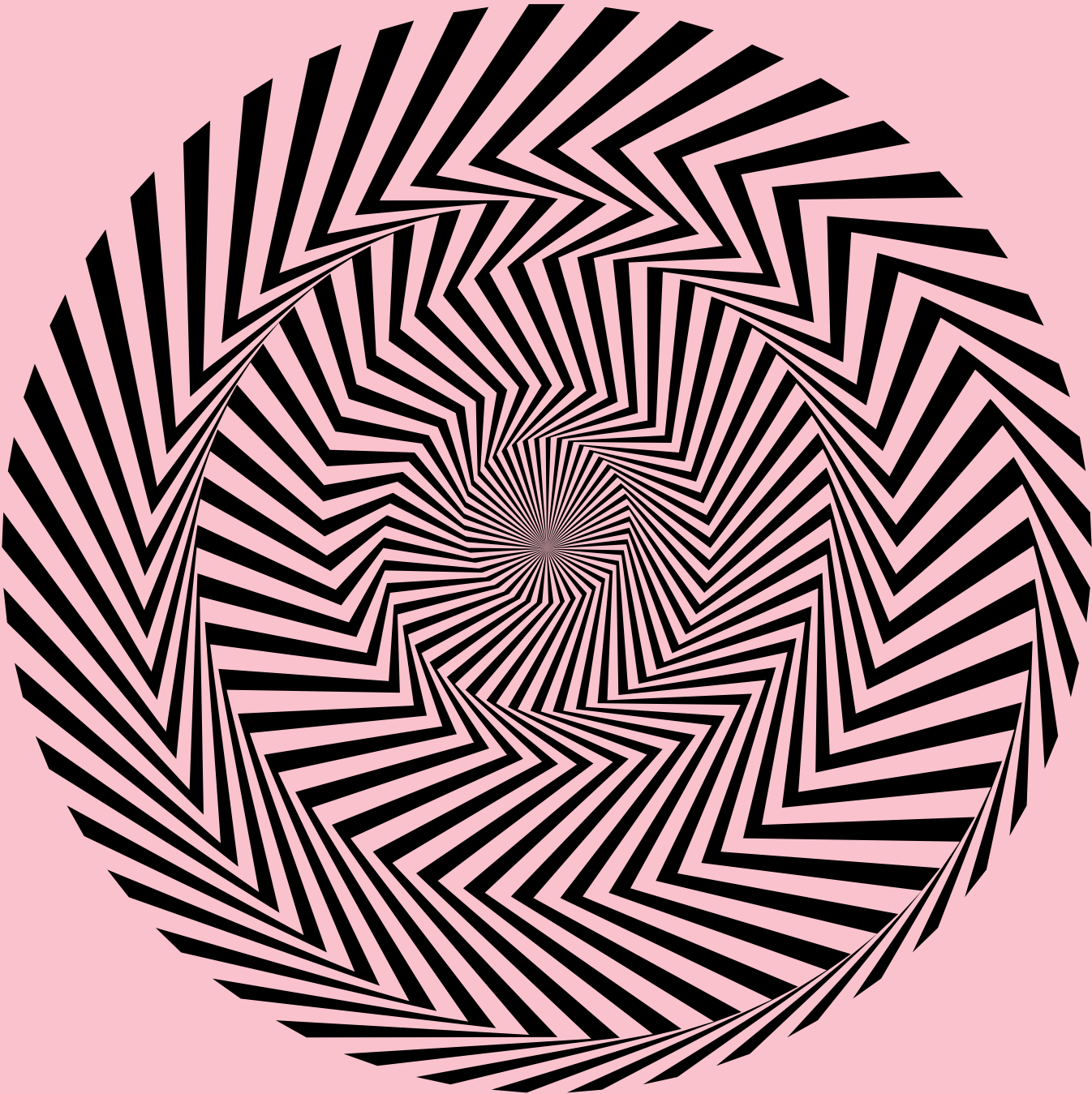


issue 43
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The magazine for the hygiene industry



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China Lucca·jiangxi xiushui

Facial Tissue Folding Machine



Automatic tissue log transfer
(match to interfolder on the left)



Model:5T/6T/7T/8T/9T/10T

Max. width of base paper:1350-2100 mm

Folding speed:500-1000 sheets min/line

Start-Stop Model Toilet Tissue Rewinder



OK-250 Type Double Lanes High-speed Handkerchief Tissue Production Line



Packing Speed: ≤250 bags/min

Jumbo roll width:2200/2800mm

Machine's speed:≤200 m/min

Finished roll tissue diameter:φ70-150 mm



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Turkey

Essity sells its stake in SCA Yildiz

Essity is divesting its 50% stake in the partly owned company SCA Yildiz in Turkey to the other part owner Yildiz. SCA Yildiz is primarily active in Baby Care products. In 2018, the company reported net sales of SEK 364m (TRY 197m). The divestment gives rise to a currency related loss of approximately SEK 150m, which will be recognized as an item affecting comparability in the second quarter of 2019. This will not impact cash flow or shareholders' equity. The transaction is subject to customary regulatory approval by the competition authorities and is expected to be finalized in the second quarter of 2019. Essity will retain a presence in Turkey through its wholly owned Professional Hygiene, Incontinence Products and Medical Solutions operations.

Austria

ANDRITZ launches new PrimeLineTEX tissue machine for textured tissue

ANDRITZ has officially launched its new tissue machine for textured tissue, the "PrimeLineTEX", enabling customers to produce textured tissue of a quality superior to dry crepe and very close to structured (TAD) tissue, while at the same time achieving significant cost savings. PrimeLineTEX is available with widths of 5.6 or 2.8 m and produces high-quality tissue for towel and sanitary applications. The machine offers up to 25% fiber savings compared to dry crepe and consumes up to 50% less energy than a TAD machine. The PrimeLine TEX is substantially shorter in length than other market solutions and uses only one additional fabric instead of two.

Furthermore, the PrimeLineTEX machine can switch between production of textured and dry crepe tissue within a much shorter time than comparable solutions. "Our new PrimeLineTEX tissue machine enables customers to produce high-quality tissue close to TAD but with substantially reduced investment and operating costs. It is available to all markets worldwide, without any restrictions. This new machine offers profitable advantages for our customers," says Klaus Blechinger, Vice President Tissue at ANDRITZ.



The ANDRITZ tissue pilot plant in Graz, Austria – the PrimeLineTIAC – is currently configured as a PrimeLineTEX machine and offers customers the opportunity to test and develop their future textured tissue. Photo: Andritz



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Portugal

Suavecel expands production capacity

Suavecel has recently purchased two OMET TV 840 lines and one OMET ASV Line for interfolded products. OMET's partner for over ten years, Suavecel is one of the most important producers of tissue for domestic use in the Iberian Peninsula.

"To grow in this market it's necessary to count on the most sophisticated converting technologies and on reliable partners for technical assistance" says Arménio Leite, Suavecel Operations Director. "Our partnership with OMET was born and has developed on this basis. We purchased and installed the first OMET machine in 2005: the reliability and the precision of the folding heads led us to invest again on the OMET brand recently, buying two OMET TV 840 lines and one OMET ASV Line. In terms of service, OMET has always answered promptly and effectively to our requests for technical assistance. The experience gained over the years have led us to choose again OMET as a partner". The company works with private label products branded Suavecel, which have driven its business growth. "Our product range is diverse and allows us to satisfy any market's request with high

quality products and competitive prices - explains Leite -. Service level and control of the whole production process are fundamental to accomplish this aim: customers are more and more demanding, given the reduced deadlines and the restricted stocks. These factors require us to be flexible and to have efficient processes, especially from the logistics point of view: we have one of the largest automated warehouses of the Iberian Peninsula".

"About 60% of our production is exported, with Spain as the main destination. Suavecel also operates in other geographical areas such as France, United Kingdom, PALOPs (Portuguese-speaking African countries) and is taking its first steps in Latin America. We want to expand and consolidate our presence in these and other geographical areas - says Nuno Ribeiro, CEO of Suavecel - but we believe that there is still room to grow even in consolidated markets like Portugal and Spain, because tissue use, in our opinion, will increase".

"In the future, we want to guarantee market shares in the areas where we are already present, enter new markets and develop Suavecel brand -

concludes Ribeiro -. The OMET lines, for their technological level and their flexibility, are fundamental for achieving our growth objectives. OMET has shown over time the ability to be in step with market needs and to make advanced technological proposals such as those for digital printing. This way OMET allow to meet customers' needs and to guarantee them the best value for money". The company started its business in 1996 by selling toilet paper in the area of Viana do Castelo, Northern Portugal. Today, in addition to the production of tissue paper, Suavecel works as a converter with folded products (napkins, facial tissue, interfolded towels and toilet paper) and rolls (toilet paper, kitchen roll and industrial roll).

In 2013 the company started a tissue converting project and today they have several converting lines for a total capacity of 150,000 tons/year of folded products and rolls.

Suavecel is part of the Ghost group, which launched in 2014 Nunex, a company operating in the field of intimate hygiene (nappies, sanitary towels).



Nuno Ribeiro, CEO of Suavecel

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Romania

ANDRITZ to supply two tissue production lines to MG TEC Industry

ANDRITZ has received an order from MG TEC Industry to supply two complete tissue production lines for their mill in Dej, Romania. Start-up is scheduled for 2020 (TM1) and 2022 (TM2), respectively.

The turnkey order comprises two PrimeLineCOMPACT V tissue machines with steel Yankee as well as complete stock preparation systems, pumps, automation, hall ventilation, and electrification.

The ANDRITZ tissue machines have a design speed of 1,900 m/min and a width of 2.85 m. They are equipped with a 15 ft. PrimeDry Steel Yankee for energy-efficient and safe operation. The drying components PrimeDry Hood G, PrimeDustEXT dust extraction system, and PrimeMistEXT mist extraction system as well as the hall ventilation system will be delivered by ANDRITZ Novimpian-ti. The ANDRITZ pumps with efficiencies of up to 90% enable long life cycles at highest cost-effectiveness. The ANDRITZ automation system combined with the latest drive technology ensures modern and efficient plant operation.

Ioan Tecar, Project Coordinator, says: "Decisive criteria for the order were the innovative technologies of ANDRITZ that enable easy and safe operation with high quality and the capability to deliver everything from a single source."

MG TEC Industry is a newly formed company focusing on innovation and sustainable tissue production.

Italy

Marco Dell'Oso new Chairman of iT's Tissue

A new management structure marks the beginning of an ambitious three-year programme for iT's Tissue, the Italian Technology Experience.

After seven years and three editions of the unique live technology open-house event, Marco Dell'Oso has been appointed Chairman, leading an independent management team to take the brand forward.

"Our network of founding members represents the best of Italian technology in the field of tissue," said Dell'Oso. "We have also benefited from the involvement of high-level partners who have brought complementary expertise to our initiative. We intend to extend this relationship more widely to a group of companies with shared values and standards of excellence. As such we can enhance the experience of our visitors and partners and ensure we are offering the best the world has in terms of tissue technology, networking and vision for the future."

The iT's Tissue management team includes Stefano Bortoletto, CFO, Maddalena Marcone, Events and PR Manager, and other experienced professionals.

The next iT's Tissue in the heart of Italy's "Tissue Valley" has been confirmed for June 2021 with the founding network members and the participation of a wider group of global partners.

On behalf of the founding members, Past President Massimo Franzaroli said: "We are delighted to hand the torch to a new management team with the experience and ability to support the growth of iT's Tissue. The network will continue to give its enthusiastic support to the brand and the unique experiences it offers."

iT's Tissue also intends to apply its visionary approach to a new event in 2020, details of which will be announced in due course.



Left to right: Stefano Bortoletto, CFO - Maddalena Marcone, Events and PR Manager - Marco Dell'Oso, Chairman

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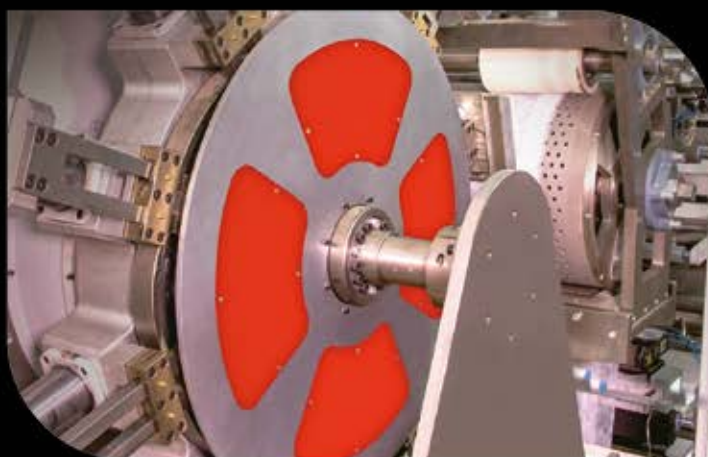


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Fabio Perini and Casmatic make eco-friendly packaging solutions

In light of recent restrictions of the European Commission concerning disposable products, Fabio Perini has developed a “green” primary and secondary packaging solution that can easily adapt to current systems and existing equipment. This provides cost efficiencies for Fabio Perini customers and helps them actively contribute to safeguarding the environment while keeping up with technology and productivity. Fabio Perini and a partner company conducted numerous materials tests on the latest generation packaging and ultimately developed an innovative, totally ecological material that combines paper and bioplastic to form properties that can be inter-

changed with normal polyethylene. Paper Packaging Solution is a paper coupled with Mater-Bi, a totally ecological bioplastic having the same properties as plastic polymers, but with the added benefits of being recyclable, biodegradable, and compostable. Two different types of Paper Packaging Solution products are available: a low-weight paper, 25 gm², and a thicker paper, 40 gm². Both are FSC-certified and are laminated or extruded with bioplastics with thicknesses ranging from 7 to 9 microns to ensure high pack weldability and an excellent product hygroscopic barrier.

Further, Paper Packaging Solution products are available in virgin paper or recycled paper.

Paper Packaging Solution products are fully compatible with Casmatic's

latest generation packaging machines — such as Casmatic A6T, CMW1000 and the new Carbon T — thanks to the “bio-pack kit.” This innovative device makes it possible to select the desired type of packaging material from the control panel and the Casmatic packaging machine automatically sets various parameters, including heat and time, required to perfectly seal the packages according to the packaging composition.



