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Biorefinery Concept Catching on in US?

In an article that appeared earlier this year (Paper 360, Jan./Feb. 2015, p.18) Bioenergy Deployment Consortium cofounders Ben Thorp, Harry Seamans and Masood Akhtar conclude that a biorefinery industry for advanced biofuels and bioproducts is emerging in the United States.

In 2007, EPA mandated a year 2022 target of 36 billion gallons of renewable fuel annually, of which 21 billion would have to be biodiesel and cellulosic biofuels. The authors observe that, despite early setbacks, real progress was achieved. In 2014 US facilities provided 85 million gallons of cellulosic ethanol capacity and began commercial production of advanced biofuels and chemical intermediates.

Most of this production has come within the agricultural community. POET-DSM in Emmetsburg, Iowa opened a facility that will produce 25 million gallons of cellulosic ethanol from corn stover. In Kansas, Abengoa will produce a similar amount from wheat straw and agricultural waste. Dupont will start up a plant of similar size in Nevada, Iowa. INEOS is producing eight million gallons of ethanol from citrus waste and sorted municipal waste in Florida.

Notably absent from the above list of industrial implementations to date are operations based on woody raw materials. According to the cited Paper 360 article, “INEOS has eliminated forest waste as a feedstock” and “The high lignin content and the tightly bound structure of wood, as well as the higher cost of feedstock, present greater techno-economic challenges than do crops, spent crops or SMSW [sorted municipal solid waste], which can be an exceedingly low cost feedstock under many circumstances.” Undeterred by such potentially daunting barriers to the conversion of woody biomass, some companies have apparently succeeded in commercializing processes that achieve this objective. One of these, Ensyn Corporation, with

headquarters in Ottawa, Canada, has developed and commercialized a “thermal cracking” process that is said to rapidly convert woody biomass to liquid biofuels. Another, the Australian company, Licella, uses supercritical water (a hybrid form of water that exists only under extreme conditions of pressure and temperature) to break down carbon-oxygen linkages in the polymeric structure of biomass to liquefy it.

And what about the forest-based biorefinery? This concept, one embodiment of which was outlined by Thorp in a 2004 presentation that can be viewed at (http://www.pacificbiomass.org/documents/ForestBiorefinery_APartialView_Georgia%20Pacific.pdf) involves transformation of the existing kraft pulp mill by extracting value prior to pulping and creating new value streams from residuals and spent pulping liquors. A Canadian company, Cascades, is taking a step in this direction. It has announced that it will implement a new technology at its Norampac – Cabano (Quebec) facility. That mill will implement a process by which hemicellulose is extracted from the wood raw material before converting it to pulp for containerboard production. Removal of the hemicellulose will presumably have little or no effect on the quality of the containerboard produced. The final product of the process has yet to be announced but is believed not to be a biofuel.

Another step towards implementation of the forest biorefinery concept is being taken by UPM. That company recently started up a biorefining process at its Lapeenranta mill, but it embodies only one aspect of the full forest-based biorefinery concept. It will utilize only one process stream – tall oil – as the raw material for biofuel production. (Tall oil is a mixture of resinous compounds that can be separated from spent kraft pulping liquor.)

These relatively modest steps notwithstanding, it appears that the industry has so far made little progress in realizing the full biorefinery concept. Perhaps this

will change in the not-too-distant future as the demand for biofuels increases and the pulp and paper industry seeks new ways to transform itself.

Trend Indicators from Industry Intelligence Inc.

Industry Intelligence Inc. has provided market intelligence to more than 600 companies worldwide since it began as Forestweb in 1999. Industry Intelligence delivers a daily report featuring news of the paper and forest products industries. For your subscription visit: <http://www.industryintel.com>

Below is a sampling of recent Industry Intelligence headlines, chosen to mirror significant trends and other interesting developments in and around the paper and forest products industries.

Advanced biofuels, including those from woodwaste, could gain ground as airlines prepare for forthcoming rules limiting global aircraft emissions just as worldwide growth in passenger numbers presents them with huge financial opportunity

Cars, trucks and trains can run on electricity, or natural gas to meet emissions rules but aircraft require so much energy that only liquid fuels can do the trick.

US printing-writing paper shipments in June down 6% from June 2014, inventories up 1% compared to May 2015; June shipments decline year-over-year for coated freesheet, uncoated mechanical and coated mechanical, but increase for uncoated freesheet: AF&PA

Uncoated free sheet paper shipments in June increased 3 percent compared to June 2014, the first year-over-year increase in the past 18 months.

