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CELULOSE IRANI DISCLOSURE

Eco-efficient industry

Pulp and paper players show technological evolutions and technical improvements that have led to cleaner production processes

The connection between the pulp and paper industry and environment is intrinsic. Natural resources, such as forests and water, provide the foundation for the entire production process. In abiding by the maxim "using wisely, no shortages there will be", the sector has achieved significant progress in terms of minimizing environmental impacts over the last years, putting into practice and consolidating the concept of sustainability.

Behind this macro objective of strengthening the sustainability tripod, composed of financial, environmental and social gains, is the practice of two other concepts: eco-efficiency and cleaner production. "Being eco-efficient means doing more with less and in a better way, that is, using natural resources more efficiently in productive processes," says engineer Rosele Wittée, from SENAI's National Center of Clean Technologies (CNTL).

She points out that, despite different names, the meaning of eco-efficiency and cleaner production is basically the same. The distinction is simply because the terms were created by different entities. "While the World Business Council for Sustainable Development (WBCSD) and its ramifications in various countries favors the term *eco-efficiency*, the United Nations Industrial Development Organization (UNIDO) and the

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ABTCP IMAGE BANK

Despite the many benefits aspired with the practical implementation of biorefineries, some particularities require caution, says Foelkel

United Nations Environment Programme (UNEP) promote the concept of cleaner production", she said, pointing out that cleaner production possesses an implementation methodology to achieve productive efficiency.

Regardless of the slight conceptual difference, cleaner production and eco-efficiency should be understood as tools on the menu of managerial options that aim to reduce pollution and improve operational efficiency, as underscored by Celso Foelkel, consultant and writer at Grau Celsius and chairman of the 46th Pulp and Paper International Congress and Exhibition, promoted annually by ABTCP. "They are strategies for continuously improving processes, products and services, based on the operational efficiency and also technology application concepts. The intention is to reduce environmental impacts, boost financial results by reducing costs, improve the happiness of people involved and, with this, allow that the path toward sustainable development be outlined," he said.

The Brazilian industry has been betting on the strategic vector for years. Not by chance, market pulp industrial mills rank among the most modern in the world. "They are extremely efficient state of the art mills for producing bleached eucalyptus kraft pulp," said Foelkel about the competitive advantage of Brazilian players.

More eco-efficient production process

One of the most important eco-efficiency advancements in the recent past is the use of water. The evolution in this aspect can be clearly measured by its reduced consumption in the process. "In view that it is a sector highly dependent on water, the reduction in consumption through increasingly more efficient processes is certainly a significant gain for the sector," said Rosele.

To exemplify such advancement, she says that in the 1990s, water consumption varied between 90 and 140 m^3/ton for bleached eucalyptus kraft pulp, whereas nowadays, in Brazil, this consumption varies between 20 and 40 m^3/ton for cutting-edge bleached eucalyptus kraft pulp mills.

ZIG KOCH

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In 2012, Fibria – one of the three finalists in the Sustainability category of the ABTCP highlights award for this year – included management of water resources in its Short-Term Goals. The objective was to conclude the project of identifying the water footprint of pulp for the Forestry and Industrial Units. The goal was achieved with the conclusion of the study for the forest base and the Jacareí, Aracruz and Três Lagoas mills, in accordance with the Water Footprint Network methodology, which Fibria is member of.

Reduced water consumption comes with another benefit for the sector and environment: the closing of circuits. At Klabin – another finalist in the Sustainability category of the ABTCP highlights award for this year – the closing of water circuits stands as one of its eco-efficiency goals. Recently, the Otacílio Costa unit made an investment that allowed the mill to operate with values below 30 m^3/ton of paper, a major feat for a kraft paper mill. The company's biggest unit has a specific water consumption of 36 m^3/ton of paper and stands as one of the best practices worldwide in the segment of integrated mills.

"We monitor the Benchmarking Indicators of Pulp and Paper Mills (an ABTCP product) and have observed the evolution of efficiency gains in productive processes for the following indicators: specific wood consumption, team productivity, specific steam consumption, evaporation efficiency, reduction in solid-waste generation, specific effluent volume and global machinery efficiency," said Leandro Farina, manager of excellence management at Celulose Irani.

