Under the main theme “Industry of the future: new paths, new processes and technological innovations”, ABTCP 2017 – 50th International Pulp and Paper Congress shed light on different trends that will guide the sector’s competitiveness over the next decades. Latin America’s biggest event of the pulp and paper industry, promoted annually by the Brazilian Pulp and Paper Technical Association (ABTCP) in partnership with sister entities, gathered government authorities, researchers, directors, managers and CEOs at Hotel Unique, in São Paulo-SP, on October 23-25.

In the opening ceremony, Darcio Berni, ABTCP’s executive director, emphasized the relevance of the event promoted this year. “In addition to the quality of work presented in our Technical Congress, we are also celebrating ABTCP’s 50th anniversary. We would like to pay tribute to the Association’s 13 founding members who helped bring it to where it is today, an important technical arm of the sector. Not even the most enthusiastic back then could imagine the position Brazil’s industry would occupy today in the global scenario. We are proud to contribute to this trajectory,” he said, referring to ABTCP’s golden jubilee celebrations and the work carried out all these years to strengthen the forest base industry. Berni also emphasized ABTCP’s potential to become a century-old entity. “For such, work will continue being dedicated to the sector’s main asset: people,” he said.

Celso Foelkel, chairman of the 2017 Congress and one of the entity’s first members, talked about how proud he is to know he helped build this successful trajectory. Looking ahead to a still uncertain future, he hopes that this is the beginning of a new stage for ABTCP. “We need to maintain that yearning to learn that we had when ABTCP was founded. For us, in order to prepare for the next 50 years and enable the sector and country to grow, we need to give our best both individual and collectively,” he said.

The chairman of the 2017 Congress also thanked the speakers and all those who organized and supported the event. “The technical and
thematic sessions, the posters distributed and the discussion panels promoted during the event presented the results of the important work done by a wide variety of authors and researchers. We also see the arrival of new professionals in the sector. Everyone is welcome and essential to consolidate our industry,” he said before introducing Elisa Piazza Goltz, a student at the Federal University of Paraná, who took the stage to receive the award for best ABTCP 2017 paper in the Student category.

Looking back at the year and the behavior of the forest base industry, Elizabeth de Carvalhaes, CEO of the Brazilian Tree Industry (IBÁ), spoke about the troubled economic scenario the industry has been facing since 2015. According to her, pulp has reacted well, since global demand is on the rise in relation to supply. The paper and wood panel segments, however, are having to make a major effort to avoid losses and maintain results stable. “To not fall as much, cannot be the target for 2018,” said Elizabeth, pointing out that new strategies need to be put into practice to overcome challenges.

The focus of work currently carried out by IBÁ has been to create business models that position packaging and other products from planted forests as competitive competitors in other segments. “Our agenda aims to increase our portfolio’s participation in different markets. We need to be precursors of the low carbon market in a world trailing new paths. When the theme is bioeconomy, what we hear the most is innovation – and wood is the most interesting alternative to fossil fuels.”

Germano Vieira, president of the Forestry Science and Research Institute (IPEF), talked about the work that the entity does to maintain the competitiveness of Brazil’s forest base industry. “The productivity of Brazilian forests is a global reference, but has stagnated over the last four years. At present, IPEF has over 300 professionals dedicated to research in all sorts of areas, seeking advancement in a continuous and sustainable manner,” he said about ongoing efforts.

Fernando Von Zuben, São Paulo’s municipal secretary of green and environment addressed the sector’s representativeness for the country’s industry. “Today, the pulp and paper sector accounts for 5% of country exports. Biodiversity preservation, as seen by the work of certified companies, is another important factor of this industry,” he said. Renewable energy generation through the use of biomass was mentioned by Von Zuben as another successful practice example in the sector.

