

issue 57 | 2023

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A NEW WAY FORWARD:

How can the EU-GCC
cooperate strategically in
the energy sector shift?

Sneak peek at
Baby diaper
market

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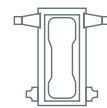
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02 Around the world

17 In the Spotlight

- 17 A New Way Forward: How can the EU-GCC cooperate strategically in the energy sector shift?

25 Industry Issues

- 25 High performance sustainable Tissue Paper from agricultural residue: A case study on fique fiber from Colombia

28 Market Trends

- 28 A sneak peek at baby diaper market

30 Technical Solutions

- 30 How to preserve paper bulk thanks to our SMARNIP® mini shoe press

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TURKEY

Essel Kâğıt achieves maximum production efficiency with Toscotec's tissue line

Turkish tissue producer Essel Kâğıt's new AHEAD 2.2L machine has exceeded its guaranteed production by a large margin and surpassed bulk and softness parameters. Supplied by Toscotec on a turnkey basis, PM3 had come online at Essel's Osmaniye mill in Turkey in October 2021. After start-up, Toscotec has been providing continuous support to fine-tune the whole plant and achieve top performance.

Ahmet Temuroglu, Production Coordinator and Burak Ipek, Maintenance Manager at Essel Kâğıt, say, "The target of our performance test was successfully accomplished with a production of 290.5 tpd on a 23 gsm towel grade at the speed of 1,810 m/min. We are now fully reaping the benefits of Toscotec's first-in-class technology across our entire product range both for tissue quality and consumptions."

Nicola Fontana, Senior Papermaker at Toscotec, says, "This double-width AHEAD line is delivering a high and stable performance. TT NextPress is offering good results of bulk and hand-feel even at maximum load on low basis weights, exceeding Essel Kâğıt's strict quality standards."

Andrea Rossi, Toscotec's Commissioning Manager, says, "The performance test confirmed the machine's low energy usage we had been monitoring including at the speed of 2,000 m/min. The total energy consumption is well below the guaranteed figure. The cooperation with Essel's team was extraordinary and they did a fantastic job in getting the machine ready to achieve its top efficiency."



FRANCE

Toscotec to supply low-carbon design tissue line to MP hygiène

MP hygiène has selected Toscotec for the supply of its second tissue line at Annonay mill in France. Scheduled for start-up in 2024, the new AHEAD 2.2 (PM2) will be supplied on a turnkey basis. This is Toscotec's second turnkey supply to MP hygiène, following PM1 that came online in 2012.

The high-performance machine has a sheet trim width of 2,800 mm, a design speed of 2,200 m/min and a capacity of 38,000 tpy. Equipped with Toscotec's winning combination of latest design shoe press TT NextPress and TT SYD Steel Yankee Dryer, this AHEAD 2.2 will also be the first high speed machine in the tissue industry to feature an entirely electrical air system with three stages of heat recovery. Toscotec's high efficiency TT Hoods are equipped with both natural gas fueled burners and electric heaters. The air system is designed to offer three efficient operation modes: gas-heated, electrically heated and a combination of the two, to ensure maximum flexibility in the choice of energy sources based on availability, cost, and carbon footprint. In full electrical configuration, MP hygiène will eliminate the direct carbon emissions linked to the hood drying process.

Christopher Colin, COO of MP hygiène, says: "We trust Toscotec is the right partner for our strategic expansion project, based on their proven capabilities managing complex turnkey operations and their focus on innovation. Toscotec's turnkey expertise and experience allows them to offer us the flexibility we need to achieve our growth targets".

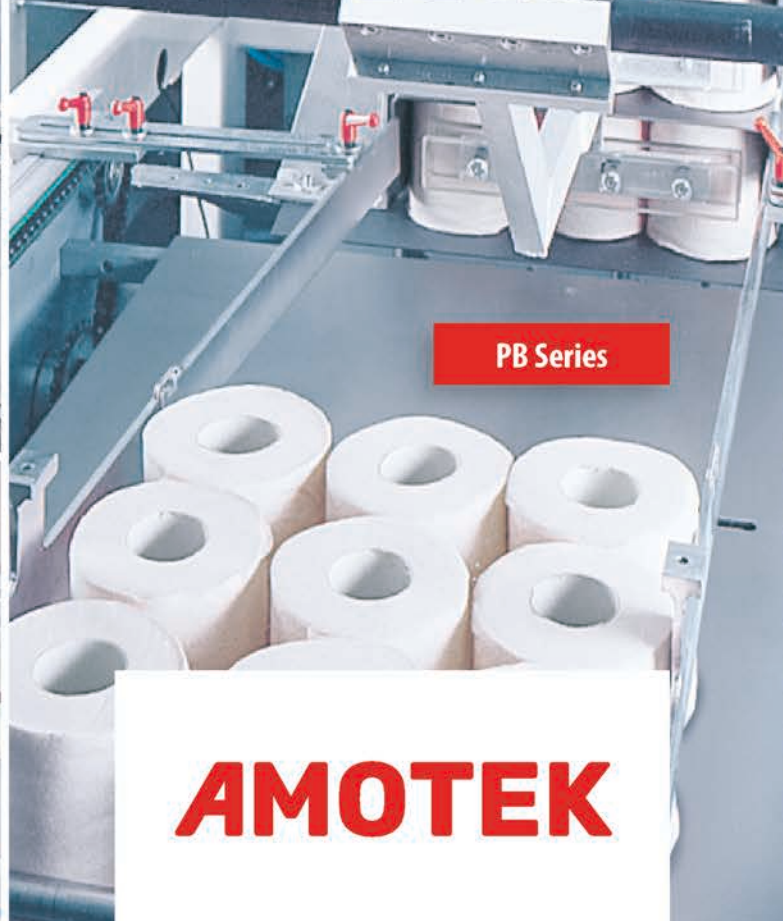
Riccardo Gennai, Toscotec's Sales Manager, says: "Ten years after the start-up of PM1, Toscotec is very pleased to partner again with MP hygiène on a highly technological project. This innovative electrical air system will offer them a key tool to continue on their current path of decarbonisation. To optimize the use of resources, we also designed the layout and turnkey supply of PM2 as perfectly integrated with PM1".

MP hygiène is the largest French manufacturer of pure cotton wadding paper labelled Origine France Garantie, as well as producer of non-woven wipes, soaps, and hand hygiene solutions. It operates 4 facilities in the Ardèche department in southern France, including Annonay Pupil paper mill which has a total manufacturing capacity of 60,000 tpy of paper refills for the professional market, round products (hand towels rolls, industrial rolls, toilet paper), and flat products (hand towels).





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GERMANY

A.Celli & Innovatec: a strong and long-term partnership

Manufacturing quality, reliability and performance: why Innovatec relies on A.Celli E-WIND® technology for their meltblown and spunbond production lines since 2014.

A.Celli Nonwovens and Innovatec first project together dates back to 2014, when the latter established a first 1.6 spunbond Reicofil line equipped with the A.Celli in-line slitting winder "WINDY CUSTOM". A.Celli technology, together with the construction quality, the performance and the first-rate customer service, impressed Innovatec so much that A. Celli was selected to supply other five winders dedicated to medical and filtration applications between 2016 and 2020.

Four STREAM IN-LINE slitting winders, equipped with a system for the handling of finished reels and shafts were supplied to serve the new 1.6 meltblown production lines. All this in addition to the E-WIND® NEXUS, the top of the range in-line slitting winder equipped with the Slittomatic knives positioning system and automatic handling of the finished reels destined to the new 3.2 spunbond nonwovens production line. About the long-lasting partnership between our companies, Mr. Daniel Jaeger, Innovatec Technical Director, says: "A.Celli convinces with practical, innovative and creative approaches to meet the requirement of Innovatec's production processes. A.Celli's design department and machine production is conspicuous and remarkable. Thanks to a quick perception, as well as to the outstanding efficiency of both departments, the winders are finished precisely and on time. Everything is supported and coordinated by a friendly and knowledgeable sales department, while in the background works a reliable customer service, available quickly both on site and online and ready for the desired action. Finally, the price/performance ratio is in a fair range that satisfies us. The long experience with A.Celli has given rise to a deep relationship of trust and friendship."

Innovatec® was established in the North Rhine-Westphalian city of Troisdorf in 1995. The company immediately invested in one of Europe's most modern melt blown units and the product portfolio has since been expanded to include high-tech materials for the medical and food sectors. Products made in Troisdorf include liquid absorbents for the food industry, elastic nonwovens and filter products for the hygiene and medical sectors.



ITALY

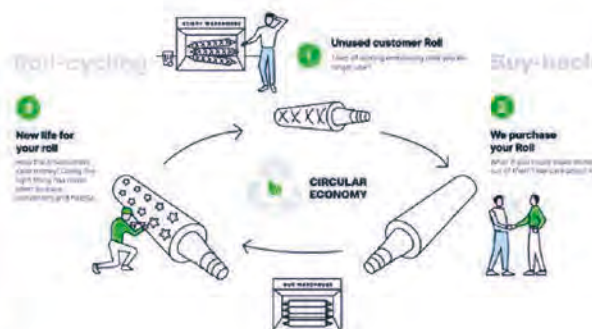
Buy-Back and Roll-Cycling: Engraving Solutions' environmentally sustainable solutions to curb energy waste and reduce costs

Engraving Solutions, the Körber Group company that specializes in designing and engraving embossing rolls, presents two innovative services that meet tissue manufacturers' demand for products with a low environmental impact.

Giacomo Tambellini, Sales Account and Product Engineer comments: "We have long been witnessing two needs in our customers: on the one hand, the demand for solutions that are able to contain the waste of energy and raw materials, and on the other hand, to "cost saving" with a view to eco-sustainability. The rolls used in the production process, over time, may be subject to degradation or sudden damage. In addition, the changing needs of the market fan that rolls may go out of production because the eimbossing pattern became old fashion. Through these two Buy-Back and Roll-Cycling services, we believe, in our role as a strategic all-round solution partner, that we have responded to customer and market demands."

Indeed, embossed rolls are a strategic element of a tissue converting line that can not only help manufacturers differentiate their products but also improve their technical characteristics and aesthetic .

Buy-Back and Roll-Cycling are complementary: the first is in fact a buy-back service, conceived after a careful evaluation of the unused embossing rollers by the Körber purchasing department; the engraved pattern on the roller is immediately destroyed and the surface regenerated to be used again. The second service is Roll-Cycling, thanks to which a new roller is made starting from the one regenerated. The result is a product with the same performance as the new one, but at a lower cost with less environmental impact. Tambellini concludes: "This is a truly circular economy: thanks to the buy-back service, unused rollers are recycled, while with Roll-Cycling products are created as new, safeguarding the environment by reducing the emissions necessary to build new ones".