Eco-friendly packaging on Casmatic machines



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New frontiers of the 4.0 industry with OMET Intelligent Plant

OMET Intelligent Plant is a system for collecting, analyzing and displaying production data that allows companies to have all information about the machine's activity anytime and everywhere. All data are stored continuously in interconnected and secure databases that can be questioned real time. The platform is web-based, safely reachable from any device connected to the company network, and compatible with all major operating systems. Thanks to the data storage, any kind of analysis for statistics or assistance purposes becomes possible. The software can have a bidirectional function: not only for collecting data, but also to give instructions to the machine about the ongoing production.

The real-time visualization of production parameters enables actions on collateral issues: for example, to evaluate the efficiency of operators working on the machine, the wear patterns, the use of optional devices, and above all to identify the causes of problems and downtimes to solve them immediately. Each line can also be equipped for measuring energy consumption. For an easy use of the software, OMET has set up an interface that displays clear and intuitive graphical information about the most important parameters useful to evaluate the machine work, such as speed (m/min, pieces/min, packs/min), the product (format, lot, percentage of completion), the operator (credentials, shift, recognition through badge or RFID tags), the configuration (units in use), the time trends of speed or temperature that can influence malfunctions or overloads.

The development of this software answers both to the global trend towards industry 4.0 and to the high request of this kind of data from the market. "Giving customers the opportunity to take a step further towards complete automation and the increasing integration of people's work with that of intelligent machines. OMET has heavily invested in the 4.0 industry and the innovations of recent years led us to a new frontier of industrial automation, which we proudly offer to our customers". All new OMET machines are equipped with this software, but it can be installed on any existing line.



The platform is web-based, safely reachable from any device connected to the company network, and compatible with all major operating systems.

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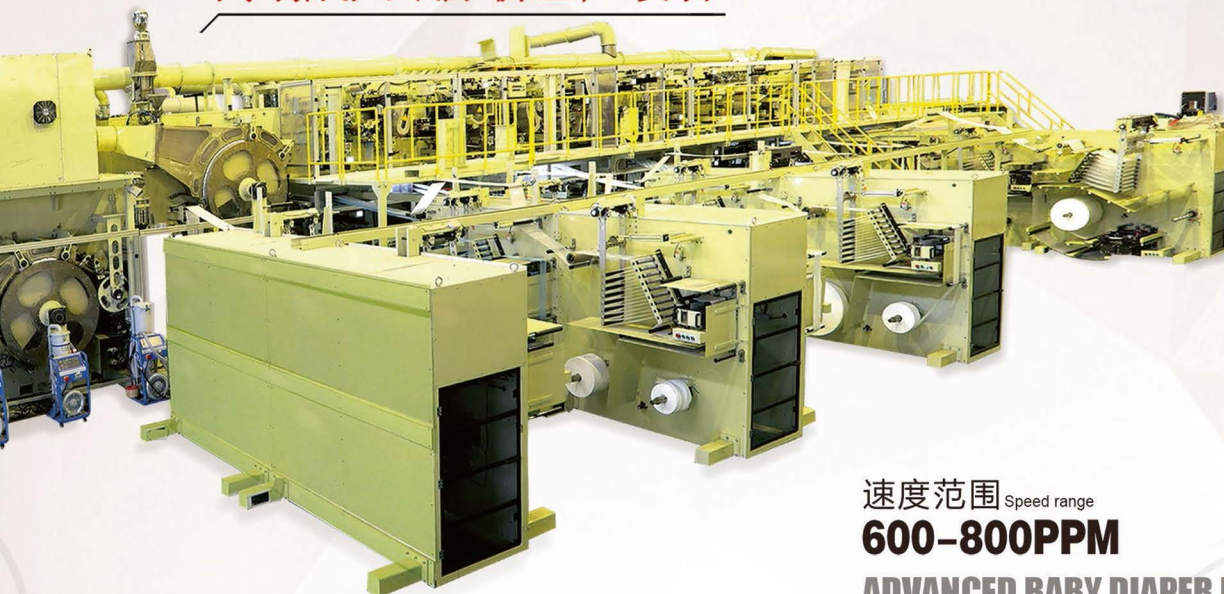


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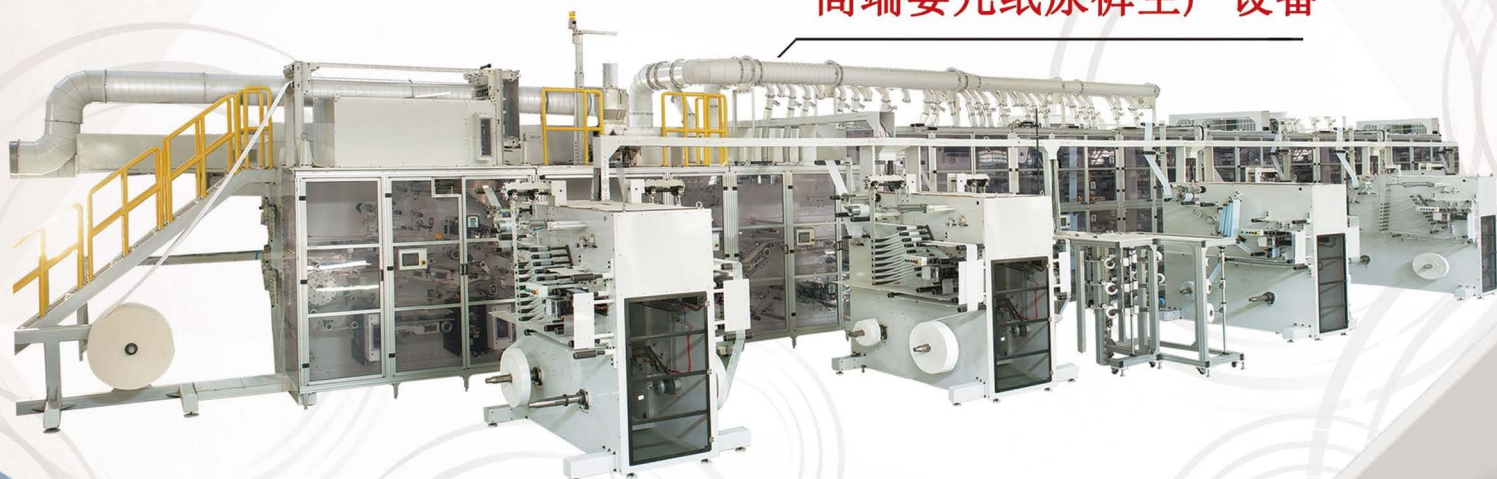


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SWEDEN

Valmet has completed the acquisition of GL&V

On April 1, 2019, Valmet completed the acquisition of GL&V, which was announced on February 26, 2019. GL&V is a global provider of technologies and services to the pulp and paper industry. The enterprise value of the acquisition is approximately EUR 113 million on a cash and debt free basis subject to ordinary post-closing adjustments. The acquired business becomes a part of Valmet's Services business line. GL&V supplies technologies, upgrades and optimization services, rebuilds, and spare parts for the pulp and paper industry globally. The acquired operations had net sales of approximately EUR 160 million in calendar year 2018 and employ about 630 people.

As announced on February 26, 2019, GL&V's washing, oxygen delignification and bleaching operations with Compact Press®, pumps and mixers technology for chemical pulping as well as the related Product Center in Karlstad Sweden are not included in the transaction scope.

"The acquisition was completed as planned, and we welcome our 630 new colleagues to Valmet. This strengthens Valmet's global services business further and complements our technology offering for the pulp and paper industry customers. The acquisition also consolidates our local presence and capabilities globally. The combination of Valmet's global reach and GL&V's product and services offering for chemical pulping, stock preparation, papermaking and finishing create a good basis for new business opportunities and for serving our customers even better," says Pasi Laine, President and CEO of Valmet.

INDIA

PAPEREX 2019 – Setting the pace for manufacturers, traders & buyers of paper & all allied industry

World production of paper and paperboard is forecasted to reach 490 million tons by year 2020.

Cardboard and packaging paper products will have continued global demand. Packaging Market is also growing all over the world, along with tissue papers, and pulp for hygiene products.

The current greatest strength of the industry is the increasing demand for packaging products. As more people around the globe turn to online shopping or ecommerce, the demand for cardboard and other packing materials continues to remain strong.

Other factors driving the success of the pulp and paper industry are the demand for hygiene products—like paper towels, toilet paper and disposable makeup wipes—and increased economic participation of the global middle class.

The center of the paper industry is also shifting towards more eco-friendly goods and technology. Overall, the pulp and paper industry is projected to remain healthy. India's paper and paper board industry thus has unlimited scope. Judging by the investments paper manufacturers have made in modernization and expansion so far, India's pulp and paper industry is well on its way to a glorious future.

PAPEREX is the series of International exhibitions on the Pulp and Paper Industry and is held biennially in New Delhi, India.

Paperex 2019 has already received an overwhelming response from the world and over 90% exhibition space has already been booked in just few months of announcement. The event is ready to repeat the success story with expected presence of 700 + exhibitors from 35 countries

A sneak preview of the whole event:

- Support from major trade associations of paper and allied industries and World Paper Forum

- Presence of over 700 + leading Exhibitors from 35+ countries
- Trade visitor from 75 + countries
- International Group Participation from China, Finland, France, Germany, Italy, Taiwan, etc
- I-50: - Special Invitation program to all Leading Paper Manufacturers & Traders of 50 countries
- Various New Launches by exhibitors
- Handmade paper pavilion
- Concurrent conference and International Business Networking Program
- A high level Technical Concurrent Conference by "Indian Agro & Recycled Paper Mills Association"
- The leading exhibitors will offer the latest technology, machinery and raw material for paper & board manufacturing
- PAPEREX is held in concurrence of three collocated events to cater the entire gamut of paper & all allied industries at one business platform
- WORLD OF PAPER a concurrent show for Paper, Printing, Packaging & Publishing industries
- CORRUGEX, a concurrent show on Corrugated Box Machinery, Technology & allied Industries
- TISSUEEX, a concurrent show highlighting the participation of Tissue, Products, Machinery & Technology

Paperex is scheduled from 3-6 December 2019 in New Delhi. For more information on the exhibition, please log on to <http://india.paperex-expo.com>

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- ▶ Converting Operations
- ▶ Market Information and Forecasts
- ▶ Nanocellulose Applications for Tissue
- ▶ Furnish and Fiber
- ▶ Chemistry and Additives
- ▶ Tissue Product Innovations
- ▶ Water Usage
- ▶ Yankee Drying, Creping and Safety
- ▶ Operating Efficiency/Energy Savings
- ▶ Regulatory
- ▶ Process Control
- ▶ New Technology Showcase

Produced by industry leaders, TAPPI and Fastmarkets RISI, **TissueCon 2019** is the only non-commercial, peer-reviewed Tissue industry conference held in North America.

Registration now open – Early Bird rates available for a limited time!
Visit tissuecon.org for more information and to register.

Formerly known as the TAPPI/RISI Tissue Conference, the debut of TissueCon 2019 is a response to the industry's growing presence and focus on sustainability, the circular economy, and the impacts of the global market. TissueCon 2019 shares new opportunities and challenges designed to help shape future industry success.

China

Yibin Paper starts up TM6

The fifth A.Celli iDEAL® Tissue machine “100% bamboo” has been successfully started up on March 11 2019. This is the last of five tissue machines ordered by Yibin Paper to A.Celli Paper in July 2017.

TM6-iDEAL®, which is using 100% bamboo slush pulp as raw material, is designed for operating speed of 1600 m/min and paper width of 2850 mm.



Yibin Paper: A.Celli TM6 start-up

Vietnam

Xuan Mai Paper boosts capacity

ANDRITZ will supply Xuan Mai Paper Co. Ltd. with a PrimeLineECO tissue machine for its mill in Ho Chi Minh City, Vietnam, for the production of high-quality tissue grades made of either 100% virgin or 100% deinked pulp (DIP). Start-up is scheduled for the second quarter of 2020.

The new PrimeLineECO tissue machine for Xuan Mai Paper has a design speed of 1,300 meters per minute and a paper width of 2.85 meters. The scope of supply includes a separate DIP line, a stock preparation system for LBKP/NBKP market pulp, an approach flow system, a fiber recovery and broke handling system as well as basic and detail engineering.

The PrimeLineECO tissue machine is a new machine extending ANDRITZ's product portfolio, focusing on emerging markets and their need for energy savings: The combination of a 15 ft. steel Yankee with a special steam-heated hood by ANDRITZ Novimpianti enables highly efficient drying with substantial energy savings. The specific hood design, proven and optimized with CFD-analysis and comprising optimized nozzle geometry, results in highly consistent and efficient drying performance.

Indonesia

Aspex Kumbong starts up new Crescent former machine

On May 15, 2019, Aspex Kumbong started up a new tissue machine at its Bogor mill in Indonesia.

The Crescent former tissue machine supplied by Papcel, is designed for a capacity of 60 tonne per day, at the operating speed of 1,200 m/min. Trimmed width on the reel is 2,850 mm. The tissue machine produces facial and toilet tissue paper, with 13 to 35 gsm basis weight ranges.

Testing and commissioning of the new tissue machine has been being carried out since April 2019. It's an approach part delivery with instrumentation of stock preparation, the entirely new tissue machine including winder and wrapper.

PAPER-ME 2019 TISSUE-ME 2019



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Japan

Crecia-Kasuga increases toilet tissue production Crecia-Kasuga Co., a joint venture for tissue paper products established by Nippon

Paper Crecia Co., a Nippon Paper Group company, and Kasuga Paper Industry Co., will install a second tissue machine (TM2) following the installation of TM1, which commenced operation in May 2018. Capital investment in the machine is approximately 8 billion yen (US\$ 75,200,000). The TM2 will be installed next to the first paper machine in the premises of Fuji Mill (Fuji-shi, Shizuoka) of Nippon Paper Industries Co., Ltd. Its annual production capacity is approximately 40,000 tons. It will mainly produce long roll toilet tissue, for which demand has been increasing in recent years. With this increase in the production capacity of Crecia-Kasuga, Nippon Paper Crecia will work to enhance the supply system that will meet the increase in demand for long roll products. In addition, the company will not only work to promote the further popularization of long roll products but will also strive to achieve growth in the market for the household paper product business while responding to diverse market needs precisely. The TM2 startup is scheduled for June 2020.

USA

Georgia-Pacific invests \$120 million to grow bath tissue business

Georgia-Pacific's Naheola, Alabama, mill is set to receive an investment of more than \$120 million for a new tissue machine and roll storage building to support the company's retail bath tissue business.

