

By Caroline Martin  
Special for *O Papel*

# Industry of the future

Forest base sector prepares to expand its business model through the endless possibilities offered by wood and technological advancements in production processes



Very familiar with lignocellulose biomass characteristics, the pulp and paper industry is fully aware of its potential and the many alternatives that may soar in the next years. The growing agenda of interests among players in the forest base sector takes on a special nature in a scenario favorable for changes: the world is convinced of the urgent need for transformation to combat climate change. Transforming pulp and paper production units in even more optimized mills, or yet, in biorefineries, transforming the current portfolio into something much more diversified, robust and apt to demands of the bioeconomy, are just a few examples of chapters in this significant evolution that promises to mark the sector over the next decades.

Over the last years, the pulp and paper industry saw its expressive growth be based on cost reduction, operational efficiency and economies of scale. Traditional capital-intensive production units obtain financial return pursuant to their efficiency and large production volumes. Today, reality is changing: production units are reaching the limits for their size, whereby it will no longer be possible to continue growing so strong in production scale. "It's unfeasible to think of mills with annual capacities of 4 million tons, in view that it there would be a highly concentrated demand for raw material and the logistics and environmental impacts would be strongly concentrated in the same given location," said Celso Foelkel, one of the top specialists and scholars of eucalyptus and pine forests, creator of the *Eucalyptus Online Book & Newsletter* and *PinusLetter*. "The current phase reflects a change in paradigms. The sector is aware of this and is seeking alternatives through innovation," he added. Foelkel is presiding ABTCP 2017 – 50<sup>th</sup> International Pulp and Paper Congress – with this year's central theme *The Industry of the Future: New Paths, New Processes and Technological Innovations* and its Call for Papers is open for registration through [www.abtcp2017.org.br](http://www.abtcp2017.org.br) (**For more information, see special box in this Cover Story**).

Jean Hamel, vice-president of Pulp Paper and Bioproducts at FPIInnovations, in Canada, has a similar view in relation to the current posture of the sector and the preparation necessary for future competitiveness. "This is a capital-intensive industry with highly complex processes, which requires the use of advanced chemistry, sophisticated controls and automation, science of materials and modern engineering techniques. Even considering the risks associated to investments and the

time necessary for decision-making, today's mills are very different than what they were a decade ago. The current productivity and quality of products makes it clear that we are talking about a modern industry. That's because, in order to face continuously-changing market challenges and respond to the challenges imposed by sustainability, the pulp and paper industry lives under constant pressure to modernize itself."

In the opinion of Carlos Alberto Farinha e Silva, vice-president of Pöyry Tecnologia, the sector is undergoing a renewal and reassessment period of its production structure, particularly in developed geographic regions. This need for renewal, he says, is triggered by two factors, including the drastic change in markets dedicated to communications, such as the printing paper market, due to the digital revolution and its influence on media; the loss of competitiveness in developed regions of the northern hemisphere in relation to developing regions of the southern hemisphere, given their low production costs of wood stemming from high-yield plantations, and the shift in consumption growth to developing regions in the southern hemisphere, especially Asia. "More and more, the sector has focused on the integral and sustained use of planted areas, and no longer on a discrete set of products and subproducts along its production chain," he said.