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ITALY

Cartiera Confalone achieves top performances on Toscotec's tissue line

The AHEAD 2.2 tissue machine supplied by Toscotec to Cartiera Confalone is operating at the maximum speed and is largely exceeding its guaranteed production capacity. After start-up of this turnkey tissue line in September 2021, Toscotec has followed through supporting Cartiera Confalone to optimize the process and achieve top performances.

Valter Di Nardo, Chief Customer Service Officer of Toscotec, says, "Considering the soaring costs of energy here in Italy, our service team has worked closely with Cartiera Confalone to maximise the drying performance of the machine by fine-tuning TT NextPress and TT Hoods to take full advantage of the cogeneration system."

Gaetano Confalone, Sole Director of Cartiera Confalone, says, "The great cooperation between our team and Toscotec stands behind today's results. Together we have executed this project in the midst of the Covid-19 pandemic, and we wouldn't be here today if it weren't for our joint efforts to achieve excellence on this new line both in terms of tissue quality and production capacity. We appreciated Toscotec's expertise and flexibility throughout this whole journey together."

Riccardo Gennai, Sales Manager of Toscotec, comments, "Toscotec has a long-standing partnership of more than 20 years with Cartiera Confalone. In 1999, we installed their first tissue line at Maiori mill. A decade later, we proposed to replace PM1's cast-iron Yankee with Toscotec's most updated technology, our leading-edge TT SYD Steel Yankee Dryer. We have always worked together as trusted partners, and we will continue on this path in the future."

With origins dating back to 1800 when a paper mill producing handmade paper was set up in Maiori, Cartiera Confalone made flattened and creped paper until the 1970s when production was converted to tissue. It is a family-run manufacturer of toilet tissue, kitchen roll, napkins, and jumbo rolls, distributing both in Italy and in international markets.



UK

WEPA Group doubles production capacity

The WEPA Group has started up a new paper machine at its Welsh site in Bridgend, thus doubling its production capacity for the British market. The paper produced is converted into toilet and kitchen paper for the UK consumer market in which WEPA has a leading role. The investment created over 50 new jobs at the site.

The new paper machine has a production capacity of 70,000 tons of tissue paper per year and is designed to produce hygiene paper products from virgin fibres as well as 100% recycled fibres. With its high energy efficiency, the new tissue machine sourced from manufacturer Valmet also significantly contributes to cutting CO2 emissions and water usage. This saves resources and optimizes cost structures. The new paper machine is technically state-of-the-art and is designed to produce the highest quality in terms of softness, strength and absorbency.

The investment project includes new buildings to house the stock preparation equipment and the new paper machine. In parallel, several converting projects have been executed including a new line for lotioned and perfumed bathroom tissue products.

Martin Krengel, CEO of the WEPA Group: "With the largest single investment in the history of the WEPA Group, we are further strengthening our claim to both: technology leadership and market leadership for sustainable hygiene papers."

The UK is a significant growth market for WEPA. Martin Krengel: "To us it is important to foster market-orientation and to produce for our UK customers in their own country. The investment in Bridgend is an investment in the future and our long-term customer partnership. It strengthens our position in the UK market with highest benchmarks in sustainability and product quality and as part of the project we created over 50 new jobs." The workforce at the Welsh WEPA site now amounts to 325 people.

The site in Bridgend has been part of the WEPA Group since 2013 – initially as a joint venture before being fully acquired in 2018. With this investment, the WEPA Group strengthens its competitive capability as one of the three largest European manufacturers in the hygiene paper market. With a total of 22 paper machines, the group has a production capacity of approximately 850,000 tons per year.

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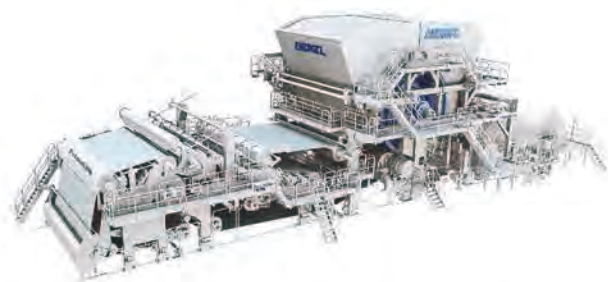
ANDRITZ to supply two tissue machines to Guangxi Sun Paper

ANDRITZ has received an order from Guangxi Sun Paper to supply two tissue machines for its new mill in Beihai City, Guangxi Province, China. Start-up is planned for 2021.

The ANDRITZ tissue machines are of the type PrimeLine™ W 2000, with a design speed of 2,000 m/min and a working width of 5.65 m. They are equipped with a large suction press roll, an 18 ft. PrimeDry Steel Yankee with head insulation, and a re-evaporation system, thus enabling energy savings. The scope of supply also includes FibreSolve FSV pulpers, the paper machine approach flow systems, broke handling and fiber recovery, and automation systems (QCS, DCS).

In July 2019, Sun Paper established a wholly owned subsidiary – Guangxi Sun Paper – to build an integrated pulp and paper mill in Beihai. For this mill, ANDRITZ was awarded the supply of pulp dewatering and white liquor plant technologies, key process equipment, and a chemi-thermomechanical pulping system in June 2020. The new greenfield mill in Beihai will eventually have a total pulp and paper capacity of 3.5 million tons annually and will be constructed in two phases over approximately five years.

The present order underlines the strong partnership that Sun Paper and ANDRITZ have in tissue. For the production site in Shandong province, ANDRITZ has already delivered two tissue production lines with tissue machines, stock preparation and automation that have been in operation since 2014 and 2015, respectively. This order once again confirms ANDRITZ's strong market position as one of the leading suppliers of machines and systems to the Chinese tissue industry and ANDRITZ's expertise specifically in wide tissue machines and resource-saving components like steel Yankees.



ANDRITZ will supply two PrimeLine™ tissue machines to Guangxi Sun Paper. Photo: ANDRITZ

Asia Symbol chooses BaoSuo to start tissue business

Asia Symbol has officially entered tissue production in China. The company chose BaoSuo Enterprise Group as supplier for its multiple factories in mainland China. The tissue project of Asia Symbol covers a series of high-quality intelligent equipment, including advanced tissue-making machines, tissue-converting machines, and packaging machines of various types.

The tissue production workshop of Asia Symbol includes a number of selected BC1600-2850 Crescent Former Yankee tissue machines produced by Baotuo Paper Machine, the subsidiary of BaoSuo Enterprise Group. Production speed exceeds 1500m/min, designed annual production capacity reaches 25,000 tons/set. The machine features high intelligence and is environmentally friendly.

The converting workshop of Asia Symbol includes the following intelligent converting and packing machines YH-PL190-2900 full automatic facial issue production line, YH-FG180-1500 full automatic facial tissue production line, YD-PL450-3000 non-stop rewinder line, YD-PL450C-3000 non-stop rewinder line, YD-PL450SE-2900 non-stop JRT rewinder line, PF-EA-3000 automatic slitting rewinder (two-color printing), MJ-NJPJ225-1500 full automatic N Fold towel production line. The machines are produced by BaoSuo Machinery and BaoJin Technology, both are the subsidiary of BaoSuo Enterprise Group.

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INDIA

Gayatrishakti enters tissue business

Toscotec will supply a complete AHEAD 1.8 tissue machine to Gayatrishakti Tissue to be installed at their paper mill in Vapi, Gujarat. The Indian manufacturer is entering the tissue market with this new line slated for start-up in 2024.

The AHEAD 1.8 tissue machine has sheet trim width of 2,850 mm, an operating speed of 1,800 m/min, a production of over 35,000 tpy.

Shri G. N. Agarwal, Managing Director of Gayatrishakti Paper & Board, says, "We selected Toscotec because we wanted to invest in state-of-the-art tissue making technology. We value their solid experience in guiding and sharing their expertise with newcomers in tissue. Gayatrishakti is a well-established board manufacturer in India and based on our strong background in Paper and Board, we understand the importance of choosing the right partner for this new market entry."

Marco Dalle Piagge, Sales Director of Toscotec, says, "Toscotec is committed to providing Gayatrishakti with first class support to ensure their successful penetration of the Indian tissue market. Thanks to Voith's global presence, they can also benefit from local services offered by Voith Paper India. With this new project, Toscotec strengthens its presence in Southeast Asia where we received two new orders of complete tissue lines in 2022."

Gayatrishakti Tissue is a subsidiary of Gayatrishakti Paper & Board Ltd (GSPBL). GSPBL is a leading a manufacturer of a range of premium grades of duplex packaging boards and kraft paper. Established in 1996, it has a head office in Mumbai and three manufacturing facilities with a combined installed capacity of 300,000 mta in Vapi & Sarigam GIDC, Gujarat state, India.



Toscotec and Gayatrishakti contract signing.

VIETNAM

ANDRITZ receives follow-up order from Xuan Mai Paper

ANDRITZ has received an order from Xuan Mai Paper Co. Ltd. to supply a PrimeLineCOMPACT S1800 tissue machine for its production line PM2 at its mill located in Ho Chi Minh City, Vietnam. The tissue machine will enable the production of high-quality tissue grades made of either 100% virgin or 100% deinked pulp (DIP). Start-up is scheduled for 2024.

The tissue machine will have a design speed of 1,800 m/min, a width of 2.85 m and a design capacity of 72 admt/d. The suction pressure roll will be covered with a polysoft polyurethane cover for high-performance dewatering. The PrimeDry Steel Yankee (16 ft. diameter) in combination with a steam-heated COMBO hood enables highly efficient drying with substantial energy savings.

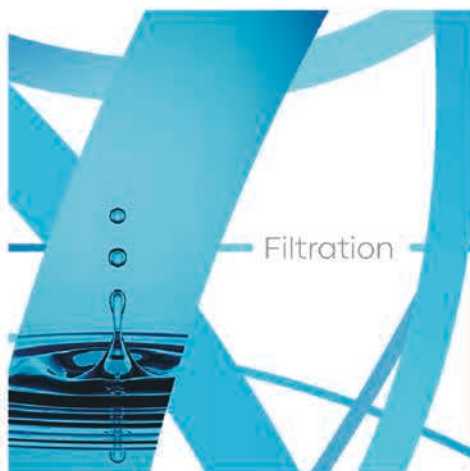
ANDRITZ will also deliver stock preparation and automation equipment, as well as process-, fan- and multistage-pumps and auxiliaries.