While the new tissue machine will replace two older machines, it will increase capacity and support new tissue converting lines that are currently being started up at the mill. These latest investments continue the modernization of the Naheola mill, which includes ongoing construction of a new biomass boiler and woodyard. Engineering and related work has begun, and the actual startup of the machine is scheduled for 2020. In the past five years, capital investment at the Naheola mill has totaled more than \$500 million, and Georgia-Pacific's statewide investments have totaled approximately \$1.6 billion.

Essity invests in sustainable alternative fiber technology

Essity is investing approximately SEK 400m in an integrated facility for the production of pulp based on alternative fiber from plant-based agricultural by-products such as wheat straw which is often made into compost or incinerated. The alternative fiber will have the same quality as conventional wood-based pulp at a competitive cost. The investment is taking place at Essity's tissue plant in Mannheim, Germany. Production is expected to commence in the second half of 2020. Essity has signed a license agreement securing exclusive rights to the new proprietary technology. Essity is now evaluating the integration of this alternative fiber as a complement to fresh and recovered fiber as raw material in its production. "To support our sustainability ambitions, we continuously assess new production methods. This is one example of how innovation can contribute to a sustainable and circular society," says Magnus Groth, President and CEO of Essity.

The process will enable a reduction in the use of water, energy and chemicals while the by-product of the integrated pulping process can be further refined to serve as a substitute for oil-based chemicals.

Kadant Black Clawson achieve sales milestone with 10,000 Fibrewall screen cylinders sold

Kadant Black Clawson LLC, a subsidiary of Kadant Inc., announced the fabrication and sale of the 10,000th FibreWall screen cylinder. The patented FibreWall screen cylinder is designed for the high-efficiency removal of debris and contaminants from pulp. It effectively removes stickies—including micro-stickies—that consist of various adhesives, resins, waxes, inks, and other viscous additives found in the paper making and recycling processes from the pulp furnish.

"Bottom line, the FibreWall screen cylinder has been a big success for our customers and for us," commented John Eklund, vice president of sales at Kadant Black Clawson. "Our customers rely on performance and consistency. The FibreWall has delivered top performance time and time again, across the globe, year after year, under the most adverse conditions. The fact that we've done this ten thousand times now is really saying something. We are extremely proud."



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Cascades acquires Orchids Paper for \$207 million

Cascades has entered into a definitive agreement for the acquisition of substantially all of the assets of Orchids Paper Products Company. Cascades will pay a cash consideration of US\$207 million, financed by the company's credit facilities. The assets to be acquired include the Barnwell, South Carolina and Pryor, Oklahoma operations, as well as certain assets, the supply and other commercial arrangements with Fabrica de Papel San Francisco, S.A. de C.V., based in Mexicali, Mexico, and certain of its affiliates. The acquired assets are expected to generate annual EBITDA of approximately US\$45 million beginning in 2021, implying an acquisition multiple of approximately 5x, driven by the maximization of capacity utilisation of the acquired facilities, Company asset rationalization, and important reductions of corporate, sub-contracting and logistics costs. Orchids Paper's integrated plants have an estimated parent roll capacity of up to 114,000 tons and up to an estimated 114,500 tons of converting capacity. Additionally, Orchids Paper has an agreement with Fabrica providing access for up to an additional 20,000 tons of converted products for the Western U.S. market. More than US\$240 million has been invested in the plants' modern production and converting equipment and strategic partnership over the last five years. This includes, at the Pryor site, the installation of a new paper machine, two new converting lines and the modernization of two others converting lines. At the Barnwell site, a new Valmet QRT paper machine was installed in 2017. In the coming months, Cascades will invest approximately US\$5 million to add swing functionality to expand the range of products that can be manufactured from ultra-premium structured tissue to high-quality conventional, thereby maximizing its full potential.

In the coming months, Cascades will maximize the profitability of the Barnwell and Pryor plants, which operated at approximately 30% and 70% of their total converting capacity in 2018, by transferring volumes that are currently outsourced to third parties or produced at the Company's other U.S. plants to these facilities. The operational optimization of the new assets, lower transportation and sub-contracting costs, reduction of Orchids corporate costs, and the rationalization of Cascades' current platform are expected to generate full-year annual EBITDA run-rate of approximately US\$45 million beginning in 2021. Cascades President and CEO, Mario Plourde, commented: "This acquisition is very well aligned with our strategic plan and supports our efforts to position our tissue platform for long-term growth. The acquisition of these well-funded assets enables us to do so while simultaneously supporting market consolidation and avoiding the risks inherent in the construction or installation of new equipment. We are focused on carrying out strategic investments in our key tissue sector that will modernize our assets, lower our fixed cost base, optimize our geographic footprint, and improve our logistics network and requirements to support the growth of our customers and Cascades. We are very pleased that this acquisition is well equipped to do all these. I have confidence in our future in this sector which has been very beneficial and generated interesting margins for Cascades over the past 40+ years".

Kruger Products to invest \$575 million to build a new tissue plant

KP Tissue Inc. and Kruger Products L.P. started the construction of their future Sherbrooke tissue plant that will be equipped with Canada's most advanced and best-performing TAD technology. Located in the borough of Brompton, the new plant will be constructed on a site adjacent to an existing Kruger paper mill, along the Saint-François River. This \$575-million investment will create 180 jobs in Estrie, as well as some 1,700 direct and indirect jobs during the construction period that will end in 2021. Kruger Products' Sherbrooke Plant will include a through-air-dry (TAD) tissue machine, it will also include converting lines. Ultimately, the plant will manufacture approximately 70,000 metric tonnes a year of ultra-premium bathroom tissue and paper towels under the Cashmere®, SpongeTowels® and Purex® brands. "We are very proud to strengthen Kruger Products' presence in Québec with this large-scale project that will provide significant benefits to the Estrie region. What's even more exciting is that the local know-how will shine across North America with products distributed throughout Canada and in the United States," said Dino Bianco, Chief Operating Officer of Kruger Products.



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Mexico

ACELLI supplies Grupo Corporativo Papeleira with iDEAL® forged Yankee

A.Celli Paper delivered a new generation iDEAL® Forged_YD – 16” Yankee Cylinder to Grupo Corporativo Papeleira, for its El Tepetloxtot plant, Mexico.

iDEAL® forged YD is the new production technology, conceived and patented by A.Celli Paper, which allows to make cylinders with a seamless shell, starting from a single piece of steel that is shaped and worked with hot forging and rolling systems. The result is a homogenized and high-quality manufacturing material structure.

Valmet to deliver fifth tissue production line to Papel San Francisco

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 third quarter of 2020. The Advantage DCT 100TS 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 tissue paper

per year to Papel San Francisco’s current production of toilet tissue, kitchen towels and napkins. Valmet has previously delivered four tissue machines to the company. Three Advantage DCT machines started up in 2006, 2009 and 2018. 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. “The choice to select the Advantage DCT machine was quite easy. Equipped with the Advantage ViscoNip press, it is the most efficient and best choice for the grades we need to produce. It is also in our philosophy to go for low energy consumption and lowest possible emissions to air and water. With this new tissue line, we expect to achieve the best tissue quality combined with lowest energy consumption,” says Dario Palma y Meza Espinoza, Operational Director, Papel San Francisco. Papel San Francisco started up their first tissue machine in 1980. In the past 35 years the company has grown steadily and is today operating six tissue machines with a yearly capacity of 180 000 tons of tissue products.

Brazil

Aspex Kumbong starts up new Crescent former machine

On May 15, 2019, Aspex Kumbong started up a new tissue machine at its Bogor mill in Indonesia.

The Crescent former tissue machine supplied by Papcel, is designed for a capacity of 60 tonne per day, at the operating speed of 1,200 m/min. Trimmed width on the reel is 2,850 mm. The tissue machine produces facial and toilet tissue paper, with 13 to 35 gsm basis weight ranges. Testing and commissioning of the new tissue machine has been being carried out since April 2019. It’s an approach part delivery with instrumentation of stock preparation, the entirely new tissue machine including winder and wrapper.



From left: Jan Erikson (Valmet), Dario Palma y Meza (PSF), Julio Rodriguez (PSF), Jan Larsson (Valmet), Fernando De La Torre (PSF), Enrique Zarate (PSF), Anders Lorentzon (Valmet) and Jose Luis Emanuel Garcia (PSF).

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TOSCOTEC

The Navigator Company reaps the fruit of success at Vila Velha De Ródão mill

Interviewed by **Giulia Fabbri**
China Sales and Marketing Manager, Toscotec



Aerial View of Vila Velha De Ródão mill

The Navigator Company is a leading producer of forestry, pulp & paper, tissue and energy. In 2015, it acquired AMS-BR Star Paper, S.A., an established tissue producer that owned two Toscotec AHEAD 2.0S tissue machines at its Vila Velha De Ródão mill: PM1, started up in 2009, 110 t/d capacity, 1,900 m/min operating speed, and PM2, in operation since 2015, 115 t/d capacity and 2,000 m/min operating speed. Joaquim Belfo, Mill Manager BU Tissue VVR and Pedro Antunes, Tissue Production Manager, shared their views on the efficiently integrated industrial unit at Vila Velha De Ródão and the cooperation with Toscotec, the mill's tissue manufacturing turnkey supplier.

Who

is The Navigator Company? What are your main products and how are you positioned in terms of market share?

J. Belfo: In 2009, we started up the second paper mill of Setubal industrial complex - which includes a pulp mill and two paper mills – and we called it “About the Future”. This undertaking decisively boosted Portugal’s industrial capacity and it positioned the Navigator Company as Europe’s leading manufacturer of uncoated woodfree paper (UWF) and the sixth largest manufacturer worldwide. Secondly, we are one of the largest producers of bleached eucalyptus kraft pulp (BEKP) in the world, for which we rank first in Europe. We currently have an installed capacity of 1.6 million tonnes of pulp - of which 1.1 million integrated with paper production - and 1.6 million tonnes of paper. We also diversified into the tissue sector and we are presently the third largest tissue producer in the Iberian

We currently have an installed capacity of 1.6 million tonnes of pulp - of which 1.1 million integrated with paper production - and 1.6 million tonnes of paper.

Peninsula, with a production capacity of 130,000 t/y of tissue reels and a converting capacity 120,000 t/y. Apart from pulp & paper, we also manage over 110,000 hectares of forest and the largest certified nursery in Europe, with 12 million plants capacity per year.

Finally, we are Portugal’s largest producer of renewable energy from forestry biomass, generating 2.5 TWh of electricity per year.

What

can you tell us about your first cooperation with Toscotec in 2009, PM1 at Vila Velha De Ródão mill? 10 years on, how is PM1 performing?

P. Antunes: Thanks to the very good partnership between AMS - at the time - and Toscotec, PM1 project was a success. We worked as one united team and figured out the best solutions to the challenges we encountered. After 10 years of operation, PM1 is still producing high quality paper, at an efficiency of more than 90%.



Toscotec AHEAD-2.0S tissue machine PM1

Let's focus on Vila Velha De Ródão mill's second line in 2015.

What

were the reasons for the expansion and for your choice of technology?

P. Antunes: In 2015, given the growing demand for tissue in the market, we decided to increase our production capacity. Vila Velha De Ródão has been designed as a vertically integrated mill, which gave us an advantage, compared to our competitors. We selected Toscotec, because we were pleased with the outcome of PM1 project. In addition, we chose to install their shoe press technology TT NextPress, because it guaranteed higher paper quality – in particular for bulk, softness and moisture profile. There was also a reduction of our production costs, in terms of drying energy consumption. The biggest challenge on the PM2 project was to define the stock preparation layout, considered that we were faced with the issue of limited available space. Toscotec managed to install all the equipment according to schedule, start up the machine at the target date, and produce sellable paper from day one.

Why

did you choose a turnkey supply on PM2? Why Toscotec as turnkey supplier?

P. Antunes: The turnkey format gave us considerable advantages, in the sense that we only had one supplier to deal with and delegated to Toscotec the detailed management and coordination of the project, including the selection, negotiation and management of a large number of sub-suppliers. This made things much easier for us. We could be very fast in solving problems and had the flexibility to make modifications as we went along.

As for the reasons for choosing Toscotec, first we were happy with Toscotec's work on PM1, which had also been a turnkey project. Toscotec managed to complete the installation from greenfield to paper

on reel in record time. They also provided extensive training programs to the staff of the mill, sharing their experience and expertise with our new team. On PM2, they showed us the 3D design of the plant and we could immediately see the careful optimization of the available space. The layout of the manufacturing area implemented in 2008 - including the cellulose handling system, stock preparation, tissue machine and rewinder - had been made in line, in order to maximize the mill's manufacturing and efficiency levels. In 2015, when we added the second tissue line, Toscotec adapted the layout of the new machine to the available space, figuring out a smart way to optimize the auxiliary systems, such as the boiler, the cellulose storage, the air compressor and the rewinder, so that they could be used in common by the two tissue machines.

The layout of the manufacturing area implemented in 2008 - including the cellulose handling system, stock preparation, tissue machine and rewinder.



Toscotec AHEAD-2.0S tissue machine PM2



Toscotec TT WIND-H slitter rewinder and AHEAD-2.0S tissue machine at Vila Velha De Ródão mill

What

results did you get on machine efficiency & product quality? What about TT NextPress performance in particular?

P. Antunes: After three years of production, we are running stable at 90% efficiency on PM2. This machine is mainly dedicated to low basis weight tissue and premium quality toilet paper. TT NextPress turned out to be a precious additional tool to manage the process. It allows us to achieve better basis weight and moisture profiles. We are very happy with the uniformity of the profiles on PM2. This translates into better quality of the final product. Another advantage of TT NextPress is that it allows us to reach better machine performance when producing low

basis weight tissue. Finally, we can definitely say that PM2, thanks to TT NextPress, is more efficient than PM1 that installs a jumbo suction press roll, in terms of drying energy consumption.

How

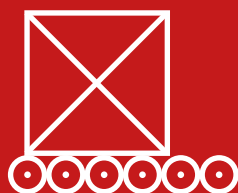
would you describe the cooperation with Toscotec? Overall, what has Toscotec done for you?

P. Antunes: we have a close cooperation with Toscotec. They respond timely and competently to the issues we face. Toscotec's team has very strong problem solving skills. In terms of goods delivery, they meet the delivery time we agreed. Moreover, the training programs that Toscotec delivered onsite at the mill

really made us start on the right foot. Our new team at the time had limited experience of modern tissue machines running at 2,000 mpm, and the detailed knowledge that Toscotec's team managed to share with them made all the difference. In general, Toscotec's support to us is not simply about solving problems. They are often proactive in proposing upgrades and improvements on their machines, in order to allow us to benefit from the progress that they make with their technology.

