SUSTAINABLE MATERIALS:

POLYKETONE AN EMERGING NYLON ALTERNATIVE

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NEW FLOWLINX PRODUCTS MADE USING SUSTAINABLE NYLON ALTERNATIVE

The pharmaceutical industry is constantly evolving, innovating and creating high-quality drug products to meet the needs of the patient. Sourcing sustainable materials that meet stringent quality and design standards can be difficult. It is unusual to discover single-use components that check all the boxes: ISO 9001:2015 level quality, creative design, affordability, and sustainable material.

FlowLinX is a newcomer to the industry, an innovative brand of bioprocess products manufactured by Carolina Components Group. Despite its youth, there are a number of FlowLinX components available that check all the boxes. For example, the Sidewinder and the FlowLinX sanitary clamp. Boasting brand-new patented designs and a sustainable nylon alternative called polyketone (PK), these products speak to a new generation of component and material design. A large contributor to the success of these components has to do with the material used: polyketone.

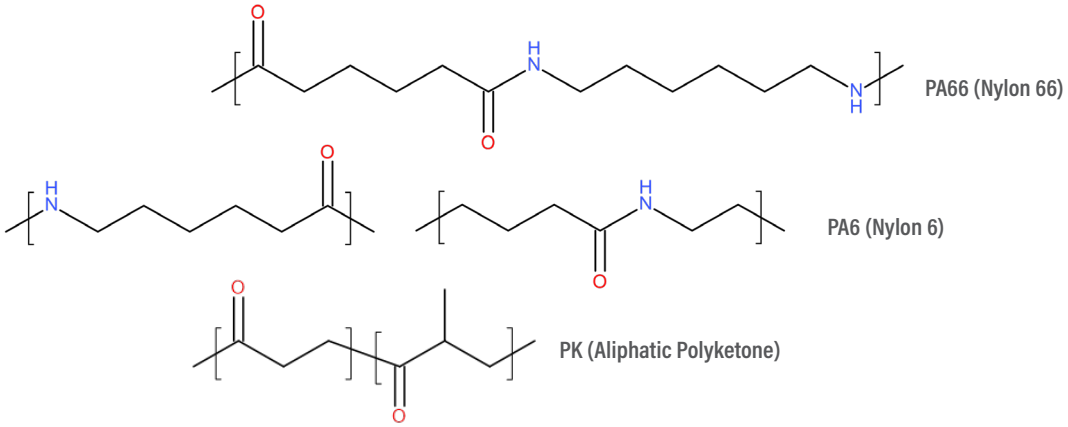
First, what is polyketone? As represented in Figure 1 below, its molecular structure is very similar to that of PA66 and PA6. Each material consists mainly of carbon and oxygen. Polyketone, however, lacks the same form of nitrogen that the nylons contain. Avient, a manufacturer of specialized polymer materials, including those focused on sustainability, states, "This makes PK much less hygroscopic than PA6 and PA66, and the resulting properties are much less sensitive to moisture conditioning."[1]

FlowLinX Sidewinder

FlowLinX Sanitary Clamp

Figure 1

What is Polyketone? A Look at Structural Similarities. Image Courtesy of Avient Corporation



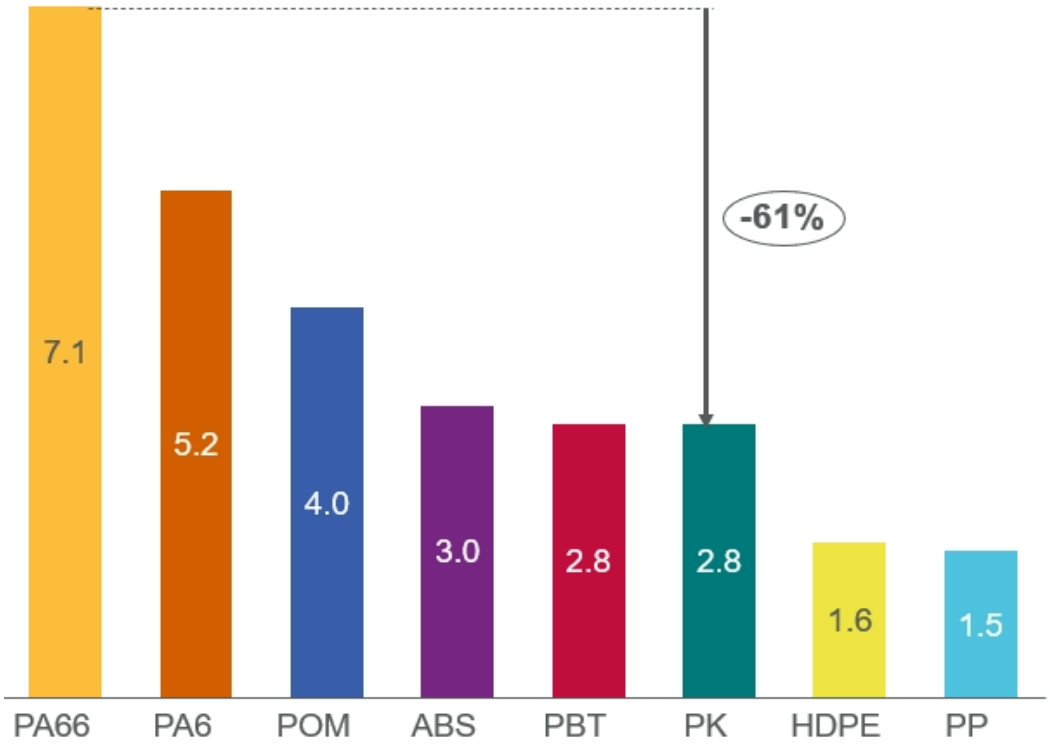
Polyketone is a sustainable alternative for a few reasons. Mainly, it has a much lower carbon footprint than the leading nylon material, PA66.