GP completes US\$35M in improvements to bleached board PM No. 3 at its Crossett, Arkansas, paper mill, including new headbox, coating plant, control systems; upgraded paper machine expected to be producing product later this summer

Total investment is more than \$45 million.

IP proposing more than US\$100M upgrade to its containerboard mill in Springfield, Oregon, including replacing paper machine headbox and boiler floor in steam plant; five-year, US\$8.6M property tax waiver sought, with terms that allow IP to trim workforce

The city's economic development manager said that, although the company doesn't plan to cut jobs, it sells its products to "international markets that are volatile."

Mozambique president urges Portucel to proceed with its pulp mill project, which is not expected to be completed until 2023 because company is planting eucalyptus trees ahead of mill startup; nursery expected to produce 12 million trees/year initially

The tree plantations, said the President, would cover 365,000 hectares and would provide work for about 7,000 Mozambicans.

Adult coloring book sales continue making gains across the US; book publisher Dover Publications has sold 3 million units, while Quarto Publishing will have 1.3 million in print this year, noting retailers are ordering as many as 60,000 units at once Really?

Global demand for cups, lids projected to increase 5.2%/year to US\$30.2B in 2019, primarily due to size of quick-service restaurant market and production of packaged processed foods, report finds; Asia/Pacific to offer one of the fastest growth rates

This according to a report from Freedonia Group.

Towns of Bucksport and Old Town in Maine hit hard by loss of paper mill revenue, see tax hikes; Bucksport official says it would have been worse if town had not started diversifying its tax base, of which mill taxes at one time accounted for 75%

Verso sold the Bucksport mill to AIM Development, which has auctioned off the machinery and intends to demolish the facility. The mill in Old Town was sold to Expera and reopened, but the company is seeking to reduce the mill's value by 85%.

Global market for liquid packaging paperboard forecast to grow to 3.6 million tonnes and US\$13.8B value by 2020, up from just less than 3 million tonnes and estimated US\$11.4B value in 2014, as market is expected to rebound starting in 2015: report

This according to a new report from Smithers Pira.

WestRock plans in Brazil to focus on value-added paper packaging and exports, says company's president in the country; among Brazilian projects currently under way is 10.5M-reais pulp and kraft paper capacity expansion at Três Barras mill

WestRock, formed by the merging of MeadWestVaco and Rock Tenn Co, is Brazil's 2nd player in the paper packaging business, with its operations stemming from the assets of MWV Rigesa.

Södra, Innventia and seven other organizations awarded EU research project that aims to boost R&D investments for making carbon fiber-reinforced

plastic composites--mainly for auto industry--from kraft lignin, by tailoring raw material and processes

Lignin from wood is used as the main carbon fibre raw material.

Domtar awarded C\$2M federal grant to develop and commercialize new premium grades of NBSK pulp at its Dryden, Ontario, mill; new facility will be launched to produce the pulp, which can be used in non-traditional markets like fiber-reinforced materials

The new grades will be developed for traditional as well as non-traditional, growing and value-added markets such as fiber-reinforced materials, including cement and fiberglass.

Lwarcel to expand eucalyptus pulp mill in Lençóis Paulista, São Paulo state, Brazil, to 1 million tonnes/year from current 250,000 tonnes/year; project would involve 3.5B reais investment, be completed in 2018

The announcement was made in connection with the signing of a São Paulo state decree that would benefit the pulp and paper sector by granting a tax exemption for the import of capital goods for industrial projects. The mill's increased output would be destined largely for exports.

Resolute selects Valmet Advantage NTT tissue machine for US\$270M project at its Calhoun, Tennessee, paper mill; preparation work has begun at the mill, and the new machine is expected to be making at-home, premium private label tissue paper in Q1 2017

The Advantage New Tissue Technology (NTT) machine will produce premium quality tissue products for the consumer market.

Ence contracts GL&V to supply all technology for rebuild of 500,000 tonnes/year eucalyptus pulp mill in Navia, Spain, set for spring 2016 completion; project will increase production, improve pulp quality, cut operating costs, lower environmental impact

Ence-Navia is a leading producer of eucalyptus pulp in Europe.

Austria increases wood pellet exports by 37% in Q1 to 90,100 tons; country's annual consumption reaches 810,000 tons compared with annual production capacity of 1.5 million tons

Austria is second in the world, behind Sweden, in terms of per capita consumption of pellets. Households, as well as many businesses, public

buildings and residential facilities are heated with pellets.