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UNAM DISCLOSURE

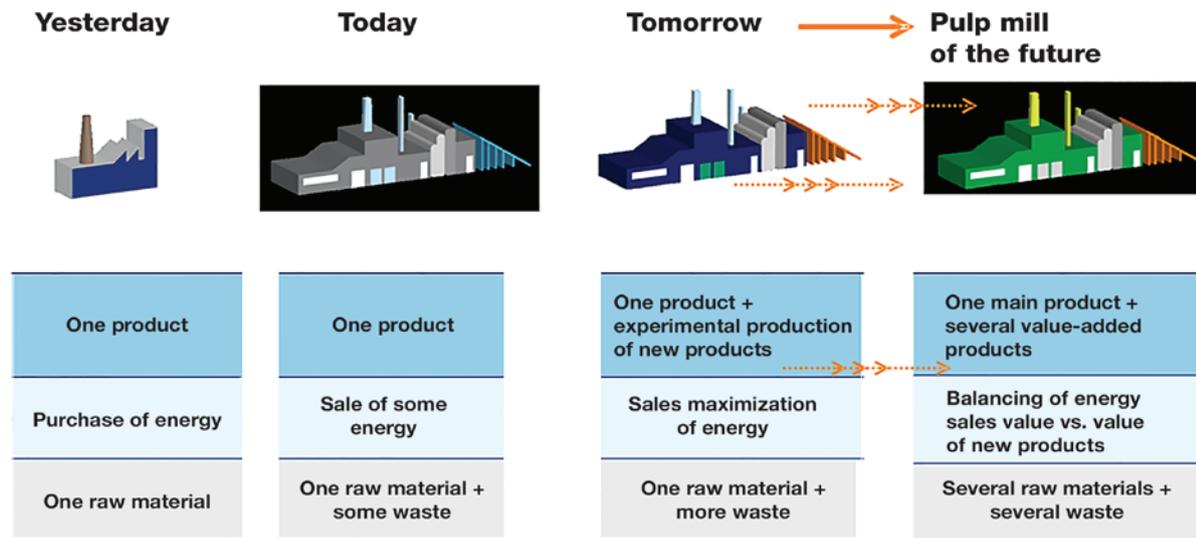


"Lignocellulose is a highly important source for various products, but requires the implementation of cutting-edge processes to be tapped to its fullest potential," says Maria Cristina

In analyzing the performance of the global pulp and paper sector in terms of innovation, Maria Cristina Area, principal of the Pulp and Paper Program (PROCYP), vice-director of the Institute of Materials of Misiones (IMAM) and professor of the Exact, Chemical and Natural Sciences School at the National University of Misiones (UNaM), in Argentina, credits this stronger bet on innovation observed over the last decade to three key reasons: the global economic crisis created by globalization; massification of digital means that impacted the production of printing and writing paper, and increasingly more-restrictive environmental legislation, coupled by strong consumer pressure. "Innovation is paramount for maintaining competitiveness. The transition from a market regulated by a production based on classic raw materials in few countries – with production expansions seen in Brazil, Uruguay and China, among others – has caused financial difficulties to many companies. Innovating is the only way to come out of the crisis, escape dependence on commodities and have high value-added products. Lignocellulose is a highly important source for various products, but

## THE PULP MILL OF TODAY, TOMORROW AND OF THE FUTURE

The pulp mill of tomorrow will be conceived for the future production of new products



requires the implementation of cutting-edge processes to be tapped to its fullest potential," he said.

It is in this evolutionary trajectory that fully exploring all possibilities offered by its raw materials is emerging as the strategic front of the sector. "Excelling at the convergence of nano, bio and infotechnologies inserted in our products will revolutionize functionalities and the value-added that our products deliver to society. This is part of our vision of leading the transition towards a bioeconomy that, while maintaining the use of renewable raw materials in the game, causes this use to become the norm. This is also central to our *2050 path towards a low carbon bioeconomy*, in which we defined our vision in the sense of creating 50% more value-added together with 80% decarbonization", said Sylvain Lhôte, director general of the Confederation of European Paper Industries (CEPI), about the work being conducted by the entity.

Hamel, vice-president of Pulp, Paper and Bioproducts at FPInnovations, says that the pulp and paper industry is already entering the biorefinery era. "Even though the core of many companies continues being the production of pulp and paper, other products will be produced and will generate additional business for mills. Similar to oil refineries, many products will be made at a pulp and paper mill, from energy to other chemical materials and products." For him, the next decade will be marked by the consolidation of value chains. "We will see revenues increase significantly and exponentially, going from very low levels to very high levels," said Hamel.

