NexantECA

Technology and Costs

Biorenewable Insights: Bioplastics for Automotive

Bioplastics for Automotive is one in a series of reports published as part of NexantECA's 2019 Biorenewable Insights program.

Overview

The global automotive industry has experienced significant changes over recent years. Vehicle population has grown strongly, exceeding population growth, and vehicle ownership per capita has been rising. As ownership rises, concerns have been raised about cost, sustainability, and environmental impact. Reduction of a vehicle's weight, or lightweighting, can reduce the amount of fuel required and goes some way towards addressing environmental concerns. The drivers of bioplastics usage in the automotive industry can be more or less dictated by regulatory and economic factors, companies' strategies, and product-specific reasons. Future petroleum price dynamics, innovations in the automotive industry, and recycling regulation/legislation associated with conventional plastics can also intentionally be current drivers. Many options for sustainable polymers are available currently to automobile manufacturers. It has been reported that bioplastics can provide the product quality, safety, and performance required by automobile manufacturers, while at the same time providing sustainability and environmental benefits. For growth opportunities in the automotive sector, auto parts made from bioplastics most provide at least the same weight (or less) of those same parts that they are substituting, be they metal or conventional plastics.

Technologies

Polymers are used increasingly in vehicles, in part to provide added functionality and reduce cost, and in part to lightweight vehicles so as to meet emission targets.

Although the consumption volume of bio-based plastics in vehicles is small, it has been growing in the past decade. Increasing crude oil prices, accelerated depletion of fossil resources, new regulations for controlling greenhouse gas emissions and management of the end-of-life of vehicles, have encouraged the automotive industry to develop bio-based plastic materials and biocomposites for cars. The majority of bioplastics used in automobiles are polyurethane, followed by polyamide, PET, and small volumes of PLA. In general, bioplastics can be made from renewable resources such as soybeans, castor beans, and corn and sugar cane through fermentation processes.

Process Economics

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

- Bioplastics:
  - Polypropylene compounded with 35 percent soybean meal via the Biobent process
  - Polyamide 6 via a generic continuous process
  - Polyamide 6,10 via a generic batch process
  - Polyether polyol via the ring opening of epoxidized soybean oil with hydrogen peroxide and acetic acid
  - Polytrimethylene terephthalate via a generic polycondensation process
  - Polylactic acid via a generic polycondensation process
- Biomonomers:
  - Caprolactam via a generic fermentation process
  - Sebacic acid via a generic caustic oxidation process
  - 1,3-Propanediol via a generic fermentation process
  - Lactic acid via the NatureWorks process

Capacity

NexantECA has provided limited data on markets, drivers, and implications for the conventional industry.

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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 of interest to the renewable energy and chemical industries.

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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.

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