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The progress of automation in the sector

Technologies implemented in the various stages of the pulp and paper production process offer competitive advantages on a global level to players in the sector

The layouts of current pulp and paper mills look very little like those installed years ago. Many technological advancements have changed the looks of mills in the sector. Of the most transforming implementations, automation technologies stand out as the most important as they have significantly optimized the pulp and paper production process. "All pulp and paper production stages have undergone some sort of change. In practice, what we see today is continuous monitoring throughout the entire production stage", summarizes Marcelo Motti, Metso's Vice-President for South America.

According to the executive, the technologies currently available today are fruit of a combination of various factors: more affordable technology prices for automating processes and the growing pursuit for quality and productivity. "The technological wave embedded in such equipment has provided some impressive results in terms of production control", he said.

Klabin's Specialist Engineer and Coordinator of ABTCP's Technical Automation Committee, Edison Strugo Muniz, says that big investments in building new pulp and paper mills around the world have yielded the kraft production process even greater development than that seen in other segments comprising the paper industry.

Comparisons aside, the fact is we see a series of technological innovations today, from forest to end product, as you can read more about in this month's Cover Story.

FRANKLIN XAVIER

MP9 Control Room: integrating operational controls of a paper machine in a single environment is already done at Klabin

Pulp mills

In search of competitiveness, investments in high quality products are growing more and more. According to Muniz, automation provides a service of utmost efficacy in achieving this goal. The offer of online analytical equipment in all stages of the pulp production process, for example, results in more precise monitoring with advanced control applications.

The initial pulp production stages, however, stand out for the transformations they have undergone. "Over the last decades, the production of baby plants have experienced highly important and major evolutions", says Muniz. "The main innovations were caused by automation in Brazil's forest nurseries, which include the production of plants in series using modulated and compartmentalized nurseries", he said about forestry management.

The automation of nurseries resulted in benefits for Brazil's entire forestry sector, given the plant propagation possibility of the best eucalyptus trees. "The cloning of 'superior' trees resulting from crossings and the large scale use of this technology were the two main factors that led Brazil to gain international reputation in the production of high-quality low-cost eucalyptus", says ABTCP's Coordinator of the Technical Automation Committee

The technologies offered by ABB point to increased automation integration with other areas and systems in the mill

ABB IMAGES

METSO IMAGES

"By monitoring the process already in the cooking stage, the chances of interference in the bundling process drop significantly, leading to considerable economies of scale", says Motti, from Metso

and Klabin's specialist engineer.

Increased total productivity of forests, improved wood quality, greater operational yield and reduced cost and environmental impact are some of the advantages provided by forestry mechanization. However, Muniz says that the main objective of automation in this stage of the process consists in obtaining the lowest forest harvesting cost, composed of cut, extraction and transport.

The technologies used by machines installed in the forest include length, diameter and volume sensors. "The trees are removed, cut into specific lengths and may even be debarked on-site", says Muniz.

Looking at the pulp production line, online analyzers are considered major contributors to improving cellulose pulp quality. "Systems today include automation with optimization software that use multivariable controllers and artificial intelligence, such as fuzzy logic and neural networks", says ABTCP's Coordinator of the Technical Automation Committee.

Designed to produce 1.14 million tons/year of pulp, Cenibra is the typical example of a player that invests in technology to optimize its production process. "The improvements promoted by the Maintenance, Engineering and Process teams have created new ways for operating that eliminate bottlenecks identified at the mill", says Ronaldo Neves Ribeiro, Manager of the Information Technology and Telecommunications Department.

The continuous pursuit of better operational results includes automation projects. From 1997 to 2003, Cenibra substituted its electromechanical

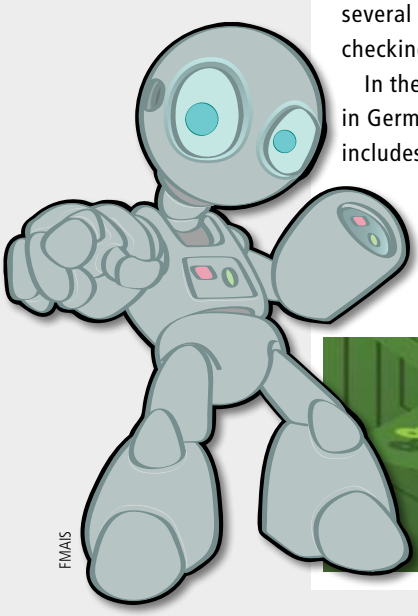
BENCHMARKING IN AUTOMATION

Due to globalization and the transfer of technology, Brazil currently ranks among the countries registering major advances in the automation area, says ABTCP's Technical Automation Committee Coordinator, Edison Strugo Muniz. "I would say that Brazil is one of the leading countries in terms of technology in the pulp and paper sector, especially in the pulp segment", agrees Francisco Razzolini, from Klabin.

