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### **Nanocellulose Update**

According to a July 4 article in the online magazine *Ecomposites*, Japan has embarked on an ambitious program to develop nanocellulose as a next generation material that can compete with carbon fiber. Lending credibility to the effort is the fact that Japan was a world leader in the development of carbon fiber and is now a leader in the market for that material. The development is part of the government's economic growth strategy.

The article cites a newspaper report stating that the Japanese government has contacted companies that are potential users of nanocellulose and has established a study group that includes Nippon Paper Industries and Oji Holdings, Toyota Auto, Mitsubishi Motors, Mitsui Chemicals, Denso, Kao Corporation and many other interested companies. The goals include making nanocellulose competitive with carbon fiber and creating a ¥1 trillion market by 2030.

Lighter and stronger than steel, nanocellulose has myriad potential applications, including automotive parts, construction materials, biomedical applications, and many others. See, for example, the recent review of polymer composite and biomedical applications by Yuan Lu and co-workers at Oak Ridge National Laboratory [*Tappi J.*, 13(6):47-54 (June, 2014)]. Since it is made from wood and other plant materials, it is considered to be environment-friendly. Making it even more attractive is the fact that it can be made from currently underutilized materials, such as forest thinnings and rice straw.

In this effort, Japan will be competing with international rivals, including the United States, Canada, Finland and Sweden. A June 26 report out of Sweden, for example, describes a joint initiative between Innventia, the Swedish forest products research institute, and BillerudKorsnäs, a paper company, to build a mobile demonstration plant for nanocellulose and to test the material in full-scale

papermaking. In making the announcement, Innventia noted, "Nanocellulose can be used as additives in papermaking to make lighter and stronger paper and board. ... This means that paper is given completely new properties and could replace plastics, for example, in many areas. More products could thus be produced from renewable and biodegradable raw material."

### **Weyerhaeuser to Relocate**

Yesterday's edition of the *Seattle Times* reported that Weyerhaeuser plans to relocate its headquarters and 800 employees from Federal Way, Washington to downtown Seattle. The company will construct a new headquarters building in Pioneer Square, in the city's historic southwest corner. In a statement Weyerhaeuser President and CEO Doyle Simons said "our 430-acre campus in Federal Way is costly and too large for our needs." He also said "moving our headquarters to Seattle will give us access to a larger talent pool to meet future recruiting needs, not just in this region but from across the country."

As reported in the *Times* article, the company has undergone considerable downsizing in recent years, including the sale of Canadian, US and Australian operations and, significantly, the sale of 114 containerboard, packaging and recycling operations to International Paper for \$6 billion. Nevertheless, it remains the state's seventh most valuable public company, with an \$18.1 billion market capitalization. In the first half of 2014 it reported earnings of \$485 million on sales of \$3.7 billion.

According to the article, Weyerhaeuser will sell the Federal Way property, which contains about 750,000 square feet of office, research and industrial space. R&D employees, numbering 120 people, will stay in Federal Way. A company spokesman reported that the R&D space would be leased back from the buyer.

## **Trend Indicators from Industry Intelligence Inc.**

[Industry Intelligence Inc.](http://www.industryintel.com) 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 small sampling of recent Industry Intelligence headlines, chosen to mirror significant trends in and around the paper and forest products industries.

***US\$1.8M federal grant likely to be sought to connect Columbia Pulp's planned straw pulp mill near Starbuck, Washington, with an existing natural gas pipeline; money would come from Community Development Block Grant funds already awarded to state***

Once operational, the plant's payroll is estimated at \$10.2 million annually for 135 jobs.

***China produces 49.33 million tonnes of paper and paperboard during January-May 2014, up 4.1% year-over-year, while export value rises 11.7% to 13.91B yuan, reports government; May's output of 10.33 million tonnes 3.7% higher than a year ago***

In May, 3.10 billion yuan of export delivery value was created by the Chinese paper sector, jumping 15.7% year-over-year.

***K-C's Scott brand launches Scott Naturals Tube-Free bath tissue nationwide following 2010 test market release in northeastern US; product comes without the cardboard tube, has potential to reduce the 17 billion toilet paper tubes thrown away each year***

The 17 billion toilet paper tubes thrown away each year are enough to fill the Empire State Building twice.

***RBC Capital Markets: Cascades' new tissue converting site in North Carolina viewed as having slightly positive impact, but North American tissue supply/demand outlook unchanged; operating rates expected to fall to 91% in 2016 from estimated 95.6% in 2014***

The industry is still absorbing new capacity added in H2/12 and Q1/13, and will see another wave of capacity additions start-up in H2/15 and 2016.

***Pratt contracts for new paper machine at its greenfield paper mill in Valparaiso, Indiana, to be supplied by Valmet; OptiConcept M containerboard production line, the first of its kind in North America, will comprise everything from headbox to winder***

The mill will utilize recovered paper in the production of recycled linerboard and corrugated medium.