The paths to consolidate the industry of the future are being outlined. Technological changes that allow reinventing the sector are already being thoroughly studied and, many of them, put into practice. Hamel informs that, in Canada, where the industry has based its production on traditional pulp and paper products, the main changes started roughly a decade ago with the objective of transforming the industry through the development of technologies aimed at producing new forms of forest base products. But it's not just a matter of technology, he said. "In fact, an industry that's highly based on commodities needs to develop and employ technologies in the context of innovation, which requires the implementation of organizational structures and the construction of new business ecosystems, increasing transformation complexity."

The pulp and paper industry is quickly advancing in the industrial fields of biomaterials, chemical products from biological sources and biofuels, exploring different ways of producing and using these products. "In each

one of these fields, several companies have already built large demonstration plants to test processes and produce products in quantities sufficient to perform tests on a large scale," said Hamel.

As examples of what is already being put into practice, the vice president of Pulp, Paper and Bioproducts at FPInnovations mentioned CelluForce's demonstration plant, one of the main producers of nanomaterials in the world, which produces 1 ton a day of nanocrystalline cellulose. In turn, Kruger Biomaterials' plant has a daily production capacity of 5 tons of cellulose filaments. Recently, West Fraser began producing 30 tons a day of lignin at its kraft plant. In the beginning of this month, Airex Energy announced the inauguration of a biochar plant. As a product with a high carbon content used to correct soils, filter liquids and reduce metals, biochar, when mixed with an organic compound or turf, promotes plant growth, as well as helps reduce metals and allows for the rehabilitation of areas degraded by mining activity. Ensyn, together with Arbec and Rétabec, began, in 2016, constructing a facility to produce 40 million leaders of bio-oil in Québec. "These are a few examples seen in Canada that illustrate the dynamism of the forest base product industry. We can certainly find similar examples throughout the world. The utilization of technologies is moving forward at full speed, in all fronts," he said.



CEPI

Lhôte: "Excelling at the convergence of nano, bio and infotechnologies inserted in our products will revolutionize functionalities and the value-added that our products deliver to society"

Agenda 2020 Technology Alliance, a nonprofit US organization, is another example of a current initiative that exists for purposes of identifying precompetitive, high-priority technological challenges for the pulp and paper industry, as well as promote scientific research and development projects targeted at addressing such challenges. Member companies believe that certain key challenges in common, overly significant to be faced individually, could be better tackled through cooperation between producers, suppliers, universities and government entities.

Reduce the consumption of water and increase the reuse of water; reduce the use of energy and carbon emissions; increase efficiency of the manufacturing process; improve the yield of raw materials

and, lastly, develop new bioproducts, summarize the organization's objectives. Such targets align perfectly with the sustainability objectives of member-companies and priorities at the federal level.

At present, 80% of the Alliance's efforts are targeted at new technologies that are vital for the production of pulp and paper, while the other 20% focus on the development of new bio-based materials. In 2014, the Alliance received a grant from the National Institute of Standards and Technology (NIST) as part of its program to support industrial consortia in the area of Advanced Manufacturing Technology (AMTech). With this financial support from AMTech, Agenda 2020 conducted workshops and published roadmaps in each technology focus-area established (*See list in Table 1*). In 2016, Alliance issued RFPs

Table 1: Roadmap and Team Objectives	Objective
Next Generation Pulping	Develop next-generation chemical pulping processes that preserve fiber strength and pulp performance attributes while achieving one or more of the following aspects: 1) 25% reduction in total energy consumption; 2) Increase wood-based fiber yield by 5% (e.g., from 50% to 55%); 3) Reduce DBO/DQO content in effluents by 25%.
Black liquor concentration	Develop a more energy-efficient method to remove water from kraft pulp mill black liquor with significant energy and production-cost savings.
Reuse of Process Effluents	Stimulate the development of new concepts and innovative technology projects that reduce average water usage 50% by 2030.
Drier Web before Drier Section	Develop advanced manufacturing technologies to increase the dryness of paper webs entering the paper machine dryer section, from the current 45-55% level of solids to approximately 65% of solids.
Cellulose Nanomaterials	Facilitate the commercial development of cellulose nanomaterials for a wide range of applications, through the development of precompetitive methods and technologies.

