

Opportunities in Bioenergy and the Bioeconomy

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Manufacturers in every sector face enormous challenges: cost pressures due to global inflation; keeping up with evolving technology; changing regulations about the use of fossil fuels; a climate crisis no longer looming on the horizon, but manifesting itself around the world. The good news? Challenges bring opportunity, and one industry sits squarely at the nexus of all these swirling forces: renewable bioproducts.

Our industry's major players are making it clear that the label "pulp and paper" is no longer big enough to capture the massive potential of modern pulp, paper, and packaging production processes. Phrases like "Fiber-based, renewable products" (International Paper); "the renewable materials company" (Stora Enso); and "a global renewable resource company" (Sappi) showcase a new emphasis on sustainability and forecast "a future beyond fossils" (UPMBiofore).

Decades of groundbreaking research and development by academic and government institutions, industry suppliers, and manufacturers themselves have cracked the code on how renewable fibers can be transformed into textiles, polymers, high-performance composites and, perhaps most importantly, "greener" fuels. According to the US Bioenergy Technologies Office, bio-based chemicals and materials can serve as renewable alternatives to many of the products derived from petroleum or natural gas, such as plastics, fertilizers, lubricants, and industrial chemicals. These bio-based materials often require less energy during production and produce fewer greenhouse gases than petroleum-based equivalents.

Two of TAPPI's most important annual conferences provide a forum for discussing these opportunities: IBBC (the International Bioenergy and Bioproducts Conference) and PEERS (the Pulping, Engineering, Environmental, Recycling and Sustainability Conference). *Paper360°* asked members of the PEERS/IBBC program committee to share their thoughts on how opportunities



(PHOTO COURTESY DBG BIOENERGY.)

Mills can avoid the incineration of paper sludge (top) by converting it into other products, such as green fertilizers (bottom).

in bioenergy and the bioeconomy could shape our industry's future. (See sidebar on page 14 to learn more about these upcoming events.)

EVOLVING ROLE OF BIOENERGY

Pulp and paper mills have long recovered and burned "waste" chemicals and fibers from their processes as fuel; before the "biofuels" label this was more a matter of convenience and economy. The growing importance of sustainable accountability is

changing the role these processes play in a mill's overall strategy.

Thanh Trung, president and executive director, FITNIR, notes that pulp and paper mills would not be economically viable without the use of biofuel; he calls black liquor "one of the most abundant biofuels in the world." Typically, it's burned to produce heat and steam, which drives machines and produces electrical energy for the mill, and often, for surrounding communities.

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—Naveen Chenna, Andritz

“Other biofuel includes hog fuel, which is used in power boilers to generate more steam and potential to produce more electrical power,” says Trung. “More and more biofuel is being used in the mill now than ever before. One example would be the use of sawdust and other biomass to supplement the fuel for our lime kilns. In fact, PEERS will feature discussions around the use of biomass in kilns to reduce usage of fossil fuel.

“As we look toward the future, it will become more mainstream to have integrated lignin plants to produce biofuel or pellets for other industries. Other possibilities include bio-oil production from tall oil and tall oil soap recovery. The pulp and paper mill will become integrated with forest products as well as energy and specialty chemical producers,” Trung says.

Naveen Chenna, director of research and innovation at Andritz, says that, while most pulp mills are already producing and using bioenergy, there is room for improvement.

“There is one clear trend we see at every new pulp mill delivery we’ve made in recent years,” Chenna says. “Bark gasification for lime kiln fuel has become almost standard process. Due to mega-trends such as the ‘green transition’ and increasing demand for sustainable products—also the unavailability of required fuels in certain markets—use of bioenergy is going to be increased. The pulp mill ecosystem will be one of the center forces in this change.”

Regulations and policies based on reducing fossil fuels and greenhouse gas emissions are gaining high visibility, says DBG Bioenergy Group Head of Business Development Toon Strijbosch, and consumers are increasingly playing a role in determining what is acceptable from a sustainability standpoint. “The

Where Experts Gather

Atlanta, GA, will host environmental experts, bioeconomy thought leaders, and pulp and paper mill professionals from around the world for two co-located conferences exploring the future of biorenewable resources. The Pulping, Engineering, Environmental, Recycling and Sustainability Conference (PEERS) and the International Bioenergy and Bioproducts Conference (IBBC) will be co-located at the Hyatt Regency Atlanta **November 5-8**. “PEERS and IBBC offer valuable information that you can apply to your mill to reduce variable costs and plan for the successful future of a pulp/paper/energy/chemical producer,” comments FITNIR’s Thanh Trung, who will chair a PEERS session on Unit Operations for Recast/Kiln.

Designed by industry professionals, **PEERS** offers CEOs, mill managers, superintendents, scientists, process engineers, and suppliers a comprehensive conference with a peer-reviewed, expert-led technical program. Seven program tracks and an exhibit floor offer a customizable event experience.