Avient explains it like this: "Polyketone is considered "eco-conscious" due to the reduced environmental impact of this base resin during the production process compared to PA6, PA66, and POM. According to third-party life cycle analysis (LCA), there is a 61% reduction in CO_2 compared to PA66. This is due to the low carbon footprint of the monomers, which is similar to that of traditional polyolefins. With PK, you can get engineered thermoplastic performance with the added benefit of a polyolefin carbon footprint."
See LCA comparisons in Figure 2.

Another thing that makes polyketone unique is its remarkable chemical resistance. Avient conducted a chemical resistance test on polyketone versus other nylons and found that its glass-filled PK samples remained stable even after 20 days in 30% sulfuric acid. PA6 and PA66, in contrast, dissolved within only one day. Figure 3 shows the outcomes of the sulfuric acid testing. Avient conducted various other tests as well, saying, "Avient also soak-tested its performance against other chemicals including 10% hydrochloric acid, 10% calcium chloride, antifreeze, 10% ammonium hydroxide, 12% sodium hypochlorite (bleach), and ethanol. In each case, the physical property retentionof Avient's PK-based formulations was superior to that of PA6 or PA66."

Figure 2

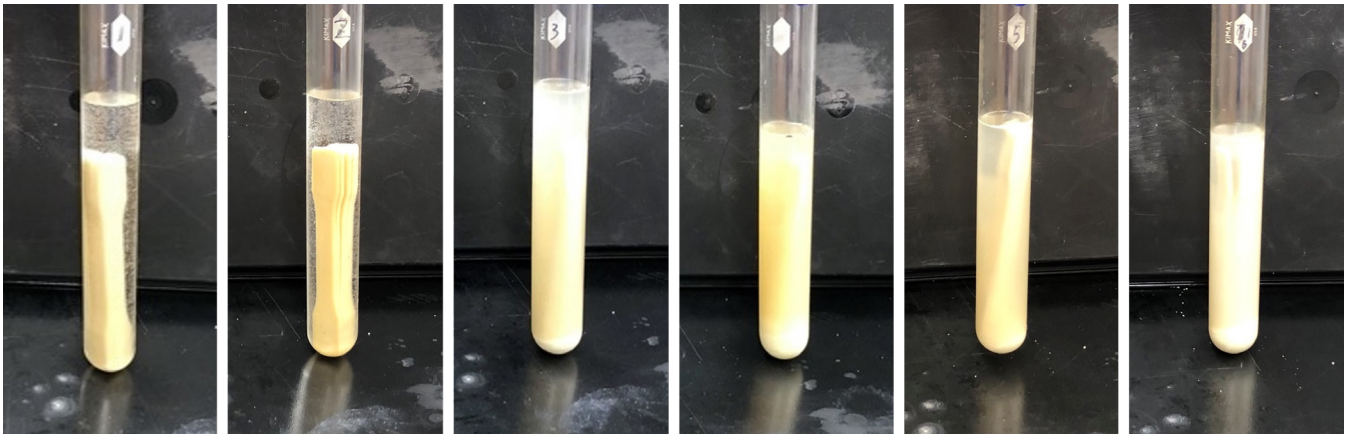
CO2 Emissions During Production Between Nylons and Nylon Alternatives. Image courtesy of Avient Corporation



Carolina Components Group believes that every small improvement leads to excellence. Polyketone is a trailblazing material with a unique capacity for increased sustainability, material design and high chemical resistance. FlowLinX's use of this material, combined with its patented design technology, results in an innovative take on the typical pinch and sanitary clamp. The Sidewinder and FlowLinX sanitary clamps were designed to meet your critical fluid flow needs, and represent a strong step towards next-generation sustainable components.

Figure 3

Understanding Chemical Resistance Between Nylons and Nylon Alternatives



1. Avient Corportation. (n.d.). *Could Polyketone be the next-generation nylon alternative?* https://www.avient.com/idea/could-polyketone-be-next-generation-nylon-alternative