Case Study

DuPont™ Delrin® Drives Productivity and Sustainability for High Speed Filling Lines

Project

DuPont™ Delrin® acetal homopolymer with advanced slip technology played a key role in the development of a breakthrough conveyor material for bottling and other filling operations that avoids the need for traditional external lubricants. The Regina e-F.A.S.T. (ecological friction abating sliding thermoplastic) material was developed by DuPont in close collaboration with Regina Chain, a global leader in conveyor chains, belts and components.

Industry 4.0 technologies such as automation control systems are allowing bottlers to increase the speed and volume of operations. To maintain high throughput, bottlers sought to move to dry-running conveyors, which enable the line to operate smoothly without the need for external lubricants. Eliminating these lubricants is highly desirable because they attract dust that must be periodically washed off, causing interruptions to the line, requiring additional labor, materials and water, and generating wastewater that requires proper disposal.

Recognizing the need for a better option, Regina turned to DuPont, its supplier of more than 20 years, for materials expertise, technical resources and a strong focus on sustainable solutions. The goal was to develop an innovative, dry-running conveyor material for bottle-filling customers that would enable high-speed production, allow bottles to move smoothly, extend the useful life of the conveyor and allow it to operate more sustainably.

Challenges

Dry running requires a material with slip properties that can ensure a low coefficient of friction (COF) that remains constant over time. Conveyors made with conventional acetal and polybutylene terephthalate (PBT) resins often require application of external lubricants to maintain a low COF over extended periods of demanding processing.

The new technology had to provide low, stable COF without migrating to the surface of the conveyor, where it would cause the same issue as external lubricants – namely, dust collection. High slip performance would not only allow external lubricants to be eliminated, but would also reduce chain pull, helping to cut the amount of energy required to operate the conveyor.

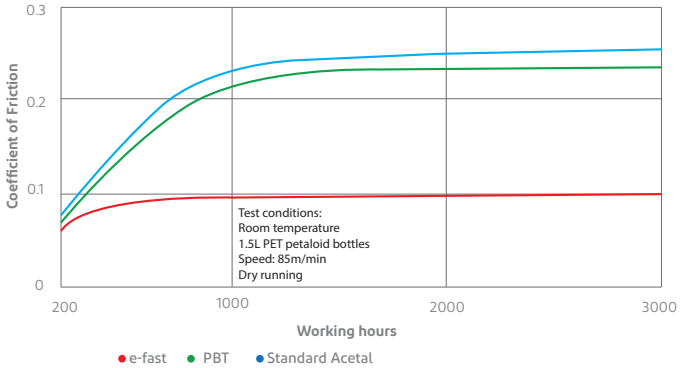
While dry running minimizes or eliminates line cleaning to remove adhered dust, bottlers must still regularly sanitize the conveyor. Making it easy for operators to identify when the line needs sanitizing would, therefore, also support overall processing safety, cleanliness and efficiency.

Solution

Working closely throughout design, development, testing and prototyping, DuPont and Regina collaboratively created the Regina e-F.A.S.T. material, a new, custom-colored grade of DuPont™ Delrin® acetal homopolymer with advanced slip technology.

DuPont performed in-house tribology work and conducted extensive testing at both Regina's facility in Latina, Italy, and its customers' sites. The team also developed a conveyor line prototype at the DuPont European Technical Center in Meyrin, Switzerland, to simulate real-world conditions.

The new Regina e-F.A.S.T. material offers significantly lower COF (a reduction of up to 40 percent compared to standard acetal and PBT). This critical property remains stable over time, enabling the full dry running of the conveyor.



With the elimination of external lubricants, line cleaning is only required for sanitation. To help Regina's customers quickly identify the need for sanitizing, DuPont customized its Delrin® grade for the e-F.A.S.T. material with a distinctive, bright yellow contrast color.

This product's exceptionally low COF also reduces chain pull, helping to decrease the amount of energy needed to run the line. Testing has shown that Regina's conveyor chains and belts made with the e-F.A.S.T. material can reduce energy consumption on a high-speed bottling line by as up 40 percent. Lower stress on conveyor chains also helps to extend their useful life by up to 40 percent and lengthen maintenance cycles.

Further, the surface slip performance of this unique material allows bottles to move smoothly along the conveyor line, reducing wear and tear which helps to preserve the bottles' clarity, haptic properties and shelf appeal.

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