However, Scandinavian countries are a level higher. "A lot of research is developed in this area and practically all their mills have been utilizing online metering systems in their processes for several years. Down here, such equipment still carries a high costs and require monitoring for checking preventive maintenance conditions and improving measurements", says Muniz.

In the vision of Ivan Medeiros, from Voith, paper mills that use the latest technologies are located in Germany, Finland, Switzerland, Sweden and China. Benchmarks in terms of pulps mills, Medeiros includes Brazil, Chile, Uruguay, China and Indonesia.

"When we talk about process knowhow, Brazil is at the top, given the four plus decades of planting and processing of eucalyptus for making paper", says Rajendra Mehta, from Smar. "Automation adapted to the process knowledge brought over by foreigners and joined with our own knowledge", he said.



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systems for others with digital controllers (SDCDs), programmable logic controllers (PLCs) and intelligent motor control centers (iMCCs). Between 2007 and 2010, Advanced Process Control (APC) system projects gained importance, together with the evolution of Manufacturing Execution Systems (MES) and routine management, in which a methodology structured by statistical calculations determines the best indicators for each production unit.

According to Motti at Metso, the current information systems responsible for collecting data from the entire mill are capable of generating detailed reports all the way back to the initial phases of the productive process. "Today, it is possible to control the use of raw materials all the way down to wood chips", he said, referring to today's level of technology. "Monitoring the process as of the cooking stage drastically reduces the chances of interference in baling, since the operational team is able to make the necessary interventions and also reduce the amount of scrap. There are significant economies of scale", he said.

The results of investments made by Cenibra are in fact observed in less consumption throughout the entire process. "At present, we produce more pulp with less chemical products, raw materials, water and energy", says the company's IT and Telecommunications Department Manager. "When Cenibra started operating in 1977, it produced roughly 1,000 air-dry metric tons/day, with a single mill operating. After these evolutions, its production reached 3,360 adt/day, with two mills operating", compares Ribeiro.

For Roger Evans, Global Director of Pulp and Paper Industrial Solutions at Invensys Operations Management, automation's contribution to the pulp industry can clearly be seen by the increase in production capacity. "Production units more than doubled their capacity, something that would be unthinkable without the help of automation", he said. "Manual control of the lime kiln, for example, is very difficult, but the use of advanced process control allows for rigorous monitoring. The same occurs with potentially dangerous process units, such as recovery boilers, reactors and oxygen and chlorine dioxide generators."

Continuing with Cenibra as a practical example, it is important to point out that besides the increase in volume, the company also improved the quality of end products and complied with legal regulations. This last item stands as a driver of technological improvement. "The evolution in normative requirements significantly contributed to the application of automation in industrial processes", says Ribeiro. In the executive's opinion, standards relating to the Labor (NRs) and Environment Ministries have encouraged suppliers to develop more appropriate systems and equipment from a sustainability perspective.

Next steps

With regards to technological perspectives focusing on the pulp segment, Muniz believes that manufacturers of machinery used in forest-harvesting tend to give continuity to the evolution and incorporation of control systems supported by software applications, as well as invest in self-diagnosis systems. "They shall also present improvements in communication and controls, with new systems for monitoring activities and transmitting information" he envisions.

HONEYWELL IMAGES

Honeywell's OneWireless Network, is an industrial wireless network that supports Wi-Fi and industrial applications simultaneously

CUTTING EDGE TECHNOLOGIES AVAILABLE IN THE MARKET

In order to achieve the best productivity and quality results, pulping and paper production processes receive more and more support from automation. Some of the technologies offered by the main suppliers include:

Online Analyzers: tools that have reduced the amount of manual intervention and inspired the adoption of preventive measures throughout the process;

Advanced Process Control (APC): increased process yield and uniformity to beyond manual control capabilities. Modern control systems include sophisticated diagnostic tools that reduce maintenance costs and unscheduled downtimes;

Web Inspection Systems (WIS): allows identifying and automatically classifying the paper defect identified, providing online high quality photo and also assists the operator in identifying the probable cause of the defect and likely solution, proposing procedures for eliminating a flaw. It has also become an important element for operator safety, which is one of the main concerns of pulp and paper mills;

Energy Management Systems (EMS): are one of the most recent automation technologies, integrating electrical automation with the process automation system using the IEC 61850 protocol, a new data communication feature that allows controlling, protecting and operating electrical systems;

Fieldbuses: reduce the complete process-cycle cost, including the operation phase (production) and maintenance.