Pham Van Dung, Vice President of the Board of Xuan Mai Paper, says: "ANDRITZ's innovative tissue solutions offer both economic and ecological benefits. Professional service offers perfectly complement the technology. Since 2012, we have established a long-term cooperation that is built on mutual respect and trust. Our joint projects are in the areas of old corrugated containerboard lines, deinked pulp lines, and tissue production lines."

In 2020, ANDRITZ already started up a complete tissue production line at Xuan Mai Paper. This follow-up order once again confirms ANDRITZ's strong position as a long-term partner to the global tissue industry and as the number one supplier to the Asian tissue industry.



Signing of contract for the follow-up order. Photo: ANDRITZ



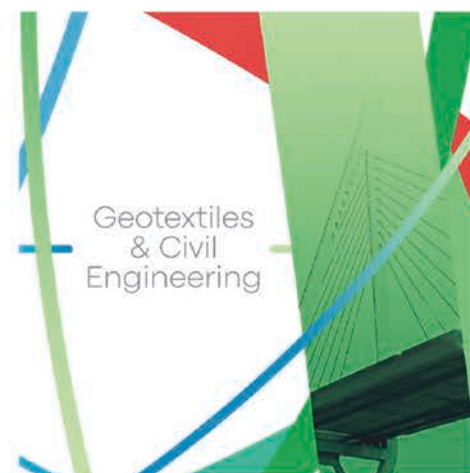
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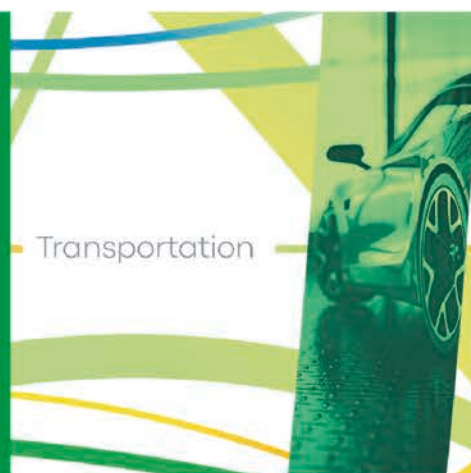


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CANADA

Sunset Converting expands business and AFH private label offerings

Sunset Converting Corp is the premier AFH private label tissue converting source for redistributors in Canada and the United States. Their industry experience, reputation for quality products, and commitment to innovation prompted the construction of a new mill in Quebec to better serve these markets.

The 2020 expansion also provided an opportunity to install two Perini MyLine on the Sunset production floor.

"Automation is in our DNA," said Sunset Converting vice president and partner Mathieu Laferriere. "Our goal for the mill was keeping things clean, automated, well done, and functional. Körber was a natural choice."

Collaborating with Körber also fueled Sunset innovation. The advanced technologies and capabilities enabled the supplier to run bath tissue and kitchen towels — products previously not available to the AFH private label market. "The flexibility of Perini MyLine is amazing. The machine does exactly what it says it can do in the specs, and more," commented Laferriere.

"We pursued equipment purchases when the pandemic made it tricky. Perini MyLine was readily available, which was key. Also, Körber could demonstrate it for us in their facility in Italy."

"Seeing MyLine in action and experiencing the excellent product quality and features like AquaBond water lamination first hand confirmed what we needed to know. Plus, the legendary reputation of the Perini converting technology from Körber gave us confidence in our purchase."

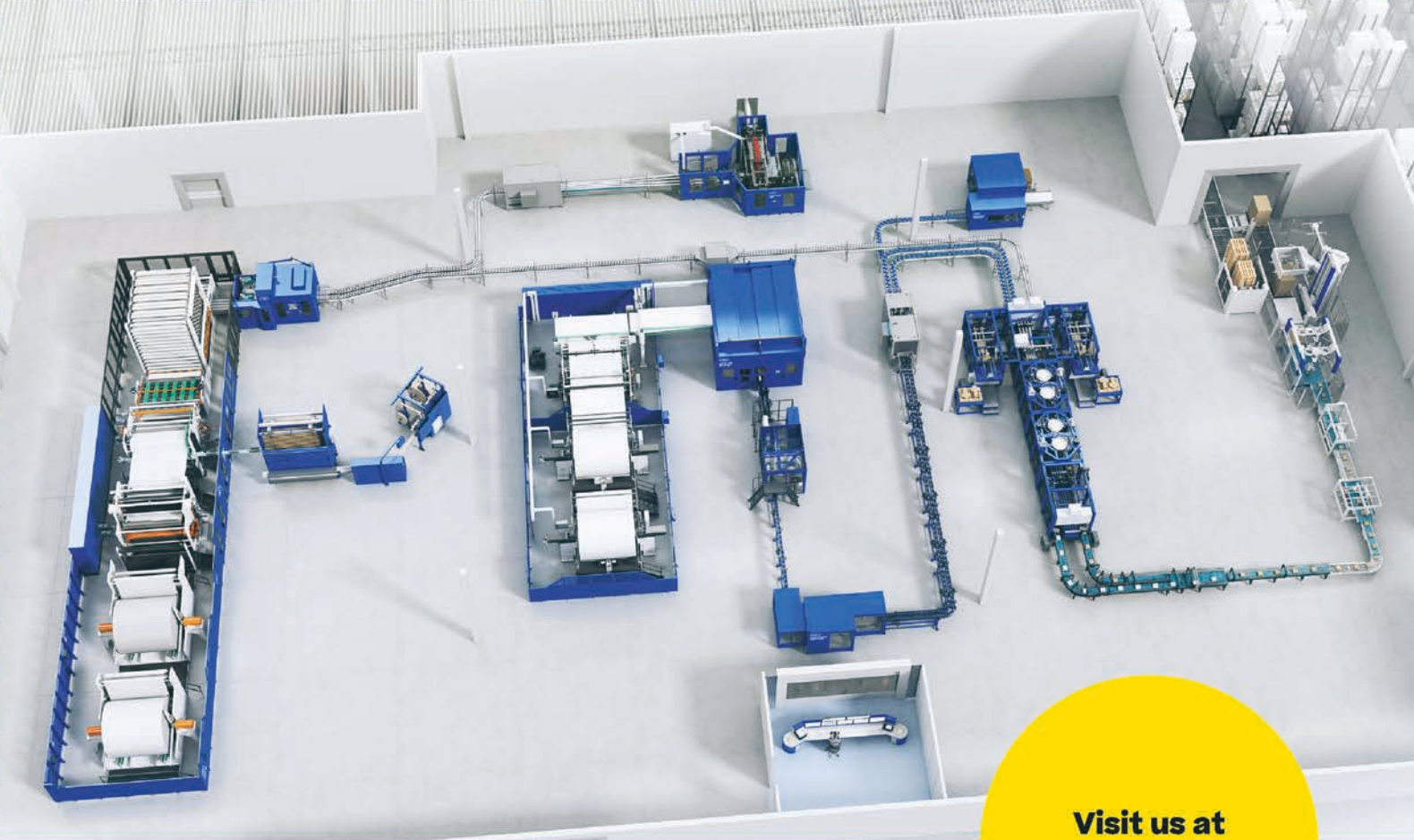
However, gaining competitive advantage with new product introductions is only the beginning of the benefits Sunset is receiving from the Perini MyLine. Laferriere sees the equipment's ease of use and maintenance simplicity as foundational to success.

Like the majority of companies across industries, Sunset struggles with filling the skilled labor gap. "MyLine helps us empower less experienced team members. They have the right automation, production versatility, and streamlined processes to achieve their goals," said Laferriere. "Our employees can be proud of their contributions. In turn, Sunset is able to serve the market well and efficiently provide high-quality private label AFH products to our customers."

Service is a top priority for Sunset, both in providing it and receiving it from their key supplier relationships. "Körber aligns with the Sunset philosophy of always being transparent and proactive with customers," explained Laferriere. "It's important for us to live that promise, and we couldn't do it without suppliers who are on the same page. [Account Manager] Matt Kowalski's professionalism and knowledge reflect Körber's commitment to their customers' success before, during, and after the sale."

From Perini MyLine versatility to Körber service dependability, Sunset Converting Corp values every aspect of Körber solutions. "When you feel good about a doing a deal, it validates your business decision," concluded Laferriere. "Perini MyLine and our trust in the entire Körber team continue to prove Sunset made the right choice."





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MEXICO

Papel San Francisco orders its sixth tissue production line

Valmet will supply an Advantage DCT 100TS tissue production machine to Papel San Francisco in Mexico. The new machine will be installed at the company's mill in Mexicali and the start-up is planned for the first half of 2024. The order is included in Valmet's orders received of the third quarter 2022. The value of the order will not be disclosed.

The new tissue line will fulfill Papel San Francisco's need of new capacity for standard tissue products. Valmet has previously delivered five tissue machines to the company. Four Advantage DCT machines started up in 2006, 2009, 2018 and 2020. In addition, Papel San Francisco was the first to start up an Advantage NTT line in 2013, which fulfills the company's demand of textured tissue.

"In today's business environment it is crucial to consistently operate equipment at the maximum productivity and efficiency. Our continued partnership with Valmet has provided us with world class equipment that not only achieves this, but also ensures we have the latest available technology in sustainability standards," says Dario Palma y Meza Espinoza, Operational Director, Papel San Francisco. "It has always been a pleasure to work with the Papel San Francisco team that has been the same for all five machines. Papel San Francisco is dedicated to details and demand excellence. Valmet is glad to live up to their high expectations and help them continuously improve. We are grateful to be a part of yet another expansion in a strong and trustful relationship," says Jan Larsson, Director of Sales, Tissue Mills business unit, North America, Valmet.

The new tissue machine will have a width of 2.8 m and a design speed of 2,200 m/min. It will add 30,000 tons of tissue paper per year to Papel San Francisco's current production of toilet tissue, kitchen towels and napkins.

Valmet's scope of delivery will comprise an Advantage DCT 100TS tissue machine. The machine will be equipped with an OptiFlo headbox and cast alloy Yankee cylinder. The machine will also feature the well proven Advantage tissue technology including a ViscoNip press, an AirCap hood and the WetDust dust system. Start-up and commissioning are included in the delivery. Papel San Francisco started up their first tissue machine in 1980. In the past 40 years the company has grown steadily and is today operating seven tissue machines with a yearly capacity of 210,000 tons of tissue products.

