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Building Better Products with Tin Stabilizers

Vinyl is a popular material used in many building and construction products. Because of its versatility, vinyl is found in both rigid and flexible applications, manufactured by extrusion or calendaring, and used for both interior and exterior products, in both residential and commercial/industrial structures.

Stabilizers are added to vinyl compounds both to avoid degradation in the manufacturing process, and to enhance the performance of the final product. In North America, tin stabilizers are the dominant choice in rigid vinyl applications such as pipe and siding. They also are used in gutter systems, window profiles, interior doors and molding, fencing, decking and railing, and some flexible products such as vinyl flooring and roofing membranes. In addition, tins are found in foamed vinyl applications such as decorative trim and shutters, consumer storage systems and residential, commercial and industrial building systems. They also are found in indoor window coverings such as vertical blinds.

Tin stabilizers are a cost-effective solution to the high demands of the building and construction industry. Tins enhance the manufacturing process as well as the performance characteristics of the final product. Due to the breadth of applications and processes involved in making these vinyl products, a wide variety of tin stabilizers can be used. A number of factors determine which stabilizer is best for a particular application. Because of their versatility and the selection available in the octyl-, methyl- and butyltin categories, tin stabilizers can be formulated specifically for the performance characteristics required in the end product. For example, in vinyl siding, a less expensive tin stabilizer can be used in the substrate while a higher performance tin stabilizer that meets demanding requirements for weather resistance and color retention can be used in the capstock.

In addition to enhancing the durability of the final product, tin stabilizers are critical to the manufacturing process. Siding is produced by extrusion, a high-heat and high-speed process, and tin stabilizers contribute to the efficiency of the manufacturing process by improving output rates while providing stability during extreme processing temperatures.

Another key factor for building products is the quality of the surface and color. In window profiles, for example, tin stabilizers allow for consistently whiter products that maintain their initial color. Tin stabilizers are used in the topcoat for vinyl flooring because they provide heat stability during the calendaring process, which allows the wear layer to be applied during thermal processing. In the final product, they provide clarity so that the vivid colors and patterns show through clearly and resist yellowing over time.

Because of the high demands of process shear and activation in foamed vinyl applications, tin stabilizers are used to enhance the process and the blowing agents. Tin stabilizers perform well under these rigorous processing conditions. Their thermal stability and efficiency make it possible for the manufacturer to create complex, multi-hollow shapes in foamed or rigid vinyl extrusions, enhancing the thermal insulation value of the final application. The result is profiles that are lightweight but durable.

Product Safety

Tin stabilizers have been safely used in vinyl building and construction products for more than 50 years. In recent years, some questions have arisen about the migration of additives, including tins, from vinyl products. Particularly in the case of interior products, such as vinyl flooring, critics have raised concerns about the potential health impact from human exposure. However, studies have clearly demonstrated that the slight migration that could possibly occur from these products does not pose a health risk.

Finally, where indoor air quality is a concern, low-odor stabilizers have been developed and can be specified.

End-of-life issues

Because they improve thermal stability, tin stabilizers make it easier to recycle vinyl products by helping to reduce degradation during the process steps required for recycling. Vinyl siding, for example, is being recycled both by manufacturers (e.g., manufacturing off-cuttings and construction site waste) and after consumer use, by removal and recycling at the end of the product's useful life. Vinyl products also can be safely disposed of in landfills. Studies have shown that levels of tin stabilizer leaching from vinyl products in landfill conditions are very low, usually attributable to wash-off from the product's surface and pose no undue risk to human health or the environment.

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