Paulo Rabello de Castro, president of the National Bank of Economic and Social Development (BNDES), said that the bank has been committed to strengthening the productive and commercial sector of hardwood pulp since the beginning of its trajectory, when softwood was still the most conventional option to produce paper. In the last seven years, informed Castro, the BNDES allocated R$24 billion to major projects developed in the sector. “Without a doubt, the BNDES wishes to be present in this next stage of the pulp and paper industry,” he said. Before this, however, he pointed out the need to take advantage of this moment to reflect
on the controversies experienced by the country and to bet on renewal in order to create a new system that allows for the return of economic growth. “Now is the time to define everything that needs to be done,” he said also defending tax restructuring that’s more attractive to conducting business. In terms of the BNDES’ next contributions to the sector, Castro pointed out that micro, small and medium enterprises will tend to gain more space in comparison to big companies. “The process of electing national champions is no longer in fashion. We have a more polarized portfolio, which is more natural,” he said about the current context.

CEOs discuss the sector’s future and commit to form a cluster

Invited to participate in a Discussion Panel on developments that will mark the pulp and paper industry, CEOs from big companies provided important reflections on the sector’s future. When asked by Lairton Leonard, moderator of the debate and chairman of ABTCP’s Board of Directors, about perspectives for the next decades, Cristiano Teixeira, managing director of Klabin; Marcelo Castelli, CEO of Fibria; Rodrigo Davoli, CEO of International Paper, and Walter Schalka, CEO of Suzano Papel e Celulose, talked about strategies currently being put into place to face the competitive challenges of the future.

Schalka started with the answers, emphasizing achievements over the last decades. “As an industry, we are a global reference. We are the only industrial segment to sequester carbon, we only use planted forests to produce our products, we invest in our surrounding communities, we generate a significant amount of renewable energy and we’re always thinking about the future,” he said. In his opinion, lignin, fluff pulp, nanotechnology, biotechnology and information technology are the strategic pillars of the next years.

Castelli pointed out that, in addition to vocation, the Brazilian industry has a lot of competence to rank at the top of global competitiveness. “Our business model has evolved to satisfy the needs of modern society. Today, we are looking closely at the bioeconomy, which should create another disruption in the business model, since the trend is to connect with other production chains. We will have to dream and innovate to achieve this reality, but we’re already well positioned for it.”

With similar thinking to that of his colleagues, Davoli pointed out an indispensable factor for strengthening future competitiveness: people. “Human capital is also undergoing transformations. We need to invest in skill-building for this adaptation to materialize and for us to be more competitive over these next 50 years.”

Teixeira talked about the need to rely on technology as an ally so that the paper’s potential as a biodegradable product be better explored and take a step ahead of competitors that do not offer environmental advantages. “Paper is already demonstrating its strength, but we still need to face the sea of plastic in front of us. We still rely on plastic for many of our forms of packaging. We need to develop barriers capable of substituting plastic entirely. And these new resins will come from forests,” he said.

The absence of a cluster to incite the sector to work together in research development that points the strategic paths to be followed over the next decades was also discussed by the CEOs. Castelli acknowledged the lack of a more-organized industry vision and pointed out that Fibria supports creating a group with the mutual goal of strengthening the country’s pulp and paper competitiveness on a global level. Schalka agreed about the need to create value jointly. “The era of individual gains is over,” he said. “We will certainly find enormous opportunities in jointly supporting research,” said Davoli. “It’s up to us to join forces and ensure the competitiveness of our industry,” added Teixeira, establishing the top four players’ commitment to consolidate this aspired cluster through ABTCP.

Top 10 papers of ABTCP 2017

Dedicated to the objective of contributing to the sector’s technical development, professionals from all areas comprising the forest base industry presented recently-produced papers that can help strengthen competitiveness. Details of this year’s 10 best technical articles, selected by ABTCP’s Scientific Committee, are provided below.