BRAZIL

Bracell SP Celulose boosts tissue capacity

ANDRITZ has received an order from Bracell SP Celulose Ltda. to supply four PrimeLine™ W 2000 tissue production lines to its mill located in Lençóis Paulista, São Paulo. Start-up is scheduled for 2024.

The four tissue machines are of the type PrimeLine™ W 2000, with a design speed of 2,100 m/min and a working width of 5.68 m. They are equipped with fully cantilevered shoe presses for gentle dewatering and easy maintenance and 18 ft. steel Yankees with steam-heated hoods for energy-efficient drying. The new tissue mill will be self-sufficient in steam and electricity consumption for the drying process, making it one of the tissue mills with the smallest CO₂ footprint in the world.

ANDRITZ's scope of supply – on EPC basis including civil construction – includes the stock preparation systems that will process slush pulp from Bracell's own pulp mill, rewinders and roll handling, as well as roll covers, machine clothing, shoe press belts, and additionally more than 100 units of high-efficiency process pumps.

All four plants will be equipped with the Metris X integrated distributed control system (DCS), which ensures optimal plant operation. The combination of advanced data analytics, automatic condition monitoring system with Metris Vibe, integrated high-end advanced process controllers (APCs), artificial machine intelligence (AI), the implementation of digital twins and operator training simulators (OTS) support the rapid commissioning and optimal operation of the plants throughout their life cycle. Assistance in maintenance processes completes the package.

The lines will produce household paper, such as toilet paper, napkins, handkerchiefs, towels and facial tissue. Per Lindblom, Executive Vice President, Bracell, says: "Together with ANDRITZ, we recently started up the largest and greenest continuous cooking line in the world for dissolving pulp. When looking for a reliable full-line partner for our tissue business, ANDRITZ immediately came to mind."

Carlos Gallo, Director Tissue Technology and R&D at ANDRITZ, explains: "Repeat orders like this once again confirm the success and customer benefits of our technologies. The four new lines will enable Bracell to produce high-quality tissue in a sustainable and environmentally friendly way."

Bracell SP Celulose Ltda. is part of the Royal Golden Eagle (RGE) group, which manages world-class companies in the resource-based manufacturing industry. Among them is the Chinese tissue producer Asia Symbol, whose three new ANDRITZ tissue production lines will start up in the next few months.



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A NEW WAY FORWARD:

How can the EU-GCC cooperate strategically in the energy sector shift?

Cyril Widdershoven,
Owner, VEROCY
Director, Strategy International



Global energy markets have changed dramatically during 2022. Global economies are now dealing with the repercussions of the Russian invasion of the Ukraine on top of the effects of the COVID-19 pandemic, which has pushed major economies to the brink.

Global energy patterns and investments are clearly grappling with both direct and indirect impacts of ongoing shifts in the global balance of power, the changing position of China and Asia, and an increased focus on energy security. The West has been confronted by a cataclysmic situation as its historically stable energy supply has become unpredictable. Its reliance on Russia as the single supplier of natural gas and crude oil has become a threat to its security and economic and social stability. Escalating Western sanctions on Russia have at times backfired as shortages of much-needed oil and natural gas have resulted in an energy market crisis and economic recession at home. For Europe and the UK, the new strategic goal has been to diversify the energy supply and identify new energy sources.

Rethinking Current Alliances

Most European countries, and the EU as a whole, are currently reassessing their geopolitical energy alliances, with particular attention to developing EU-MENA relations. Since May 2022, the EU has started to establish a new strategic partnership with the Gulf. Josep Borrell, vice president of the European Commission, announced that the EU would launch a "Strategic Partnership with the Gulf" with the aim to broaden and deepen its cooperation with the GCC and its member countries. Borrell stated that "at a time of insecurity and significant challenges to the rules-based international order, aggravated by Russia's war on Ukraine, the European Union and Gulf countries stand to gain from a stronger and more strategic partnership stretching over a number of key areas. We need

to work more closely together on stability in the Gulf and the Middle East, on global security threats; energy security, climate change and the green transition, digitalization, trade and investment."

As the EU has clearly indicated, a stronger partnership would be beneficial for the EU and for its Gulf partners. *With regard to current projected demand for renewable energy supplies, especially green hydrogen and ammonia, the EU will be the world's largest single market for the foreseeable future. At the same time, after years of neglecting the GCC and MENA region, the EU is now stepping up its role as an important security actor in the Gulf and as the leading actor on global challenges such as climate change and digitization.*

In a statement on 9 November, EU foreign policy chief Borrell reiterated that energy and security cooperation with the GCC was particularly important in light of current events. The EU diplomat indicated that the current energy supply scenario could continue for years. During COP27, Borrell said an EU-GCC energy partnership made more sense now than ever before, but emphasized that hydrocarbon would not be the energy source forever and that new sources of energy needed to be pursued. Borrell noted that the current energy crisis had accelerated the green transition in the EU, adding that the Gulf has always been very important to Europe, not only as an energy supplier, but also as a strategic link between Europe and Southeast Asia.

The GCC's Strong Position

The GCC has already become a major strategic partner for the EU in crude oil and petroleum products, and during the last few years, as a reliable LNG supplier. New energy relationships with non-Russian partners need to be set up in light of the current European energy crisis, particularly following energy sanctions on Russia, which escalated on 5 December 2022 to include oil and petroleum products. The EU and most of its member states understand that *the GCC will become a major supplier of renewable energy to Europe during the energy transition.*

The GCC, especially Saudi Arabia and the UAE, is home to some of the best solar and wind resources in the world. For both sides, the development of renewables or alternative energy resources is a mutually beneficial strategy to meet climate commitments as well as other economic goals. The new strategy must be pursued by both sides, that is, by GCC power brokers as well as by Brussels and the EU. The UAE and Saudi Arabia will play a pivotal role in this regard, as already demonstrated by increased diplomatic and economic activity with these actors. The parameters of this future lie in the hands of EU consumers but also with the producers—Saudi Arabia, the UAE, and Egypt.

As is evident from the EU's statements about energy ties with the GCC and MENA region, Europe hopes to join forces with regional actors to address climate change and support a sustainable economic future for all. Using renewable energy to pave the way towards a carbon-free economy will be a long journey. The power of hydrocarbon producers such as the UAE remains very strong and continues to shape global economic growth and prosperity. At the same time, there is an opportunity to develop an emissions-free green hydrogen and ammonia market which could meet some of the demand currently met by hydrocarbons in the EU and UK. The green hydrogen commodity market cannot fully emerge until demand is connected with supply. The UAE, Saudi Arabia, and Egypt will all play a crucial role in this transition. These countries hold vast renewable resources and also have a very attractive logistic advantage with regard to their geographical proximity to potential EU markets.

Renewed Importance of Hydrocarbons

Since the Russian invasion of Ukraine, the GCC—especially the UAE, Saudi Arabia, and Qatar—has started to play an important role for EU countries. The ongoing EU energy crisis has made hydrocarbon geo-economics a central concern for European leaders, who also became increasingly interested in the potential of renewable energy from the MENA in general and from the GCC in particular. The geographical

proximity of the Middle East provides clear advantages for current and future European energy supply networks.

Europe needs to find a way to replace approximately 150 to 175 billion cubic meters of Russian natural gas and LNG.

Since 5 December 2022, it also needs to find an alternative source for Russian crude oil and products totaling more than 4.4 million barrels per day. Following Russia's invasion of Ukraine, the EU has had to find new energy suppliers, while also working towards meeting renewable energy targets for the coming decades. The REPower EU energy plan focuses on accelerating Europe's energy transition away from hydrocarbons and exponentially increasing renewable energy at the same time.

To meet renewable energy and climate change targets for 2030-2050, the EU needs to develop a new energy economy. Before the Ukraine crisis, it seemed that Brussels had failed to grasp the direct links between geopolitics and geo-economics, especially in the energy sphere. For the last several decades, the EU and especially Germany failed to invest in strong energy cooperation with the Middle East. Both the EU as a whole and national governments within Europe have been obsessed with renewables and climate change issues and adopted an anti-fossil fuel strategy that did not account for the role of hydrocarbons in the economy and society. This resulted in an apparent lack of interest in pursuing energy relations in the Middle East. European countries seemed to think that Middle Eastern and North African producers, such as Algeria and Egypt, would be there to provide necessary energy supply even if Europeans did not offer security assurances, economic support, or political cooperation in return.

Russian President Vladimir Putin's attack on Ukraine dramatically shifted this status quo. European leaders are now eager to visit nearby energy producers such as Algeria, Egypt, and Israel, as well as "old partners" such as Saudi Arabia, the UAE, Qatar, and others. Even the Caucasus and Central Asia have once again become major focal points for energy supply.

Brussels, Berlin, Rome, London, and Paris have recognized that giving the cold shoulder to major oil and gas producers was not working and was counterproductive to their own strategic energy transition goals.

Alternative Trajectories

As Europe searches for alternatives to Russian oil and gas, the Gulf's LNG projects have received particular media attention. However, these political-economic arrangements are not going to bear much fruit in the short term, since additional LNG and even crude oil supply for energy-thirsty European markets is yet not available. The only possible additional LNG supply in the short term will be from eastern Mediterranean countries or Algeria, both of which are close to European shores. Qatar's LNG is almost entirely unavailable since it is mostly tied up in long-term contracts with Asian and some European customers. The UAE might potentially have some spare capacity, but not enough to make a real dent in Europe's current natural gas demand. New LNG supply from the GCC is not expected to hit the market until 2025 or 2026. Qatar's major LNG expansion plans and the Abu Dhabi National Oil Company (ADNOC)'s ongoing projects will also help relieve market pressures, but not before the end of 2025.

Given the above, it is clear that Europe's current energy crisis will not be resolved anytime soon. Both the EU and its GCC/MENA partners stand to benefit significantly from further developing their energy cooperation. Hydrocarbons will once again forge major ties between European capitals and Arab governments. EU energy strategies have always encountered obstacles due to the European tendency to address these issues unilaterally, an approach that the current crisis is gradually changing.

Brussels is angling to become a real power broker on global energy markets in order to identify suppliers for oil, gas, and renewables. Everything becomes fluid under pressure, and Brussels will now allow collective purchases of energy or strategic products by a consortium of private energy companies and even by states.

