

nextlevel

by Voith Paper — N° 01.2018

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close partnership

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has a real edge

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The global pioneers
are choosing tissue

rolling
out the
next
generation
of tissue

Editorial



World-class technology is highly valued all over the world, and so too are innovative services. Both are at the core of Voith Paper. These are the pillars that guarantee a more comfortable journey for our valued customers on a global scale. But don't just take our word for it. In this issue of nextlevel, we are proud to present a number of individual customer journeys from all grades and stages in the papermaking process. Through their personal insights, you can discover how we help to drive their success to the next level.

As you will read, personal trust plays a crucial role in all of these journeys. Whether in China, Brazil, Sweden or Germany, only through a trustful relationship can such success be realized over the long term. Trust leads to tailored solutions, to pioneering innovations and business models that are more sustainable and eco-friendly. We trust you will enjoy the read!

Andreas Endters

Andreas Endters
CEO, Voith Paper

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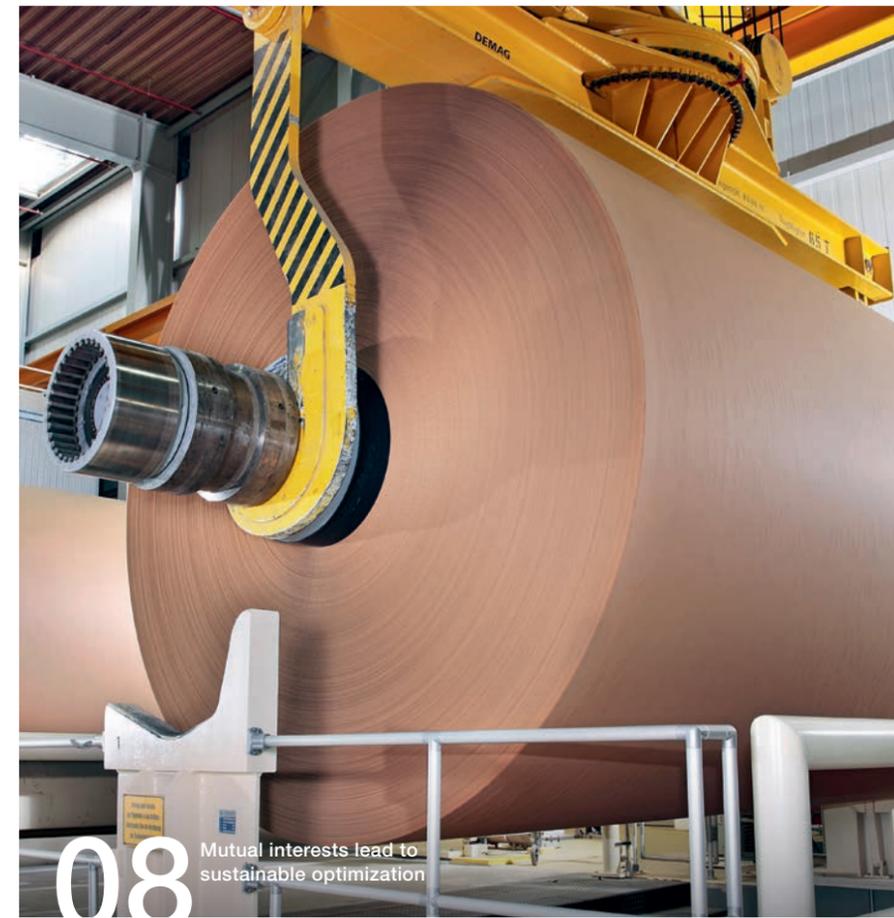
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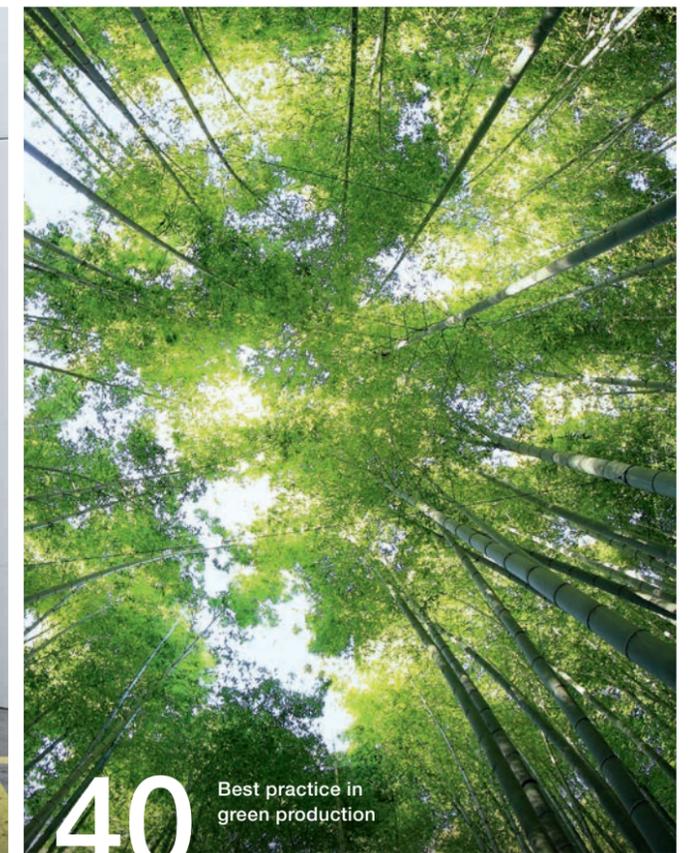
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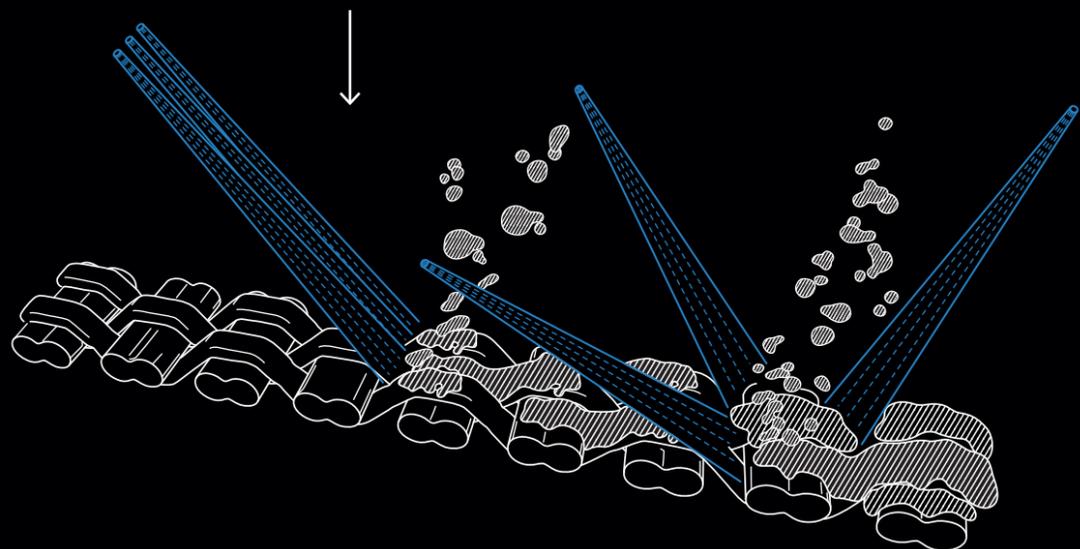
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New directions

