important coating types used on today's composites are polyurethane enamels, which continue to set new benchmarks for appearance and durability. Two-component polyurethane coating systems are available that provide excellent hardness, mar and abrasion resistance, and color and gloss retention, all in a single pass, for a wide range of composites. The durability of two-component polyurethane coatings comes from their crosslink density, which provides excellent depth of color and a distinctive finish for composite materials.

Polyurethane coating systems also offer environmental compliance. Some polyurethane enamels exhibit VOC emissions below 2.8 lbs/gal and have zero lead and chromate hazards. Depending on the particular polyurethane coating formulation, there are other distinctive benefits. For example, some polyurethanes have a high solids composition (59 percent by volume) that allows applicators to obtain a greater film build in one pass versus conventional urethanes, which can result in higher throughput.

These coatings also tend to have excellent flow properties, which makes for good transfer efficiency and leveling. In addition, most polyurethane coatings can be applied by conventional, airless, air-assisted airless and HVLP so they are easily applied on many finishing lines.

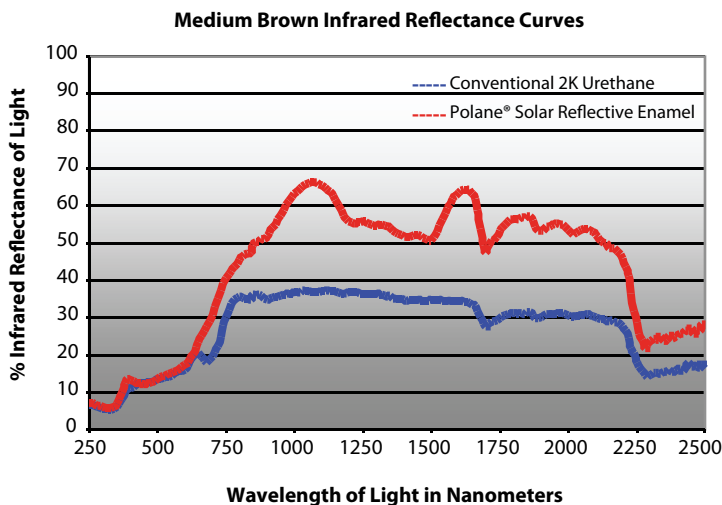
**Polyurethane Advance**

Until recently, polyurethane coating systems for cellular PVC could be offered only in lighter colors, because lighter colors tend to reflect rather than absorb solar heat. Because of heat absorption, darker colors exacerbated the problem of warping and bowing of vinyl siding in exposure to sunlight. This was an obstacle for building products manufacturers wanting to appeal to today's homeowner, who is demanding deeper, more saturated colors, particularly for high-end custom homes and historic renovation projects.

A reduced-VOC, next-generation polyurethane finish is providing a solution. The new finish has heat-repelling characteristics, which allows vinyl siding, shutters, windows, trim and patio doors to be coated with popular darker colors without the heat build-up that contributes to vinyl warping and bowing.

The coating system consists of a two-package polyurethane enamel one-coat direct-to-substrate system. The self-crosslinking coating is applied by high-speed spray in the factory and offers the advantages of low cure. In addition to durability and block resistance, the coating is HAPs-free and is formulated with non-fading pigments for

**FIGURE 1** | The illustration represents Total Solar Reflectance curves of a medium-brown color matched to within 1.0 Delta E color tolerance. The total solar reflectance is the total solar energy reflected outward from the coating. This is the energy from approximately 300 to 2100 nm (visible to near infrared). The graph demonstrates that at 900 nm the Polane® Solar Reflective Enamel reflects 53% solar energy compared to 35% for a conventional 2K urethane coating. Both coatings were applied at 2 mils dry film on standard PVC plaque.



enhanced UV stability. It also meets or exceeds the ASTM D 3679-05 standard for vinyl siding.

### **Early Success**

Recently, an innovative manufacturer of fully recyclable cellular PVC has incorporated the new coating on its finishing line. The process starts in a high-tech paint kitchen where 12 colors of paint are kept under pressure and hard-wired to a manifold allowing fast, computerized color change.

The computerized system allows independent control of the pressure and atomization of the finishing line's spray guns. Plural component spray equipment enables mixing at the gun so there are no pot-life concerns and the lines can be quickly purged to change out colors. The coating chemically hardens to a tough barrier, which allows finished siding to be stacked face-to-face without slip sheets.

The new coating chemistry has enabled the cellular PVC siding maker to offer finishes in 22 standard and 1400 custom colors, including popular dark shades. The company also offers fully integrated siding-and-trim packages so builders can single source these materials and be certain of consistent performance, look and color. According to the siding maker, broad color selection has provided them with an important early market advantage.

From this example it is apparent that consumer preferences, changes in the housing market and technological advances are bringing change to the market for composite materials used in the building products industry. ■

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