Green Hydrogen and Ammonia

For GCC countries, the European energy crisis could be a major boon. As Europe's geopolitical and energy geo-economics have shifted towards the GCC/MENA, Gulf states need to grasp the long-term opportunities on the horizon. Europe will remain a viable and very important partner for hydrocarbon products, but a new path forward also needs to be charted very soon. Europe's stringent renewable energy and climate change targets for 2030-2050 could turn out to be a blessing in disguise for GCC producers. Renewable energy, including wind and solar, already offer opportunities for MENA producers to deliver electricity to Europe via grid connections available to southern Europe. The potential to develop green hydrogen and/or ammonia markets needs to be studied further. GCC producers can use the MENA's vast resources in wind and solar production, including floating offshore wind, to establish a solid market position in developing European green hydrogen economies.

Renewable energy projects in the GCC region have been making headlines for over a decade. During the past year, green hydrogen has come to the forefront and outpaced even solar and wind. The emergence of this new energy source was first met by skepticism, but is clearly gaining momentum worldwide. As reports have already indicated, Saudi Arabia, the UAE, and even Oman will be promising suppliers for large-scale green hydrogen production during the coming years.

Egypt also has significant potential and should not be forgotten. As Moody's Investors Service noted in its latest report, renewable energy projects in the Gulf region have faced "significant delays," which could slow down the production and export of green hydrogen. Moody's reiterated that Saudi Arabia, Oman, and the UAE were particularly well-placed to produce and export these energy resources, given their access to cheap renewables such as solar power and expertise in water desalination. The current delays are partly caused by difficulties in the auctioning processes for renewable energy projects in the GCC, but

primarily due to increased raw material and commodity costs and elevated freight and energy prices following the economic recovery of 2021.

During the last months, many major green hydrogen plans have emerged. Further plans are expected to be unveiled at the COP27 conference in Sharm El Sheikh, Egypt. The UAE, Saudi Arabia, and Egypt are accelerating their strategic planning in this field. Egypt and other MENA governments indicated that they hoped to position the region as a major green hydrogen exporter. European countries such as the UK and Germany, as well as the USA, Japan, and other nations, are all looking to find reliable long-term alternatives to Russian fossil fuels. The comparatively low costs of renewable power production in the MENA offer clear advantages. Europe is looking to Saudi Arabia, the UAE, and even Oman, while Egypt is scrambling to join the scene, with projects for green hydrogen production already hitting the 100 billion dollar mark. *Cairo, spurred by the spotlight of COP27, could produce up to 3.6 million tons of green hydrogen annually, equivalent to around 30 percent of Europe's projected demand by 2030.* However, based on current resource availability and the status of MENA projects, the first significant exports of green hydrogen are not expected to hit European markets until 2025.

Latest Trends

Cornelius Matthes, CEO of Dii Desert Energy, stated that the MENA region expects to see a massive acceleration in its capacities for solar, wind, and green hydrogen production during the coming years. Dii Desert plans to develop green hydrogen projects with a capacity of over 20 gigawatts (GW), which it will expand in the medium term to 100 GW. *The MENA region will be able to produce solar energy for 1 to 2 cents per kilowatt hour (kwh) and wind energy at 1.3 to 3 cents per kwh, which is lower than other regional assessments and offers clear commercial advantages. Europe should focus on the MENA region to take advantage of low-cost solar and wind energy production.*

The UAE-based news site Zawya Projects has indicated that the Middle East ranks third globally regarding hydrogen investments through 2030. The MENA and GCC region also already have transport infrastructure for ammonia in place, which would further facilitate implementation of hydrogen infrastructure. Green ammonia has vast potential as a climate-neutral feedstock. It could be an important raw material for the chemical and fertilizer industry and is easier to transport than other forms of energy. However, some challenges remain regarding existing hydrogen transport infrastructure. Green hydrogen projects in the MENA region will use grid-connected non-renewable electricity during the initial phases. In June 2022, Zawya Projects reported that the Saudi megaproject NEOM will initially be powered by up to 50 percent grid-connected energy from non-renewable sources.

Moody's has reported that green hydrogen projects in the MENA region are continuing to make progress. These include the Helios Green Fuels project in Saudi Arabia, which has a 2-gigawatt electrolyzer capacity, and the NEOM Green Hydrogen Company, which operates in collaboration with ACWA Power Management and Investments One. The latter aims to produce 1.2 million tons of green ammonia per year and 650 tons of green hydrogen from 4GW of renewable energy. Taking into account that NEOM expects renewable energy production to reach 21GW or more, there are opportunities to expand further in this field. According to Moody's, green hydrogen will reduce the GCC's "heavy reliance on hydrocarbons and underlying credit exposure to longer-term carbon transition risks." It added that "reducing the economic and fiscal dominance of the hydrocarbon sector in the GCC will only be a gradual process."

Green Hydrogen's Future

For energy-thirsty European markets, the GCC and North Africa offer strategic opportunities. GCC nations are ideally positioned to contribute to new blue and green hydrogen markets since they have access to cheap domestic gas production and renewable energy sources. As Europe's carbon transition accelerates, these producers, including

the UAE, Saudi Arabia, and others should take advantage of these developments by establishing green and blue hydrogen projects. This would mitigate the negative economic ramifications of reduced global oil demand and lower oil prices, since green hydrogen would make the GCC less reliant on hydrocarbons and reduce credit and other risks tied to the long-term carbon transition.

With regards to bilateral and multilateral relations between the EU and GCC/MENA, both sides stand to benefit significantly from developing green energy. However, further investments are still needed to develop a commodity market. GCC governments are already committed to setting up facilities to produce low-carbon blue hydrogen and zero-carbon green hydrogen from water using electrolysis and renewable energy (from natural gas with carbon capture). While blue- or grey-hydrogen will be the first step, since costs are relatively low, the GCC and Egypt are looking to also set up a global green hydrogen market.

This will take longer, since green hydrogen production is more expensive and difficult than blue hydrogen production. With regard to low-cost renewable energy production and water desalination capacity, *Oman, Saudi Arabia, the UAE, and Egypt also have the potential to manufacture and export green hydrogen within the next 5 to 10 years.* As previously stated, exponential growth in renewable energy production capacity is needed in order to accelerate investment in green hydrogen and ammonia. The latter will require a more flexible auctioning process from states. As analysts have observed, major investments in hydrogen storage and transport technology and infrastructure are needed to promote the large-scale commercialization of green hydrogen.

The UAE is currently leading the push for green hydrogen, especially with regard to cooperation with Europe. In October 2022, the UAE and UK discussed how to pursue major green hydrogen initiatives that could result in the creation of around 100,000 new jobs. A report by the UAE-based Zest Associates and the World Green Economy Organization (WGEO)

indicated that key collaborations across policy, innovation, investment, and business could “unlock mutual benefits for climate and economic development.” Zest Associates stated that “by 2050, hydrogen is estimated to deliver up to \$8.7 billion annually to Dubai’s economy alone, and \$15.5 billion to the UK, as well as over 100,000 new jobs in each country under high-adoption scenarios.” It also indicated that hydrogen-related investment in the UAE and UK could reach 50 billion USD by 2030, with the Abu Dhabi National Oil Company (ADNOC) aiming to become a leader in hydrogen by 2025 as part of its investment program.

In addition to ADNOC’s overall green hydrogen and ammonia investments, other major investments in the UAE include ENGIE and Masdar’s 5 billion USD 2GW green hydrogen joint investment, a 1 billion USD green ammonia facility in Abu Dhabi’s Khalifa Industrial Zone, and the 2GW green ammonia facility developed by TAQA and Abu Dhabi Ports. These projects could be linked directly to the UK pipeline project to unlock 4.8 billion in private investment for blue and green hydrogen production in the UK.

Potential UAE investments in the UK and other European countries are already being planned, as demonstrated by Masdar’s major investments in offshore wind in the North Sea and major onshore wind and solar projects in Poland, the Balkans, and elsewhere. ADNOC also has agreed to buy a 25 percent stake in British oil and gas giant BP’s H2Teesside blue hydrogen project. Abu Dhabi’s Masdar also signed a MOU to acquire a stake in BP’s green hydrogen project, HyGreen Teesside. These projects comprise a relatively small portion of global investment in hydrogen, which is projected to reach 500 billion USD by 2030. This still falls significantly short of the 1.2 trillion USD required to reach long-term net zero goals. For the UAE, hydrogen represents an opportunity to diversify energy sources to replace income from fossil fuel exports, which currently make up 30 percent of the country’s GDP.

GCC countries are clearly mapping out agendas to kickstart the hydrogen

economy. The UAE, Saudi Arabia, and Oman are spearheading ambitious plans to supply Europe and the Asia-Pacific region with green hydrogen and ammonia. European countries and companies have signed an expanding series of memoranda of intent and contracts in this field, and the first large-scale projects are underway. For most Gulf countries, hydrogen is not only a means of diversification, but also a chance to maintain their current economic and political standing. Hydrogen from the Gulf could be an effective tool for mitigating climate change, but European countries will be faced with other trade-offs and questions to consider.

The GCC’s ambitious plans for a hydrogen economy are based on high solar yields and abundant territory for producing green hydrogen from renewable electricity. In the short term, the GCC and Egypt’s vast natural gas reserves offer opportunities for blue hydrogen production, which is produced from natural gas via carbon capture. The GCC and Egypt’s extensive oil and gas reserves, low-cost supply for international financial markets, direct decision-making, and existing infrastructure make these two countries excellent hydrogen first-movers.

Even prior to the Russian invasion of Ukraine, major green hydrogen projects and strategies were on the table. In October 2021, Saudi Minister of Energy Abdulaziz bin Salman Al Saud announced that Saudi Arabia aimed to become the world’s largest hydrogen producer. The country’s hydrogen policy is closely linked to Vision 2030, which outlines the holistic transformation of Saudi Arabia. Saudi Crown Prince Mohammed bin Salman (MBS)’s Vision 2030 aims to significantly increase domestic value creation, non-oil exports, and renewable energy, and to expand the natural gas industry. Meanwhile, Oman’s Vision 2040 calls for a general “diversification of energy sources.” In August 2021, Oman founded the Hy-Fly Alliance, which brings together government agencies, representatives from the oil and gas sector, educational and research institutions, and the ports of Sohar and Duqm within a joint platform.

The UAE has been the most aggressive in developing hydrogen as an energy source. At the COP26 summit in November 2021, the UAE announced that it was working on a Hydrogen Leadership Roadmap. It aims to establish new value chains for the export of low-carbon hydrogen and its derivatives and to pursue hydrogen-based production of steel and jet fuel. The UAE has already set a target of reaching 25 percent of the global hydrogen market. The UAE’s hydrogen agenda is also linked to its Energy Strategy 2050, which the country adopted in 2017. This strategy aims to increase clean energy in primary energy consumption from 25 to 50 percent by 2050.