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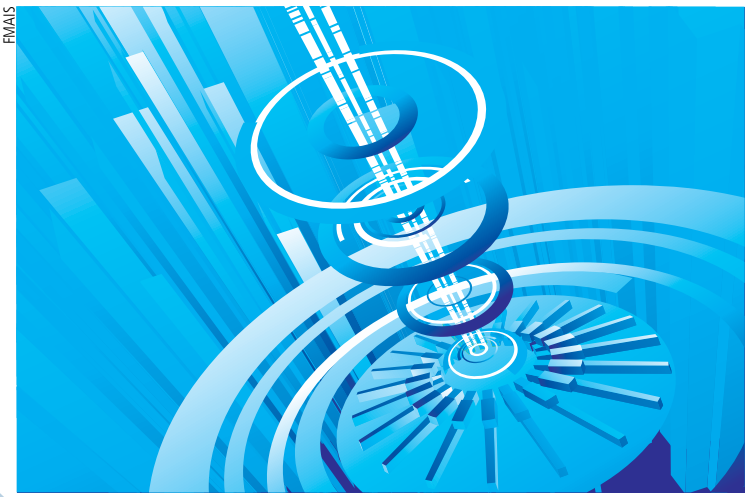

With a similar vision, Motti points out that the continuous concern towards quality and productivity shall again lead pulp producers, as well as suppliers of these functions, to stay aligned with new technologies. "The increase in quality and productivity requirements ends up leveraging the entire chain to seek technological innovations, as well as invest more in monitoring, not only of the process, but also in the maintenance area, with 24 hoursx7 days and online service."

Roger Evans, Director at Invensys Operations Management, says that the automation sector is working to reduce service costs, as it improves its capacity. However, he points out that "integrated engineering tools reduce mill configuration costs and allow for better integration".

Paper mills

When looking at a paper production mill to analyze the evolution of automation technologies, the paper quality online measurement and control systems (QCS - Quality Control Systems) stand out. "More precise sensors and more efficient control algorithms were introduced, satisfying a demand generated by paper machines that are faster, wider and with narrower variability limits", says Fernando Oliveira, ABB's General Manager of Pulp and Paper for South America.

According to the executive, asset management systems are also being used considerably at paper production mills, as well as new technologies in sectional drive systems.

The adoption of such trends results in more precise analyses and, consequently, improvements in paper machine performance. The logic is simple: "With the better measuring of chemical products, the quality of fiber entering the paper machine increases, as does the paper produced", says Muniz.

The technologies gaining space over the last ten years can be translated as real time information management systems with the capacity to store large amounts of data collected automatically. In

addition to resources for acquiring and storing data from all points in a production unit, users also have the possibility of obtaining data in different formats, such as trend graphs, reports, spreadsheets for viewing data about profiles of variables.

Automation evolution has also altered premises for building pulp and paper mills. "Electrical rooms are smaller and distributed in a much more efficient manner throughout the mill. The amount of control cables and related trays, for example, dropped considerably", said Oliveira about layout changes.

This integration of operational controls at mills using advanced software is already perceived as common practice among players that keep up with automation technology advancements. Klabin is part of this group. In the daily routine of mills, what you see is management being done from a single room. "This provides for better communication and, consequently, more efficient management of operations", says Francisco Razzolini, Klabin's Planning, Projects and Technology Director.

In addition to grouping operations in a single environment, the amount of information available about each stage of the productive process increased. "The electronic system adopted provides much quicker and more precise answers, leading to greater uniformity in the process and product", says Razzolini about the main gains from investing in automation.

Aside from ensuring a better level of quality, the company was seeking greater operation reliability and less maintenance need, which led to lower operating costs. "By centralizing operations, we also ended up qualifying and optimizing the number of workers in the production areas", he said. Klabin's Planning, Projects and Technology Director also says that automation is already part of all company production units, albeit a few differences in technology level.

"There are some units where almost all processes are automated, while others are in their final process of automation", he said. Klabin's greatest example of automation is, without a doubt, the paperboard machine in Monte Alegre, Paraná. "It is a machine with a capacity to produce 400 thousand tonnes/year of board for packaging and extremely automated", describes Razzolini.