Pulp

With the objective of reducing operating costs and boosting the competitiveness of pulp manufacturers, Gabriel Morgan, sales manager for South America at BTG Américas, presented a solution to optimize bleaching plants through innovative measurement technologies. “As a commodity, pulp forces producers to adjust controls and measurements to ensure the lowest productive costs possible,” he said, justifying the reason that led to the development of his paper.

Based on an analysis of operational data, Morgan identified potential gains based on chemical savings through the use of a different technology. “With it, we can conduct bolder negotiations, ensuring gains based on an in-depth analysis of the reality of the pulp mill in question. With the installation of operational process-control equipment and software, we make final adjustments until the expected results are achieved, without negatively impacting any other aspects of the mill,” he said.
Morgan also points out that the package that’s installed is not a black box. “The client itself, with proper training, can make eventual changes and adjustments to the control system.” Additionally, BTG’s sales manager pointed out that all projects analyzed showed an excellent short-term payback rate. “Projects like these usually undergo approval, installation and a medium-term investment return varying between 2 to 5 years. One of the competitive advantages of our solution resides in the fact that we are able to reduce this return rate to between 1 and 3 years upon initial contact and analysis of the data.”

In terms of main practical results achieved, Morgan mentioned the positive impact on chemicals consumption and the significant reduction in process variability, which also contributes to the financial gains of a pulp mill. “By reducing variability in final brightness of a client, we’re able to reduce the final brightness objective, leading to financial gains through less consumption of chemicals in the last bleaching stage,” he said. The innovative concepts presented are basically a better way of managing lignin throughout the entire bleaching process through a modeling system for predictive control fed by constant measurements directly in the production process of kappa and carryover. “We’ve been able to significantly reduce the consumption of chemicals in a pulp mill: between 5% and 10%, depending on the operational characteristics of each pulp mill.”

This control concept dialogues directly with the intelligence behind operational systems, leaving the mill prepared for its next step towards Industry 4.0, he said. “We need to break some production paradigms and we believe we’re on the right track, showing the solutions and results achieved. BTG believes that this technology will be indispensable to reach Industry 4.0 level with the Big Data concept implemented in the world of technology we currently live in,” he said, pointing out the challenges to be overcome in the next years.

Leonard de Almeida Batista, industrial production specialists in Fibria’s Pulp Production Department, addressed the influence of cooking conditions in the bleachability of brown pulp. “The initiative came about through a study in which we tried to assess potential opportunities within our production process that had not yet been evaluated due to the high complexity of the topic,” he said. “We were able to identify an opportunity with a very interesting return potential and did a deep-dive into the matter,” he said about the initial work phase.

According to Batista, one of the alternatives used in the market to reduce chemicals consumption has been to update equipment and technologies along the production process, an efficient bet in most industrial units. The work, however, looks to explore the potential of already existing equipment in a pulp mill by changing and evolving already-consolidated operational parameters. Without new investments or major changes to equipment on the production line, we made changes to the hydraulic regime of the digester with the objective of reducing the consumption of chemicals in the bleaching process. In practice, research was conducted through the balance of mass between different zones of the digester. “Following the diagnostic, changes were made in a subtle and gradual manner, since everything occurred at industrial scale in the mill’s day-to-day, and we needed to ensure stability of the entire process,” said Batista.

The main result achieved was a reduction in chlorine dioxide, the main chemical agent in the bleaching process. “The innovative concept was the influence of the digester’s hydraulic regime on pulp bleachability,” said Fibria’s Industrial Production specialist. In view of the result obtained, Batista pointed out that many concepts can be put into practice by the industry. “The influence of the digester’s hydraulic regime on pulp bleachability provides a new vision of different influences of the process in the consumption of chemicals.”
An analysis of eucalyptus chip compaction disturbances in a Compact Cooking G2 continuous digester was presented by Maria Emilia Blonski, Production Engineering Consultant – Suzano Papel e Celulose Pulp Line. She said that the idea to do this project stemmed from the practical need to model a disturbance that occurs in the digester. “The theme was chosen given the possibility of a technical contribution on a global level. Imbalance in the wood chip column movement causes major impacts in the stability of the cooking process of an entire mill, since the equilibrium between mass balance and waste generation for the energy grid are directly dependent on a digester’s stability,” she said. According to her, the objective of the study was to better understand the occurrences of retention in the wood chip column to facilitate operational control of the equipment during instabilities and minimize production and product-quality losses. “The project sought to translate something very technical and specific in an application of easy understanding in operational controls of the cooking process,” she said.