The reduction in greenhouse gas (GHG) emissions is another important achievement by the pulp and paper industry. At present, modern mills are working hard to minimize the production of these gases. Celulose Irani is a good example. Between 2005 and 2012, CDM-WTS (Clean Development Mechanism – Waste Treatment Station) and CDM-Biomass have allowed reducing greenhouse gas emissions by 1.3 million tons of CO_2 equivalent and provided a financial return of R$17.5 million from the sale of carbon credits. "Environmental management focuses on managing atmospheric emissions, waste, effluents, energy, environmental education, biodiversity, soil quality, water resources and analysis of product lifecycles," said Farina, adding that the GHG Inventory projects, Cleanup Program, Environmental Protector, Recycling of Hydrapulper Plastic Waste, Sharing Value Project, Sustainability Report and FSC Certification also guide the company's managing – which, by the way, led Celulose Irani to being one of the finalists in the Sustainability category of this year's Highlights Award.

Fibria is another company that stands out for dedicating attention and efforts to mitigating GHGs. The company conducts its GHG emissions inventory utilizing as base the months of January to December of the previous year. In this analysis, it takes into account the industrial and forestry operations of its three units, as well as the logistics operations of pulp exports for all of them. The inventory count is conducted in accordance with various calculation protocols, including the World Resources Institute and the WBCSD, adapted by the International Council of Forest and Paper Association (ICFPA) for the pulp and paper sector. In 2013, base-year 2012, the result showed a positive emissions balance: 0.8 ton of CO_2 equivalent sequestered per ton of pulp produced. There was also a 3% reduction in direct emissions and a 1% reduction in total emissions.

Among the eco-efficiency gains presented by pulp and paper mills, the use of electricity is another component that underwent major improvements when compared to a few decades back. In practice, we see mills today not only using electrical energy in a more rational manner, but also generating energy for their own production process and, also, producing excess energy for the energy grid, from forest biomass and black liquor itself.

Optimizing energy use is ever present in Klabin's day-to-day operations. The company has the goal of cleaning its energy grid. In 2012, approximately 80% of the grid was based on renewable natural resources, such as lignin, biomass and hydraulic energy. The expectation is that in the next few years the company will become self-sufficient in electrical energy, with the construction of a biomass-based thermal electric power plant at the new pulp mill in Ortigueira (PR).

At the same time, in its pursuit to reduce consumption of fossil fuels, Klabin is also making investments in biomass boilers, which help optimize the production of steam and generate a significant reduction in fuel consumption. Since 2004 (base year for monitoring GHG emissions), the company has already obtained a reduction of more than 60% in CO_2eq/t.

The series of merits obtained over the last decades results in a complete operational efficiency that passes through all stages of the production process and culminates in hardly any production losses. "Modern mills operate with few stoppages, resulting in a lower environmental impact and better financial results," said Foelkel.

The manager of excellence management at Celulose Irani credits a good part of these improvements to the availability of technology to substitute equipment for others that are much more modern, but also points out the participation of professionals from the sector, who, with technical training and qualification, have helped the industry evolve and reach higher levels of competitiveness, as well as reduce the environmental impacts of production processes.

In search of constant progress

The mills that comprise the country's pulp and paper industry are, in their majority, certified according to ISO environmental and quality management standards. Practically all companies also possess certified forests in accordance with principles defined by the Forest Stewardship Council (FSC) and CERFLOR (ABNT/INMETRO), including forest management and the custody chain of their products.

Rosele says that "many companies certified by environmental management systems sometimes understand that cleaner production concepts are already contemplated, since they already possess certification". The CNTL engineer defends that the implementation of an environmental management system should include methodological ways for proving the adoption of cleaner production or prevention concepts in process assessments, emphasizing that, much more than the application of a prevention methodology, cleaner production leads to a change of paradigm in companies.

Also according to Rosele, the PmaisL (Cleaner Production) methodology can make a major contribution towards establishing environmental program goals implemented by companies. "I believe that the main players in the sector should invest heavily in the assessment of their processes, in preparing reliable evaluation reports and getting to know the best technologies out there that can be employed, since a change of paradigms obtained through PmaisL translates very quickly into environmental and financial benefits, in addition to thoroughly modifying the overall perception of employees regarding environmental matters."