Table 2: Current Projects	Objectives
Next Generation Pulping	Develop catalytic pulping chemicals that are competitive in terms of costs with the utilization of current chemical pulping methods, higher yield and less energy use. Two projects are underway: one with the USFS and the other with the DOE's HPC4Mfg program. Both involve the analysis of catalysts proposed through computational chemical methods and evaluation of delignification efficiency and selectivity for chemical oxidation with metal oxides.
Black liquor concentration	Joint project with Teledyne Scientific to concentrate black liquor using membrane technology, using a sacrificial superhydrophilic antifouling coating that can be regenerated in situ to combat fouling. Project carried out through Georgia Tech's Renewable Bioproducts Institute to develop carbon molecular sieve membranes on porous alumina substrates.
Drier Web before Drier Section	Joint project with Lawrence Livermore National Lab and Lawrence Berkley Lab (LLNL and LBL) to develop a model to stimulate the flow of moisture from the web during the paper machine pressing process, focusing on the critical paper web/press felt separation phase. Model results will be used to make improvements to ultimately reduce the energy required for drying.

\***Members:** The Alliance currently consists of 15 member-companies and 17 partners and affiliates. In the last 14 months, new members include Southworth, Georgia Pacific, Asten Johnson, Voith and Solenis. New partners include Miami University, Western Michigan University, Wisconsin-Stevens Point and Virginia Commonwealth University

to identify and fund projects addressing high priority challenges (See Table 2). The selection of projects to be financed is currently underway. In addition to the work of formatting new projects based on roadmaps, various other projects are currently going on.

The director-general of CEPI says that, in terms of Research and Development in these different fields of the industry of the future, all of Europe is committed, varying according to tree species and projected applications. "It's not surprising that many R&D activities are occurring in leading countries of the forest base industry, like Sweden and Finland," he said. According to Lhôte, biotechnologies offer various opportunities that will exert impacts in the medium and long-term – notably when referring to forest productivity and yield increases in certain categories of materials, like cellulose. With regards to nanotechnologies, its full potential is still unknown. "At present, the industry includes in this category not only nanofibrillated cellulose and nanocrystalline cellulose, but also microfibrillated cellulose and microcrystalline cellulose. Initial uses of these materials point to significant potential for reducing the use of raw materials, while also maintaining or even improving end-product performance (for example, packaging strength). Research also demonstrates potential benefits in the form of barriers, such as against contaminants. Similarly, a huge territory not yet explored for nanotechnologies is the development of bioproducts as an alternative for current fossil resource-based products," said Lhôte.

Ken Patrick, Colleen Walker and Larry N. Montague, spokespersons for the Technical Association of the Pulp and Paper Industry (TAPPI), and Rod Fisher, from Fisher International, both based in the United States, say that, in addition to developments occurring in North America, biorefinery development, from pilot stage to full commercial scale, is gaining momentum in Brazil and Sweden, such as, for example, to produce electricity. They said that in North America, United States specifically, the development of biorefineries, particularly at the totally commercial level, was in a certain way restricted due to the concern that domestic bioenergy plants would inevitably compete with pulp and paper mills in obtaining wood fibers, leading to price increases and impacting the overall availability of wood fibers. As a parallel unexpected result, growing amounts of fibers from US forests are currently being harvested and shipped to Scandinavia and parts of Europe to be used in their refineries and bioenergy plants. According to the analysis from the spokespersons at TAPPI and Fisher International, this has not yet produced the effect of significantly increasing prices, but, as the biorefinery and bioenergy industry continues to develop and grow in these countries, with growing import volumes of wood chips from North America, price increases will probably occur for all parties involved.