The study was conducted based on a fuzzy logic approach, which allows for perfect alignment between the applied experience of operators and existing logical models. The combination between known episodes of wood chip column trapping in the digester and logic tools allows anticipating identification of the phenomenon and develop a control tool. In practice, Maria Emilia explained that this means analyzing each event and verifying common characteristics in order to, based on these observations, come up with a variable that allows for the anticipated identification of the disturbance and decision-making, with the objective of minimizing the impacts of retention time variations on quality of pulp produced and production rhythm.

The main result achieved was the identification of the most relevant variables for recognizing the column trapping problem in a Compact Cooking G2 digester. “Literature proposes a few models for other types of digesters, but the creation of a model for this technology was an innovative concept. The model created could also be applied to other cooking processes, since the wood chip column trapping occurs with all types of continuous digesters,” said Suzano’s production engineering consultant. She explained that the composition of the column trapping indicator allowed to preventively identify column trapping symptoms, enabling the operator to take corrective action and avoid greater problems, minimizing losses in production and product quality losses. “The index created in the study is already part of the mill’s operation routine. The creation of unique variables that group other important variables for identifying problems is an excellent alternative to facilitate an operator’s analysis of information, allowing disturbances to be identified in advance,” she said.

Maria Emilia also informed that the creation of a model has a direct impact on reducing pulp production losses, which leads to an increase in product sales revenues and a better financial result for the company. “From the perspective of quality, there are also significant gains for end clients, since greater stability in process parameters increases efficiency and reduces the number of complaints,” she said, pointing out that greater production stability allows negotiating a better product price, since delivery volume and quality are ensured, adding another factor to boost a company’s competitiveness in the international market.

Adjustment of the recently-created indicator to process changes and improvements will be a next step in the project given that the process is continuous and dynamic. "It is necessary to ensure that the index continues being capable of predicting disturbances after equipment and process changes are made," said Maria Emilia. Additionally, the next big challenge will be to automate the operator’s decision-making process, achieving a level of control excellence where human decision is no longer necessary, but rather use of logic controls directly applied
to mathematical models in the process. “For such, the model needs to be tested in different scenarios, so that in the future it is possible to combine fuzzy logic with neural networks and artificial intelligence models,” she said.

In the analysis of Marcus Vinícius Gomes Veloso, development analyst at Cenibras’ Customer Coordination, Monitoring, Research and Service area, regarding the reintroduction of waste generated in the unbleached pulp purification stages, “resource optimization has led many projects to focus on the pulping process with the introduction of new technologies. Even with all the improvements obtained in the cooking of wood, the waste generated (knots, clumps) still represents a significant yield loss, impacting the specific consumption of wood, which is the most expensive input in the process. Therefore, in practice, any study that aims to increase yield or reduce costs has high potential of being implemented,” he said.

Veloso said that the study was broken down into three stages: the first, to collect and characterize the waste and study its generation in the mill; the second, in laboratory, analyzing the reintroduction of waste in the pulp line and its impact on cellulosic pulp characteristics, and the third, an analysis of pulp quality produced from pulping when waste is added.

The results show that the purge of waste after the stick washer represents a loss of 0.5 t.d\(^1\) of sodium as NaOH. “The return of this waste to the digester represents the possibility of elevating production by as much as 0.8\%,” he said. “There’s major potential for refeeding this waste into the digester, since no changes in the quality of cellulosic pulp parameters were observed,” he said, remembering that this project can contribute to the sector, demonstrating that based on specific studies, it is possible to boost plant productivity without compromising product quality, as well as promote a reduction in waste generated and cost involved with disposition.

