

BIO-BASED CHEMICALS JEREMY PAFFORD HOUSTON

OPXBIO sees big future for microbes

CEO Eggert says bio-based technology will change chemistry. Links with Dow and Evonik bode well

OPX Biotechnologies (OPXBIO) president and CEO Charles Eggert sees chemicals a bit differently than most. Where others see large petrochemical plants entangled with pipes, valves, tanks, gauges and assorted other contraptions, he sees another way to produce the same chemicals created by the mammoth plants – a much smaller way.

Eggert does not see a petrochemical plant. He sees a biochemical plant – right in the heart of microscopic microbes.

Eggert spoke passionately about the future of bio-based chemical production, and specifically that which his company is pioneering.

“We are using our technology to change chemistry,” he said in an interview with ICIS.

Earlier in May, OPXBIO and Germany-based chemical producer Evonik announced a joint agreement to develop bio-based specialty chemicals. The agreement is similar to the partnership OPXBIO and US chemical producer Dow established in 2011 to develop bio-based acrylic acid.

DOW PROJECT PROGRESS

The Dow project is now 80% towards its goal of having cost-competitive commercial production of bio-acrylic acid by 2017, Eggert said.

The standard petroleum-based method of producing acrylic acid involves the oxidation of propylene in a petrochemical plant.

The OPXBIO process differs greatly, with sugar as the feedstock and not propylene.

It starts with microbes being genetically modified at the genome level via the company's proprietary *EDGE* process to have them turn sugars such as sucrose and dextrose into 3-hydroxypropionic acid (3HP).

The 3HP is collected and converted into acrylic acid that is just the same as acrylic acid produced from petroleum feedstock, Eggert said.



OPXBIO and Dow are aiming for cost-competitive commercial bio-acrylic acid production by 2017

In a general production sense, the petroleum-based and bio-based processes are the same, he said.

Petrochemical chemistry is done within a large plant; bio-based chemistry is done within the confines of a microbe. “The factory is entirely in the microbial cell,” Eggert said.

Petrochemical plants use computers to operate their processes; bio-based chemistry's “software” is the programmed genomes, he said.

KEY FACTS

- Evonik partnership to develop bio-based specialties announced in May 2013
- Dow partnership aims for cost-competitive bio-acrylic acid production by 2017
- Acrylic acid/acrylates market: \$8bn+ and growing
- End-market customers interested in renewable alternatives
- Three key steps: fermentation; 3HP recovery; conversion to acrylic acid

But while petrochemicals are made in a high-pressure, high-heat, energy-intensive environment, OPXBIO's chemistry occurs in a low-pressure, low-temperature, water-based system, Eggert said.

The chemistry is sound, he said, but some work remains in scaling it up for commercial use and making it cost-competitive with petroleum-based production. But OPXBIO and Dow are close on bio-acrylic acid and are on track for their 2017 goal, he reiterated.

SHALE GAS IMPACT

When Eggert brought his decades of chemical experience to OPXBIO in 2008, the chemical producing environment was much different than today. It was just before the US shale boom, and feedstocks such as naphtha and natural gas liquids (NGLs) were much more expensive than today.

The shale boom's cheaper feedstocks – specifically ethane – might seem to be detrimental to the bio-based chemical movement, but Eggert adamantly disagrees.

“We believe the availability of shale gas and natural gas liquids

is good for our industry,” he said. Feedstock ethane contains fewer complex molecules for crackers to make into chemicals such as propylene. The continued switch away from more expensive naphtha to ethane for cracking is leading to a short market for propylene, a trend that will continue into the future, Eggert said.

As that propylene is a feedstock for acrylic acid, Eggert sees a natural market emerging for bio-based acrylic acid production from renewable sugar feedstock.

Another benefit of the shale boom is that companies are investing more in new facilities in the US due to the success they are enjoying from the added available resources, he said.

From that companies also will invest capital into bio-based chemistry such as that OPXBIO offers, as the demand for renewable, sustainable chemical production will only grow with time.

“Our customers are increasingly interested in more renewable ingredients,” he said. “There is definitely a market pull from the customer base.” ■