***AF&PA hosts legislators from 25 states to present industry's contribution to sustainable manufacturing and paper recycling, including tours in Minnesota of RockTenn's paperboard mill in St. Paul and IP's Roseville-Twin Cities recycling collection center***

AF&PA President and CEO Donna Harman: "By hosting these tours, we can explain how the industry's role in the local economy conveys to the global economy, demonstrate how our sustainable manufacturing practices are economic drivers in local communities, and showcase the industry's family wage manufacturing jobs at our facilities around the country."

***Filter demand in China to grow 14% per year, reaching 90.2B yuan in 2017, fueled by increased production of motor vehicles and higher manufacturing output, construction spending, other industrial activities, as well as raised health awareness: study***

Demand for filters in consumer and other markets will be fueled by increasing personal income levels and rising concerns about air and water quality.

***UPM spent 301M yuan to make its pulp and paper mills in China more eco-friendly, says executive; Changsu mill uses 65% less energy per tonne of paper produced than 10 years ago, UPM Paper Asia uses 25% of water set by industry to produce one tonne***

UPM Paper Asia started construction of a third production unit at its Changsu mill in June this year. The new unit is due to become operational in 2015.

***Resolute Forest Products' 45,000-tonne/year wood pellet plant in Thunder Bay, Ontario, expected to come online in early Q4; pellets from facility to be sold to Ontario Power Generation under 10-year supply agreement***

OPG will use them to fuel the Atikokan Generating Station, which burned its last piece of coal in April in preparation for its conversion to run on advanced biomass.

***Gorham Paper and Tissue in New Hampshire to reopen paper mill soon, following one-month shutdown to consider new business strategy; two paper machines will restart to make tissue products but one machine that makes printing and packaging grades won't***

The mill was closed when Patriarch Partners bought it in 2011. Patriarch Partners, an investment firm, spent about US\$35 million to buy a new paper machine for the mill.

***US production of print books slows in 2013, down about 1.6% from 2012, print output of non-traditional publishing sector declines 46%, as web and print-on-demand options dominate market; overall print production is stable as e-book sales slow: study***

Production of print books by traditional publishers slowed in the United States in 2013, according to Bowker®, the global leader in bibliographic information. The two percent decrease reverses the sector's growth in 2012 over 2011, but points to a relatively stable market for print works despite competition from e-books. The non-traditional sector is comprised primarily of reprint houses specializing in public domain works and by presses catering to self-publishers and "micro-niche" publications. Their titles are marketed almost exclusively on the web and printed on-demand.

## **Paper Quotes**

“Yes, we do think it was a good idea to do that. In the long term, the demand fundamentals are very strong and we firmly believe that it's the right thing to do. We have some very key customers in that market space and we partner them as they go larger, and we want to be there with them as they get larger.” – *Steve Binnie, CEO, Sappi Limited, in response to the question “... given what's happened, do you still think or do you still believe it was a good idea to convert the Cloquet mill to dissolving pulp?”*

“And we have this big project at Calhoun on replacing the eight batch digesters by one continuous digester that is going to bring our costs down and also leave [us] with more capacity...” – *Richard Garneau, President and CEO, Resolute Forest Products Inc.*

“Yes, there has been a change in the US economy. There's less manufacturing, there's more service industries. And manufacturing and food service

industries use corrugated containers more than the service industry. .... State Farm insurance doesn't buy a lot of boxes.” – *Paul Stecko, Chairman, Packaging Corporation of America, responding to the question, “... is there some secular decline going on in the use of corrugated?”*

## **Technology for the Nontechnical: Refining**

As described in our last issue, wood fibers are like tiny pipes, the walls of which are made up of several layers and are stiffened by lignin, a hardened, glue-like substance. Converting wood to pulp removes most of the lignin, making the fibers somewhat more flexible and more nearly capable of conforming and bonding to one another. Bonding occurs as a result of interactions between the cellulose on the surface of each fiber with the cellulose on adjacent fibers. It is this bonding that is responsible for the strength of the paper made from the pulp.

That said, the bonding ability of the fibers in the newly formed pulp is limited, for several reasons. One is the presence of an outer fiber wall layer (the “primary wall”) that has a high concentration of (non-bonding) lignin. As well as being high in lignin, this layer acts like a sausage casing, limiting the degree to which the fiber can swell, flatten and conform to its neighbors.

Subjecting the pulp to a process called “refining” or “beating” remedies the situation. This process forces the pulp fibers through a narrow space between moving sets of metal bars which subjects the fibers to mechanical forces that have several effects. Refining strips away the primary wall, allowing water to penetrate and loosen the internal structure of the underlying layer (the “secondary wall.”) The fiber consequently swells and becomes soft, flexible, collapsible and conformable. In addition, the process loosens threadlike elements of the secondary wall (“fibrils”). This effect, known as “external fibrillation,” causes a large increase in the fiber’s surface area that is available for bonding to neighboring fibers. (The loosening of the internal wall structure described above is called “internal fibrillation.”)

The overall result of the refining process is a much more highly bonded and stronger sheet of paper.