Paper machines using recycled fiber need to continuously clean dryer-section fabrics. As conventional cleaning systems use only one direction of high-pressure water jets, contamination can remain within the surface pattern and structure of a fabric. However, the newly launched CleanLine Extract4D uses four directions of water jets, which directly contact and remove more of the contamination. As a result, the dryer fabrics have cleaner surfaces and retain more of their permeability for better drying efficiency and runability of the sheet, and so improve the overall performance of the paper machine.

Maximize cleaning

The innovative design of the CleanLine Extract4D ensures that the water jets are aimed directly at the contamination – on the fabric surface, inside the fabric structure and through the CMD voids.



CleanLine
Extract4D

News

A quick round-up

Smart pioneer in the paper industry

Sun Paper, one of China's leading papermakers, has successfully implemented the Voith Papermaking 4.0 project on PM 31, increasing the efficiency, productivity and quality of its paper production process. The smart package is provided by OnEfficiency Strengths, which maximizes the machine's full potential with a number of tools. The OnV VirtualSensor allows Sun Paper to forecast paper strength, while the ComCore software platform acts as the control base. In addition, the OnEfficiency Cockpit, Voith's operating system, works to eliminate incorrect dosages and reduce secondary effects. Thanks to the project's success, Sun Paper is now planning to install the Papermaking 4.0 package on two new Voith XcellLine paper machines: PM 36 and PM 37.