IBBC brings together experts interested in leveraging the knowledge and assets in the pulp and paper industry to produce fuel, energy, and chemicals from biomass. IBBC’s highly-focused program includes technical presentations, expert panels, and case studies that offer a deeper analysis of technology and economics in commercializing biorefineries.

One registration fee covers both events; attendees may access technical sessions for PEERS and IBBC at any time, regardless of the topic area. This includes keynote presentations, Hot Topic Breakfasts, panel discussions, and more. The co-located events will be packed with information about sustainable production for today—and the future.

“A well-run pulp mill is a great asset in the bioeconomy and traps a lot of CO₂,” says Daniel Nicholson of Solenis, who chairs TAPPI’s Alkaline Pulping & Bleaching Committee. “Pulp mill guys are keenly aware of energy saving efforts, but some of the bioenergy projects being discussed in conference sessions are still R&D efforts.”



future of our economy largely depends on whether or not clean energy technologies are developed this decade. Paper mills have the opportunity to play a crucial role in the direction of a green energy economy,” Ozdamar says. “They now have the chance to decide whether to switch to the side of bioenergy or remain on the side of ‘emitters.’”

NEW TECH FOR NEW PRODUCTS

Lowering emissions is only part of a sustainability profile and, along with managing water and energy use, is an area that most mills have been exploring for years. Today’s opportunities focus not only on conserving resources, but on creating new ones.

Advanced technologies can help. DBG, for instance, concentrates on transforming paper sludge, the main waste stream from the paper

industry. The company helps mills with either on-site or off-site solutions.

“Paper mills, especially in Germany, are increasingly struggling to find ways to reduce costs and encourage more sustainable production; we operate at the frontier of their needs,” Strijbosch says. “Our process offers the opportunity to avoid the waste or incineration of paper sludge and convert it into our own specific products: BioLNG (that is, liquified natural gas from biological origin), green fertilizers, and biogenetic liquid CO₂.”

Daniel Nicholson is principal scientist for Solenis, a specialty chemicals provider to the pulp and paper industry. “We think of the kraft pulp mill recovery boiler as the biggest bioenergy generator in the world,” Nicholson says. “Great effort is made to optimize the concentration and burning of black liquor, and

the chemical conversion and heat transfer that occurs there. This results in more steam for processing pulp, less chemical loss, and more electricity generation for export to the grid.

“A big consumer of fuel oil in the pulp mill is the lime kiln. Increasing the dryness percentage of material entering the lime kiln is an excellent opportunity to reduce fuel consumption,” he adds. Chemical treatments can help make that happen; this solution is already in use at several of Solenis’s Latin American customers’ mills.

“There are many exciting opportunities in the biomass processing sector,” says Chenna. Harnessing pulp mill byproducts can include the following, he says:

- Processing crude sulfate methanol to commercial grade methanol (see related article on page 17.)
- Gasifying bark to produce syngas for use as fuel in lime kilns, replacing fossil natural gas/fuel oils.
- Producing syngas from woodchips/bark/other forest residues and converting it to methanol/fuels.
- Capturing CO₂ from the pulp mill, producing H₂ from excess energy, and catalyzing both to produce methanol/fuels.
- other advanced biofuel concepts.

Technologies developed outside of the pulp and paper realm also stand to significantly impact our industry’s role in the bioeconomy. For instance, demand for sustainable airline fuels (SAF) is expected to increase rapidly as airlines and regulating industries increase their sustainability targets. But where will producers get the biomass needed to increase production—or the bio-based chemical components used to create “greener” fuels? Pulp and paper mills could have a key role here (see article on page 42 to learn more.)

TAKING THE LEAD


We asked our PEERS/IBBC experts what differentiated their mill customers who were already leading the pack in terms of leveraging opportunities in the bioeconomy—and what other mills can do now to gain ground.

Chenna said that while it is difficult to single out the leader, investments being made in bioenergy production is the first indication. “We can see Metsä, UPM, Södra, StoraEnso, Klabin, and Suzano all trying to utilize the opportunities in the bioenergy sector. Their announced and planned investments are some of the main reasons these customers are leading in the bioeconomy sector.”

Thought leadership is also important, says Nicholson. “Many pulp producers recognize the value of the energy they generate in the recovery boiler and work hard to capture it. Some pulp producers are also exploring alternative fuels for lime kiln heat, including gasification of secondary woody materials. This forward thinking will make pulp mills fossil free and net energy producers in the future.”

Concentrating now on efficiency and agility—in order to quickly respond to consumer needs—is a critical first step toward leveraging opportunities, says Trung. “Take steps to carry out maintenance and optimize the mill

to run as efficiently as possible. Improve fixed assets and reduce variable costs to achieve the highest possible quality and drive profitability. Energy costs will continue to climb, so strategic investments to reduce energy demands will be critical. The shift to bio-fuels will further reduce carbon tax and increase credits.”

To join the leaders, learn from the leaders, he adds. “Gather knowledge, learn from others, and maintain key personnel that will be the drivers in the future. Look for key opportunities and anticipate market demands and trends in the bioeconomy.” 



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