Also according to them, the forecast is that over the next decade the continued development of biorefineries at commercial scale will continue accelerated in Scandinavia, Brazil and parts of Europe, as well as



Plane being filled with biofuel produced from forest waste

ROBERT HUBNER / AWSU PHOTO SERVICES

Canada. Today, on a global level, the amount of energy produced from charcoal is still greater than from liquid biofuels. However, charcoal is basically an inefficient production process, indicating an increased trend in the strengthening of emerging technologies, be it through efficiency improvements in the production of charcoal or the substitution of charcoal for other sources of renewable energy, such as biogas and densified products, like pellets.

Farinha also points out that the Brazilian pulp and paper industry has assumed a leading role in cutting-edge technologies applied to improving its forest base, placing the productivity of its high-yield plantations at the top of the global ranking. He points out that the pursuit of innovation and new products occurs throughout the entire production chain, beginning in forests, by making use of waste such as tree branches and ends, or even wood chips, to produce several bioproducts, all the way through to the production of subproducts stemming from different biomass components.

Besides the development of isolated projects, however, the vice president of Pöyry Tecnologia defends the need to create a structured joint agenda between Brazilian industry players. "It is necessary to join efforts and work on a Research and Development program that contemplates the innovative promises of the next decades. If we create a broader agenda, we'll have the possibility of offering more products and more services with a sustainable profile," he said.

Foelkel sees Brazil's industry making up for eventual lags in biorefinery research through the current strategic measures it is taking. "Recently, Fibria acquired a Canadian company with in-depth knowledge of lignin, whereby it had already established a partnership with a bio-oil company and another with a nanocellulose company. Suzano is also working hard in this type of development, with a division additional to its traditional business activities. International Paper is another

company that is focusing on research, but projects have been concentrated in the United States," he said. Foelkel believes that the main challenging factor in creating a joint agenda in Brazil is the small number of big companies that comprise the sector. "We are a robust industry in production volume, but with few companies, which hinders the dissemination of larger cooperative projects with joint effort in this pre-competitive phase," he said referring to the reality of the local industry. "Perhaps this is the exact moment in which a government industrial policy for innovations, with strategic support for the sector, could be fundamental for Brazil," he said.

The difficulty caused by the limited number of companies, however, could be solved. "Being a bit more difficult does not mean being impossible," said Foelkel, pointing out that the solution resides in the systems that energize such partnerships. "The energizer could be the government, through research financing, or yet, creation or strengthening of a highly-qualified research center aimed at executing multidisciplinary projects, which practice we do not yet see very much down here" he said. "Our big success can continue being the ability to plant forests with high wood production and low implementation costs. But we can no longer base our entire competitiveness solely on productive forests. We need to combine cutting-edge technologies, appropriate equipment and, qualified and talented professionals willing to master challenges. Without a doubt, we will discover which paths to trail with the potential we have," said Foelkel.

### The future also includes room for process improvements

For Maria Cristina, implementation of the biorefinery concept also opened doors to processes that had been studied in the past, but were discarded due to a lack of competitiveness in relation to the kraft process. Today, processes with sulfite, steam explosion, Organosolv (pulping technique using ethanol) now arouse interest. "Bioproducts that before were not competitive in relation to oil byproducts will begin being chosen by consumers. The possibility of generating multiple products from a same production process is tempting, even considering the market challenges that still exist," she said.

While the future does not arrive, the spokespersons from TAPPI and Fisher International point out that, even though alternative processes for producing pulp exist, they do not yet produce pulp with the same quality as kraft. For them, reaching this stage of quality will require major investments, which makes the implementation in large-scale in the short to medium-term improbable.

Sheets of rigid foam resistant to water or fire containing cellulose and nanocrystals



MELODEA

Hamel also believes that the main changes foreseen in the pulping process will not directly substitute the kraft process. However, processes should improve if integrated in a biorefinery concept. "Changes will be leveraged by market demands of new products. Requests for lignins with certain properties will require significant changes in the kraft process. The extraction of hemicellulose for certain markets will affect the quality that shall be maintained, calling for process adjustments," said the vice-president of Pulp, Paper and Bioproducts at FPInnovations. "All this will have to be done pursuant to the goal of reducing capital intensity and environmental footprint," he said.

