



Biorenewable Insights: Wood to Chemicals

Wood to Chemicals is one in a series of reports published as part of NexantECA's 2019 Biorenewable Insights program.

Overview

Trees are a prolific and renewable source of raw materials for a host of conversion processes, ranging from ancient to innovative and emerging. Trees are a wonderful provider of feedstock for many reasons. Trees absorb carbon dioxide from the atmosphere as they grow, especially in managed commercial forests and in plantations. Best growing and harvesting practices that have been honed over decades, combined with relatively more recent engineering practices to select and design hardier species, have improved tree growth and yield. For example, on-purpose hybrid poplar plantations may yield usable biomass from a tree in just two to three years.

There is large and attractive potential to displace key plastics in existing markets with bioplastics made from biomass feedstocks, such as wood. Many finished products made from these plastics find their way into consumer product packaging, where marketing and environmental consciousness are important drivers of market share and financial performance. Well-known consumer product companies currently using bioplastic include some of the biggest names in consumer products.

Thus far there have been no significant non-fermentative downstream users of cellulosic sugars. It is likely that the high quality and purity requirements of many synthetic processes have precluded widespread use. As with fermentative fuels and chemical production, synthetic producers' partnership efforts have thus far been development-level only.

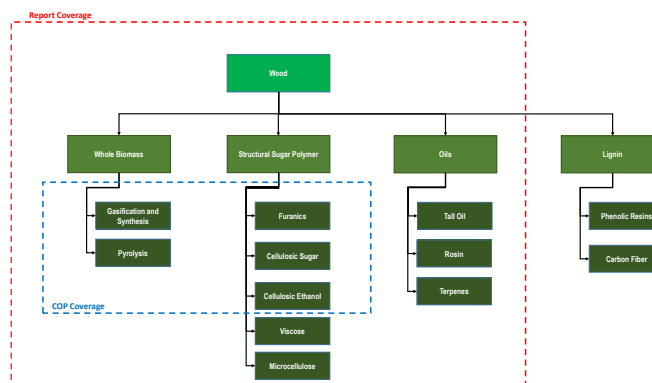
Technologies

NexantECA has investigated several classes of wood to chemicals technologies:

- Whole Biomass:
 - Gasification and Synthesis
 - Pyrolysis
- Structural Sugar Polymer:
 - Furanics
 - Cellulosic Sugars
 - Cellulosic Ethanol
 - Viscose
 - Micro cellulose

- Oils
 - Tall Oil
 - Rosin
 - Terpenes

Lignin is covered separately in its own report.



Many of these technologies are enabling technologies. Currently, the biomass-based production of sugars and chemicals is a nascent industry.

Process Economics

Cost of production models for USGC, Brazil, Western Europe and China are shown for various products from wood:

- Methanol via Biomass Gasification
- BTX via Pyrolysis
- Acid Hydrolysis:
 - Cellulosic Sugar
 - Cellulosic Ethanol
- Enzymatic Hydrolysis:
 - Cellulosic Sugar
 - Cellulosic Ethanol
- Supercritical Water Hydrolysis to Cellulosic Sugar
- *p*-Xylene via Furan Intermediate



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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.

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

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- Cost of production tables in spreadsheet format (as requested)
- Consultation time with the project team

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Technology@NexantECA.com or www.NexantECA.com



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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.

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