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Is circular economy the next breakthrough in tissue business?

Tissue comes in different dimensions and sizes, whether toilet paper, facial tissue, towels, or napkins. A valuable commodity – even essential - playing a vital role in improving sanitation and hygiene needs. But it's resource intensive, which urges for sustainable practices, for a better world, and, a better business.

Dana El Sanioura,
Contributing editor





Though the industry has taken stride in improving its own sustainability, progress has been slow and somewhat sparse. Widespread environmental concerns among governments regarding unsustainable production, high level of consumption patterns in industrialized countries, coupled with water shortages, increased costs of energy, and uneven distribution of natural resources throughout the world are some of the drivers of change in the centuries-old industry. On the surface, the onus of sustainable behavior has been directed to the consumer through behavioral change whether through curbing consumption, changing products preferences, or recycling. Whereas much of the impact of the industry is in fact concentrated within the compounds of factories. Larger companies are seeing the benefit of new tools like Life Cycle Assessments and Environmental Assessment technologies.

The following review is the first article in a two-part series which examines the role of circular economy in mitigating environmental challenges facing the tissue paper industry.

Such assessments monitor the overall environmental performance in order to improve the manufacturing process through informed decisions while more importantly driving down the overall costs of production in an increasingly competitive market. The following review is the first article in a two-part series which examines the role of circular economy in mitigating environmental challenges facing the tissue paper industry. This paper is divided into three main sections; the first section is a brief overview of the key processes involved in the manufacture of tissue paper and provides a glimpse into the type of resources needed in each stage. The second section outlines the environmental impacts that results from traditional manufacturing practices of tissue paper. We will end the discussion by introducing the

rationale behind integrating circular economy in this resource-intensive sector as the consensus of the scientific community provides further evidence to the direct implication of human-related industrial activities in climate change. Moving over to our next article; we will introduce an overview of the best available environmental techniques in the market that mitigate the impacts of traditional manufacturing and present examples of sustainable approaches from key players in the sector. We will also provide recommendation of a better implementation of the circular economy approach in the industry.

Background | Tissue manufacture

Tissue paper is made from either virgin pulp (fiber coming from the cooked wood chips), or from recycled paper products. To make pulp using wood based raw materials, a pulp mill first has to turn tree logs into wood chips. The latter are cooked by an energy and water-intensive harsh chemical process in order to separate wood fibers into cellulose fibers free from natural adhesives such as lignin and sugars. Once the cellulose is separated from unwanted debris, the pulp goes through a series of rollers where water is extracted resulting in a naturally brown colored product.

Hence, in the following stage, the pulp is sent through a chemical bleaching process to whiten the product and increasing fiber strength.

On the other hand, if raw material is based on recycled paper products, then the latter is mixed in with water and chemicals in a pulper and then screened in order to separate cellulose based fibers from impurities and dirt.

At this stage in both processes, the furnish (pulp mixed with chemicals and water) should be sent to the tissue machine, where water is drained and evaporated and the sheet of tissue paper is basically formed. This is carried out by passing the furnish in a press and then through a steam dryer and air-drying hood. The dryer is a large cylinder where high steam temperature is used to dry the sheet by rolling it over the dryer surface and allowing the steam to heat up the sheet.

The air-drying hood is a cap of hot air blowing on the sheet surface and at the same time used as an exhaust fan to discharge the evaporated water out from the sheet, giving the newly formed sheet main characteristics of thickness, softness and dryness. After that stage the tissue paper is creped or crinkled and rolled on the reel to form the jumbo tissue roll.

Finally, the jumbo tissue paper rolls

are sent to a converting machine that generate multiple ply tissues, fold napkins and tissue, and other tissue products that consumers can recognize.

Environmental impact of the tissue sector

Energy Consumption

As the fourth largest Greenhouse Gases (GHG) emitter among global manufacturing industries, the Pulp and Paper (P&P) manufacturing industry accounts for 6% of total global industrial energy consumption while being responsible for around 9% of the total overall CO₂ emissions from manufacturing industries (see Figure 2). In effect, the International Energy Agency ranks the sector alongside other energy intensive sectors such as cement, iron and steel. Specifically speaking, in tissue paper production, electricity consumption used to power different motor drivers can account for 25% of the total GHG emissions especially in countries where the national grid is dependent on fossil fuels. In fact, the Total Life Cycle Energy Requirements of any tissue manufacturer can vary slightly according to the origin of electrical power used to run the facility (solar power vs wind power vs fossil fuel), nevertheless it is common practice for other operations to dependent entirely on fossil fuel.

The transportation of virgin wood from forests to pulp making mills and then to the paper manufacturing site is an energy extensive activity. Each stretch of the operation could be occurring in a different country from a different continent. According to Gemechu et al. (2013), tissue paper manufactured in Catalonia can procure 75% of its wood pulp from Europe by lorry and import about 25% from South America by ship, in contrast, waste paper can be sourced from a 250 km radius from around the Catalonia area thus significantly cutting down on the Total Life Cycle Energy Requirements. According to the same study, the extensive use of steam and hot air in the tissue paper production is also a major contributor of GHG emission, where it can be responsible for up to 23% of the overall tally (which followed a cradle-to-grave approach whereby logging, chemicals, and

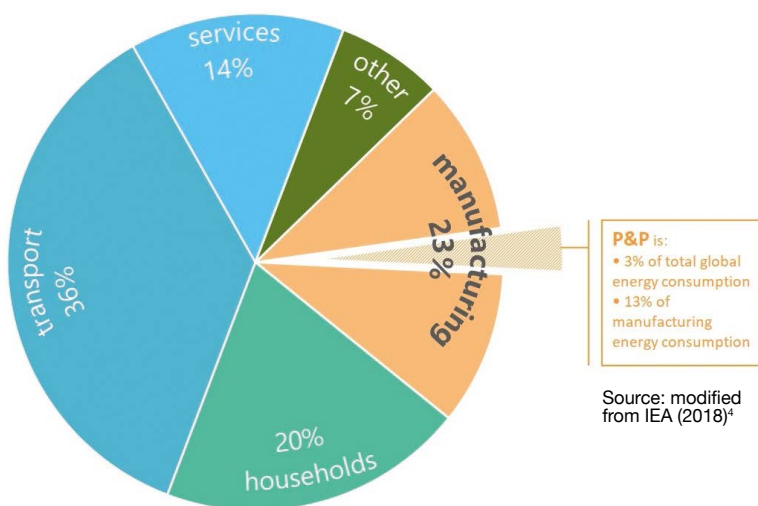


Figure 1: Largest energy end-uses by sector

¹GHG are any of various gaseous compounds (such as carbon dioxide [CO₂] or methane [CH₄]) that absorb infrared radiation, trap heat in the atmosphere, and contribute to the greenhouse effect.

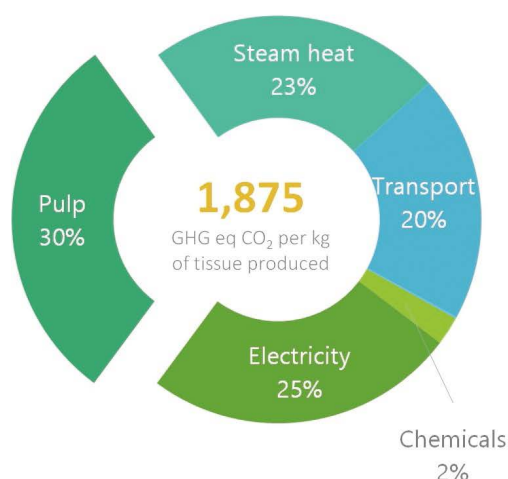
²Pandey, A.K. and Prakash, R. (2018) Energy Conservation Opportunities in Pulp & Paper Industry. Open Journal of Energy Efficiency, 7, 89-99. <https://doi.org/10.4236/ojee.2018.74006>

³Gemechu, E. D., Butnar, I., Gomà-Camps, J., Pons, A., & Castells, F. (2013). A comparison of the GHG emissions caused by manufacturing tissue paper from virgin pulp or recycled waste paper. The International Journal of Life Cycle Assessment, 18(8), 1618-1628.

⁴Energy efficiency indicators 2018 highlights. Published by INTERNATIONAL ENERGY AGENCY. Available at www.iea.org

⁵Pandey, Ashok & Prakash, Ravi. (2018). Energy Conservation Opportunities in Pulp & Paper Industry. Open Journal of Energy Efficiency. 07. 10.4236/ojee.2018.74006.

virgin wood process



recycled waste paper (rwp) process

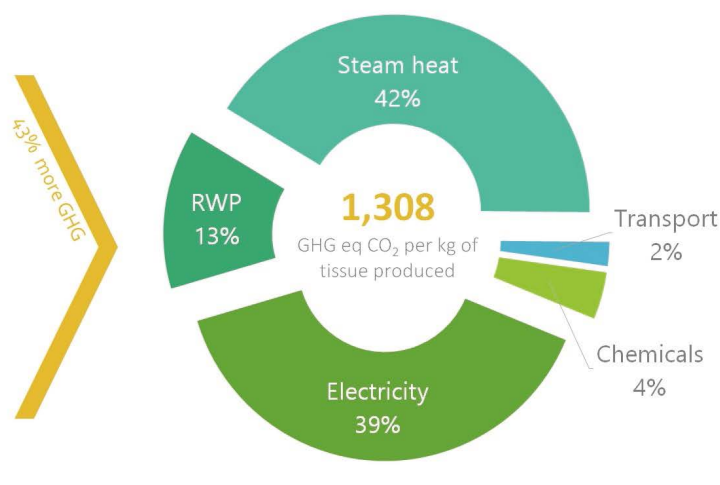


Figure 2: Comparison of GHG emission between virgin wood and recycled waste paper

transportation were included in the calculations). In fact, most of the steam is needed in the drying stage of the paper making process. The process uses large quantities of steam in order to evaporate residual water left from the previous pressing stage. Steam heat generation in the mill is indeed entirely dependent on the use of fossil fuel. In reality, newer technologies are presenting the industry with many opportunities for saving of electrical and thermal energies including the introduction of Combined Heat and Power co-generation which allows energy self-sufficiency in the process. Noting that any saving of electricity (high grade energy) translates into 3 to 4 times saving of primary thermal energy.

Resource Consumption

The primary input material in tissue manufacture is pulp sourced from either Virgin Wood (VW), annual plants, or other sources of fibers such as Recycled Wood Products (RWP). High value logs are generally directed to the construction and furniture sectors, whereas lower value logs and wood waste from sawmills are preferably directed to Pulp & Paper (P&P) processes leaving little to be wasted from the forest industry. Wood can be considered a sustainable resource should the forestry practices adopted by the sector promote sustainable forest management. The P&P sector as a whole uses about 42% of all wood harvested globally

for industrial use, this figure is critical to deforestation and other severe environmental outcomes like drought and desertification. Deforestation alone contributes 25% of the annual carbon emissions caused by human activities. Tissue paper products are derived from two types of virgin pulp: softwood and hardwood, unfortunately virgin fiber remains by far the most destructive and common source of pulp. You see, hardwood originates from deciduous trees whereas softwood is obtained from coniferous trees from areas such as the Canadian boreal forests which is a zone of closed-crown conifer forests with some deciduous species. In fact, Northern Bleached Softwood kraft

PROCESS

EXAMPLES OF GENERATED SOLID RESIDUES/WASTE

WOOD HANDLING	Bark and wood fragments, sand, and stone
RAW WATER TREATMENT	Sludge from flocculation
CHEMICAL PULPING (KRAFT)	Excess line, dregs and grits from the recovery system, extracted ESP ash; rejects and fiber
CHEMICAL PULPING (SULPHITE)	Ash from the recovery boiler, sludge from the cooking liquor system, rejects and fiber
MECHANICAL PULPING	Sand and wood fragments from chip washing, rejects and fiber from the fiber line
PROCESSING PAPER FOR RECYCLING	Rejects from stock cleaning (non-fiber rejects), fiber rejects and de-inking sludge
POWER BOILERS	Ash
EFFLUENT TREATMENT	Fiber sludge, biosludge, and chemical sludge
COMMON RESIDUES	Metals, plastics, glass, building waste, domestic waste, hazardous waste such as chemicals, spilled oil and lubricants

(NBSK), a type of softwood pulp for which Canada is known, is the most desired grade of softwood pulp for tissue products in the United States constituting between 20-40% of toilet paper and facial tissue products, and 25 to 75% of paper towels.

Forests are essential for carbon sequestration by capturing carbon dioxide from the atmosphere and transforming it into biomass through photosynthesis. By considering emission release due to loss of woodland through decomposition of fiber tissue, carbon release from soil, and eventual loss of carbon storage, one can conclude that the manufacture of tissue products from virgin fiber has a substantially higher carbon footprint than those made from other biomass. Truly, the manufacture of products purely from virgin fiber generates 3 times as much carbon as those made from other sources. Additionally, the use of RWP in tissue products reduces the use of excessively harsh chemicals and eliminates the use of bleach compared to the use of VW (even though the overall quantities of chemicals used are slightly higher, see Figure 2). However, it is not possible to recycle paper ad infinitum as fiber cannot be recycled more than seven times, thus not all recycled content is created equal. Accordingly, from a comprehensive perspective, emphasis should be directed to not only substitute VW with RWP, but to also optimize the process and reduce the amount of raw material (and consequently energy and water) needed in the first place. This becomes more feasible as technological advances allow RWP to be used to obtain products with the same quality and functionality as that produced from VW.

Solid Waste Generation

Solid waste generated from pulping processes consists of bark and wood residues from the debarking which are usually burned in boilers; washing and screening of chips, fiber rejects (primary sludge); ash from energy production which is usually disposed of in landfills or more creatively used in building material; and excess sludge from external biological wastewater treatment.