Paper sacks

110,000 tons

Russia's Segezha Group has celebrated the successful start-up of their new Voith XcellLine PM 11 – the first complete paper machine in Russia since Soviet times. The new PM 11 will produce 110,000 tons of unbleached sack kraft paper at a design speed of 800 m/min, resulting in an increase in production capacity of 30%. "We have created a modern production facility capable of manufacturing products with high added value within the country," says Kamil Zakirov, the Segezha Group President.



Papermaking

4.0

OnEfficiency Strengths

ComCore
The modular automation platform.

OnEfficiency Cockpit
The gateway to real-time data visualization.

OnV VirtualSensor
Estimating values with high reliability and accuracy.

A smart combination of tools



"The integrated logistics solution is a game-changer for the industry."

John Fox,
President and CEO of merQbiz®

One-stop shop for recovered paper

Officially launched in March 2017, merQbiz is an online marketplace designed to improve the way buyers and sellers of recovered paper do business. Now, Voith continues to expand its digital agenda and extend the range of its trading platform for recovered paper. For this purpose, merQbiz has announced C.H. Robinson as the exclusive logistics provider for the platform. The collaboration brings unmatched freight capacity, competitive real-time pricing and a powerful supply chain network to the platform. "C.H. Robinson's capabilities are a perfect complement to the merQbiz digital platform. Together, we aim to provide unmatched logistics capacity, increased options and real value for our customers," says John Fox, President and CEO of merQbiz.

merQbiz

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innovate

A closer look at innovative technology, people and solutions

Why so blue?

The vibrant blue is truly eye-catching. But it is the functionality of this coater backing roll cover that is catching real interest in the paper industry. OceanCoat is the newly launched coater backing roll cover from Voith for demanding applications. Thanks to the blue color, any cover overheating can be spotted and dealt with quickly. What's more, the special advanced material ensures a perfect fit on the blade coater, leading to longer grinding intervals. And, because the OceanCoat cover is very easy to clean, your machine can be back up to operating speed faster after a sheet break. In combination with the SkyCoat coater blades, you can shift your coating performance to the next level. True blue is the new black.

The Servolution has begun

Servolution



A targeted commitment to tailored service solutions.

1 Phase

Assess
Identify needs, potential and targets.

A true partnership of expertise, engineering and interests is the best way forward in papermaking. Discover how services are evolving to support manufacturers to increase productivity and efficiency.

“My highest compliments go to this customer and their team of operators,” says Maryam Kazerani, Optimization Engineer at Voith Paper. “They are truly among the best-educated and most competent that I have ever worked with in my career. We had mutual goals, trust and respect and worked together at eye level to achieve an optimized boost to their production line.” The close teamwork was crucial. “We were able to push the design of the paper machine to its limits and achieve so much more than even our expectations,” explains Kazerani. “The operators celebrated every achievement. It was a great feeling for everyone whenever we topped the 1,000 tons a day mark.”

The customer in question is Varel Paper and Board Mill, the renowned paper and board manufacturer in Germany. And, according to Kazerani, also one of the most ambitious, forward-thinking and technologically advanced companies in the industry. As Kazerani spent—→



“We had mutual goals, trust and respect.”
Maryam Kazerani
Optimization Engineer, Voith Paper

2 Phase

Tailor
Customize solutions using the Voith portfolio of services.

3 Phase

Commit
Steer the project and optimize production.

Productivity
Services that bring tangible results for the long term.

Pioneering role
The optimized combination of technological solutions and service offerings.



Expertise and commitment at Varel Paper and Board Mill: optimized together with Voith.

over a year embedded in the team at the plant during the rebuild of their Voith paper machine PM 4, she has the inside view. Her long-term role at Varel is a clear indication also of Voith's own commitment to a customer, long after a paper machine has entered into operation. Such embedding is also part of an innovative service portfolio from Voith Paper.