CELULOSE IRANI DISCLOSURE

Optimizing the use of energy is more and more present in the day-to-day operations of mills, generating not only raw material for the productive process itself, but also excess energy for the grid

The opinion of Umberto Cinque, Fibria's environmental and industrial general manager, is similar regarding the combination of environmental and financial gains. "They are gradual and continuous long-term processes, always based on two indispensable pillars: lower environmental impact and resulting financial gain. This means that, by working in an eco-efficient manner, the industry gains simultaneously by reducing environmental risk and improving financial results."

Cinque believes that the sector is engaged with sustainability programs and processes. Fibria, for example, has been following an eco-efficiency program since the days it was VCP. "It is a program that provides significant environmental and financial gains, to which we dedicate a lot of time and effort, since we know that, by regulating environmental impacts, seeking less losses, we don't lose raw materials and win additional revenues", he said. The manager exemplified the gains mentioning that, for every R$1 invested in cleaner production, the average return is R$10, according to the area in which investments are made.

Farina, manager of excellence management at Celulose Irani, says that producing more with the same or less resources is, without a doubt, a matter of survival. "Taking better advantage of resources available, wasting less and producing less waste makes a company more efficient and, consequently, competitive."

FIBRIA DISCLOSURE

Fibria follows an eco-efficiency program that has yielded environmental and financial gains since the days the company was VCP

Opportunities available in the various stages of the production process

Aware of the need for progressive improvements, pulp and paper industry players pay close attention to the production stages that offer advancement opportunities. In fact, the potential for improvement begins in the forest, says Foelkel. "Better wood quality, more homogenous, accelerates the pulping and bleaching process. It is for these and other reasons that leading companies have placed significant focus on research and development in the forestry area", said Grau Celsius's consultant and writer.

In the industrial process, Foelkel sees excellent opportunities for reducing water consumption. According to him, the truth is that the values practiced, despite being much better than in the past, still offer margin for significant improvement. The manager of excellence management at Celulose Irani agrees and points out the path for achieving such advancements: "without a doubt, water consumption in pulp and paper production still has significant room for reduction. Projects and investments in closing the circuit of processes are necessary to reduce the use of this resource."

According to the engineer at CNTL, another area with significant improvement opportunity is the generation of internal wastepaper. "There are companies that produce between 10% and 20% of internal wastepaper. The question that comes to mind: is sustainability possible for mills that refuse or return back to the process this amount of ready-made product, in which enormous quantities of value were added and are then discarded as if they didn't have a significant cost?", she asks, encouraging improvements.

Cinque says that industrial solid waste, in fact, reflects a short, medium and long-term goal, as it is possible to achieve gradual reductions within the production process that provide considerable benefits for the company. "It is important to remember that even when we achieve a low amount of waste it is possible to utilize it outside the process, through recycling," referring to the concept called 4 Rs: reduce, replace, reuse, recycle. Agreeing about the importance of making better use of this window of opportunity, Celulose Irani's manager points out that reducing the amount of waste will play a key role in relation to the new Solid Waste National Policy.

The effluent stage stands out as another space for positive changes. Nowadays, we still lose between 0.5% and 2% of fiber in effluents, says Rosele. "This is another area that can bring big returns for companies, since the loss of fibers in effluents reduces the utilization of this raw material in the process, increasing the environmental cost of treatment and disposal", says CNTL's engineer.

According to her, suppliers of equipment and chemical products play a major contribution in the pursuit of eco-efficiency advancements. "The machinery and equipment sectors, as well as chemical products suppliers in general, should be more and more involved in matters relating to cleaner production. Increasing the efficiency of equipment, optimizing the performance of processes, design of machinery and developing chemical products that are less and less aggressive and "greener" can make all the difference between an eco- or non-efficient company", she says.

It seems that suppliers are highly engaged in this continuous process. "They are the main levers for technological improvements that lead to cleaner production. They are global companies that possess technological centers in various countries. They not only conduct their own research, but also establish partnerships with the players they service", says Foelkel.

