NexantECA

Technology and Costs

Biorenewable Insights: Polypropylene

Polypropylene is one in a series of reports published as part of NexantECA's 2016 Biorenewable Insights program.

Overview

There is no route today to a fully renewable polypropylene (PP) resin that is economically competitive, and most customers are not willing to pay a premium for a bioplastics that exhibit the same or worse properties compared to conventional PP. However, by blending the conventional polymer with a less expensive bio-based material without compromising physical properties or having to change handling and fabrication equipment, companies are able to reduce the cost of production, and penetrate the large, international PP market.

Polymer producers and plastics convertors are alternatively pursuing producing and using modified PP resins made by mixing renewable natural materials with conventional polymers, also known as compounding. Replacing a percentage of the plastic with a starch or polysaccharide powder can reduce the carbon footprint of the resulting plastic, and in some cases reduce the cost of production, so long as the polymer properties are similar to pure PP. This is the challenge that bio-compounded polypropylene manufactures face when trying to create a bioplastic; downstream users of the PP want a fungible product that does not require alteration of their own process conditions and equipment.

Technologies

This report analyzes several routes to a bio-based PP resin, or bio-compounded PP plastic. These include:

- Production of Bio-Propylene Followed by Polymerization
  - Gevo's Alcohol to Hydrocarbons, followed by Polymerization
  - Global Bioenergies' Direct Fermentation to propylene, followed by Polymerization
- Bio-Compounded Polypropylene Bioplastics
  - Trellis Earth's bioplastic compounded with a thermoplastic starch (TPS)
- Biobent's bioplastic compounded with soybean meal

At the time of this publication, the latest indications are that Trellis is in bankruptcy. It is believed that the company was brought down by the challenge of processing difficult starch polymers together with conventional polymers and by their business model of item manufacturing. Also, it would appear that the company was attempting to market garden and agricultural structures and materials with the qualities of biodegradability, many of which would likely be competing with wood. Unlike Trellis, Biobent blends soy meal with conventional commodity polymers and supplies these blends to its customers, plastics convertors, aiming primarily at cost savings.

Process Economics

Cost of production models for USGC, Brazil, Western Europe and China are shown for:

- Bio-Homopolymer Polypropylene:
  - Gevo's Alcohol to Hydrocarbons to produce propylene, followed by Grace's UNIPOL propylene polymerization
  - Global Bioenergies' Direct Fermentation to propylene, followed by Grace's UNIPOL propylene polymerization
- Bio-Impact Copolymer Polypropylene
  - Gevo's Alcohol to Hydrocarbons to produce propylene, followed by Lummus' NOVOLEN propylene polymerization
  - Global Bioenergies' Direct Fermentation to propylene, followed by Lummus' NOVOLEN propylene polymerization
- Bio-Compounded Homopolymer Polypropylene
  - Trellis Earth's bioplastic compounded with 35 percent thermoplastic starch
  - Biobent's bioplastic compounded with 35 percent soybean meal

Capacity

NexantECA catalogues existing and planned poly-propylene capacity and provides profiles of projects.

NexantECA

Technology and Costs

Biorenewable Insights: Polypropylene

Subscribe to BI

The BI program (sister program to the world renowned TECH program, formerly known as PERP) is globally recognized as the industry standard source of process evaluations of existing, new and emerging technologies of interest to the renewable energy and chemical industries.

BI's comprehensive studies include detailed technology analyses, process economics, as well as capacity analysis and impacts on conventional industry. Reports typically cover:

- Trends in technology
- Strategic/business overviews and/or developer profiles
- Process Technology:
- Chemistry
- Process flow diagrams and descriptions of established/conventional, new and emerging processes
- Process economics – comparative costs of production estimates for different technologies across various geographic regions
- Capacity tables of plants and analysis of announced capacities
- Regulatory and environmental issues where relevant

Subscription Options

A subscription to BI comprises:

- PDF reports including detailed technology analyses, process economics, as well as commercial overviews and industry trends
- Cost of production tables in spreadsheet format (as requested)
- Consultation time with the project team

An annual subscription to BI includes 10 reports published in a given program year. Reports can also be purchased on an individual basis, including reports from previous program years.

For more information, please contact
Technology@NexantECA.com or www.NexantECA.com

NexantECA

NexantECA Subscriptions & Reports provide clients with comprehensive analytics, forecasts and insights for the chemicals, polymers, energy and cleantech industries. Using a combination of business and technical expertise, with deep and broad understanding of markets, technologies and economics, NexantECA provides solutions that our clients have relied upon for over 50 years.

Technology and Costs comprises the Technoeconomics – Energy & Chemicals (TECH) program, the Biorenewable Insights program (BI), and the new Cost Curve Analysis. These programs provide comparative economics of different process routes and technologies in various geographic regions.

NexantECA serves its clients from over 10 offices located throughout the Americas, Europe, the Middle East, Africa, and Asia.

Americas
Tel: +1 914 609 0300
44 S Broadway,
5th Floor White Plains
NY 10601-4425
USA

Europe, Middle East & Africa
Tel: +44 20 7950 1600
110 Cannon Street
London EC4N 6EU
United Kingdom

Asia Pacific
Tel: +662 793 4600
22nd Floor, Rasa Tower I
555 Phahonyothin Road
Kwaeng Chatuchak
Khet Chatuchak
Bangkok 10900
Thailand

For more information. please contact
Technology@NexantECA.com or www.NexantECA.com