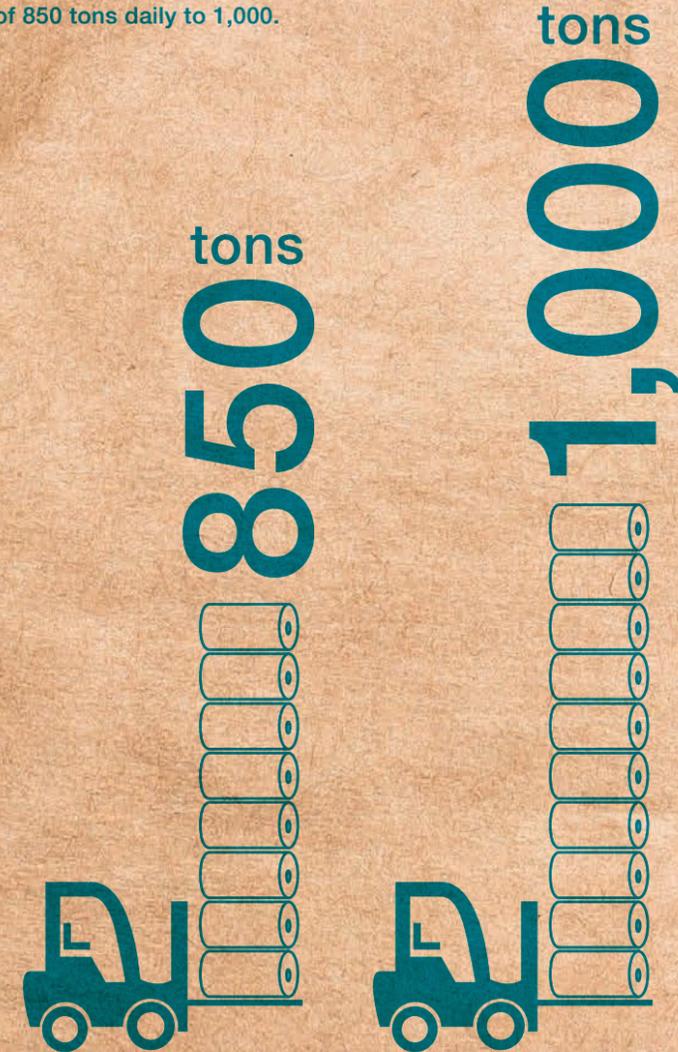
A new wave of services

"Right now, there is a need for an innovative wave of services to complement the fourth industrial revolution, this technological shift across industries and consumer habits," says Erik Forsberg, Director Global Service Solutions at Voith Paper. "As we hold a pioneering role in developing today's technological solutions in

papermaking, we are also at the forefront of an evolution in service solutions for the industry. We're calling it Servolution. But it is not just a new term. It is a win-win concept for customers and Voith together."

How does Servolution work in practice? It effectively encapsulates Voith's commitment to providing an all-round service with intelligent solutions that meet customer expectations. Essentially, the concept covers their entire needs, from Equipment Services, which includes all parts and materials needed to keep a piece of equipment efficient, Process Services, for know-how transfer and optimizing customer processes, and Integrated Partnerships, where customers can outsource the full responsibility for their service processes to Voith. With →

Following the major rebuild of PM 4 at the Varel Paper and Board Mill, the company now has almost a completely new machine, as only the press section remains from the first rebuild step of the original machine from 1989. The rebuild itself took four months, and then another year was spent with Voith optimizing the production, from stock preparation to calendering. The rebuild increased the design limit of 850 tons daily to 1,000.



"A production capacity of over 1,000 net tons daily is truly impressive."



Ulrich Lange
Managing Director
Varel Paper and Board Mill

Mr. Lange, the optimization of the PM 4 is complete. How satisfied are you with the whole process? At the end of the process the joint good result was important. Rebuilding and optimizing PM 4 together with Voith set an example in our market. Voith was an invaluable support to us, particularly regarding production trials, quality assurance and the development of stock preparation, in particular for the various paper grades that we manufacture on the PM 4. We had carried out a number of trials on our other Voith machine in-house, the PM 5, which was installed in 2005, and therefore were able to clearly define specific targets in advance for the rebuild. The Voith team ensured that we made rapid progress so that the whole project was wrapped up quickly. Their expertise and know-how made it an exemplary partnership, particularly regarding the stock preparation of different qualities of recycled paper.