Qatar, another key GCC country, is not pursuing a strong hydrogen strategy, but rather is focused on becoming the world’s leading exporter of liquefied natural gas (LNG). Bahrain and Kuwait are not currently pushing for green hydrogen investments.

In the Gulf, as in Europe, most energy strategies are being discussed by various government ministries and agencies. At the same time, national oil companies are making significant progress in this field. These companies include the Abu Dhabi National Oil Company (ADNOC), Saudi Aramco, the Kuwait Petroleum Corporation (KPC), and Petroleum Development Oman (PDO), and are closely linked to state ministries. In addition to operating the petroleum business, these companies develop and execute petroleum policy. Within this framework, they also have a mandate to design and implement hydrogen policy. Regional utility companies have a stake in hydrogen in coordination with government agencies. Sovereign wealth funds (SWFs) are also set to play a slightly underassessed but increasingly important role in the coming years.

Saudi Arabia is currently planning to produce blue hydrogen from shale gas in the country’s Eastern Province through the 110 billion-dollar Jafurah field project, which was launched in October 2021. An existing hydrogen plant in Jubail Industrial City has also been upgraded to produce blue hydrogen. In 2022, Saudi Arabia

announced more than 15 new projects. The UAE and its economic and political hub Abu Dhabi have already launched the first green hydrogen plant in the Middle East. The project is a joint venture between Siemens Energy and Dubai-based company DEWA and has been in operation since 2021. There are plans underway for a facility for hydrogen derivatives for land and air transport backed by a consortium that includes the Mubadala subsidiary Masdar, Siemens Energy, Lufthansa, and other UAE partners. In 2021, a new Emirati company called Helios announced that it had contracted ThyssenKrupp for a feasibility study to produce green ammonia in the Khalifa Industrial Zone in Abu Dhabi (KIZAD). In late 2021, Abu Dhabi developer Masdar and French utility ENGIE joined forces to develop a green hydrogen hub in the UAE.

From the outset, green and blue hydrogen projects in the region have looked to Asian-Pacific demand. Saudi Aramco and the Japanese Institute of Energy Economics announced the world's first maritime delivery of blue hydrogen in September 2020. Aramco also has signed agreements with Japanese refining company ENEOS and South Korean giant Hyundai Heavy Industries. Saudi sovereign wealth fund PIF has signed contracts with South Korean companies Posco and Samsung C&T for green hydrogen production. The UAE has also ramped up energy cooperation in this region and South Korean companies plan to build a green ammonia plant in the UAE. In 2018, Emirati company ADNOC concluded an agreement with the Japanese Ministry of the Economy and South Korea's GS Energy on ammonia as a transport fuel and to support blue ammonia production.

Building Bridges

The current EU-GCC strategic discussion remains primarily focused on technology transfers, investments, and ad-hoc decision-making about sourcing energy. These very diffuse strategic propositions do not yet constitute a fully envisioned path towards strategic energy cooperation, although the building blocks have been set for such cooperation in the future. There are new opportunities on the horizon, even as the EU deals with internal debates over

whether to make levels of domestic fossil fuel consumption and unilateral reduction of this consumption the main indicators of climate change progress.

The Ukraine crisis, and before that, the COVID-19 pandemic of 2020-2021, made clear that unilateral geopolitical and geo-economic strategies are not feasible. These international crises demonstrated that setting up strong ties with neighboring countries are beneficial to all involved. The new power that the MENA region, and the GCC in particular, now holds with regard to European energy security needs to be taken into account. With Russia gone from Europe's oil, gas, and coal energy markets, other alternatives need to be pursued. The GCC and countries such as Egypt are now of central concern for all European powers dealing with energy crises.

Before the Ukraine war, internal European energy discussions were focused mainly on removing hydrocarbons from the energy economy. However, it is now evident that such a shift has not yet happened, since the current energy crisis is a hydrocarbon crisis. Countries such as the UAE, Saudi Arabia, and even Qatar and Egypt are now reaping the rewards of their continuing vigilance with regard to investing in upstream capabilities to meet market demand. At the same time, European powers are starting to realize that the so-called hydrocarbon region (MENA) is also the most appropriate producer for renewable energy. The European demand for green hydrogen and offshore wind and solar gives GCC suppliers power with regard to energy security. The willingness and capability of major hydrocarbon-based GCC and North African economies to support green hydrogen or ammonia production is a unique selling proposition (USP) for their European energy consumers.

Up until this point, cooperation between European countries and their GCC counterparts has been purely economic, as is clear from trade balance sheets. Strategic security cooperation, economic diversification, and even power alliances were largely ignored or even actively avoided by certain parties. The current and future shifts inside Europe and the MENA region call for

deeper long-term strategic cooperation across all fields, as Borrell observed.

Cooperation in the fields of water, energy, and food security will need to be expanded and codified into concrete agreements. Historically, there has been a one-way financial stream of European products to the GCC/MENA and of natural resources from MENA to the EU. This will need to shift, as the GCC and North Africa seize the opportunity to invest and participate in ongoing energy transitions in the EU and UK. It is time for lopsided balances of power to be righted and for the GCC to invest in Europe to support the vast energy changes to come while taking advantage of the opportunity to shape them. Abu Dhabi's national oil company ADNOC, with its vast subsidiaries and joint ventures must play a central role in Europe's natural resources, chemicals, and utilities futures. UAE companies such as Masdar and Fertiglode, and even its vast sovereign wealth funds could help realize the green future that Europe imagines. At the same time, Europe can help realize Gulf Visions in the UAE as well. The same approach could be adopted by Saudi Arabia's giant Aramco, as well as its sovereign wealth fund PIF, and others.

GCC countries should realize that there is a second or third largest market next door, the EU, with 320 plus million customers, vast industrial and high-tech opportunities, and perhaps better capabilities than those of its US or Asian competitors.

Building a new energy path forward for renewable energy could help launch mutually beneficial strategic cooperation between the MENA and the EU. Both energy and security have long been neglected by both sides but now are back in the spotlight. GCC states could further bolster ties with the EU as a soft power move to mitigate skepticism or criticism of GCC countries within Europe.

This time, instead of undermining cooperation, energy could be the GCC's deal maker.



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HIGH PERFORMANCE SUSTAINABLE TISSUE PAPER FROM AGRICULTURAL RESIDUE:

A case study on fique fiber from Colombia

Rajnish Kumar, Franklin Zambrano, Ilona Peszlen, Richard Venditti,
Joe J. Pawlak, Hasan Jameel, Ronalds W. Gonzalez
North Carolina State University

Global sustainability megatrends are promoting the utilization of sustainably perceived fibers such as recycled and agricultural residue fibers in hygiene tissue applications. Tissue paper products advertised as sustainable have higher prices and inferior performance than conventional products manufactured from virgin wood fibers. This work demonstrates the feasibility of using agricultural residues from fique plantations (*Furcraea microphylla* genus) as an alternative to Northern Bleached Softwood Fibers (NBSK) in high-performance hygiene tissue applications.

Environmental concerns

Global paper production has been steadily increasing over the years and reached approximately 425 million tons in 2020 (FAO - Forestry Production and Trade 2020). Hygiene tissue paper is one of the fastest-growing categories of all paper products witnessing a CAGR (compound annual growth rate) of 2.0% between the years 2015-20 (FAO - Forestry Production and Trade 2020). Within the broad spectrum of hygiene tissue paper, a wide range of products such as bath tissue, kitchen towels, wipes, facial tissue, napkins are designed to serve the specific needs of consumers. For example, kitchen towels have excellent strength and water absorbency, while bath/facial tissue should have softness and strength. Overall, water absorbency, softness, and strength are the most critical properties of tissue paper products (Wrap 2005; Gigac and Fišerová 2008). By choosing a suitable combination of fiber mix, paper machine technology, and chemical additives, tissue papers can be produced to achieve the desired performance as required for any specific application (de Assis et al. 2019; Zambrano et al. 2020).

Fiber morphology plays an important role in tissue paper performance. High-value premium tissue papers are predominantly manufactured using a fiber mix from virgin wood fibers of softwoods and hardwoods. Tissue products manufactured from virgin wood fibers account for more than 60% of the total market share, while products made from recycled fibers and other non-wood alternative fibers constitute the remaining fractions⁶ (Fisher International 2021). NBSK (Northern bleached softwood kraft) and BEK (Bleached eucalyptus kraft) are the two most important raw materials for the tissue industry, representing approximately 45% of the total market share of pulps (Fisher International 2021). Long and thin fibers of northern softwoods are added to provide superior strength properties, whereas shorter, low coarseness fibers of BEK provide good softness properties (Gonzalez et al. 2020). Thus, an optimum mix of NBSK and BEK provides tissue paper with a superior combination of softness and water

absorbency at a given strength (De Assis et al. 2018; de Assis et al. 2019).

However, the exclusive use of virgin wood fibers for making premium tissue products puts tremendous strains on already scarce natural forests. Substantial environmental concerns have been raised over the logging of NBSK from Canada, a key raw material in tissue furnish (Skene and Vinyard 2019; Vinyard and Skene 2020). Global sustainability megatrends are forcing manufacturers to look for alternatives beyond virgin wood fibers (Thomas and Liu 2013). This has motivated tissue makers to utilize sustainably perceived fibers such as post-consumer recycled fibers and agricultural residue fibers (Vinyard and Skene 2020).

A sustainable alternative

Post-consumer recycled paper as a raw material for tissue paper is certainly a sustainable option as it diverts the waste from entering landfills and the manufacturing process has lower environmental footprints than using virgin fibers (Wrap 2005; Skene and Vinyard 2019; Vinyard and Skene 2020).

However, the high content of short fibers, fines, and other foreign matters (fillers, ink, and stickies) typically present in recycled pulp may have a detrimental effect on tissue properties (Hubbe et al. 2007). In addition, recycled fibers are stiffer with limited fiber swellability and wet flexibility¹³ (Hubbe et al. 2007). Hence, tissue papers produced with higher content of recycled fibers are weaker, stiffer, denser with lower softness and water absorbency (Wrap 2005; De Assis et al. 2018; de Assis et al. 2019). Shortcomings associated with recycled fibers limit their use to mainly economy and value-grade tissue products and are rarely used in premium or ultra-premium tissue products^{2,8} (Wrap 2005; De Assis et al. 2018).

