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Special for *O Papel* Magazine

INNVENTIA DISCLOSURE



PROJECT POLYNOL TARGETS THE PRACTICAL IMPLEMENTATION OF BIOREFINERIES

The union of forest base industry players with Swedish-Brazilian universities and research centers resulted in a project of big objectives, called Polynol. The project, initiated by the Swedish research institute Innventia, began this year and will conclude its first phase in 2016. It aims to facilitate the large-scale production of renewable polymers, cellulosic ethanol, carbon fiber and other chemical derivatives of a renewable nature and other sugar chemicals.

The raw materials used for studies is bagasse and forestry waste from pulp mills. AkzoNobel, Fibria, Novozymes, Sekab, Stora Enso, and Kemiinformation are the players working in partnership with Innventia, universities and institutions such as UFRJ, Unicamp, USP-ESALQ, Chalmers University, Processum and UFPR in seeking to detail the potential of biomass of lignocellulosic nature and its many paths in a production process within the concept of biorefineries integrated with the pulp mill.

In an exclusive meeting with ***O Papel***, Innventia spokespeople, Niklas Berglin, deputy director of Innventia's business area Biorefining, and Anna von Schenck, senior project manager and technical coordinator of the project, together with Fibria's representative, Paulo César Pavan, process and product development manager and chairman of the project board, reveal details of the partnership and how it was developed together with the Swedish-Brazilian Research and Innovation Center (CISB). In the interview below, they tell how mutual cooperation is providing fundamental results to the highly aspired goal of putting biorefineries in operation.

O Papel – Where did the idea come from to carry out this joint project and how was the participation of each player, institution and University defined in Polynol?

Niklas Berglin – The initiative of developing the project came about two years ago during a workshop we participated in São Bernardo do Campo (SP). At the time, we raised the hypothesis of what could be done in partnership with representatives from different areas, investors and research institutes. The idea was to follow the example of big projects that Innventia initiates and leads in Europe, involving industry players, universities and research centers. We found some players interested in this type of networking and, from there, we decided to kick off work activities, trying at first to identify the parts in which each one could contribute. A major part of this initiative and confidence behind all this work came from Innventia's expertise in developing research associated to the pulp and paper industry, however, the initial focus resided in identifying partners with competencies complementary to ours.

Paulo Pavan – At the time when CISB started its activities aimed at exchanging information and experiences between Swedish and Brazilian companies and institutions, it also coincided with the period in which Innventia established the interest of further developing activities in Brazil. In this scenario of seeking innovation, came the idea of developing a technological platform composed of different companies and entities.

O Papel – How are the results obtained by each participant compiled?

Anna von Schenck – Innventia is responsible for all the research being developed. We tend to organize large projects of this type dividing them into workgroups and defining leaders for each one of them. Fibria, for example, is the leader of one of these groups, while Innventia manages the work developed by all teams. In practice, the project is organized into small parts, but we disseminate information among all participants. Each one is kept informed about the work carried out by the others and the respective results. Additionally, we promote two meetings annually to exchange ideas and share discoveries.

Pavan – This continuous interaction is done through a platform that offers support and all the information about the most recent discoveries to all those involved. Each participant can access this platform to find out what has been achieved by the other workgroups.

So, it isn't just every six months that we can access all the information and research that's being carried out in the project, but rather in real-time.

O Papel – What results have already been learned so far and what doors do they open for future stages of the project?

Berglin – Our current focus has been to investigate different components of the raw material and its respective process conditions. The objective is to identify the quantity we can remove from some biomass components, such as cellulose and lignin. Talking specifically about cellulose, the intention is to capture it and transform it into sugar, since this product can be used as the precursor for various chemical materials, such as ethanol and other renewable products. This is basically the work we've been developing so far. In the next stage, already with the quantity and process conditions established, we aim to develop such products from sugar.

Pavan – The stage we've been currently executing is, in fact, the beginning of work with the raw material we selected. The current stage can basically be summarized as the development of appropriate procedures for separating and processing the material, and the search of solutions for bottlenecks found in these processes.

O Papel – With the research conducted so far, has any of the bioproducts presented greater potential and be considered the most promising?