And with the results? A production capacity of over 1,000 net tons daily is truly impressive. To be honest, I believe that Voith could certainly afford to be even more confident about the potential performance of their paper machines. We've shown that together we can push the design limits and achieve outstanding productivity results. The quality of our products has been welcomed on the market and sells extremely well. We are now planning a rebuild of the press section to complete the whole PM 4 to a new machine. We think Voith knows its strong points and will make an innovative offer. Our current production capacity on our two paper and two board machines is 850,000 tons a year. In five years' time, we expect it to be 1 million tons.

Turn it up for tissue

→ Varel, Kazerani was part of a fourth option: Productivity Services, which offers innovative value agreements to ensure a mutual interest in increasing productivity. Within such a transparent partnership, maximizing efficiency and reducing operational costs become a common goal.

What's your key performance indicator?

With Varel, the partnership evolved around the company's decision to increase the production capacity and product range of the existing Voith PM 4, which had been installed at the mill in 1973. The sophisticated rebuild involved a major extension of the stock preparation system and a complete modernization of PM 4 and its paper machine control system. As part of the agreement, both stakeholders took on a shared responsibility for a mutually defined target.

When a papermaker seeks to achieve a business-related key performance indicator or a specific goal with fixed parameters – such as paper quality or fiber yield – Voith steps up to the challenge. “We focus on the customer business-related productivity concept,” explains Forsberg. As part of the agreement with Varel, for instance, for every additional ton manufactured after the Voith optimization measures, Varel would pay Voith an additional compensation. “And in the spirit of true partnership, we share in the responsibility of reaching the targets, and are compensated according to the business performance related to the improvement,” adds Forsberg. “When we understand the costs, it helps to optimize the solution.”

As well as dedicated solutions for board and packaging, Voith has the solution for all paper grades, including these typical equipment services for tissue from the Voith OnSite Services Package for production optimization.

TerraDry HHT

The Yankee cylinder coating for the highest drying efficiency and the lowest energy consumption.

OTR Precise

The measurement technology for reliably identifying surface deformations on the Yankee cylinder.

MiniGrinder

The compact grinder for the accurate removal of irregularities, old coatings and chatter marks.