With regards to new possibilities in the kraft process, Foelkel points out that the recovery and cooking areas are among the stages with greatest change potential. "A lot of material is still burned in the boiler that, eventually, could be removed from the liquor or even wood chips, before cooking occurs. These materials could be transformed into much greater value-added products. Changes in the form of recovering liquor or in separating and retrieving extractives, lignin and hemicelluloses may be seen in the next few years. Removing these valuable extractives during the process, however, may pose an additional need in terms of new and efficient technologies, and even additional expenses with wood and chemical and energy inputs," said Foelkel.

Lhôte says that there are several drivers of innovation in the production process. One of CEPI's objectives is to establish a positive foundation that leads to breakthrough innovation – which by definition involves forcing and exceeding the limits of science and technology, with all the uncertainty and risk that this may imply. If successful, it could change the foundations of competition, "rewrite the rules of the game" of an industry and transform perspectives of the successful innovator – and allow for its use with significant cost and resource savings. "One of these foundations is the policy to address climate change. The industry is exploring many ways to reduce their greenhouse gas emissions, especially by reducing energy consumption or changes in the mix of fuels. More precisely, the drying section in paper production makes very intensive use of energy. Improved or completely new drying techniques are being explored and studied today – until we arrive at the point where the "Holy Grail" of producing paper without water becomes an attractive research topic," said the general-director of the entity. Another area of research is the production of low weight papers: "like



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producing paper with the same performance, but with much less raw materials," said Lhôte. "In this area, nanocellulose has the potential of providing answers that would be particularly relevant to the packaging sector," he said.

Technological changes that allow reinventing the sector are already being thoroughly studied and, many of them, put into practice

Establishing partnerships with other sectors could be an efficient strategy to improve the current production process and explore all the potential of biomass. "Plants need time to identify all these potentials within the production process. Once identified the opportunities, a strategic alternative could come from partnerships with companies that may, within this productive arrangement, tap the subproducts and become a shareholder or business partner," said Foelkel as a way of expanding the array of products from the same raw material. In his opinion, realization of the factory-of-the-future idea, with different productions, including fibers, paper, energy, lignin and other products, will involve a large number of partners surrounding a same production unit. "This means that the pulp and paper mill would function as an anchor in a multiple-company productive network or arrangement surrounding it," he said.

"The biorefinery concept does not mean that a plant will be operated by a single company. We can expect to see an entire corporate and business ecosystem be built around plants, adapting to the characteristics, location and business opportunities of each unit," said Hamel. According to him, it is possible to expect the development of different business models, from customized product sales, codevelopment of business projects, strategic alliances and joint ventures, aimed at the optimal exploration of the biorefinery concept.

## A successful innovation management process integrates market research and development

Maria Cristina points out that the number of products that can derive from lignocellulose-based biorefineries is practically unlimited. But, if in terms of quality these innovative products already compete equally with their traditional versions derived from petroleum, they still lose in economic terms. The challenge, she says, is not only economic. To arrive in the market in a competitive manner, the obtainment process of bioproducts must be optimized from an economic and ecological perspectives, in view that they are targeted at a niche of demanding consumers, who seek to combine quality and price, and are interested in the lifecycle of products. Lowering energy and water consumption, reducing CO<sub>2</sub> emissions, tapping all subproducts in order to minimize expenses as much as possible with effluent treatment and ensure recyclability are some of the key aspects listed by the professor from the National University of Misiones in this maturation process.

In also focusing on the challenges that will mark the next steps of biorefineries, Hamel believes that the main driver of bioproducts will be the development of markets. "Although it seems like a very slow process for investors, it will certainly provide major rewards to those who are patient," he said. Hamel says that some of the potential markets will be limited in terms of volume, but early and patient investors will have the advantage of building their business relations with partners and generate agreements and contracts before the competition begins. "Since many of these markets will not be in commodities, being the 'second-best' will not be an option," he said.

