

IHS Chemical Week

Anellotech advances biobased aromatics

Deal with beverage giant Suntory, process partnerships validate technology and strategy

Renewable aromatics startup Anellotech (Pearl River, NY) is building momentum toward commercializing its catalytic technology, lining up a number of big-name process and technology partners late last year. It has also received an indication from leading Japanese beverage maker Suntory Holdings (Osaka) last January to consider building the first commercial plant pending the outcome at a pilot/demonstration-scale unit slated to come online later this year.

“Up until this point, no one has really conceived that you could make a cost-competitive biobased aromatic,” says David Sudolsky, president and CEO of Anellotech. “People have been working to develop biopara-xylene (*p*-xylene) for years, and no one has been able to get a commercial plant funded because of process economics. If you’re starting with sugar or require several process, we think it’s very difficult to be cost-competitive.”

Unlike many renewable chemical firms that use finicky fermentation processes, Anellotech’s Bio-TCat thermocatalytic, single-step process converts lignocellulosic biomass to benzene, toluene, and *p*-xylene (BTX) in a fluidized-bed reactor. Biomass is thermally decomposed to form pyrolysis vapors, which are converted into the desired aromatics. The basic process was invented by George Huber at the University of Massachusetts Amherst and licensed for further development and scale-up by Anellotech in 2009. Bio-TCat makes aromatics directly. In specific contrast to biofuels producer KiOR, which filed for bankruptcy in 2014, Anellotech’s technology avoids the production of bio-oil that requires extensive and costly hydrotreating to convert oxygenates into hydrocarbons.

Anellotech has emphasized a capital-light strategy by leveraging the know-how and infrastructure of experienced partners. It has entered development partnerships with leading technology providers IFP Energies nouvelles (Ifpen), IFPEN subsidiary Axens, and Johnson Matthey. Downstream, it has com-

mitments from Suntory to move ahead with studies to consider the first commercial-scale Bio-TCat plant. The beverage giant is looking for a viable source of biobased *p*-xylene to meet its targets for using 100% biobased polyethylene terephthalate in its packaging.

In addition to Suntory, which has invested \$15 million, Anellotech recently announced that it received \$10 million from an unnamed, multinational strategic investor. Although the company is not able to disclose the terms of other financing deals, Sudolsky says all of



BREAKING GROUND: Sudolsky (l.) and Trecora CEO Simon Uppfill-Brown mark the beginning of T-Cat 8 build.

Anellotech’s funding has come from partners whose definition of success is based on a successful commercial introduction.

Because its partners are market leaders, Sudolsky describes Anellotech as a start-up that is not really a start-up. “Half the brain power is coming from R&D powerhouses,” he says. “We’re not trying to do everything on our own.” Anellotech is collaborating on catalyst development and manufacturing with Johnson Matthey, while Ifpen is contributing process development and scale-up expertise. “By leveraging this [experience], we can develop things faster and more efficiently and, equally important, progress more rapidly down the cost curve,” Sudolsky says. Anellotech plans to license its technology rather than try to build, own, and operate their own plants—a daunting prospect considering the scale needed to be meaningful in large petrochemical markets, like *p*-xylene and benzene. Sudolsky says this strategy—along with its R&D partnerships—is



T-CAT8: Thermocatalytic, single-step process converts lignocellulosic biomass to benzene, toluene, and *p*-xylene

“resonating in industry board rooms because it makes economic sense.” Axens will contribute its experience licensing technology when the Bio-TCat process is validated and ready to be rolled out to future customers, he adds.

Anellotech was also able to lower costs and accelerate its timeline by tapping Trecora Resources subsidiary South Hampton Resources to host Anellotech’s first development and testing facility at Silsbee, TX. The unit, T-Cat 8, was jointly designed with Ifpen, and commissioning will start later in 2016.

Anellotech is now exploring opportunities for its benzene stream, and polystyrene packaging, detergents, and nylon are all potentially attractive prospects. And because Suntory is not a chemical company, Anellotech is still looking for an appropriate operating partner, Sudolsky says. “We can be on a partner site and leverage existing resources and structure,” he says. “The idea is get the first plant built and demonstrate it. When you don’t go greenfield, you significantly lower risk.”

Low oil prices have tempered the outlook for biobased chemicals, but the momentum Anellotech has built over the last few months has made Sudolsky optimistic. At current oil prices, “we can be cost-competitive, but you don’t make a lot of money. But the bottom line is what the market is doing.” The company recently closed a \$3-million follow-on tranche of financing from the unnamed strategic investor and the initial \$7-million close was last August. “This was not when oil was \$120/bbl. \$80 is a lot better than current prices, but people are writing checks and investing resources nonetheless.”

—REBECCA COONS