

Engineering /Technology

Co-Extrusion vs. Mono Extrusion

Co-extrusion and mono-extrusion are the extrusion processes typically used in the production of all types of PVC-extruded products such as vinyl siding, vinyl window and doorframes, pipe and fence products. The American Society for Testing and Materials (ASTM) has specifications for each product line. The buyer should be aware of which specifications are being used by the extruder (Fence products using pipe specifications are being produced by 40% of the fence extruders. The pipe specs have lower demands for UV stabilization and impact resistance.)

Mono-Extrusion

The mono-extrusion (or monolayer extrusion) process blends the elements of the PVC compound extruded through the die to become the walls of the single layer product.

Co-Extrusion

Co-extrusion is the newest technology used for shaping PVC products. Two or more layers are produced. The outer layer (or cap stock) is similar to a “skin”. It contains a denser concentration of the essential elements (including UV inhibitors) and protects like a sunscreen when exposed to harmful UV rays. ASTM’s specification for rigid PVC exterior profiles used for fencing (F964-94) requires the cap stock layer to be a minimum of 0.015 inches thick and a maximum of 20% of the profile wall overall thickness. It is important for the buyer to determine what ASTM specification is being used by the extrusion supplier to determine the supplier’s compliance with ASTM standards.

The inner layer (or substrate), when produced from virgin materials, is essentially the same as the cap stock, but with a lesser quantity of UV inhibitors and, possibly, a color (or pigment) differential. This promotes an improved molecular bond by the impact modifiers in the substrate compound and results in a stronger product. Usually, rails and posts are also co-extruded to comply with ASTM F 964-94.

Co-Extrusion with Regrind

Some manufacturers outsource recycled plastics (known as regrind) for use in the substrate profiles for cost savings. They may emphasize that only waste vinyl fence products are used, but it is impossible to control the content of this material. It cannot be determined how many times the material has already been processed. Multiple reprocessing usually results in a more brittle and inferior product. The exact chemical composition of the waste product material cannot be verified and a poor extrusion may result. All but the Green Series* of Saratoga Fence’s residential fence and railing products, whether mono- or co-extruded, contain only virgin—non-outsourced and non-recycled materials.

*Green Series Posts and Rails do have an “In House” only recycled virgin vinyl substrate resulting in a cost savings to the customer. None of the PVC railing products offered by Saratoga Fence contains the Green Series recycled products.

Dispelling Myths

One popular misconception is that a color differential between cap stock and substrate indicates regrind in the substrate. However, this is not necessarily so. If color pigments are decreased in a virgin substrate, a different hue in color may result. Conversely, a regrind substrate may be exactly the same color as the cap stock, giving the impression that mono-extrusion is used.

Another misconception is that the co-extrusion process is inferior to mono-extrusion. Co-extrusion is the newer, more expensive technology and supports concentration of the essential materials, resulting in a stronger, more durable product-the customer receives more value per dollar. (Manufacturers who cannot afford retooling or do not support this new generation of advanced processing may make claims of the inferiority of high-tech co-extrusion.)

Thirdly, there are claims that the layers in co-extruded products may delaminate. Co-extrusion is not a lamination. Lamination is a process whereby adhesives or reheating are used to bond two or more layers together. Co-extrusion is a homogenous process accomplished at high pressure and temperature in a sealed environment where moisture and air cannot be trapped. Co-extrusion produces superior product without the use of adhesives, making separation of the layer virtually impossible.

Resin, Additives, TiO₂

Resin

PVC resin is the main component used in vinyl fence profile compounds, equaling over 80% of the total. Like flour used in a cake mix, a superior quality resin costs more than resin of inferior quality. Likewise, several grades of resin are available from a number of different manufacturers. Saratoga Fence uses only the highest quality resin manufactured by the premier manufacturers of PVC resin in the world. Rigid quality control protocol rejects PVC pipe-grade resin, which is broadly used by fencing manufacturers.

Additives

In order to create a high quality product with aesthetic appeal as well as impact resistance and long-term weather ability, controlled quantities of specialized compounds are added to Saratoga blend (or cake mix). These additives are governed by quality assurance protocol to ensure the high standards on which our customers rely.

Titanium Dioxide (TiO₂)

Titanium Dioxide is the ultraviolet (UV) inhibitor used to manufacture PVC products. Some manufacturers may use a TiO₂ that causes eventual chalking commonly found on surfaces exposed to sunlight for an extended period. At Saratoga, we only use non-chalking durable-grade TiO₂ containing coated particles that do not leach. We think the added expense we incur using this superior compound is worth the final result because Saratoga fencing products retain their luster without chalking. Saratoga fences glossy finish may dull or become dirty* over time (e.g., they are exposed to the same atmospheric conditions as your car). *See [cleaning methods](#) for dirt.