In terms of challenges for implementing the study, Veloso pointed out reducing the silica content (\(\text{SiO}_2\)) in waste, in view that it causes negative impacts, elevating levels of corrosion by abrasion in the digester. “I believe that, in the future, when new washing and purification technologies are developed we will see a significant reduction in waste and also the possibility of, once generated, be much cleaner and provide a safe return to the process,” he said.

The pursuit of a new method for measuring the kappa number led to the paper submitted by Thanh Trung, Vice President of Technology at FITNIR Analyzers. The pulping process involves the delignification of wood chips for purposes of producing pulp. Trung explains that measuring the kappa number of pulp, which is an indication of the residual lignin content of pulp, is an extremely important measurement, as it provides information about the extent of the cooking process and the bleaching process. “This information, in turn, has important implications in terms of yield, since overly-aggressive cooking also removes cellulose, thus reducing yield. On the other hand, insufficient removal of lignin increases the amount of bleaching chemicals necessary to obtain the desired whiteness. Therefore, it’s desirable to obtain a kappa target value to maximize yield and, at the same time, reduce consumption of energy and chemicals,” said the paper.

Trung also pointed out the fact that, since inputs (fiber/wood chips) account for roughly 30\% to 50\% of pulp production costs, any improvement in the pulping process exerts a significant impact on a mill’s competitiveness in today’s global market.

Trung also informed that online measurements are available to assist in production. “However, standard kappa measurements made through manual tests can have significant errors, resulting in differences from one person to another, as well as from one laboratory to another,” he said, mentioning that such errors result from the complex steps in performing standard kappa tests, such as sampling, washing, forming, drying, specific weights of samples and even reaction time for analyses. “Errors in standard measurements lead to uncertainties in process and operation targets, resulting in process variability” he said.

Therefore, Trung’s paper addressed industry’s need for reliable and precise measuring of residual lignin content of pulp that can be performed easily and quickly. “As part of the Congress theme’s objective, we focused on an innovative technique that utilizes light, specifically molecular spectroscopy, which measures the absorption of light by molecules present in the sample — in this case, lignin present in the fiber. The absorption information, in turn, can be translated in terms of concentration, that is, a kappa number for the pulping operation,” he said about the use of Near Infrared
Spectroscopy (NIRS). According to FITNIR Analyzers’ VP of Technology, the technique can be performed in a relatively short period, taking approximately four minutes. The most important factor, however, is the elimination of human error and, at the same time, increased precision and repeatability.

To apply the technique, samples were collected in several process positions that require measurements. The samples were taken to the laboratory, washed and the main pieces of debris removed manually, whereby the pulp was then squeezed by hand to remove excess water. A sample weighing roughly 80-100 grams was then placed in a sample cup where it was automatically washed and pressed until forming a thick pulp “pad”. The “pad” was then removed from the cup and placed in a measurement chamber where it was scanned to obtain the kappa number. “The project took many years to be concluded, especially the automatic sample preparation stage to obtain the size and pad density. Then, laboratory verifications and mill tests were conducted to reach a stage in which it became reliable for operation in digesters,” said Trung.

According to him, the main achievements of the project are several. “We developed a way to measure the kappa number without the need for chemicals; it only takes four minutes for wet pulp samples and less than a minute for dry; plus, the benefits of less errors,” he said.

Trung also pointed out that the NIR Kappa system is currently implemented in several mills for measuring kappa on a routine basis, improving digester operations and making pulp quality verifications before selling to customers. The concept, which received US and international patents, is already benefiting the industry as a whole. “The main challenge to be overcome refers to industry’s awareness that new and innovative technologies can truly provide precise and reliable data, providing many benefits in relation to the traditional technique. The ability of pulp mills to adopt new and innovative technologies should be encouraged in order to continue improving operations, and allow mills to become more competitive on a global level and, at the same time, environmentally sustainable,” said Trung.