## ***AF&PA Statistics***

Since our last reporting of American Forest and Paper Association statistics releases, the Association has issued its July 2014 Printing and Writing Report, its July 2014 Kraft Paper and its July Containerboard and Paperboard Reports.

### **Printing and Writing**

Total shipments decreased 6 percent in July compared to July 2013, with total paper inventories declining 1 percent compared to June. Uncoated free sheet (UFS) paper shipments in July decreased 10 percent compared to July 2013. YTD shipments are down 8 percent in 2014. Imports of UFS increased year-over-year for the eighth consecutive month and were up 20 percent in 2014, with imports from Indonesia having doubled relative to the same six months in 2013. July coated free sheet paper shipments increased 1 percent compared to 2013. YTD shipments of coated free sheet grades are down 1 percent and imports through June are down 2 percent. Uncoated mechanical (UM) paper shipments increased 7 percent in July, the sixth consecutive month of year-over-year increases. Year-to-date shipments of UM are up 4 percent compared to 2013. Coated mechanical (CM) shipments in July decreased 11 percent relative to July 2013 and are down 6 percent for the year. Imports of CM in June were down 17 percent compared to June 2013 and CM exports increased 33 percent year-over-year in June but are down 2 percent YTD.

### **Kraft Paper**

Total Kraft paper shipments were 122.4 thousand tons, 5 percent lower than June. Bleached Kraft paper shipments increased from 8.4 thousand tons in June to 9.6 thousand tons in July, while unbleached Kraft paper shipments decreased from 120.6 thousand tons to 112.8 thousand tons. Overall, shipments for the first

seven months of 2014 were 2.5 percent lower than the same period last year. Total month-end inventories increased 2.3 percent compared to July.

### **Containerboard**

Containerboard production was flat compared to July of last year and 2.7 percent higher than in June 2014. The month-over-month average daily production decreased 0.7 percent. Shipments for June were 3,118.9 thousand tons, representing 175.8 billions of square feet. The containerboard operating rate for July dropped by a full percentage point, from 97.1 percent in June to 96.1 percent.

### **Paperboard**

Total boxboard production increased 2.8 percent when compared to July 2013 and increased 2.4 percent from June. Unbleached kraft boxboard production increased over the same month last year and increased compared to last month. Total solid bleached boxboard and liner production increased when compared to July 2013 and increased compared to June. The production of recycled boxboard decreased compared to July 2013 but increased when compared to June.

The full reports can be purchased by contacting Caroline Nealon, [Statistics\\_Publications@afandpa.org](mailto:Statistics_Publications@afandpa.org) or 202-463-2448.

## ***Statistics Corner: Municipal Solid Waste Recycling***

The table below shows that paper and paperboard made up the largest component (28%) of the municipal solid waste (MSW) generated in the US in 2011. On the flip side, it was recovered at a greater rate (66%) than any of the other wastes except nonferrous metals, a minor component. As a result, it made up only 14.8% of the total materials discarded. ■

**Table 1. Generation, Recovery, and Discards of Materials in MSW, 2011 (In millions of tons and percent of generation of each material) (US Environmental Protection Agency)**

<b>Material</b>	<b>Weight Generated</b>	<b>Weight Recovered</b>	<b>Recovery As a Percent of Generation</b>	<b>Weight Discarded</b>
Paper and paperboard	70.02	45.90	65.6%	24.12
Glass	11.47	3.17	27.6%	8.30
Metals				
Steel	16.52	5.45	33.0%	11.07
Aluminum	3.47	0.72	20.7%	2.75
Other nonferrous metals*	1.96	1.34	68.4%	0.62
<i>Total metals</i>	<i>21.95</i>	<i>7.51</i>	<i>34.2%</i>	<i>14.44</i>
Plastics	31.84	2.65	8.3%	29.19
Rubber and leather	7.49	1.31	17.5%	6.18
Textiles	13.09	2.00	15.3%	11.09
Wood	16.08	2.38	14.8%	13.70
Other materials	4.59	1.28	27.9%	3.31
<b><i>Total Materials in Products</i></b>	<b><i>176.53</i></b>	<b><i>66.20</i></b>	<b><i>37.5%</i></b>	<b><i>110.33</i></b>
Other wastes				
Food, other**	36.31	1.40	3.9%	34.91
Yard trimmings	33.71	19.30	57.3%	14.41
Miscellaneous inorganic wastes	3.87	Negligible	Negligible	3.87
<b><i>Total Other Wastes</i></b>	<b><i>73.89</i></b>	<b><i>20.70</i></b>	<b><i>28.0%</i></b>	<b><i>53.19</i></b>
<b><i>TOTAL MUNICIPAL SOLID WASTE</i></b>	<b><i>250.42</i></b>	<b><i>86.90</i></b>	<b><i>34.7%</i></b>	<b><i>163.52</i></b>

Includes waste from residential, commercial, and institutional sources.

\* Includes lead from lead-acid batteries.

\*\* Includes recovery of other MSW organics for composting.

Details may not add to totals due to rounding.

Neg. = Less than 5,000 tons or 0.05 percent.