Bio-based Chemicals and Materials Market Trends and Outlook 2021

ADVANCED BioSYSTEMS VIRTUAL WORKSHOP
Growing the Bioeconomy in Uncertain Times

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Tecnon OrbiChem
Tecnon OrbiChem has been a world leader in providing data and analysis to the petrochemical industry since 1976. We are now one of the world's foremost marketing consultancies to the bulk chemicals, petrochemicals and plastics industries. We specialize in Chemical Intermediates, Synthetic Fibres and Resins.

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Bio-Materials & Intermediates
Chemical Business Focus

A monthly publication reporting market trends, pricing, and feedstock for Bio-based chemicals and their Petrochemicals counterpart

www.greenchemicalsblog.com
What is Bioeconomy?

“Bioeconomy is broadly defined as the production, and utilisation of biological resources and innovations in order to provide sustainable goods and services in all economic sectors. Bioeconomy might contribute substantially to green growth, innovativeness and sustainable development.”

- The First Global Bioeconomy Summit 2015
Bio-based Chemicals and Bioplastics
Market Situation in 2020

- Global Pandemic Effects in the Chemical Industry
  - Production Lockdowns and Trade Disruptions
  - Slowdown in industrial, automotive and textiles demand
  - Increase in health and hygienic products demand
  - Reduced globalization of supply chain
  - Accelerated Digitalization (E-Commerce, Block Chain)

- Global Pandemic Effects in Renewables
  - Slowdown in R&D due to lockdowns
  - Reduced fossil fuel use, refocus on alternative feedstock
  - Surge in Recycling investments
  - Focus on climate change issues, pollution and sustainability
  - Green Financing, Bioeconomy/Circular Economy Initiatives
Bio-based Chemical and Bioplastics
Market Situation in 2020

- Surge in Renewable chemicals and plastics investments
  - Single-Use Plastic Products Ban
  - Brand Owners Sustainability Commitments
  - Reduction of Technology Risks
  - Government Tax Credits, Federal Grants
  - Consumer preference for bio-based and sustainable materials
  - Localized production favors bio-based markets

- Risks for renewable carbon investments
  - Volatility in government-mandated policies
  - Feedstock uncertainties
  - Price premiums
  - Consumer confusion and Greenwashing
Bioplastics Demand and Capacity Surge

...Biodegradables lead the pack

Global production of bioplastics

Source: nova-institute, EU Bioplastics Conference 2020

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Bioplastics Demand and Capacity Surge

...more capacity news in the past three months

Global production capacities of bioplastics 2025 (by region)

Source: nova-institute, EU Bioplastics Conference 2020, Tecnon OrbiChem
Rising Bio-based Building Blocks Demand
...more bio-based monomers supply needed

- Global Lactic Acid/Lactides supply is tight as PLA demand rises
- Projected additional PBS capacity = More succinic acid demand
- Cathay Biotech to increase bio-LCDA and 1,5 PDA capacity for huge bio-PA investment
- Increasing sebacic acid supply in response to price volatility
- Increasing bio-MEG/MPG/FDCA capacity for bio-polyester/bio-PET and future PEF demand
- New feedstock sources for renewable ethylene/propylene
- Rising R&D on new feedstock sources for PHA
- Expanding 1,3 PDO production for sustainable textile
### Rising Bio-based Building Blocks Demand

...Focus on low-volume specialty markets

<table>
<thead>
<tr>
<th>Coatings/Adhesives/Solvents</th>
<th>Lubricants/Base Oils/Hydraulic Fluids/Corrosion Inhibitors</th>
<th>Household Cleaning Products/Detergents/Surfactants</th>
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<tr>
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<td>Fertilizers/Biopesticides</td>
<td>Cosmetics/Personal Care/Flavors and Fragrances</td>
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<tr>
<td>Pharmaceuticals/Biomedical materials</td>
<td>Environmental solutions in branded textiles, shoe wear</td>
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</tbody>
</table>
Bio-based Building Blocks Feedstock

…New Renewable Carbon Sources

- Bio-based Naphtha and Propane as co-products from Renewable Diesel process
- Crude from pyrolysis-based plastic recycling
- Monomers from chemical recycling of waste plastics
- Ethanol from microbial fermentation of CO-rich waste gas
- Methane from gasification of biomass, MSW
- PHA from methane-rich waste gas, algae and carinata oilseed
- Phenolics from lignin
- Cellulosic sugar from woody biomass, sugarcane bagasse, corn stover
- Hydrogen from electrolysis
Rise of Renewable Diesel

…Oil firms continue towards the biofuel path

Biodiesel and HVO production overview, key global markets

<table>
<thead>
<tr>
<th>Region</th>
<th>2019</th>
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<th>2021</th>
<th>2022</th>
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<tr>
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<tr>
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<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1.5</td>
</tr>
</tbody>
</table>

- Neste
- Total
- Eni
- Repsol
- Preem
- PKN Orlen
- St1 Oy
- Pertamina
- Valero
- Marathon Petroleum
- Phillips 66
- Holly Frontier

Cracking the Naphtha code

Hydrotreatment of Fats and Oils

Petrochemical Process
2021 Trends: Renewable Chemicals and Materials

- Decarbonizing chemical processes and products
- Surge in certifications for supply chain tracing and sustainability
- Further Digitalization (Block chain, E-Commerce)
- Environmental Regulations will take hold
- Recycling Investments worldwide continue
- Tightening relationship between agriculture and chemical industries
- Increasing popularity of Green financing
- Rising production for biodegradable/compostable plastics
- Increase R&D on waste-based feedstock
- E-cars = Less gasoline ➔ Less crude oil ➔ Less petrochemicals
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## Forest2Market: Products & Services

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- Wood Raw Material Benchmarks
- Lumber Price Report & Benchmark
- Stumpage Pricing
- Price Forecasts

### TRENDS & ANALYSIS
- Timber Supply
- Precipitation
- Global Economic

### PARTNER PRODUCTS
- Sawmill TQ by The Beck Group
- Madison’s Lumber Reporter
- Industry Edge’s Wood Market Edge

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- M&A Advisory & Due Diligence
- Custom, Confidential Market Research
- Long-term Availability & Cost of Supply Studies
- Industry Reports for Trade Associations

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- Water & Waste Treatment
- Equipment & Automation
- Corrugated
- News & Projects

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- Prices
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- Capacity Trends

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- Viability
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- EBITDA

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