**Paper**

Identification of the dimensional stability profile of reprographic paper formed in a high MD-CD ratio condition of traction resistance was the proposal of the paper spearheaded by Afonso Henrique Teixeira Mendes, partner-manager of Centre Consultoria and researcher at the University of São Paulo (USP). “The interest in this dimensional stability study came about from the search of trying to better understand the consolidation mechanism and interference possibilities of hygroexpansivity of paper as a tool for improving the quality and functionality of reprographic paper in its end use,” he said.

To investigate the transversal profile of dimensional stability, paper samples were collected from the machine roller where, through the application of image analysis techniques, the differential shrinking profiles and their correlation with the hygroexpansivity measurement results were obtained. “Fiber orientation aspects were also addressed, in order to understand their effects on the dimensional stability of paper,” said Mendes.

According to the author, the paper demonstrated an example of operational adjustment to a paper machine equipped with a double screen former of the “forming roll” type, where the index adopted for anisotropy of paper resulted in a specific dimensional stability profile, in which significant quality limitations were observed, particularly on the lateral areas of sheets produced. “The study proposed to provide a better intuitive understanding on the part of teams from the production areas of paper mills regarding the importance of selecting operation parameters, such as the degree of orientation of fibers to obtain better uniformity of transversal properties in a sheet of paper.”

Greater understanding of the impact in selecting operational parameters certainly contributes to the possibility of obtaining paper with better quality in terms of property consistencies, as well as a better level of functionality, which constitutes an essential characteristic for reprographic paper in its end use. Mendes said that the concepts presented – for perception of adjustment perspectives of sheet anisotropy in double screen formers, as well as a resource for improving the dimensional stability profile of paper, incorporated to a solution of commitment to other properties – can have an immediate application in the machine’s operation. “There aren’t major challenges for implementation. Based on the work team’s awareness and understanding of the phenomenon involved in forming the sheet of paper, the application can be immediate, since there’s no need for additional equipment.”

For the future, given the continuous development of process control solutions, Mendes said it is possible to expect incorporation, based on a personal algorithm of online processing to indicate the ranges of dimensional instability of the sheet when coming off the paper machine.

The study presented by Fabricio Nicolao, production leader at Iguaçu Papel e Celulose, was the topic of his Production Engineering course-completion paper at PUC-PR. “At Iguaçu Papel e Celulose, there are...
groups that work to identify improvement opportunities in the industrial plant with the objective of reducing losses and waste that compromise the unit’s operational efficiency. At the time, we were working in a team that aimed to propose and implement improvements to reduce cellulosic fiber losses throughout the production process. To achieve this objective, I used the knowledge acquired in school and applied it in the project’s development,” he said.

Nicolao explained that the project was developed through applied research with a qualitative and descriptive objective approach – as it described the company’s characteristics in a study through his vision, as a researcher, without inference. “The study used the Problem Analysis and Resolution Method (MASP), which is based on the PDCA cycle,” he said. During the study under the MASP method, quality tools were used to analyze the current situation of losses, map production costs, identify/stratify losses into subgroups, prioritize losses aimed at identifying the most relevant ones, seeking the fundamental causes that result in losses, identifying root causes and, lastly, proposing and implementing improvements to eliminate them.

As a result, Nicolao achieved the target proposed by the company. “The reduction obtained from improvements implemented elevated this loss indicator to an acceptable level in terms of plant operational efficiency,” he said. “The production unit already had isolated projects to reduce fiber losses in its production process, but it wasn’t being successful at achieving its objective. In this case, the MASP method presented an innovative concept when compared to previous initiatives, since problem segmentation is one of its principles, allowing for a better analysis as well as an organized systematization with predefined steps and substeps intended to choose the problem, the analysis of causes, the determination and the planning of actions, as well as to verify results,” he said.

