Estolides as environmentally friendly lubricants

Olio is an Inform *column that highlights research, issues, trends, and technologies of interest to the oils and fats community.*

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In the early days of the green chemistry movement, when sustainability pioneers were attempting to wean the world off its dependence on petroleum, Mark Miller did not have much luck selling biodegradable and biobased lubricants. An entrepreneur and chemical engineer, Miller says that in the late 1990s, potential clients were reluctant to switch to plant-based products. Now, his products are so mainstream they are sold on Amazon. "Today, it is a no-brainer," he says. "Everybody gets it."

Green manufacturing experts believe they have finally reached a tipping point now that sustainability is accepted as a global priority. This is true across a variety of different market sectors. Personal care, in particular, has shifted to a primarily ecofriendly, sustainable industry with the majority of labels replacing their unsustainable ingredients and packaging. Even the plastics and elastomers industries, conceived out of petrochemicals over 50 years ago, increase the number of green formulations each year.

"Early on, there was resistance, but as technologies like ours have become more mature people are realizing these biobased, synthetic products work," says Miller, who credits his household cleaners with helping consumers make the green shift. "Household cleaners have really shown consumers that sustainability does not mean that you have to give up anything."

One area where performance is crucial is lubrication. Lubricants act as a barrier between two sliding interfaces in contact with each other. The moving parts of machines cause friction that leads to wear, and will eventually fail without lubrication. A variety of petroleum-based formulas address the unique friction environment of specific applications, just as a car's engine and transmission use two different lubricants.

Extensive research on petroleum lubricants and their additives has led to product reliability consumers have grown to expect, hence the hesitation to adopt plant-based lubricants. However, technology developed by the US Department of Agriculture (USDA) has resulted in exceptional plant-based lubricants, known as estolides. "The industry has come such a long way that we are able to create sustainable, environmentally safe products that can compete on a performance basis with petroleum and even petroleum synthetics," says Miller, now CEO of Biosynthetic Technologies, based in Indianapolis, Indiana, USA. Through a Cooperative Research and Development Agreement (CRADA) with the USDA's Agricultural Research Service, Biosynthetic Technologies continues to develop estolide functionality for sustainable, ecofriendly consumer goods.