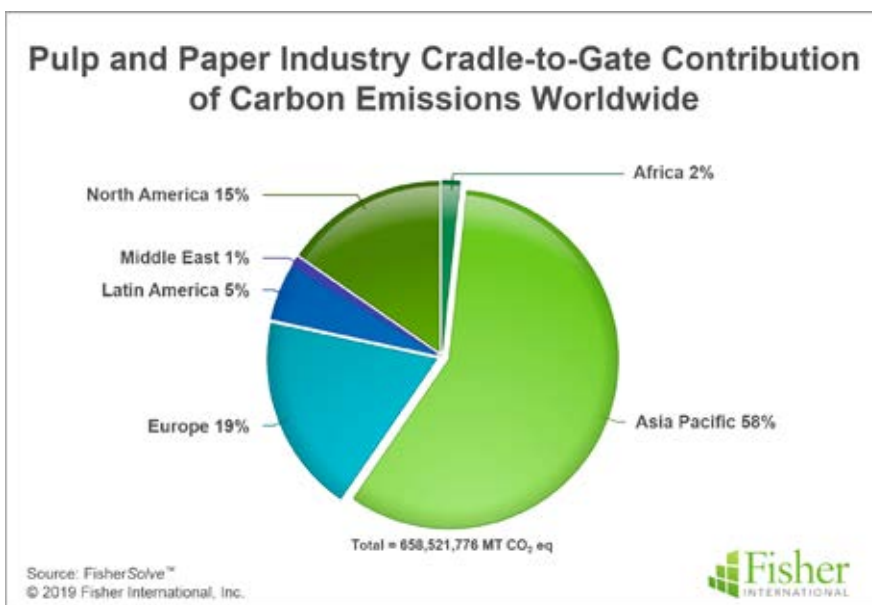
The biggest waste fraction consists of different types of sludge, mainly fiber-containing primary sludge. A more detailed list of types of residues encountered in the P&P manufacture is presented in the table.

Closing the loop in this section is the use of RWP as a raw material. Though it is considered the more environmentally friendly option considering the lower production process emissions as well as the amount of waste paper sent to landfills and the wood harvesting demands; RWP processing highly depends on the origin of the recycled fiber. Virgin fiber pulping, papermaking, printing, and packaging processes use a variety of chemicals that can have an influence on recyclability of paper. Certainly, due to strict consumer expectations of tissue paper including softness, high absorbency, and high levels of cleanliness, the processing of paper for recycling of tissue can also generate its own slew of residual waste. Pulp fiber have to be free from ash and dirt (see Section I for more on this topic), whereas their content in recycling paper can be up to 35 – 45 %. The process of washing

out these components decreases the yield during processing paper for recycling goes down to 53 – 58 % creating along the way a substantial amount of waste that required treatment. Though, it has been noted that dewatering and incineration with the intention of generating energy seems to be a growing trend in the industry.

Water Consumption and Wastewater Generation

Another essential component of the tissue paper industry is water. Throughout this review, water consumption was tackled in different forms [need for extensive washing and pulping, steam, generation of effluents]. Truly, the pulp and paper industry is ranked as the world's third largest consumer of water and is consequently producing high amounts of wastewaters; high consumption of freshwater is one of the most important environmental concerns in the paper industry. In tissue production, water consumption is higher than in many other grades like newsprint or fine paper and usually ranges from 8 to 100 m³/ton. This is because tissue products have very high quality standards



⁶Gemechu, E. D., Butnar, I., Gomà-Camps, J., Pons, A., & Castells, F. (2013). A comparison of the GHG emissions caused by manufacturing tissue paper from virgin pulp or recycled waste paper. *The International Journal of Life Cycle Assessment*, 18(8), 1618-1628.

⁷Ezeudu et al. (2019) Sustainable Production and Consumption of Paper and Paper Products in Nigeria: A Review

⁸NRDC (2019) The Issue with Tissue: How Americans are Flushing Forests Down the Toilet

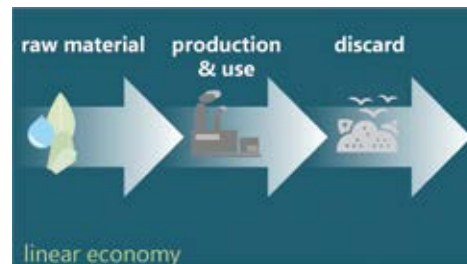
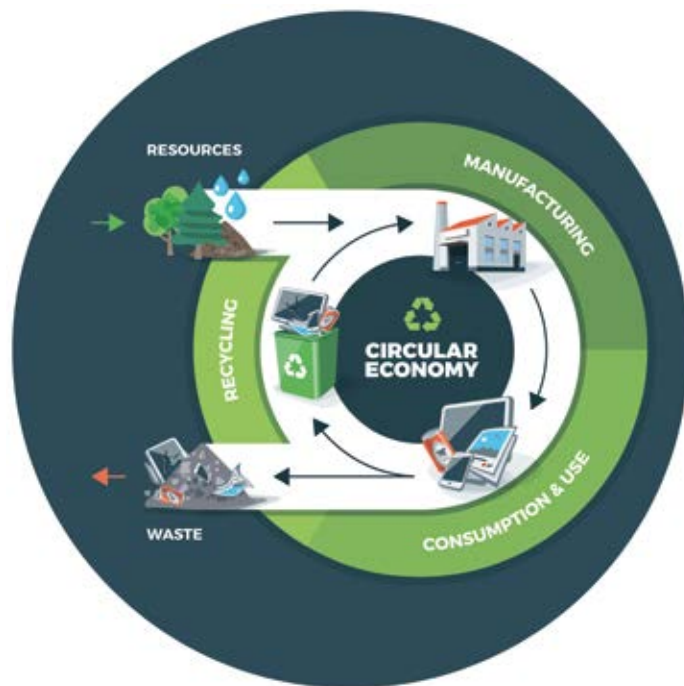
in brightness, texture, and odor necessitating more frequent washing. Water scarcity is an issue that concerns all and that cannot be ignored for long. The reduction of the water use in the process is no longer a matter of simply caring about the environment, but in fact a matter of (1) adhering to governmental regulations and restriction in terms of water consumption and discharge, (2) reducing the consumption of freshwater and the ensuing economic, environmental and sociological costs, and (3) reducing the amount of wastewater that should be treated. Water plays a diverse role in the process whereby it is needed for cleaning, lubrication, cooling, and in the development of the product's quality. A common methodology to reduce water consumption is the utilization of a closed loop water system. Unfortunately, the use of high temperature water leads to increased concentration of suspended and dissolved solids. The accumulating solids can severely damage used technologies while also negatively impacting the quality of the product depending on the extent of the closed water system. "Equilibrium between the advantages and the disadvantages relevant to water consumption restrictions should be established." Fortunately, the development of new processes and other technical improvements have decreased the fresh- water consumption over the years. Concerns in the P&P industries around water and wastewater revolve around (1) the high level of toxic compounds and chemical oxygen demand (COD) found in the effluents, (2) The pulp and paper industry is the sixth largest polluter discharging a variety of gaseous, liquid and solid wastes into the environment, (3) the typical methodology for treating paper mill wastewater should consist of a combination of biological, physical, and chemical treatment, though most P&P mills resort to only biological treatment leaving much pollutants to be discharged into watercourses. Untreated industrial wastewater streams pose a serious threat to human life, plants, and animals, and to the ecosystems of the bodies of water they enter, luckily tougher environmental regulation have curbed the release of raw industrial

wastewater around the world, though the level of implementation and accountability leaves something to be desired.

Introducing Circular Economy

Following decades of scrutiny, the tissue industry has made very positive initiatives in improving its environmental sustainability performance. Through the increasing use of sustainable forest products, use of Recycled Waste Paper (RWP), advances in wastewater treatment technologies, optimization of the process and re-use of water, etc. the industry aimed to tackle problems such as deforestation, water pollution, extensive energy use, air pollution emissions; toxic pulping and bleaching process chemicals, and the production of greenhouse gases (CO₂, Methane). Nevertheless, many opportunities are still up for grabs including the integration of the circular

economy approach in the industry. By definition, a circular economy is an alternative to a traditional linear economy (make, use, dispose) in which resources are used and re-used for as long as possible to extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life. A prime example would be the use of RWP in the making of new tissue products, the integration of eco-designs in the packaging of products, the use of Combined Heat and Power co-generation, the re-use of water in looped cycles, etc. The key advantages of this circular approach are (1) the reduction of operational costs through energy, water and resource conservation and (2) an improved image opening up doors to new consumers who are looking for more sustainable options.



⁹Bajpai, P. (2011). Environmentally friendly production of pulp and paper. John Wiley & Sons.

¹⁰Suhr, M., Klein, G., Kourti, I., Gonzalo, M. R., Santonja, G. G., Roudier, S., & Sancho, L. D. (2015). Best available techniques (BAT) reference document for the production of pulp, paper and board. European Commission.

¹¹Bajpai, P. (2017). Pulp and Paper Industry: Emerging Waste Water Treatment Technologies. Elsevier.

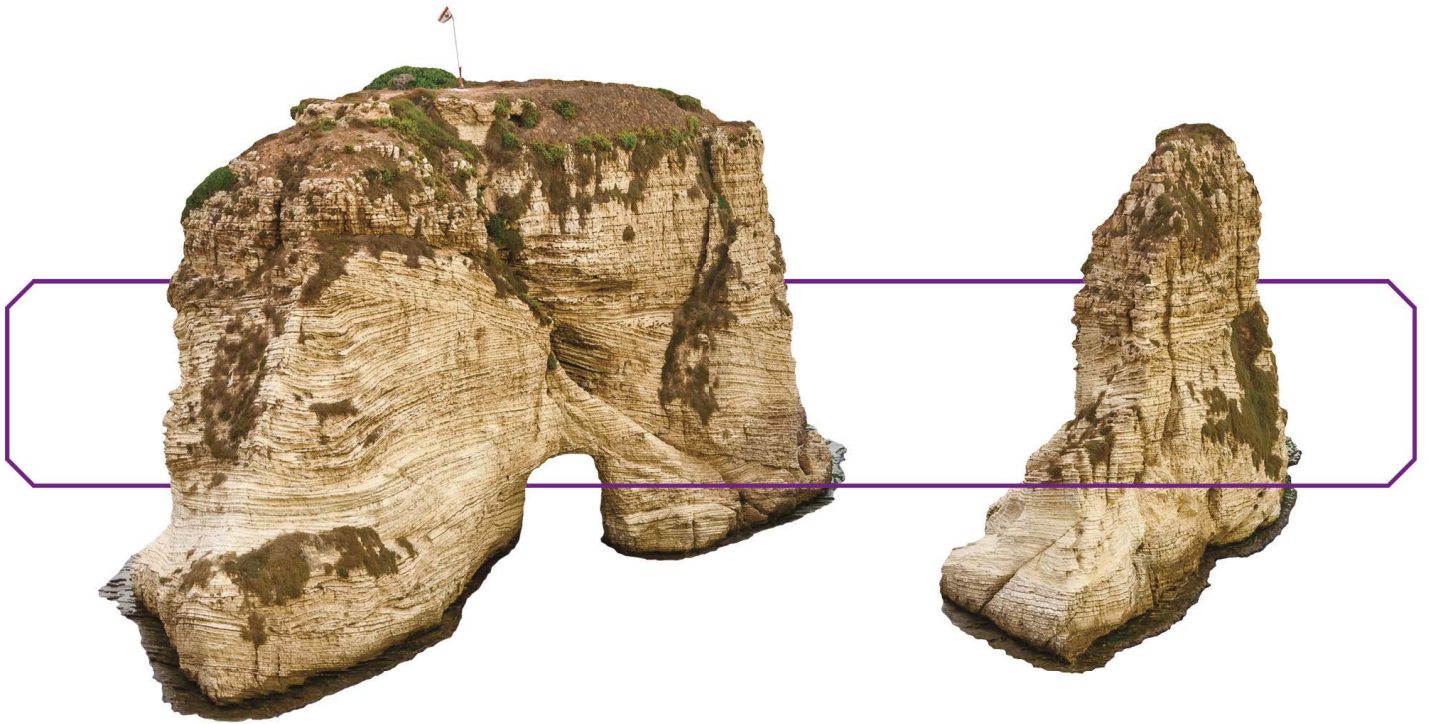
¹²Olejnik, K. (2011). Water Consumption in Paper Industry—Reduction Capabilities and the Consequences. In Security of Industrial Water Supply and Management (pp. 113-129). Springer, Dordrecht.

¹³Un, U. T., Topal, S., Oduncu, E., & Ogutveren, U. B. (2015). Treatment of tissue paper wastewater: application of electro-Fenton method. International Journal of Environmental Science and Development, 6(6), 415.

¹⁴Bajpai, P. (2017). Pulp and Paper Industry: Emerging Waste Water Treatment Technologies. Elsevier.

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Manufacturing is Back, and More Intelligent

Than Ever—But Are We Reaping the Benefits Yet?

Terri Hiskey,

Vice President of Product Marketing for
Manufacturing, Epicor Software

Look around, and the manufacturing industry is brimming with examples of firms that are bringing the latest technological developments to their factory floors. Their goal? To improve processes, increase automation levels, and facilitate future business growth.

A case in point is the manufacturing giant Siemens, which has used automation to reduce the rollout time of new products by a third.

Another example is global autoparts manufacturer Hirotec, which has used cloud-based analytics and the Internet of Things (IoT) to reduce system inspection times by 100 percent—a move that has helped the company avoid a painful \$361 per-second bill for downtime during manual inspections.

Inspiring innovation

It is outcomes such as these that are inspiring other manufacturers, across the globe, to implement IoT technologies into their production environments. In fact, according to recent research from Epicor, 69% of manufacturers believe their

industry is on the verge of large scale IoT adoption, or is at least at an experimental level.

All this indicates the sector is entering an exciting period of change, where manufacturers seize on digital innovation and transformation opportunities. Indeed, the same Epicor research shows us that manufacturers are increasingly embracing technology. 79% already have sensors on their machines, and 42% are using IoT technology to control and work with robots. In addition to making manufacturers more agile and more responsive, such technologies can also enable smaller firms to compete against much larger players.

Like many emerging trends, willingness to adopt and get to grips with IoT varies across geographic regions. Despite the hype, a surprising 44% of global manufacturers have still either never heard of IoT or know little about it. This rises to 57% in EMEA, where the pace of adoption is much lower compared to Asia Pacific, where the thirst for new technology is much higher. Just 27% of manufacturers in APAC are unaware or poorly informed about IoT.

Counting the gains

However, where IoT is put to work—with production robots that can send and receive data, or perhaps the use of RFID technology to connect shipments with factory equipment—not every manufacturer is finding it easy to measure the gains enabled by these technology implementations.

The research was conducted by Morar Consulting on behalf of Epicor in December 2017. The research questioned 2,200 manufacturing business decision makers and employees in businesses in 14 countries across the globe.