The implementation of improvements proposed to eliminate the root causes of fiber losses is considered by the researcher as one of the main challenges of the project. “In view of the fact that the company was in a financial constraint, we opted to not implement the solutions. As a result, the study underwent adjustments, and a new solution was presented to contain the root causes, which was approved and implemented at a lower cost,” he said about the alternative chosen. “In the pulp and paper sector, price is a key factor for differentiating from the competition. To have a competitive price, companies need to be efficient in their production process, presenting low levels of losses, reduced waste and lower production costs. In the production engineering area, we have several methodologies developed for applying product and process improvements, with the objective of maximizing results or minimizing losses and costs,” he said.

Over the last years, many works have been published regarding the impacts of pigments and how they affect the porosity of applied paper, ultimately influencing their printing quality. However, Janet Preston, senior scientist at Imerys, pointed out that few addressed the chemical aspects of application, that is, the impact exerted by the polarity of the application and its effect on printability. “This study was executed with the objective of better understanding the impact exerted by the surface free energy on lithographic printing. We tried to separate the physical aspects of the application from those of a chemical nature in order to observe which of them exerted the greatest impact,” she said in her speech.

According to Janet, the work was executed by a university student contracted for an internship at Imerys as part of his chemistry degree. “Graduation includes a one-year period in industry, a phase in which students need to carry out a relevant scientific project that
helps them obtain their degree and also provides useful results for the company,” she said about Jonny Keen’s work who was jointly supervised by Janet and Andrew Findlay, utilizing laboratory instruments and samples from Imerys’ Cornwall unit.

One of the main objectives of the study was to research the best way to measure the surface free energy of paper. “Ideally, it should be measured on a smooth, nonporous and homogenous surface, but paper isn’t exactly like that. Therefore, it was necessary to determine the best contact angle method to measure this aspect, which comprised the first part of the publication,” said Janet. In practice, the first part of the work explored the best way to measure the surface free energy of paper and propose a method to do it. Adjustments for the topography impact were also included, as well as a discussion regarding the impact exerted by porosity on the measurement.

The main conclusion of the study was that surface chemistry is of secondary importance compared to porosity and topography of the coating layer, and that in most cases the surface chemistry will be dominated by the choice of binder. However, Janet says that the influence of pigment will become more important as binder concentrations are reduced (due to cost reduction). It is well known that in offset printing, latexes containing polar monomers will reduce ink setting rate, and in flexo printing, faster water penetration can be achieved using the Corona treatment, or by adding a more polar binding agent to increase the polarity of the applied coating layer. “The work will be useful in optimization processes that require faster or much slower water absorption. Porosity of the application can be optimized with the use of different pigment structures, but fine-tuning can also be done through the careful choice of binder, which exerts impact on the chemistry. This can be useful in the development of application fluids for water-based flexo or water-based inkjet printing,” she said.

Janet pointed out that the addition of a moistening agent was described in the last part of the publication, which may cause some problems, such as issues related to reduced adhesion or the buildup of foam. As such, Imerys’ senior scientist explained that adding extra components to help in terms of surface free energy, should be done carefully, keeping in mind these potential negative aspects.

Maria Elisa Marciano Martinez, Industrial Property researcher at the National Industrial Property Institute (INPI), presented a mapping of technologies in the pulp and paper sector through patent documents deposited in Brazil between 2009 and 2013. The initiative to conduct this mapping came about in 2014, with her first work, pertaining to the 2004-2008 period, having been published in O Papel magazine (October/2015). “The theme was selected with the objective of mapping the evolution of patents filed in Brazil and involve pulp and paper sector, pointing out the dominant technological link,” said the researcher.