Berglin – Carbon fiber has been commented quite a bit due to its high potential. There is considerable interest on the part of the manufacturing industry to work more with carbon fiber, expand its use beyond what it is currently used for. The automotive industry is a good example. I would say, therefore, that there exists a sort of potential market for different types of carbon fiber. In turn, lignin stands out for its technical characteristics. It can be modified, separated in different fraction sizes, so it presents numerous qualities that generate opportunities for various uses. It is becoming more and more obvious that it is possible to obtain a purer lignin, so new applications are being pursued for this component. The technology used to separate lignin has existed for a long time, but the techniques for obtaining it in a purer and economically viable manner have intensified in the last ten years with the LignoBoost process developed by Innventia and Chalmers and now commercialized by Metso.

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Pavan bets on competitive advantages, such as having green products with affordable prices, for consolidating new market niches

O Papel – Do you believe that in 2016, at the end of the project, it will already be possible to implement biorefinery platforms? Will it be possible to see players in the pulp and paper industry also competing as biofuel and bioproduct players?

Berglin – The pulp and paper industry is, of course, already a producer of biomaterials. The Polynol project will contribute to strengthen this path, as the industry is already moving towards production of renewable intermediate products such as lignin. Polynol is a research and development project composed of three stages. At present, we are in phase one. Installation of a pilot plant represents phase two, and a demonstration in commercial scale would conclude the project, characterizing phase three. With this work scope, it is important to point out that our focus is on understanding how different raw materials can be processed into sugars and, thus, generate other products. However, there are other important discoveries we aim to obtain throughout the process, including ways how these intermediary products can be employed in different industries. This discovery of which bioproducts we can offer the market is what guides the commercial interest of companies that are participating in the project. In pursuing this macro objective, we will have to discover, for example, if a product made with lignin is more advantageous than the products that are already applied in these processes today. The fact is that, only when we are able to fully understand the chemical processes involved in these productions of new bioproducts, will we be able to start the following stage of the project, in which we intend to set up a pilot plant. To reach this stage, we depend on this detailed knowledge, including sustainability of the concept and its economic attractiveness. We depend on the success of results from this stage that precedes large-scale production.

O Papel – What challenges are involved regarding the practical implementation of biorefineries at industries already operating?

Berglin – With regards to the more technical challenges, the first one is to discover how pure these products can be and what are the necessary characteristics of biomass that will be used at these plants to generate such products. Another bottleneck to be resolved will be the processing of waste and its transformation in value-added products, whereby there already exists an ongoing productive process. What I'm trying to say is that these materials are already utilized in an efficient manner and are part of a closed cycle. So

the question is: how to integrate the current process to the one we aim to implement to produce new products? It is a question we will have to solve in the next stages of the project without a doubt. We already have some ideas on paper, but we need to reach the next stages to be certain that they will truly work. Another practical challenge regarding the implementation of biorefineries is to discover where these new products can be employed. This analysis was one of the first we considered when we defined that it would be important to count on different partners in the project's development, since, with different representatives in the value chain, it would be easier to overcome bottlenecks between concept and marketing.

Pavan: Just to complement the challenges mentioned by Niklas, I would say that logistics is also another challenge, since a biorefinery involves substituting materials from different production processes. The raw materials, subproducts and products will be shared and, for such, we have to identify the most efficient model for this flow.

O Papel – Do you consider that the consolidation of markets that will receive bioproducts will be one of the main challenges of players interested in implementing biorefineries?

Berglin – Certainly. There are some market niches that don't even exist. In other cases, they are still too small compared to the product volume we will be able to produce based on this concept. Once again, the importance of gathering participants from different parts of the value chain is fundamental. The union of work teams will be useful for aligning the timing between research development related to the production process and the commercial understanding that will lead to the consolidation of each one of these markets. It is a question that's being analyzed by several project participants.

Anna – We have to show the market that traditional pulp production processes can resort to the type of cooking that generates lignin with competitive advantages for different uses. In other words, the intention is to adapt the traditional technique so that it can provide, for example, a perfected lignin, ready for various applications.

Pavan – Advantages such as being a green product, stemming from a sustainable production process, and being affordable, and sometimes even cheaper than those currently available, will contribute to the consolidation of new niches. ■