Given its huge importance, at the end of 2012, Klabin expanded its look over the value chain and kicked off a pilot project of mapping and monitoring the supply chain. This action, directed at the more than 4,000 company suppliers, was developed in four complementary stages: 1) officializing social and environmental commitments and guidelines that are essential in a Klabin Supplier Contracting Policy; 2) inclusion of social commitments and environmental obligations in service agreements entered into with suppliers; 3) creation of a criticality matrix that analyzes and classifies the company's suppliers utilizing economic-financial, social and environmental criteria, and 4) developing a supplier audit program that is attended by the company, to be implemented in

2014, monitoring social and environmental practices of suppliers considered the most critical in the matrix.

The improvements stemming from partnerships between suppliers and players, however, present certain challenges. Improvements call for significant changes in equipment and installations, which require considerable financial resources. "More government incentive is still necessary in order for everyone to have access to these resources and make organizations cleaner and more efficient", says Farina. They believe that a good alternative for facilitating the pursuit of innovation is approximating companies with research and education institutions.

In turn, Fibria's Environment general manager draws attention to another difficulty: the slowness in obtaining environmental licenses. "We carefully analyze all risks involved in the area where we allocate capital, in order to have the best return possible, be it in a maintenance or improvement process. However, it is necessary to make long-term projections and, many times, environmental licenses are very slow." Cinque underscores that, although the bureaucratic issues that involve Brazilian environmental agencies is not an obstacle for achieving advancements, it ends up delaying the development of projects aimed at achieving gains.

Regarding the speed of positive changes that directly apply to players in the pulp and paper industry, Foelkel says: "we are a sector that works with well-structured and consolidated technologies and does not overly risk. This inherent characteristic makes chances of improvement to not occur in major proportions and in a radical manner, but rather in progressive stages, following a continuous growth and improvement process. They are, in my opinion, clear aspects of a capital-intensive industry."

Biorefineries: the trump car of eco-efficiency

As very recurring theme among different representatives in the pulp and paper production chain, biorefineries have lately been in the spotlight. "The possibility of integrating kraft mills with accessory units intended to take advantage of the material generated and not consumed by pulp and paper mills to generate new products, such as biofuels, biomaterials, nanocellulose and others, would add value to the business", says Foelkel about the significant interest.

In practice, the integration of plants with distinct objectives tends to be a major trump card of eco-efficiency. "Biorefineries can further boost eco-efficiency, particularly if processes are created that utilize the waste today generated by industrial and forestry operations", says Rosele. "If there is social environmental responsibility, as well as a commitment to eco-efficiency, the results for the sector could be much better than the results achieved at present," she believes.

Still looking at the future, the CNTL engineer bets on greater operational and energy efficiencies, scale increases, closing of circuits and reduction of unit pollution loads. Rosele also believes in the creation of multi-business production clusters, always associated to the concept of eco-parks.

In spite of the many benefits aspired with the practical implementation of biorefineries, certain particularities require caution, as pointed out by Foelkel. "In the event they are not well developed, these biorefinery projects could cause higher energy consumption, leading to waste", he said. "Any change in a production process currently adopted needs to be very well balanced and carried out in a detailed manner, based on appropriate engineering, technology and efficiency knowledge", he said, encouraging the maturing of studies in this area. ■

Greater operational and energy efficiencies, scale increases, closing of circuits and reduction of unit pollution loads reflect the future of the pulp and paper industry

Obligatory technologies for parks that aspire state of the art status

According to Celso Foelkel, consultant and writer at Grau Celsius and chairman of the 46th Pulp and Paper International Congress and Exhibition, it is consensus that certain technologies are indispensable for any new bleached kraft pulp mill.

As intensive technological obligations, Foelkel lists: kraft cooking modified with pre-impregnation of wood chips, oxygen delignification, ECF bleaching, efficient pulp washing, low odor recovery boiler, multiple stage evaporation for roughly 80% of solids in concentrated black liquor, secondary or tertiary effluent treatment, use of biomass as fuel in substitution of fossil fuels, flash drying of lime mud in furnace, fluidized bed boiler, condensate distillation system and burning of volatile gases.

Foelkel also points out that simply having the best technologies isn't sufficient, it is also necessary to operate them well, with responsibility and commitment in relation to stakeholders, including people and nature.