According to Maria Elisa, the study was carried out in three parts: theory, including bibliography review of the pulp and paper sector and patent documents as source of information; recovery of patent data from the sector deposited in Brazil (international classification of patents D21) during the 2009-2013 period; data treatment (number of patent documents deposited per year and the main technologies, based on the international classification of patents, both by year and by technology relevant to the pulp and paper sector; main forms of deposit, priority countries, depositors and inventors).

As a result of the study, Maria Elisa pointed out that pulp and paper related technologies with the highest number of patent documents are: #1) pulp compositions, paper impregnation or
coating; #2) production of pulp through elimination of non-cellulosic substances of materials that contain cellulose; regeneration of pulp liquors; and #3) paper making machines; paper production methods.

“Most patent documents are deposited through the Patent Cooperation Treaty (PCT), that is, international deposit, with origin in the following entities: United States (49%), European Union (12%), Finland (9%), Switzerland (9%) and others (21%),” she said. With regards to depositors, the researcher said that they are distributed in a pulverized manner and that the main depositors are international corporations, such as Andritz, Kimberly Clark, Stora, Metso and Voith Patent. In relation to inventors, she said that they are distributed in a highly dispersed manner and that the main ones are foreign individuals. Additionally, Maria Elisa informed that the majority of patent documents related to Brazil’s pulp and paper sector refer to pulp compositions, paper coating or impregnation, whereby the main form used for depositing them is through the PCT (international deposit), having the United States as main origin of the invention, this being the same situation observed between 2004 and 2008.

Through the preparation of this panorama, it is possible to demonstrate the strategic information potential of these patent documents for the technological monitoring and management process of technologies that comprise the pulp and paper sector. “The concepts obtained can already be used as subsidy and also reinforce decision-making support based on important facts and concrete evidence regarding the technological development dynamics of the pulp and paper sector in Brazil,” said Maria Elisa. She also pointed out that this mapping should continue in order to offer the possibility of comparing the local panorama with the international scenario.

**Posters**

Jorge Lepikson Neto, industrial researcher at Instituto Senai de Inovação Biomassa, spoke about the long-term effects of flavonoid supplementation in the forming of eucalyptus wood. “The project started out with an analysis of the genetic expression of different eucalyptus species, seeking to identify genes that could be related to the forming of wood and superior characteristics for paper production. We basically compared good species for producing paper against others without this characteristic and we were able to identify a few targets, promising genes and their outputs,” he said.

In developing the project, Neto said that supplementation protocols of eucalyptus plants were made and also a complete physical-chemical analysis of the wood, in addition to sequencing the transcriptome to understand the consequences of these protocols at molecular level. “Initially, this was done in a small scale. With positive results, it was expanded to the nursery of a big pulp and paper company,” he said about the research stages. “We verified that the effects had a memory: six months after the supplementation, the changes persisted. As the work expanded, we were able to verify that such effects, in fact, persisted until the adult age of trees – that is, nursery supplementation at a young age affects characteristics of trees four years old,” he said, pointing out that the project is being developed since 2008. Among analyses already executed so far, we have: analytical pyrolysis, NIR, RNA sequencing, metabolomic, thioacidolysis and enzymatic hydrolysis.

According to the researcher, flavonoid supplementation has effects on wood solubility, increasing the S/G ratio of lignin and reducing Klason lignin by as much as 10% in adult trees. “As the main innovation of the project, we went from a genetic expression analysis, with a simple and cheap protocol, to modifying the chemical composition of eucalyptus wood. Biotechnological analyses are not yet applied much in the sector, but have major potential for medium and long-term results,” he said.

Neto reinforced that the possibility of applying a quick and cheap method, capable of reducing lignin from eucalyptus is very promising. “This can already be put into practice. We are also looking to identify the molecular mechanisms responsible for these effects in order to create new possibilities for industrial application,” he said about next steps. Neto said the team is looking for ways to do continuous application in the field, without the need to involve company personnel. “We’re looking for something automated and even develop products that release this compound little by little. With this, we hope to intensify the effects on adult trees,” he said.