



IMAGE: IKA

Development in PVC additive technology, such as stabilisers, aims to provide more sustainable options for construction and other applications, writes Mark Holmes

Sustained innovation in additives for PVC

The push for greater sustainability and the increasing role of regulation are driving the development of alternatives in the PVC additives market to long-standing traditional products, including those based on tin and heavy metal technology. Additives that can increase recycling rates for PVC are also under development and some are now reaching the market.

Some tin-based stabilisers for PVC have drawn the attention of regulators in Europe in recent times and calcium-based stabilisers can offer an alternative, according to **Baerlocher**. "Regulatory activities are one of the dominant drivers for developments," said Dr Stefan Fokken, head of research and development. "Tin stabilisers for PVC have been in focus of regulatory bodies for years now and recently many studies to assess octyl- and methyl-tin stabilisers have been conducted. Additionally, the current activities by the European Chemicals Agency (ECHA) for assessment of PVC

and its additives also focused on tin stabilisers.

"This has triggered ongoing developments for calcium-based alternative stabilisers to replace conventional tin-based chemistry. In many application fields, such as plasticised film or rigid compact and foam sheet extrusion, calcium-based alternatives have already gained a decent market share, proving that the alternatives are workable," he says.

Foaming developments

Another application area where tin stabilisation has been utilised is production of foamed sheets and profiles. Baerlocher says many foam profile producers in the UK are now using calcium-based stabilisers while many European foam sheet producers are also using only calcium-based systems.

In foam applications, achieving a homogeneous foam structure, smooth surface appearance, and good initial colour are the main issues to be addressed. Surface properties are, however, less

Main image:
There is a clear trend in PVC additive development towards more sustainable, lower carbon footprint solutions

Below: Calcium-based stabiliser systems are being used in foamed profile applications in Europe

important for foamed profiles because most are coextruded, enclosing the foamed core with a PVC or acrylic compact skin.

Calcium-based stabiliser systems used in continental Europe for foamed applications are typically designed around the acid scavengers, metal soaps and co-stabilisers that are used in non-foamed rigid PVC profile extrusion. Baerlocher says, however, that specific care must be taken when choosing the co-stabiliser system as some of the known chemistries interfere with the blowing agents used and can lead to some yellowing from the start.

Perhaps the most challenging part of a one-pack formulation development is the lubricants. The company says adjusting melt viscosity is crucial to successfully extrude wide sheet with an even, flow line-free surface lines and the desired density. Melt viscosity adjustments are not exclusively linked to the lubricant selection either; applied acrylic processing aids can also influence the results.

Construction drivers

According to German PVC additives manufacturer **IKA**, the building and construction sector is a key driver towards the use of calcium-based products for PVC worldwide. chief executive officer Alexander Hofer says there is a clear trend towards more sustainable products and, as the complexity increases, so do the technical requests.

Availability and sustainability of feedstock remains an issue, Hofer says, while systematic innovation is necessary to meet the ever-increasing demands of the customer base - recycling being a good example. IKA has now developed calcium-based products to replace liquid and tin solutions in almost all application areas.

In January of this year IKA Group and **Ingenia Polymers** incorporated a joint venture for production of stabilisers and additives to the North American PVC market. The Houston, Texas-based company – IKAvin Additives – marks another step in IKA's long term strategic growth, according to Hofer. It will focus on providing added value stabilisers and technical support for North American customers, including alternatives to tin in rigid PVC.

IKA group board member and co-owner Timo Seibel says the company will continue to focus on ensuring future sustainability along the full PVC supply chain and aims to expand its sustainable-focused product lines worldwide. He says achieving the VinylPlus Supplier Certificate for incorporat-

ing sustainability in its corporate strategy last year, can be seen as confirmation of its constant efforts in this area. In addition to product development, IKA is also focusing on using energy from renewable sources, as well as on initiatives for closed loop recycling management and energy consumption reduction.

While the construction industry may be key to PVC additive development, demand has been impacted by a slowdown in the sector and the wider economy, according to **Dow**. "As a result, there was a sudden drop-off in demand in Q4 of 2022, resulting in an overstocking of PVC additives from last year that the industry is still working through," said Azize Ala, North American marketing manager within the company's plastics additives business.

"Market signals suggest a continued slowdown in 2023 throughout the value chain coming off the wave of strong demand through the first half of 2022. Despite these challenges, the PVC industry is expected to grow in the next few years, with many PVC capacity expansions announced publicly over the past few years," Ala said.

Like other key players in the PVC additives market, Dow sees sustainability as a priority in development terms and sees it high on customer priority lists. "This trend in sustainability has led to a significant emphasis on using post-consumer recycled materials in finished PVC products, influencing the development of additive products and how they handle re-processing and formulating



IMAGE: BAERLOCHER

Right: Internal view of IKA's additive manufacturing facility at Bitterfeld-Wolfen in Germany



IMAGE: IKA

IMAGE: NORAC-ADDITIVES



Above: Recent innovations from Norac include “booster” products to alleviate tin stabiliser supply shortages

with different PVC recycle streams,” Ala said. Another notable trend she highlights is weight saving. “By incorporating new additives designed for lightweighting and density reduction, PVC manufacturers can enhance the value proposition of their products for customers, while also reducing their environmental impact. Additionally, reducing the weight of PVC products can help to lower freight costs and improve product performance, making it an attractive option for manufacturers looking to meet sustainability goals.” Ala adds that new solutions are required for recycling PVC, however, including addressing the demand and supply imbalance, developing additives to mitigate the challenges of variability in PVC recycle streams, and investigating ways to improve the compatibility of different plastic types. Additionally, she identifies a need for industry players to address misinformation about PVC and to advocate for PVC in a changing regulatory and environmental landscape.

Targeting recycling

One of the main current technical areas of interest is improving the process for recycling PVC and being able to incorporate different recycle streams to achieve consistent quality. “At Dow, we are addressing this issue through the use of our innovative Surecel and Paraloid acrylic additives,” said Ala. “These additives can improve the rheology, melt strength, and processability of recycled materials, which facilitates meeting density reduction targets comparable to virgin material. By aiding our customers’ incorporation of recycled materials into their products, we are not only making a contribution towards sustainability, but also reducing costs and increasing efficiency in the PVC manufacturing process.”

Dow’s Surecel processing aids are said to enable improved efficiency and high-quality cell structure at any thickness in foam applications. The company says the latest addition to the range, Surecel 488, is designed with a tailored ultra-high molecular weight to reach a high efficiency of foaming, allowing for lightweighting and improved cell structure. It, and the pre-existing Surecel 467 grade, provide density reductions in various PVC foam applications - sheet, deck, and pipe. They contribute to improved melt strength and cell structure when extruding product containing various levels of in-house scrap, post-industrial scrap generated during production in the same or external PVC applications, and post-consumer PVC recycle generated after consumer use.

Demand for durable and sustainable materials in outdoor living spaces also continues to rise and Dow has a number of solutions to meet the needs

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