Foelkel points out another important aspect in this market evolution process: lignin can be extracted from other materials besides wood. "We need to know that

we're not the only ones in the world. Those who already produce these products that the forest base industry is trying to produce will certainly not like it nor will they applaud this interest of ours for a piece of the market, be it in biomaterials or energy. We will face strong competition in markets that, at times, become easily saturated. Or yet, we may embark in a product that is easy for us to produce, but, in the meantime, a better, less expensive one may surface, as we constantly see happening in the electronics and technology areas."

As part of the solution, Hamel says that an efficient and successful innovation management process integrates research with the simultaneous development of markets. "We discovered that clients and users must be included in the entire process. Not involving clients is the main reason for failure in technology startups. The pulp and paper industry is not familiar with these concepts. This is not a commodities market where balancing performance and reducing costs is sufficient to win. In innovation, it is necessary to develop a value proposal for a client, and not simply set out to compete," he said.

CEPI's director-general shares the same point of view: "the aspired value creation will result from how we work together throughout the value chain with our clients and with other industries, in the sense of creating and giving life to better products and new products. This implies that we establish new R&D platforms, such as the joint research program we are executing, for example, with 14 companies and all the main research institutes of deep eutectic solvents to revolutionize the way pulp is produced."

## Current portfolio will continue having space in the global market

In the current context, as well as in 20 years, the world will still need many types of paper and products derived from cellulose. It's a fact that quantities of printing and writing paper, newsprint and other qualities will continue to decline due to the electronic era and the Internet. However, products will still need to be packaged for consumers in some way, which will increase demand for packaging, inform the spokespersons from TAPPI and Fisher International. Other products, like toilet paper and paper towels, will be consumed more in the world, increasing demand for mills to earmark their production at these types of products, in detriment of declining paper qualities. The specialists say that the trend reflects the occurrence of further consolidations, as well as of companies investing in other countries where there's raw material available and consumers for their products with adequate levels of sustainability.

In breaking down the context that surrounds the

Solid biofuel in the form of pellets



FPI INNOVATIONS

different segments of today's paper industry, they comment that in North America and Europe, the rapid and continuous growth of digital communications continues exerting a very strong impact on the printing and writing paper sector. In the United States alone, demand for these types of paper dropped roughly 50% in the last decade. This radical drop in demand forced many printing and writing paper companies to modify and further specialize their product lines.

With the objective of remaining competitive and profitable, many printing and writing paper producers progressively shifted their focus to the quality of coated and uncoated printing paper targeted at specific models of printers and also specific end-use applications. This involved the development of several new ink technologies and applications per se. Other printing and writing paper mills closed down or converted their processes to other types of products that are currently experiencing healthy growth, particularly packaging papers and boards, tissue or specialty papers, leveraged by a boom of new technologies.

To enter this arena of specialty papers, many old producers of printing and writing paper are now producing new qualities of paper with special barrier applications that, in a very effective manner, do not allow grease, mineral oils, odors, oxygen, etc. to penetrate, as well as that prolong the validity of packaged food products. The specialist revealed that these and many other similar technologies are quickly proliferating.

Another example of what's been happening lately refers to printing and writing paper mills that are converting their paper machines for the packaging segment in a broader manner, be it for the basic production of packaging (linerboards, corrugated medium, varieties of carton, board, etc.) or the superior value-added packaging segment. On the basic packaging side, while general production technologies continue to seek the continuous improvement of performance properties, some more-recent technologies are drastically expanding the scope of capacities in terms of product shipping and tracking. New technologies are establishing competencies in terms of container coding that allow product shippers to program their boxes and crates to be tracked via satellite when in transit, at anytime, anywhere in the world. These new capacities (container programming) are different and more adaptable to reuse than the programming of labels that normally need to be "read" by scanners in specific places on packages or packaging.