Research tells us that IoT technology itself can be challenging to implement, and that its impact can be hard to quantify. In fact, around three-quarters (72%) of manufacturers surveyed by Epicor in the research above, say they are yet to measure any real return on their IoT investments to date.

This, it seems, is the harsh reality of IoT. Yes, connected technology is putting the spotlight back on manufacturing. Yes, it's making the factories of the future possible, today. And yes, there are outstanding examples of manufacturers transforming their operations as a result. Yet many firms within the manufacturing community are struggling to justify their spend on all of this new technology.

IoT and ERP—the perfect pairing

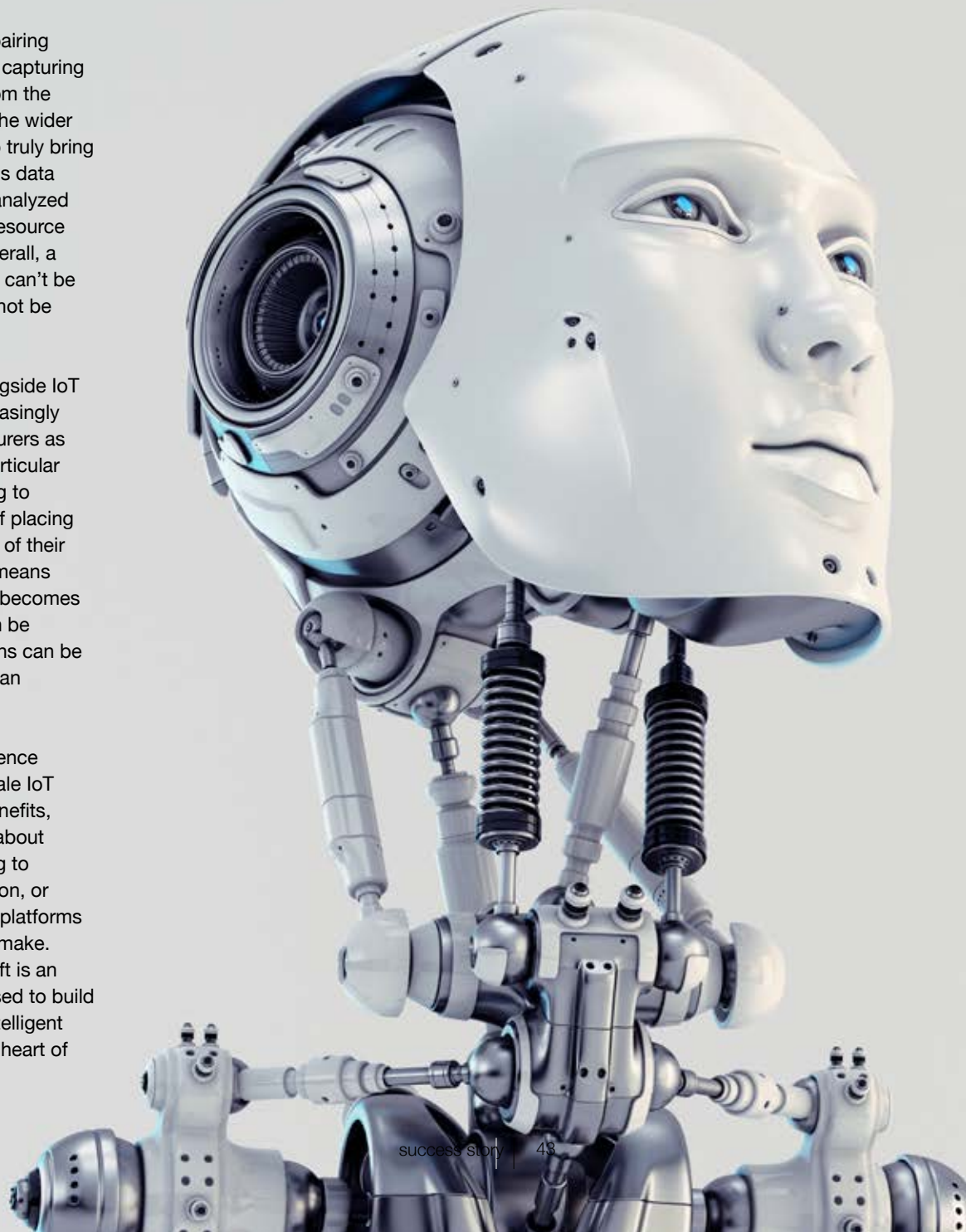
By default, the IoT involves capturing a huge amount of data—from the production line through to the wider supply chain. If the IoT is to truly bring value to an organization, this data needs to be captured and analyzed via an effective enterprise resource planning (ERP) solution. After all, a return-on-investment figure can't be calculated if outcomes cannot be measured.

Using ERP technology alongside IoT solutions is becoming increasingly accepted among manufacturers as a way of addressing this particular challenge. Many are starting to recognize the importance of placing an ERP system at the heart of their smart factories because it means that centralized monitoring becomes possible, accurate data can be collected, informed decisions can be made, and improvements can be measured.

To give factories the confidence to take the plunge in full scale IoT adoption and realize the benefits, they need to be reassured about security and stability. Failing to start with a secure foundation, or utilizing best practices and platforms is an expensive mistake to make. Azure Sphere from Microsoft is an example of a technology used to build highly secure connected intelligent products. Security is at the heart of

the microcontroller and combined with the operating system and cloud services provides in-depth defense against threats and the ability for manufacturers to focus on the real features of IoT, not the underlying concerns. Combine this with Epicor IoT and each manufactured product can be coupled with its digital twin, and bi-directional events can flow between the core ERP system, providing a next generation platform allowing manufacturers to move quickly with confidence and reimagine their business.

As we move in to the second half of 2019, we can expect to see switched-on manufacturers continue to shift towards using intelligent cloud-based ERP solutions to justify their IoT investments. This will enable them to continue to take advantage of new opportunities, to optimize processes, and to remain agile. All through the powerful combination of IoT and ERP. Manufacturing is certainly back—gone are the days of dirty or dingy factories. Gone is the high use of manual labour and blue screens. Instead, we are entering an Industry 4.0 world where manufacturing is increasingly digital. In this world, ERP software combined with smart factory technology will be the perfect pairing.



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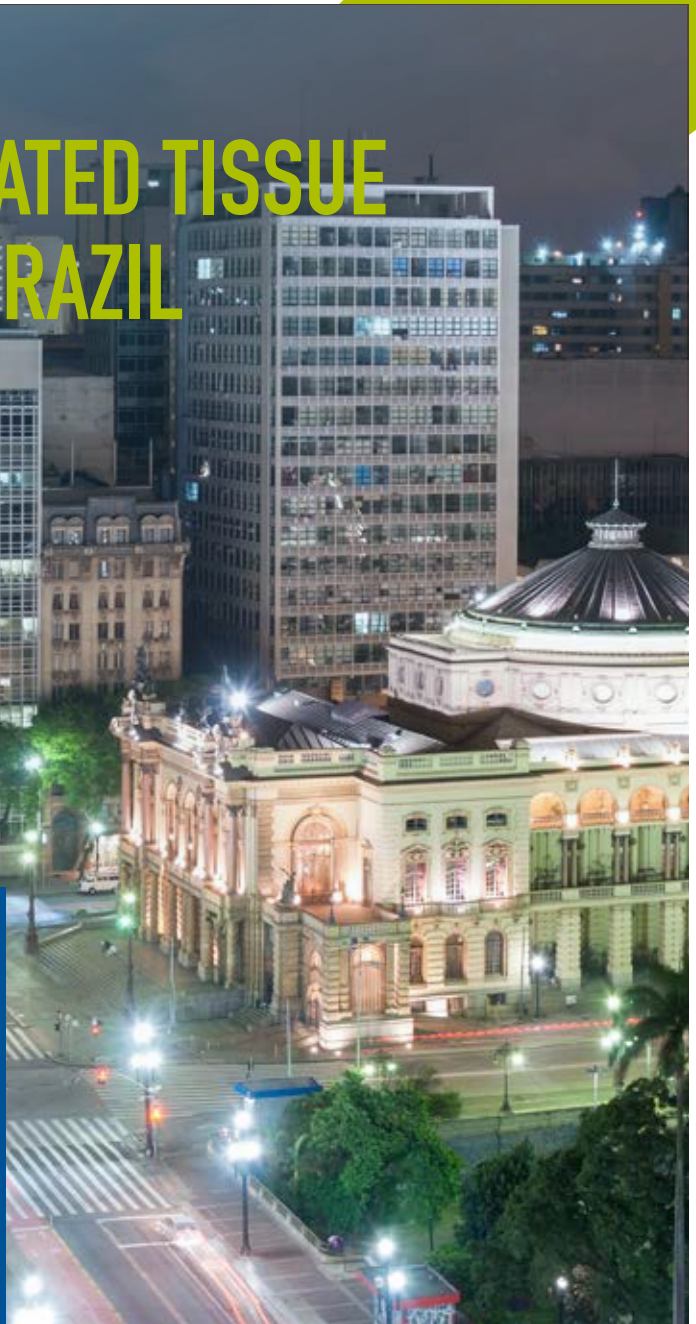
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Solenis Growth Addresses Industry Trends, Customer Value

It's been five years since global specialty chemical company Solenis spun off from Ashland. Since then, the company has followed an aggressive growth strategy that relied heavily on merger and acquisition activity, completing nine deals to add geographic reach, new technology platforms and additional product line offerings.



John Panichella, Solenis President and CEO

Having completed its most ambitious venture on January 31, 2019 by successfully joining forces with BASF's paper and water chemicals business, the company continues to focus on growth by developing value-added chemicals, process solutions and monitoring and control systems for water-intensive industries. The goal, according to Solenis President and CEO John Panichella, is to substantially change the landscape for customers in industries such as pulp and paper manufacturing, biorefining, chemical processing, mining, oil and gas and power generation. "We've used these acquisitions to achieve two important objectives," Panichella said. "The first is to establish a geographic presence to supply the market directly. The second is to improve our technical portfolio in the key vertical markets we serve. And, if we can't acquire the technology to help us grow, we rely on our specialized R&D teams to develop it."

Although its acquisitions have been getting the most attention, Solenis has continued an equally aggressive campaign of plant expansions and new product development to better serve customers in key growth areas, including:

- Adding its ninth manufacturing plant in the Asia Pacific region in Zhuhai City, Guangdong Province, China, to make



Ed Connors, Solenis President, Paper and Water, Americas

functional, water and process chemistries

- Opening a new technology center in Paulínia, São Paulo, Brazil, to better serve the South America region
- Doubling polyacrylamide production capacity at its plant in Perm, Russia, and adding new production lines for sizing and defoamer products.

An important metric Panichella noted, is that 25 percent of Solenis sales come from products that are less than five years old. "That keeps our R&D teams focused on identifying key trends and customer challenges emerging in industries around the world," he said.

25 percent of Solenis sales come from products that are less than five years old

Key Global Trends Shaping the Paper Industry

Sustainable alternatives

One area of global focus is in developing environmentally friendly packaging. "The paper industry has been elevating its focus on sustainability concerns for more than a decade," said Andreas Tuerk, Solenis President, Paper and Water, Eurasia. "They look to suppliers like Solenis to help them reduce consumption of natural resources and energy and develop environmentally friendly packaging that is recyclable and repulpable."

To address this need, Solenis offers TopScreen™ fully recyclable and compostable barrier coatings technology (see sidebar Creating Environmentally Friendly Packaging). Derived from sustainably produced vegetable oils, TopScreen can replace paraffin and polyethylene coatings – substances that present challenges in recycling – used in candy twists, beverage cups, breakfast-food wraps, bread bags and other packaging elements.

Increased demand for packaging materials

Similarly, as global eCommerce continues to flourish, the market for corrugated and paperboard boxes is

growing rapidly, according to a study by the Fredonia Group¹, reported in SupplyChain 24/7². As a result, there is a universal desire to develop packaging that's strong enough to withstand the rigors of shipping, but as light as possible to save on shipping costs. Achieving sheet strength efficiently and profitably has long been a quest of paper-based packaging producers. For many years, mills were able to meet strength requirements using tried-and-true tools, like fiber selection, refining, sheet formation and wet pressing. However, certain trends make this a difficult proposition, including increasing recycled content, decreasing old corrugated container (OCC) quality, increasing water system closure and reducing packaging weights or volumes. Single-component strength additives have been challenged to deliver the necessary performance to respond to these trends. Having joined forces with BASF, Solenis provides the most robust portfolio of retention drainage fixations and strength solutions on the market. For example, using a novel approach combining best-in-class chemistry with state-of-the-art process control analytics, Solenis developed FusionSM strength and performance technology which gives paper and board manufacturers more flexibility in developing new grades to address market trends.

New innovations to provide competitive advantages

Solenis has always been known as an innovator whose breakthroughs impact both papermaking processes and end products. Examples include:

- The imPress™ ID line of paper additives which improves the runnability and performance of HP Indigo Digital Presses, generating print adhesion as much as eight times more effectively than common products on the market
- TapestrySM Yankee Coatings Solutions that help tissue makers meet increasing demands for softer, stronger and more absorbent processes, thereby improving manufacturing performance and controlling

Solenis provides the most robust portfolio of retention drainage fixations and strength solutions on the market.



Andreas Tuerk, President, Paper and Water, Eurasia, Solenis

operational costs

- MicroSolSM advanced retention and drainage solutions that help graphic and specialty papers manufacturers improve colloidal retention, drainage and dewatering, also optimizing starch use and formation.

In addition, following the BASF deal, Solenis now offers a full range of colorant products designed to provide a wide spectrum of colors, enhancing an extensive variety of paper, tissue and board grades (see sidebar *Colorants to Build Competitive Advantage*). Finally, in the face of rapidly rising silicone prices, Solenis has developed high-efficiency silicone defoamers that deliver advanced knock-down and drainage characteristics to meet customer performance expectations while also controlling program costs.