In addition to recycled fibers, several non-wood alternative fibers have been researched as a source of raw material to produce tissue papers (Byrd and Hurter 2013; de Assis et al. 2019). Typically, non-wood fibers can be classified into agricultural residue and fiber crops (Hurter 2001; Byrd and Hurter 2013). Agricultural residue

fibers such as wheat straw, corn stalks, and sugar cane bagasse present an interesting case from an economic and sustainability standpoint. Primary crops can account for most of the cost and environmental burden associated with the cultivation and harvesting of agricultural residue fibers (Byrd and Hurter 2013). Additionally, the utilization of agricultural residue in the paper industry offers an economical solution to the waste disposal problem as most of the leftover straw residues are burnt off in the field in the absence of any suitable disposal solutions (Byrd and Hurter 2013; Skene and Vinyard 2019). However, prior efforts to utilize agricultural residue fibers in tissue paper have yielded limited results in terms of product performance. De Assis et al. (2019) compared the performance of bleached and semi-bleached wheat straw soda pulp with commonly used virgin wood pulps in tissue paper manufacturing and concluded that wheat straw pulps had remarkably higher fines content, which resulted in lower freeness of the pulp and increased densification of the tissue handsheets made thereof (de Assis et al. 2019). Increased sheet density had detrimental effects on important tissue paper properties. Wheat straw pulp had the worst combination of softness, water absorbency, and tensile strength among all market pulps evaluated in this study and was found only suitable for making economy-grade tissue products (de Assis et al. 2019).

On the other hand, fiber crops such as cotton, flax, hemp, jute, kenaf, abaca, sisal, and fique are cultivated specifically to yield fibers. Papermaking pulps obtained from these fibers have extremely high tear and high tensile strength beyond what can be achieved with premium wood pulps (Judt 1993). However, pulps from these fibers are mainly utilized for making specialty paper products that command a premium in the market over commodity paper products (Judt 1993; Atchinsons 1998). Some limited efforts to utilize these fibers in hygiene tissue application have given positive results in the past. For example, patent US5320710 assigned to James River Corporation describes utilizing low coarseness and longer fiber length of chemically pulped hesperaloe fibers to produce tissue papers with

improved bulk, water absorbency, and softness compared to those resulting from similar fiber blends of softwood and hardwood pulps (Reeves and Plantikow 1994). Similarly, Hermans et al. (1997) from Kimberly-Clark Corporation claims to use low coarseness fibers of abaca, paper mulberry, or pineapple leaf fibers to improve the softness of tissue paper products by introducing them in fiber blends of softwood and hardwood fibers (Hermans and Sauer 1997). Nevertheless, the high cost of market pulps from these non-wood fibers prohibits their utilization in tissue paper applications.

The standard processing technique employed to extract fibers from the fiber crops also produces a significant quantity of by-products or waste along with the primary fibers. These by-products are trimmed waste, which has similar characteristics as primary fibers but is mixed with foreign particles, soils, parenchyma cells, and inorganic impurities (Ovalle-Serrano et al. 2018b; Lee et al. 2020). For example, the processing of bast fibers such as flax, hemp, and jute produces a series of by-products such as shives and tows along with the primary bast fibers (Michael Carus 2017). Similarly, mechanical decortication of leaf-based fibers such as abaca, sisal, henequen, and fique generates short and entangled tow fibers as by-products (Ovalle-Serrano et al. 2018a). Such residues are either sold as low-value products or left on the field without any market value (Michael Carus 2017; Ovalle-Serrano et al. 2018b). Considering these by-products comprise the major yield of fiber processing, these residues present an interesting case as low-cost biomass for valorization into value-added products.

Fique as a raw material

In this context, the objective of this work was to study the feasibility of upgrading residues from the processing of fiber crops as a substitute fiber to Northern Bleached Softwood Fibers (NBSK) for high-performance hygiene tissue applications. Future forecasts point to uncertainties over the long-term supply and prices of NBSK fibers and require the tissue industry to explore developing alternative fiber sources to complement the currently used fiber mix (Thomas and Liu 2013).

To achieve this objective, the residue obtained from the decortication process of the fique fiber was selected as a raw material for our study. Fique is a leaf-based natural fiber similar to abaca and sisal, which is primarily utilized for the fabrication of coffee sacks in Colombia. Fique residues are a by-product of the decortication process that produces 4-5% primary long fibers (used for making coffee sacks) and 8-10% short tow fibers as a residue (Ovalle-Serrano et al. 2018a). These residues are left on the field without any market value. To the best of the author's knowledge, no prior work on upgrading residue from the processing of bast and leaf-based fibers for hygiene tissue applications has been reported in the literature. Considering that these residues are currently left on the field without any market value, their upgradation into an alternative raw material for tissue manufacturing offers a unique opportunity to utilize these fibers into value-added products.

The process

Fibers from fique residue can be upgraded into high-quality pulp using a simple mechanical cleaning and mild pulping and bleaching process. Fiber morphology played a critical role in developing tissue paper's properties, and a comparison of morphological properties showed that fique residue pulp has similar fiber length, lower width, coarseness, fines content, and higher fiber population than NBSK market pulp. SEM micrographs showed that the compressive forces acting during the refining process easily collapsed the thin cell walls of NBSK pulp into a flat ribbon-like structure, while fibers from the fique residue pulp were less flexible and conformable. The bulk of tissue handsheets made with fique residue bleached was consistently higher than NBSK pulps at all refining levels, which corroborate different responses of both fibers to mechanical refining. Therefore, NBSK pulp displayed higher tensile strength than fique residue pulp at higher refining levels (lower pulp freeness) but similar strength properties at higher pulp freeness. When tradeoffs between the tensile strength, water absorbency, and softness were evaluated, fique residue bleached pulp provided a superior combination of water absorption

capacity and softness properties than NBSK market pulp at a given tensile strength value. However, it is important to mention that NBSK market pulp is a once-dried pulp, while fique residue pulp was produced in the laboratory and has not been dried. Drying has been shown to bring some irreversible changes in the fiber cell wall that negatively impacts the bonding ability and swellability of fibers.

In numbers

A complete characterization of tissue paper properties (bulk, softness, water absorbency, tensile strength) was performed and compared against the NBSK market pulp. Additionally, fique residue pulp was blended with Bleached Eucalyptus Kraft (BEK) to match the performance of a selected benchmark consisting of 70% BEK and 30% NBSK. Results indicate fique residue bleached pulp has similar fiber morphology and comparable strength properties in terms of the tensile strength (+6%) and tear strength (+10%), but superior bulk (+12%), water absorbency (+28%), and softness (-29 % TS7 values) than NBSK pulp. A fiber blend of 70% BEK and 30% fique residue showed superior tensile strength (+21%), tear strength (+54%), bulk (+ 5.5%), water absorbency (+1.5%), and softness (-8.7% TS7 values) over a similar fiber blend of BEK and NBSK.

Conclusion

Our findings demonstrate that fibers from fique residue can substitute NBSK in hygiene tissue applications. Upgrading residues from fique fibers as raw materials for the tissue industry can bridge the gap between sustainability and product performance. The results should be analyzed as demonstrative rather than representative of the pulp samples. Nevertheless, promising results obtained from this study show the potential of low-value residue from fiber crops of abaca, sisal, fique, hemp, flax to be developed into high-quality pulps for hygiene tissue applications. This may not only solve the residue handling problems but also open a new revenue stream for millions of small farmers in the producing countries while providing flexibility in fiber sourcing for the manufacturer of tissue paper products.

A SNEAK PEEK AT BABY DIAPER MARKET

Diapers will keep booming in a few developing countries

The penetration of Open Diapers and Pants for babies aged 0-3 is the highest in developed countries like the West European and North American ones.

The greatest opportunity in the baby diaper market is in MEA (Middle East Africa) and APAC (Asia-Pacific), where the average income is rising and the upside is significant. Indonesia, India and Nigeria made almost 10% of the global volume of baby diapers while their per-capita consumption is below average, showing plenty of room for growth if income, accessibility, hygiene awareness and product variety keep increasing.

Birth rates are rising in both the regions, making Asia-Pacific and Middle East and Africa interesting opportunities when it comes to baby diapers. According to the World

Economic Forum, in less than a decade one in five people will be African[1]. This population boom is strongly counter trend when compared to the fertility rate in the rest of the world.

Open Diapers vs Baby Pants

Between Open Diapers and Baby Pants, the dominant format is the former, making about 70% of the entire category's total volume and value sales in 2020. It is most prominent in Africa and the Middle East, **especially in Nigeria, Kenya and Egypt**, largely due to its inherent affordability and growing appeal to low-income consumers switching to disposable diapers.

On the other hand are Baby Pants. While not the prevalent format, they are definitely the fastest-growing one, with a volume share of 23% of the category in 2020, which is expected to reach 30% in 2025. In countries such

as **China, India and Vietnam**, more and more consumers favor Baby Pants due to their comfort, flexibility and convenience. If Open Diapers represent the affordable solution, Baby Pants lie on the affordable premium spectrum of the baby diaper market. Interestingly, Baby Pants are also growing in North America and Western Europe. Here, Baby Pants are mainly used for potty training, while in APAC they tend to be used from the very first months of the child's life.

In both formats, natural ingredients and functionalities such as leak protection and skin-friendly materials are highly sought-after. A consistent phenomenon among consumers is the unwillingness to pay extra for must-have properties, paired with the **willingness to punish those who don't include them**[2].

The profile of the consumer in developed and developing countries

In 2020, women at their first childbirth were 23 years old on average globally - primarily Gen-Z and younger Millennial parents. Income-wise, the situation is quite complex. Excluding older millennials, most of these consumers have yet to enter or just entered the workforce. This should put them in the low-income category, but as a matter of fact, most of them are part of the highest income social class segment. This is no mistake: simply put, **there is a wide income gap across this group.**

One thing is certain: 2023 will be full of opportunities, the greatest ones being in MEA and APAC, where birth rates are rising and living standards are improving, especially in the affordable premium category.

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There's no stopping the baby diaper market. Developing countries are registering a strong momentum, largely driven by rapid urbanization and product variety, with the smallest yet highest-growth format being Baby Pants in contrast with the dominant but lagging diapers category. Here, attention to hygiene is growing proportionally with improving living standards, especially in big urban areas where unemployment tends to be lower and access to capital greater.

A significant difference between Millennials and Gen-Z on the one hand and older generations on the other is the former's attention to a few topics, such as identity politics, diversity, environmental and social responsibility.

Manufacturers are switching to a regional production to get closer to end-consumers

Inflation is rising around the world[3]. With price sensitivity already

being a major issue, it is no wonder that businesses are taking action, optimizing their value chain. But with worsening global shortages and rising wages, they can't save their capital neither on labor nor on commodities, as they also are at record-high[4],[5]. That's why more and more corporations across the globe are trying to optimize their supply chain by going regional. Deglobalization is quickly becoming the new normal[6].