In practice, an average of 7 thousand control loops practically waive the need for operators next to the machine. The equipment even comes with an automated packaging system. "Today, we have robots that package paperboard reels", said Razzolini, while talking about the R$ 2.2 billion investment Klabin made in 2007.

Papirus is another player that has invested in automation to improve the quality of its products and, at the same time, reduce production costs. "Over the years, the production hours available increased", said José Claudio Moreira, the company's Engineering, Maintenance and Environment Manager.

Today, the almost 6 thousand tonnes of paperboard produced monthly by Papirus are the result of various changes: automation of the fiber refining system, more precise control over pulp tank levels (including the automation of ingredients that make up the furnish) and installation of a supervisor at the paper machine, where the operator and assistants control the entire equipment, from pulp preparation to the winder.

Benefits of the investments can be noted in various ways, but the reduction in paper web breaks is one of the most important gains. "We used to have 2 to 2.3 breaks/day, and now this number has dropped to an average of 1.2", says Moreira. The Manager also mentioned the reduction in machine set-up time and rejected products. "The combination of these items represented, over the years, an increase in net production."

Improvements to paper machines

Automation will always be present in processes where it is possible to substitute manual activities for automatic functions. This is what Voith Paper Brazil's Automation Sales Manager, Ivan Medeiros, says. Not by chance, paper machines have received important investments in automation, allowing for rapid and precise actions in correcting processes,

Automation technologies allow for considerable optimization in the pulp and paper production process

With the evolution of automation, electrical rooms have become much smaller and distributed in a much more efficient manner throughout mills

improving quality of end products and reducing risks for operators and equipment.

A series of technological developments have marked the trajectory of equipment we see operating today. Ben Blanchette, Honeywell's Global Pulp and Paper Business Development Manager, says that measurement and control improvements in paper machines have allowed achieving new milestones in terms of speed and quality. "Additionally, more advanced controls have enabled smaller machines to produce high quality items, using less energy and reducing raw material expenses, a key factor for remaining competitive."

However, Medeiros points out that each type of paper has different technological requirements. "Print paper machines underwent major advancements due to the brutal increase in operation speed and product quality improvement requirements", he said. To keep up with these demands, automation developed better and more reliable solutions, such as color measurement sensors, as well as for measuring thickness without coming in contact with the web, as well as for sheet formation using images.

In 2003, Stora Enso Arapoti decided to improve its paper machine, installing a Jet Module, a transversal control of basis weight that dilutes the pulp directly in the headbox. "At the same time, we inserted an auto-vacuum box with the objective of increasing dryness in the Duoformer sheet formation exit", said the unit's Industrial Director Lucinei Damalio.

"The goals were achieved and exceeded", he said referring to the gains obtained from these installations. According to Damalio, the transversal profile control of basis weight, coupled with an independent fiber control orientation, improved print quality as proven in the PPS (Parker Print Surf) smoothness results in the various production stages, as well as by the missing dots measurement.

More advances on the way

The combination of operational efficiency with reduced costs and quality excellence, translate a constant goal of the pulp and paper industry, as commented by ABTCP's Technical Automation Committee Coordinator. It is the mission of suppliers in the automation area to make this objective a fact.

"Trends point to even greater integration of automation with all other areas and systems of mills", envisions Fernando Oliveira, from ABB. The executive points out that, today, integration is still partial, but that in the future automation will interconnect Enterprise Resource Planning (ERP) systems, Manufacturing Execution Systems (MES), Energy Management Systems (EMS), Process Information Management Systems (PIMS), Computerized Maintenance Management Systems (CMMS) and Laboratory Information Management Systems (LIMS). "Operators will no longer need to worry which systems they are accessing, and will be able to focus solely on the information they need for executing their tasks", he said.

For Honeywell's Manager, wireless technologies, such as mobile operating stations, are yet to take over most of the spotlight in automation. "They tend to be used more by operators and engineers, with the objective of improving production efficiency and reduce programming time of control systems", he said. Blanchette also believes that this is an effective way for adding control elements to already existing systems.

Smar's Pulp and Paper Director, Rajendra Mehta, bets on the popularization of fieldbuses which, according to him "shall become a standard protocol. Transmitters will become even smaller, lighter and cheaper, while wireless transmitters will gain market acceptance". Connectivity through the web for operating, monitoring and, especially, for managing are other trends mentioned by Mehta. "Since we know that maintenance nowadays is an important factor for a process to run with little downtime, packages like Asset Management will be adopted without restrictions", he said, making yet another automation projection in the sector. ■