¹<https://www.fredoniagroup.com/industry-study/corrugated-paperboard-boxes-3686.htm>

²http://www.supplychain247.com/article/fredonia_demand_for_folding_paperboard_boxes_to_2022/Fredonia_Group

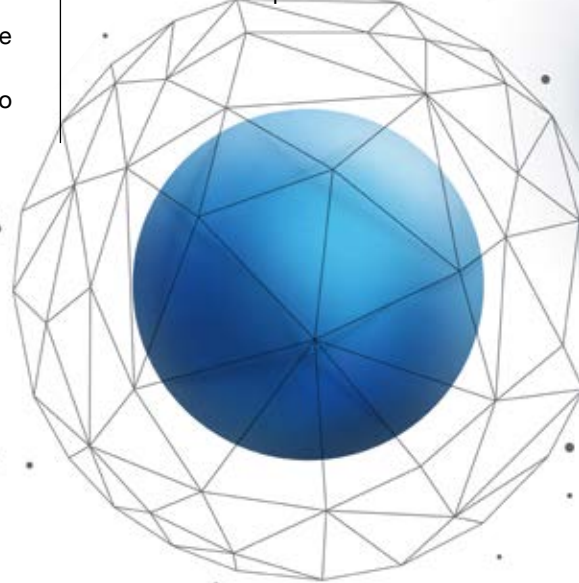
Key Global Trends Shaping the Industrial Water Market


More demand for water reuse, water quality and regulatory compliance

Water quality, water scarcity and regulatory compliance are main concerns in nearly every market Solenis serves.

"Reduction of water use is an important issue for heavy industries around the world, as companies work to meet their sustainability initiatives and address government regulation of this precious resource," said Ed Connors, Solenis President, Paper and Water, Americas.

Connors believes those trends will continue as companies assess the





With the complement of BASF's paper and water chemicals business, Solenis is a strong No. 2 player in the PAM market

overall impact of their water usage, from social and environmental perspectives to compliance and scarcity considerations. China, for instance, recently imposed more restrictions on air and water pollution, going so far as to close non-compliant plants.

"We have decades of experience helping customers with both water treatment and water conservation challenges," Connors said. "So, we are uniquely equipped as a technology and service provider to help customers tackle these issues."

Greater demand for PAM

The market for polyacrylamide (PAM) in water treatment has also tightened due to increased demand. With the complement of BASF's paper and water chemicals business, Solenis is a strong No. 2 player in this market, well-positioned to secure the supply of PAM for its customers. In addition, Solenis offers a full complement of PAM products, including cationics used in paper, industrial and municipal wastewater applications, as well as anionic and nonionic polymers used in mining, oil and gas and other applications.

Profitability and productivity

Because water is used as a heat transfer fluid in many industries, the presence of scaling and impurities

in heating and cooling water is another important issue everywhere, from paper to chemical processing. Solenis' state-of-the-art OnGuard i controller with Leak Alert not only helps control corrosion rates and minimize scale, it also provides early warning of potential equipment malfunction, enabling rapid response and corrective action.

One of the most water-intensive industries, the mining and mineral processing sector also struggles with scaling in ore processing. Unlike many competitive antiscalant chemistries, Solenis' newest Zalta™ antiscalants effectively reduce scale formation, even under extreme conditions. Real-time remote monitoring is also possible to verify performance.

Key Global Trends Shaping Both the Paper and Industrial Water Markets

Loss of expertise from a retiring workforce

Across the industry, as experienced workers retire, more companies are relying on outside resources for support. With decades of experience in the role of a trusted advisor, Solenis has a reputation for helping customers solve highly complex customer challenges quickly and precisely. "We have thousands of passionate professionals who work together across 120 countries and

five continents to deliver innovative and cost-effective solutions," Panichella said. "The addition of BASF only enhanced those capabilities, giving our customers access to an unmatched level of expertise and product selection."

Increased demand for digital solutions

In a related issue, companies in all industries are also seeking digital solutions to help address productivity concerns, especially in monitoring their manufacturing systems.

"About 20 years ago, we recognized a need to support customers with application-specific monitoring and control technologies that allowed them to see how their water systems were performing on a daily or even hourly basis," Panichella said. "That's why we developed OnGuard™."

The OnGuard™ performance-based monitoring and controls system is recognized for its ability to enable real-time measurement of key performance indicators. About two years ago, the company added the ClearPoint™ biofilm detection and control program for industrial cooling and influent water. This system uses the OnGuard 3B analyzer, combined with advanced chemical treatment and Solenis' industry-leading applications expertise.

In addition, Solenis recently launched OPTIX™ applied intelligence that combines real-time predictive analytics and machine learning to create tailored models and process insights that help customers optimize their production processes. In one example, a North American paper board producer used OPTIX to reduce its wet strength chemistry costs by approximately 20 percent. “These new solutions have raised customer expectations,” Panichella said. “No one wants to wait until a scheduled operation or shutdown to measure what is occurring with their water systems.”

Sidebars

Creating Environmentally Friendly Packaging

As countries and municipalities take aim at the mountains of waste from discarded packaging materials, Solenis has created a family of barrier coatings that can be used to create environmentally friendly packaging. In fact, the company was one of 12 winners in the NextGen Cup Challenge, a global innovation competition backed by giants of the food-service industry to redesign a widely recyclable and/or compostable-fiber hot and cold to-go cup. The Challenge attracted nearly 500 entries from more than 50 countries.

Solenis received the award in the Innovative Cup Liners category

The Solenis barrier coating solutions are water-based biopolymers and bio-waxes derived from renewable resources

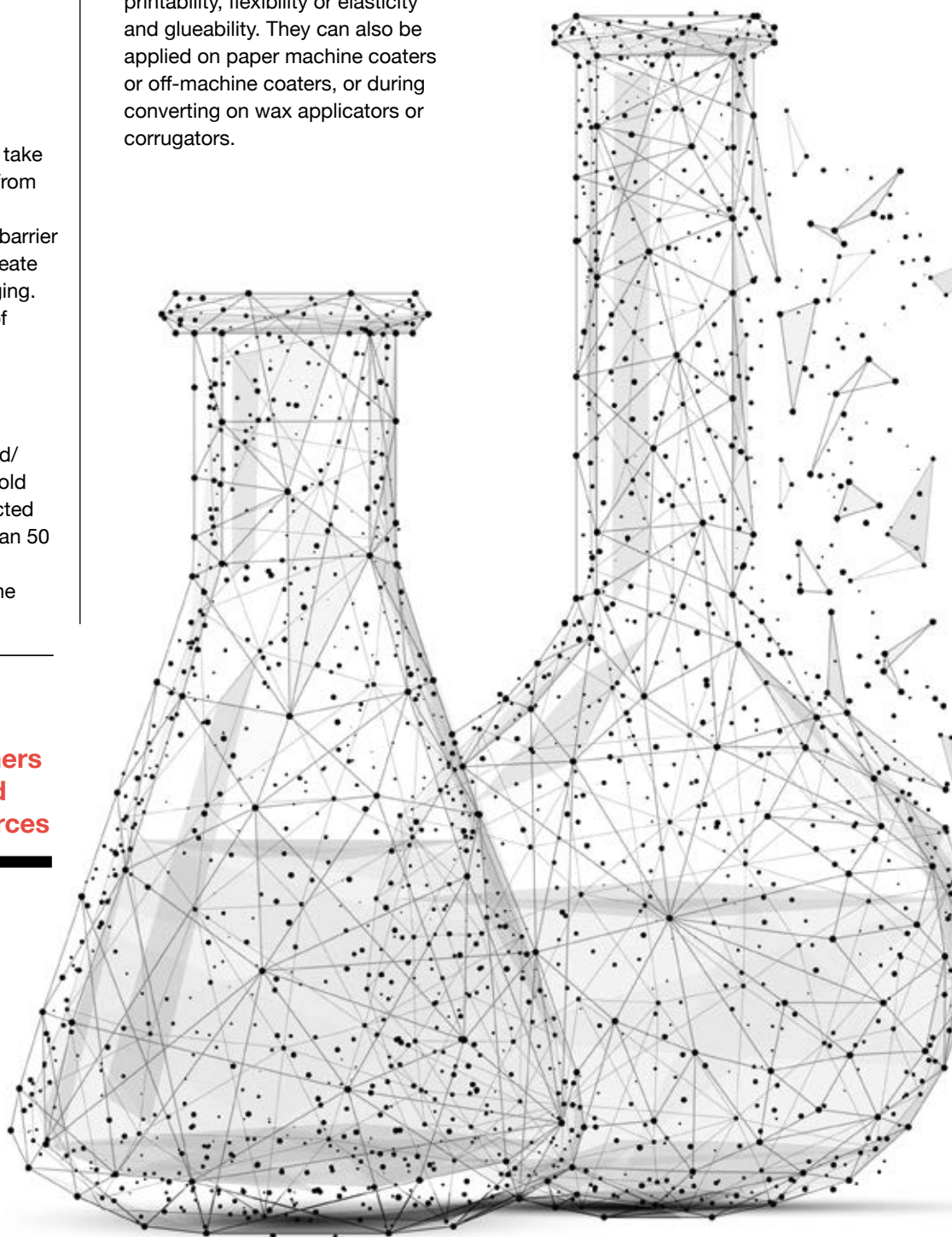
for its TopScreen™ recyclable and compostable barrier coatings. Using this technology, paper/paperboard manufacturers and converters can produce paper and board that is repulpable, recyclable and compostable.

The Solenis barrier coating solutions are water-based biopolymers and bio-waxes derived from renewable resources. That means papermakers can satisfy consumer demand and produce more environmentally friendly cups and food packaging. The new formulations can be adapted to accommodate a number of additional requirements, including printability, flexibility or elasticity and glueability. They can also be applied on paper machine coaters or off-machine coaters, or during converting on wax applicators or corrugators.

Colorants to Build Competitive Advantage

After joining forces with BASF's paper and water chemicals business, high-quality Solenis colorants cover virtually all paper and board grades.

- Liquid and powder direct dyes that resist fading, bleeding and chemicals
- Pigments specially manufactured for use in high light fastness printing papers
- Basic dye range used for tinting newsprint and wood-containing papers



Baby Pants: the convenience that attracts Millennials

Millennial parents simply want more for themselves and for their children above all: more information, higher quality, greater sustainability, more personalization, easier accessibility and lots of alternatives.

The millennial wave of parents is unlike any previous one: they are more informed than their predecessors, they shop differently, and are much more likely than the past generations to use their smartphones to research products, use a same-day shipping option, or a subscription service as part of their online shopping, and have a different set of priorities and ways of evaluating products.

The online world is giving Millennials a platform to reach the world.

Young moms and dads use smartphones while shopping for different reasons: they consult

product reviews, parenting websites, blogs, online forums and social networks, comparing prices, asking for information and interacting with other users. The baby products e-commerce has experienced a 20% increase in 2018 [1] and is forecasted to keep strong in the years to come (+21% CAGR 2018-F2022) [2]. Since young parents now have higher disposable income and busier lifestyles, they look for products able to alleviate the household chores. Convenience is then becoming their main driver for purchases: Baby Pants are perfect to save time, enjoying the benefit of wearability.

[1] Nielsen Connected Commerce report - 2018
[2] Businesswire

Since young parents now have higher disposable income and busier lifestyles, they look for products able to alleviate the household chores.

Baby Pants' convenience is unmatched

Given their fast-paced lifestyles, consumers focus more on childcare and convenience. In particular, increasing consumer awareness and education are driving parents towards Baby Pants, a solution that offers greater freedom of movement to jump around and play.

Today, Pants have become the most popular type in many regions, for example in APAC, primarily due to 3 main reasons:

- **Convenience:** since they are easier to put on and off compared to open diapers, they are advantageous also away from home;
- **Comfort fit:** their wearability ensures the required comfort for babies, acting as much like real underwear as possible;
- **Gentleness and softness:** thanks to premium materials.

Convenience, ease-of-use and baby comfort: GDM's solutions designed to satisfy consumers' essential needs

Acknowledging millennial parents' needs, GDM has developed a Baby Pants platform, covering different production capacities, designed for product quality and flexibility in terms of sizes, costs optimization and ease-of-use. This solution enables premium materials processing, delivering the highest quality with the best comfort fit. Moreover, it has been designed focusing on raw material control and tensioning, optimizing both production – power consumption reduced up to 30% – and product costs. Indeed, the result is a baby pant design with intermittent nonwovens that allows saving on raw materials up to 40%. In addition, GDM's solution also reduces the product weight variation and minimizes the operator intervention during size changeover. GDM uses state-of-the-art technologies to create Baby Pants with permanent channels, fluff/SAP ratio optimization and 3 core alternatives: fluff-based, pre-engineered and hybrid.



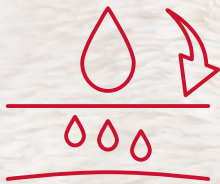
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SOFT & COMFY



HIGH ABSORBENCY

STATE OF THE ART TECHNOLOGY



RAW MATERIALS CONTROL AND TENSIONING

Lean process configuration and advanced tension control system

In-line embossed topsheet



SIDE SEAM WELDING

Cutting edge technology for side seam welding of soft materials

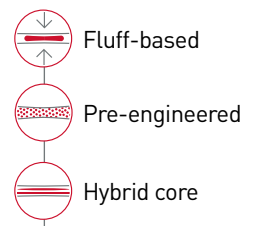


ULTIMATE CORE GENERATION

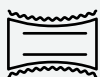
Permanent channels

Fluff/SAP ratio optimization

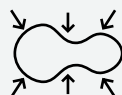
3 Core alternatives



RESULTING IN TOP QUALITY PRODUCT CORE WITH THE HIGHEST PERFORMANCES*:



CORE INTEGRITY



HIGH RETENTION CAPACITY



NO SAGGING EFFECT



MINIMUM REWET

* Tests run with independent test lab

PRODUCTION CAPACITY

Baby Pants platform includes **BP6 machine**, running at **600 ppm**, and **BP8 machine** running at **800 ppm**



PRODUCTION COSTS OPTIMIZATION



POWER CONSUMPTION

-30% VS STANDARD
CORE FORMATION



PROCESS CONTROL
FOR CONSISTENT
PRODUCT QUALITY



IMPROVED PRODUCT
THANKS TO
RECIPE STABILITY



PRODUCT CONSTRUCTION
-40% RAW MATERIALS
WITH INTERMITTENT NW
IN 3-PIECE PRODUCT



TURN-KEY SOLUTIONS
CONNECTION WITH
OUR PACKAGING
MACHINES

New

Opportunities to Evaluate the Hand Feel (HF) Potential of Fibre Resources

Marcel Prinz,
Doctoral Student at University
of Applied Sciences in Munich

Softness is defined as a multisensorial human perception. Many different senses play a role. But most important is the tactile impression. Today, some available measurement devices try to describe the perception of softness.