Unsurprisingly, Private Labels are coming to the fore, especially in Russia and Eastern Europe, gaining more volume and value market share than name brands over the last five years. The role played by Private Labels vary depending on the area. In Russia, they stand out for their lower pricing. In higher-income countries, such as Norway and the UK, the boundary between them and established brands has gotten blurred in recent years.

¹ John Mckenna, (2017, May2). *6 numbers that prove the future is African*. World Economic Forum. <https://www.weforum.org/agenda/2017/05/africa-is-rising-and-here-are-the-numbers-to-prove-it/>

² (2021, October). *Global Baby Nappies/Diapers/Pants Update: Balancing Affordability and Premium Innovation*. Euromonitor. <https://www.euromonitor.com/global-baby-nappies-diapers-pants-update-balancing-affordability-and-premium-innovation/report>

³ Ryan Avent, (2021, Nov 8). *What will happen to inflation in 2022?*. The Economist. <https://www.economist.com/the-world-ahead/2021/11/08/what-will-happen-to-inflation-in-2022>

⁴ Elisabeth Buchwald, (2022, Jan 10). *'It will hit an inflection point': Americans are earning record-high wages — how long will it last?*. MarketWatch. <https://www.marketwatch.com/story/americans-are-earning-record-high-wages-how-long-will-they-keep-going-up-11641594348>

⁵ Omar Abdelrahman, (2021, October 21). *Commodity Price Report: Supply Disruptions Revive the Rally*. TD Economics. <https://economics.td.com/us-commodity-price-report>

⁶ Andrew Browne (2020, February 29). *How the Coronavirus is Accelerating Deglobalization*. Bloomberg <https://www.bloomberg.com/news/newsletters/2020-02-29/why-deglobalization-is-accelerating-bloomberg-new-economy>



Valter Canelli,
Sales Director,
A.Celli Paper

How to preserve paper bulk thanks to our **SMARNIP®** mini shoe press

The bulk is an important characteristic for many types of paper, capable of determining the softness of the papers for hygienic-sanitary use or the dimensional stability of the paper sold in sheets. In these cases, where it is essential to implement a correct and effective pressing process, our SMARNIP® mini shoe press is the ideal solution to optimize the dryness and mechanical properties of the paper.

The shoe press is a Beloit invention dating back to the 1980s aimed at the production of packaging paper. It is an Extended Nip Press (ENP) where a concave stationary shoe, opposed to a cylinder, is used to substantially expand the nip, thus allowing the application of a high linear load while keeping the specific pressure low.

Since the first installations, it was possible to highlight advantages in terms of sheet drying compared to traditional cylinder presses, guaranteeing excellent results in terms of increased production and energy savings. The interest aroused by this innovation has led to the application of the concept also in the production of graphic papers, but we had to wait until 2003 to have a shoe press specifically designed for applications where paper bulk was a priority.

It was in that year that PMT, a company part of the A.Celli Group since 2020, patented the SMARNIP® mini shoe press. Let's see the characteristics of this solution in detail.

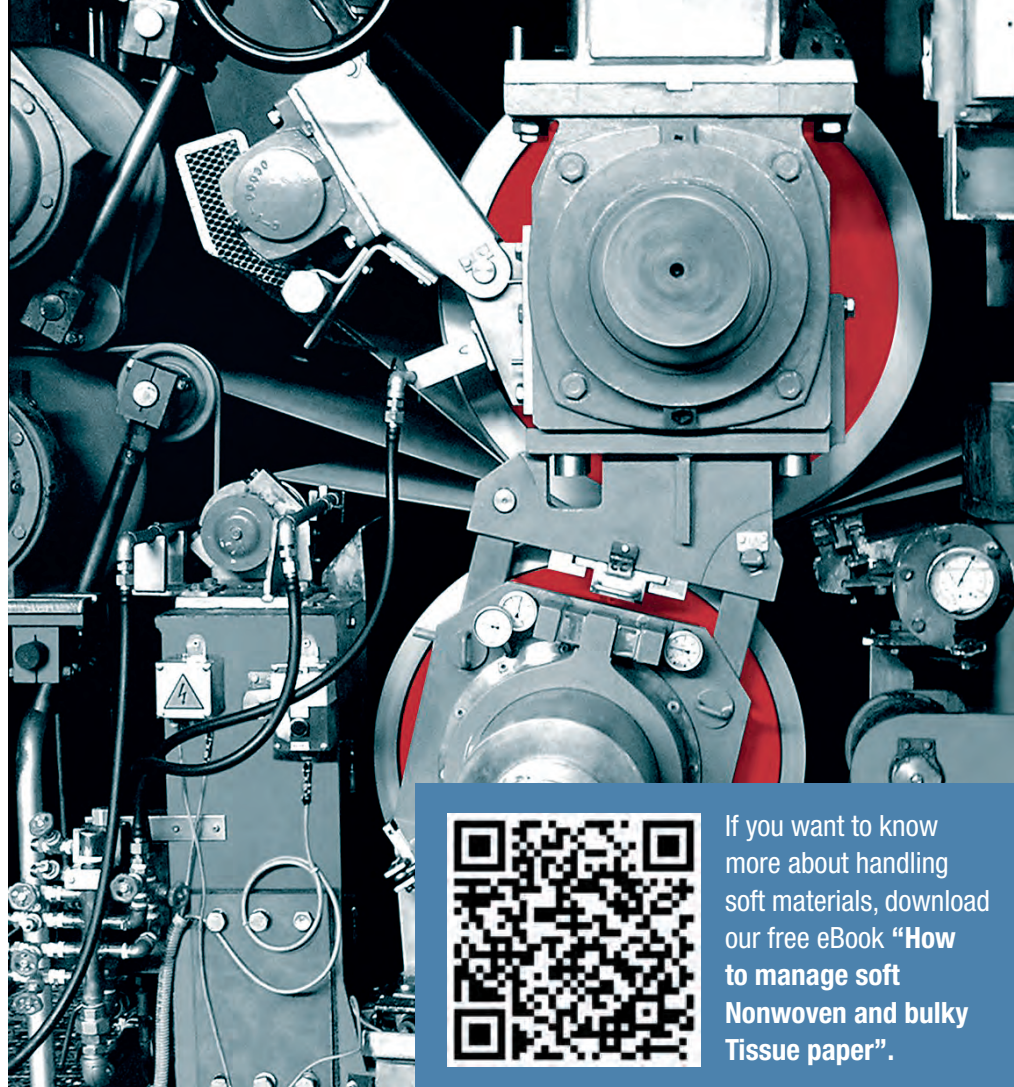
Why PMT developed the SMARNIP® mini shoe press

The experience deriving from applications in production lines of graphic papers and papers with specific bulk needs has led to the conclusion that, for these products, the "standard" load exerted by a conventional shoe press (about 1,000 kN/m) is excessive.

Furthermore, even the size of this shoe press itself is disproportionate to the real needs, for which a smaller and more manageable solution is sufficient also from the point of view of the overall dimensions.

The installation of a conventional shoe press also requires significant interventions on the paper machine and, often, on its surroundings, such as the strengthening of the overhead crane and the reinforcement of civil structures, with an increase in installation costs and a reduction of the profitability of the investment.

To overcome these limitations and find an appropriate balance between the desired degree of dryness and the qualitative properties of the paper,



If you want to know more about handling soft materials, download our free eBook **“How to manage soft Nonwoven and bulky Tissue paper”**.

we have developed and patented the SMARNIP® mini shoe press.

The characteristics of the SMARNIP®

The SMARNIP® is a relatively compact and light solution, with diameter from 700 mm to 1000 mm, shoe width from 70 mm to 125 mm and overall dimensions similar to a variable-crown roll.

Our mini shoe press is capable of exerting a linear load from 100 to 700 kN/m and has the same characteristics as a conventional shoe press, i.e. a pivoting concave shoe loaded by two rows of transverse pistons and a commercial polyurethane sleeve.

The aforementioned loading system gives the SMARNIP® an operational flexibility such as to guarantee an optimal ratio between dryness and bulk. Furthermore, the distribution of the hydraulic pressure applied to the pistons can be easily set while the machine is running to facilitate optimization even in the event of frequent production changes.

SMARNIP® advantages

The numerous references and the positive experiences accumulated have shown that our SMARNIP® mini shoe press is able to increase dryness up to 2% more than a roll press with the same bulk (this result can obviously vary based on the composition of the mixture of the specific case).

Considering the advantages obtained also in relation to the small dimensions of our solution, it is often interesting to consider the installation of two SMARNIP® in the same press section. This possibility opens the way to a completely new approach in evaluating the possible investments to be made in the press section itself.

The installation of the SMARNIP® is particularly recommended for paper machines of limited width and, in general, for the production of all types of paper in which a high bulk is sought.

Among the many advantages we can mention:

- Increase in production, thanks to an increase in the degree of dryness and a consequent reduction in the evaporation load on the dryer
- Greater efficiency of the paper machine, as it is possible to obtain a drier, more resistant sheet
- Greater bulk
- Better control of paper smoothness, both in absolute terms and relative terms (between the two sides of the paper)
- Easy installation, thanks to the limited dimensions
- Less interventions on the building due to the reduced weight of our mini shoe press
- Interchangeability with conventional cylinder, unlike a traditional shoe press which has a greater distance between bearings than roll presses

Ultimately, the SMARNIP® embodies all the advantages of the shoe press while preserving the simplicity and compactness of traditional presses.



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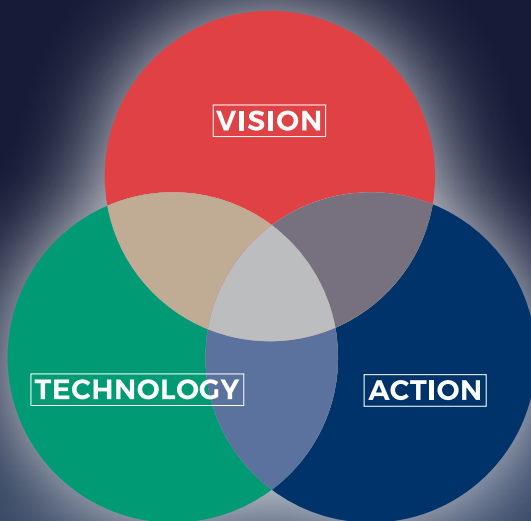
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