Brazil produces 1.389 million tonnes of pulp in May, up 4.5% from a year ago, while year-to-date increases 4.3%, but paper output falls 0.1% in May to 845,000 tonnes and January-May is off 1.1%: Ibá

For January through May, pulp exports increased 5.3% from the year-ago period, while imports were up 4.8%. January-May paper exports were up 0.7% to 808,000 tonnes. Paper imports year-to-date were down 20.4%.

Growth in shipments of wood pellets to northern Europe drives 44.2% increase in traffic during May at Logistec's East River Terminal at Port of Brunswick, says Georgia Ports Authority; total bulk cargo volume exceeded 134,200 tons

Biofuel exports moving through the Port of Brunswick are picking up. Terminal operator Logistec and the ports authority poured nearly \$12 million into the terminal in 2011 and 2012 to enhance the facility's ability to move bulk cargo like wood pellets to keep up with growing demands overseas.

AF&PA Statistics

Since our last reporting of American Forest and Paper Association statistics releases, the Association has issued its June containerboard and kraft reports.

Containerboard

Production was 1.2 percent higher compared to June of last year. The month-over-month average daily production compared to May 2015 was 2.9 percent higher. The containerboard operating rate for June increased slightly to 97.4 percent from May's 97.2 percent.

Kraft

Total kraft paper shipments were 149.3 thousand short tons, 5.8 percent higher than in June 2014. Bleached kraft shipments increased from 8.4 thousand short tons in May 2015 to 10.9, while unbleached shipments increased from 131.5 thousand short tons to 138.4. Overall, shipments for the first half of 2015 were essentially flat compared to the same period in 2014. Total month-end inventories decreased to 73.4 thousand short tons.

Purchase the full reports by contacting Caroline Nealon, Statistics_Publications@afandpa.org or 202-463-2448.

Paper Quotes

“As paper became the dominant medium of written communication, paper and the postal system formed an alliance which was just as epochal as that between paper and the printing press.” – *Lothar Müller, in “White Magic,” English edition, Polity Press, 2014*

“In England in the 1820s, the steeply rising curve of mechanically produced paper left the ever-declining curve of handmade paper far behind it.” – *Lothar Müller, ibid.*

"I'm not Pollyannaish about this, I'm not optimistic, I'm not pessimistic, but I'm determined." –*Julie Felgar, managing director for environmental strategy at plane maker Boeing, which is coordinating sustainable aircraft biofuel research programs worldwide.*

“Our new mill will be the most efficient and modern bio-product mill in the world. The global increase in the demand for high-quality softwood pulp is the most

important driver for the investment, and our aim is to strengthen our leading position in this market. The investment will support Metsä Fibre's growth and improve profitability in the long term.” – *Kari Jordan, President and CEO of Metsä Group, referring to the company's Aankoski project, currently under construction.*

Statistics Corner

The table below shows performance metrics of a few companies that have some degree of relevance to the paper industry. Using only these metrics, International Paper is the strongest performer among companies whose primary products are directly paper- or forest-related. Other strong performers in the paper and forest products arenas were Rock-Tenn, Weyerhaeuser, Domtar and MeadWestvaco. Strong performers with paper products in their portfolios included P&G and K-C. ■

Table 1. Performance in 2014 of Selected Fortune 500 Companies

Company	Revenues, \$millions	Revenues Rank among Fortune 500	Profits, \$millions	% Change in Profits from 2013	Profits as % of Revenues
Wal-Mart Stores	485,651	1	16,363	2.1	3.4
Exxon Mobil	382,597	2	32,520	(0.2)	8.5
Procter & Gamble	84,537	32	11,643	2.9	13.8
Dow Chemical	58,167	48	3,772	(21.2)	6.5
DuPont	36,046	87	3,625	(25.2)	10.1
International Paper	26,221	114	555	(60.2)	2.1
Kimberly-Clark	21,044	140	1,526	(28.8)	7.3
R.R. Donnelley & Sons	11,603	258	117	(44.4)	1.0
Air Products and Chemicals	10,448	284	992	(0.3)	5.5
Rock-Tenn	9,895	293	480	(34.0)	4.8
Weyerhaeuser	7,976	355	1,826	224.3	22.9
Owens-Illinois	6,784	399	75	(59.2)	1.1
Gannett	6,008	441	1062	173	17.7
MeadWestvaco	5,631	464	263	(68.7)	4.7
Domtar	5,563	470	431	374	7.7
Black – Revenue leaders					
Red – Pulp and paper producers and/or converters					
Blue – Printers or publishers					
Green – Suppliers to the pulp and paper industry					