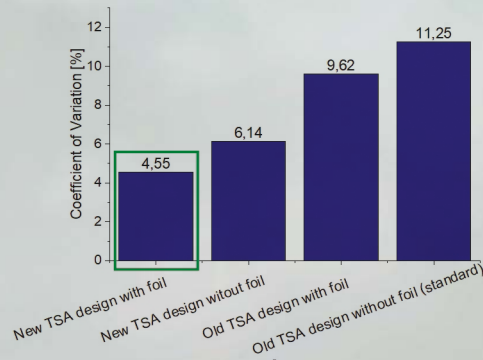
Since softness is received by five different mechanoreceptors located in the human skin, it is difficult to imitate. Furthermore, the perception of softness includes a subjective component coming from the consumer. This component differs between societies, religions, gender and several more. Nevertheless, tissue softness can be described to certain extends by different paper properties, such as stiffness, surface texture/smoothness and strength. The human skin does nothing more, than sensing those physical properties and processing them to a perception of softness.

For several applications, the emtec TSA (Tissue Softness Analyzer) could show its beneficial insights into this complex subject. This is especially true for tissue producers and converters as well as their chemical suppliers. But also, nonwovens and textile users highly appreciate the knowledge gained by the TSA. It enables the objective evaluation of the three single parameters softness, roughness and stiffness. From these three parameters, a hand feel value can be calculated, adapted to already mentioned subjective components.

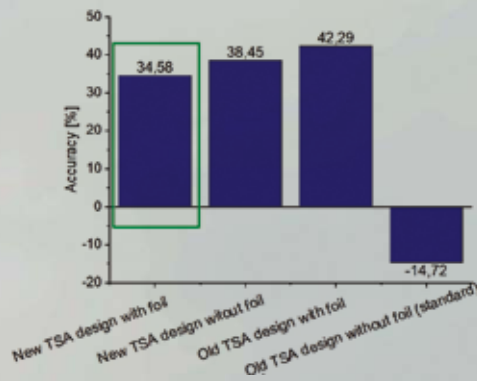
Until today, it is impossible to evaluate the influence of different fibre mixes (long/short fibre ratio) to the tissue softness potential of pulps before running them on a tissue machine, but that is now set to change. By a successful cooperation between the developer emtec Electronic, the University of Applied Sciences Munich and the company Mercer Pulp Products a procedure was developed to first-time observe well known influences of different pulp sources on softness, obtaining a high reproducibility on hand sheets. To achieve that the TSA was slightly modified, and the hand sheet preparation was adapted to the needs. Which means a new sensor design was added to the existing TSA configuration.



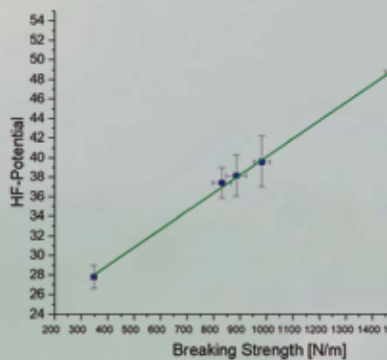
Results of comparison between long and short fibre pulps - Variation



Results of comparison between long and short fibre pulps - Accuracy



Strong correlation between newly measured pulp softness potential and the breaking strength



The aim was to show a significant difference between long and short fibre pulps, and at the same time, to achieve a low coefficient of variation.

Furthermore, a plastic foil was positioned underneath the hand sheet sample. For the adjusted sample preparation, a standard laboratory hand sheet former was used to create 30 g/m² hand sheets. Those were dried inside a climate control room at 25°C and 50% relative humidity with one surface exposed to the air. By doing so, only the used fibres defined the sample surface and not the usually used smooth counter sheet.

To rate the correctness of this new approach the well-known difference between soft and hardwood needed to be defined, here it is called "accuracy" and is calculated as followed:

$$A = \frac{\Delta \bar{X}_x}{\bar{X}} * \%100$$

A : Accuracy

$\Delta \bar{X}_x$: Difference between long and short fibre mean

\bar{X} : Average of long and short fibre samples

The aim was to show a significant difference between long and short fibre pulps, and at the same time, to achieve a low coefficient of variation. The investigation could show the expected differences between long and short fibre with a variation coefficient of less than 5% and an accuracy of 34,58% (rel. difference between long and short fibre).

Furthermore, a strong correlation between the newly measured pulp softness potential and the breaking strength gained through refining was demonstrated.

Both corresponds to the expectations of researchers and operators inside the tissue industry.

The observed results open a wide range for following investigations. With the outlined procedure pulp and tissue producer might also be able to develop their products further in the lab without the need of running expensive customer trials at a tissue machine.

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Improving tissue making and converting efficiency

Nina Deng and Frederic Parent,
FPInnovations

Advanced techniques and tools developed by FPInnovations to characterize tissue web uniformity are providing new opportunities for tissue mills to improve their tissue making and converting efficiency.



FPIInnovations' Roll Testing Facility (RTF) A Unique Tool to Quantify CD Variation of Tissue

To capture variability of CD key properties such as CD tension, moisture and BW

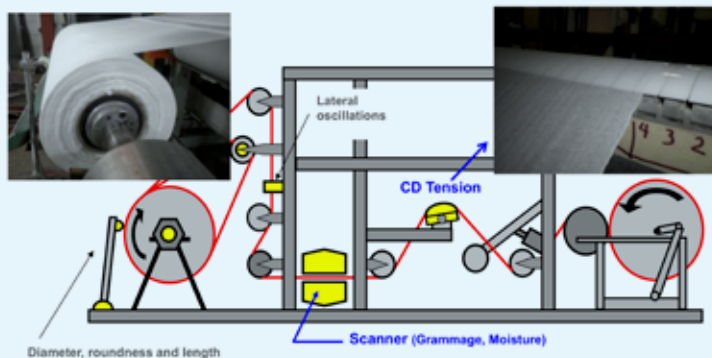


Figure 1: FPIInnovations' Roll Testing Facility (RTF)

- Non-uniform tension profile can lead to bagginess

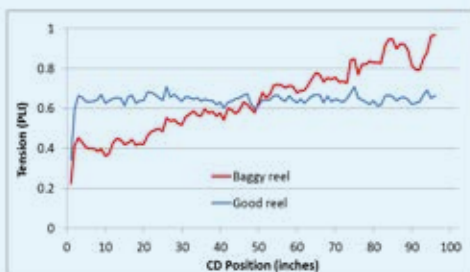


Figure 2: CD Tension Variation of Tissue: Baggy roll vs. good roll

Quantification of Strength Variation in MD - M factor analysis

- Tissue is inherently non-uniform
- A large number of tensile measurements follow Weibull distribution
- $F(T) = 1 - \exp[-(T/T_s)^m]$
- m-factor** indicates strength uniformity
- Higher m values, have better strength uniformity and thus better converting efficiency

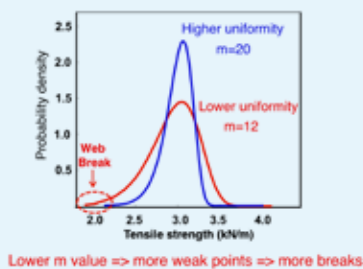


Figure 3: Definition and Quantification of m-factor

Challenges in tissue converting

For many tissue mills, converting efficiency is relatively low (40-70%) so the low tissue converting efficiency is often a bottleneck in tissue production. It represents a large potential improvement area for overall tissue manufacturing efficiency. Tissue converting efficiency is affected by three main factors including 1) poor operation and set-up time, 2) equipment failure caused by poor maintenance and 3) tissue web non-uniformity which leads to rejects and web breaks. Tissue properties can vary in both machine direction (MD) and cross-machine direction (CD). Over the years, FPIInnovations has developed unique measurement tools to map the non-uniformity of printing and writing paper to relate it to web performance and runnability in pressrooms. These tools have been applied to characterize tissue non-uniformity and relate it to tissue converting performance and efficiency.

Roll Testing Facility (RTF)

FPIInnovations developed its Roll Testing Facility (RTF) 15 years ago to quantify CD non-uniformity of paper rolls (Figure 1) and it has been used to diagnose and solve many web performance issues such as web breaks, bagginess, wrinkles and other roll structure defects. An important step in its evolution came in 2015 when a rebuild of the equipment allowed the RTF to test low basis weight paper rolls such as tissue (all grades). The timing was good as the needs in tissue testing, for example in the uniformity as well as problems seen in embossing such as wrinkles, were increasing. In addition, all the knowledge FPIInnovations developed from paper roll testing can be applied to tissue rolls.

For example, we applied RTF to test tissue rolls from a mill which experienced some "bagginess" problems. The good rolls, without any bagginess, were also tested for comparison. As can be seen in Figure 2, the good roll has a rather uniform tension across CD while the baggy roll has a significant variation of tension across CD. This explains why the mill has experienced some bagginess problems leading to wrinkling and web breaks. The mill took action on the tissue machine to correct the tension variation and the bagginess then disappeared.

The m-factor

Tissue has very low basis weight so it is more sensitive to strength variations. To address this, we have applied a concept called "strength uniformity" which was developed for predicting web breaks of lightweight paper in the pressroom to quantify the strength uniformity of tissue in MD. Analyzing strength uniformity (m-factor) is a useful tool in troubleshooting web breaks in tissue converting. The low strength uniformity entails that there is a greater number of weak areas in the tissue; when the weak areas meet tension variations on the converting line, the risk for web breaks greatly increases. An m-factor analysis consists in measuring the variations of MD tensile for a certain tissue length, and then calculates the Weibull modulus (m-factor) of the tensile distribution using PapTune software which was developed at FPIInnovations (Figure 3). The higher the m-factor, the higher the strength uniformity and the lower the risk of having web breaks.

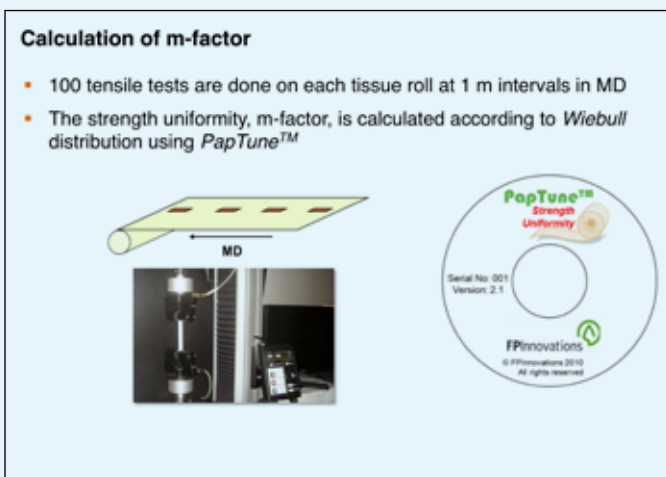


Figure 4: How m-factor is measured and calculated

We carried out benchmarking of strength uniformity of tissue samples produced on different tissue machines. As shown in Figure 4, there is a wide range of strength uniformity (m-factor from 10 to 18) among different machines. For the machines producing tissue with low strength uniformity factors, we worked with the mill staff to identify the potential causes and made recommendations to improve it. The factors that could affect tissue strength uniformity include the variations in basis weight, caliper, fiber orientation, formation, non-uniform creping...., etc. The contributions of these factors are being investigated under FPInnovations' tissue research program.

Stretch variation

Stretch is another important parameter as the tissue can have about 20 times higher stretch than traditional P&W paper grades. Stretch is created by creping and significant variations can be created by non-uniform creping. Tissue stretch is the key in many converting issues so FPInnovations has focused on achieving a more uniform stretch profile, finding the root causes of stretch variation that can lead to performance issues. Below is an example of non-uniform stretch caused by poor creping due to the deterioration of Yankee surface. We measured the stretch profile of tissue samples collected along CD. As seen in Figure 6, there is a significantly lower stretch in one location. This was attributed to the local deterioration of the Yankee surface, as measured through surface profile.

After re-surfacing the Yankee, we measured the stretch profile again. As seen in Figure 5, the stretch profile was improved especially in the poor creping area. This indicates that Yankee surface quality has a significant effect on creping, thus tissue stretch variation. It is important for the tissue mills to monitor the Yankee surface and re-surface it if needed to ensure a uniform stretch profile.

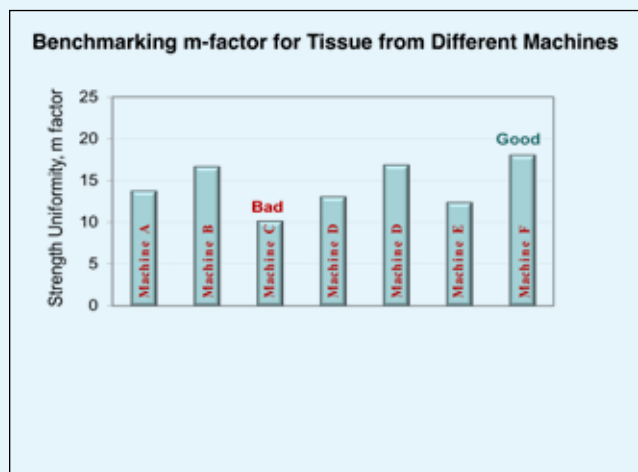


Figure 5: m-factor of tissue made on different Tissue Machines

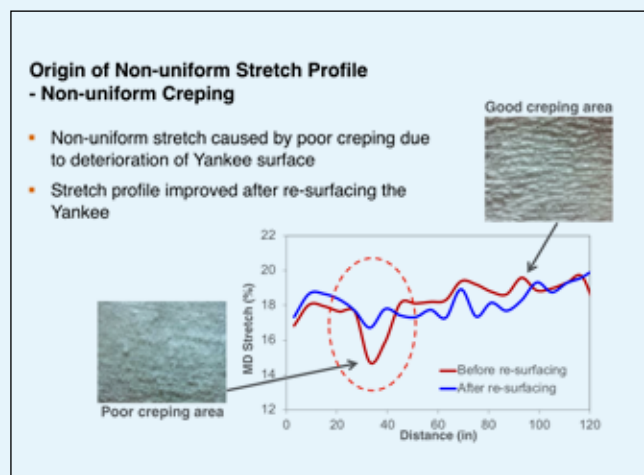


Figure 6: CD stretch profile of the tissue samples before and after Yankee re-surfacing

Summary

Tissue web uniformity is critical for tissue making and converting efficiency as it can cause many performance issues including bagginess and web breaks. FPInnovations has developed unique measurement tools such as RTF, strength uniformity (m-factor) analysis, etc. to map out the tissue non-uniformity in both CD and MD. These tools have been used by tissue producers to identify the causes of tissue non-uniformity and minimize them through improving tissue making operations.

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