An example of new technologies in the superior value-added segment for packaging are the special

sensors embedded in the packaging of drugs and pharmaceutical products, which detect when a blister packaging or other type of packaging is violated and sends information to a receiver at the individual's residence, which then electronically transfers data to the patient's doctor. These technologies can maintain medical staff duly informed about doses that were not taken or drug overdoses, as well as when to reissue medical prescriptions. There is currently an abundance of new technologies shaping advanced packaging.

In terms of tissue paper, the team from TAPPI and Fisher International informs that several new technologies are allowing for the production of softer and more absorbent paper, using less fibers per ton. The production of tissue via TAD (Through Air Drying), which in reality was developed more than 30 years ago, has made a comeback in the last years after the original patents expired. The TAD process creates a pattern in relief during the forming stage, which is then retained through hot air drying without the high-pressure stage (which could flatten the pattern). The pattern in relief increases softness and absorbance.

Even though less fibers are utilized in comparison to conventional tissue-production processes, TAD makes relative intensive use of energy due to the high amount of heat required for drying. TAD is being used mainly in North America, especially in the United States, where people are willing to pay the extra cost to obtain higher quality. Europe uses TAD a bit and other technologies with structured forming, but mainly uses Crescent



FOVRY DISCLOSURE

**New packaging formats and proposals, in both retail and industrial solutions, can be developed**

Cutting-edge technologies, appropriate equipment and, qualified and talented professionals willing to master challenges form the foundation of the industry of the future



Formers with tissue presses and more traditional Yankee cylinders. Structured tissue-paper production processes, developed over the last five years, also generate structured patterns in the forming zone and, as such, are similar to TAD, except for the fact that they do not utilize drying with such intensive use of energy. Overall, they are economically more advantageous alternatives. Several machines with structured technologies can be found with variations between structured and conventional forming. At present, China and most of Asia, as well as South America, use little or no TAD technology for structured tissue.

The pulp and paper industry understands that it needs to focus on two fronts: current portfolio and future opportunities. "You can't consider abandoning a sector this size to dedicate exclusively to another that is just surfacing. Certainly, the sector will continue optimizing the current industry, especially in order to be able to make the investments necessary in other potential areas," said Foelkel. "The traditional sector will continue growing, producing whatever is possible in accordance with what the market demands. At the same time, it must put aside the mindset of a single process to think about parallel processes that generate other products. More than this, the sector shall contemplate how to create productive arrangements around their plants, since they shall operate as central businesses that will feed and energize industrial districts, which will be based on the products, processes, services and waste generated and shared," he said.

The key for strengthening the current and future portfolio in accordance with market changes resides in adding new functionalities to paper says Maria Cristina. Examples of innovative products include intelligent materials, like new fibers, functional packaging, bioplastics, inputs for the food and drug industry, among others. "In order for these products to be produced, a new business model needs to be established. This will occur through cooperation and strategic alliances between the pulp and paper industry and other industrial sectors," she said, with a similar perspective as Foelkel's. ■



## ABTCP 2017 defines the future of the forest base industry as its central theme

The 50th International Pulp and Paper Congress promoted by the Brazilian Pulp and Paper Technical Association (ABTCP) to take place October 23-25, defined The Industry of the Future: New Paths, New Processes and Technological Innovations as its central theme. The call for papers that will comprise the advanced technical sessions ends at the end of this month. Those who are interested in registering works or applied cases that contain innovative potential in one of the seven subareas (Pulp, Paper, Environment, Engineering and Automation, Recovery and Energy, and Forestry) can obtain more information at: <http://www.abtcp2017.org.br/pt-br/o-evento/congresso/chamada-de-trabalhos>.

Celso Foelkel, president of this special edition of the traditional ABTCP Congress, points out that it will be an excellent opportunity to share knowledge about this topic of fundamental importance for the future competitiveness of the forest base industry. "To broaden these discussions, it is indispensable that participants focus on this year's central theme and present works that effectively contribute to the event proposed and consolidation of the industry of the future. Even papers that do not have such a direct tie with the central theme can generate conclusions or propose new paths on the different ways for helping the industry become more competitive over the next decades," he said, reinforcing this call to all professionals in the sector.