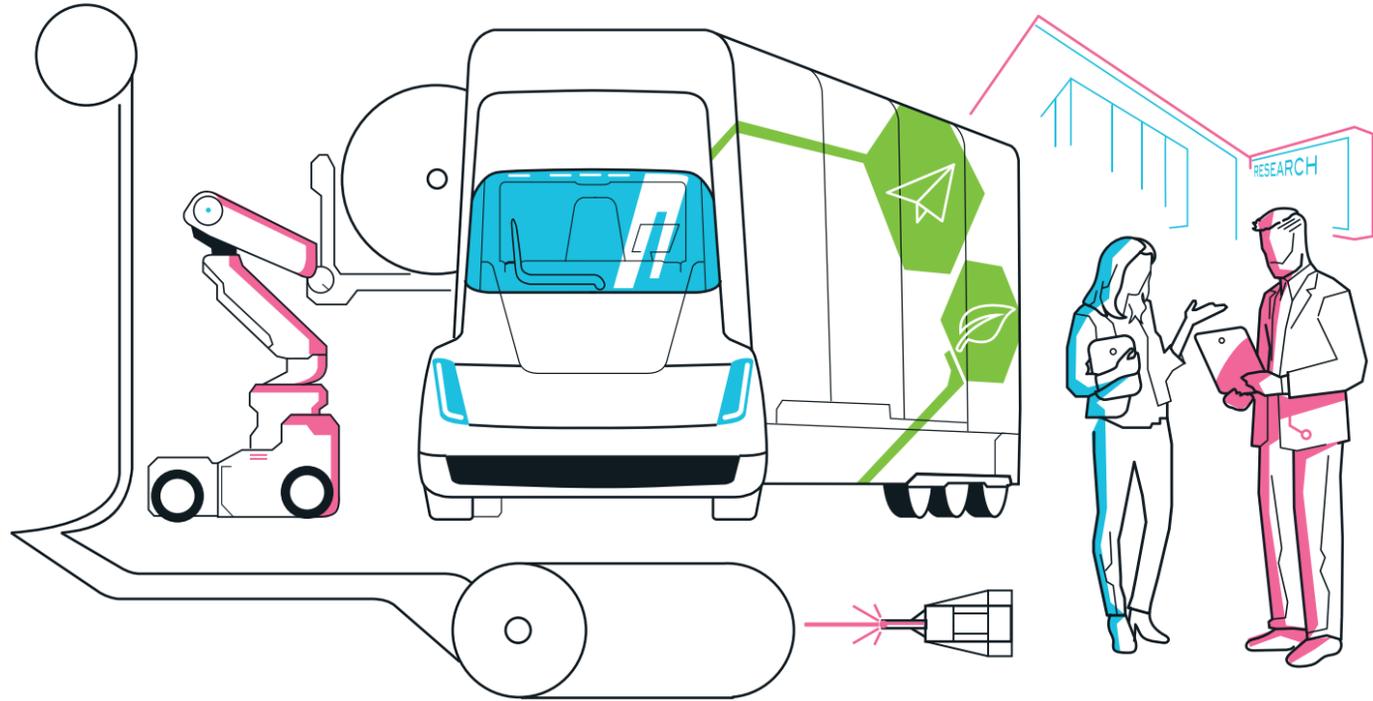
SkySoft

The highly wear-resistant SkySoft creping blade with ceramic coating ensures constant tissue quality and helps increase productivity.



Discover the whole range of Servolution options for all paper grades, including tissue, at www.voith.com/servolution

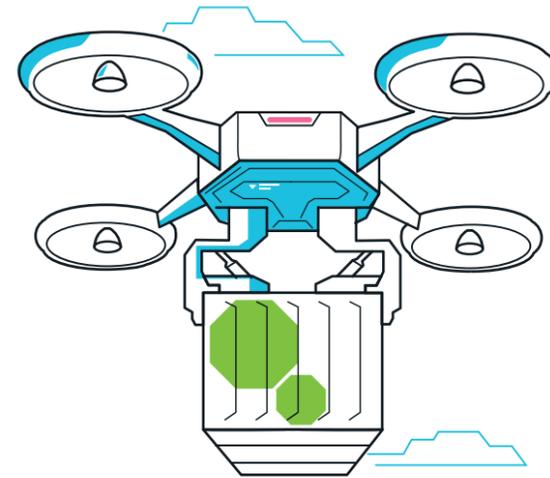
Make no assumptions



Machine learning, digital manufacturing or new materials in papermaking? What's the next big thing? And how do you know? To find out, Timo Kalefe is keeping a very close eye on developing trends.

_____ **Mr. Kalefe, you are responsible for foresight management at Voith. What does that mean?** Essentially, my work is about getting to know promising topics and trends from the outset or earliest stages – and crucially about not missing any developments that may be relevant for the future of papermaking. It involves the careful observation of the megatrends of our century. Of all kinds of social, political, environmental and technological trends and drivers. Foresight management is a mixture of analysis and evaluation of trends with the goal of identifying, and then eventually pursuing, the new, embryonic technologies or disruptive topics that could offer the most promise and potential for Voith, and with it bring papermaking to the next level for our customers.

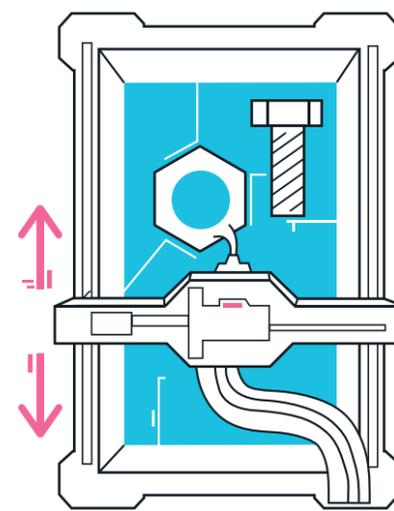
_____ **How does it work in practice?** You need to have your eyes everywhere! It could be through monitoring research at relevant leading universities or organizations, attending conferences, meeting with peers from outside the industry, and of course through talking to our customers. At Voith we have developed our own processes based on five key pillars: Trend Analysis, Technology Foresight, Customer Foresight, Consumer Foresight and Radical Technologies. Within each pillar, we've broken it down into smaller activities. At the start, Trend Analysis encompasses everything that is going on currently, and that is relevant for nearly every company, such as additive manufacturing, raw material availability or CO₂ emissions. Bibliometric analysis is one area within Technology Foresight,



for example, where we look at patterns in scientific literature.

_____ **How do you know what to pursue?** At first it's important not to stick to your existing assumptions. This is about leaving our own comfort zone and getting inspiration from fields that we had never thought of before, where the approaches are completely different to our own. Nevertheless, we have set up a clear process with defined criteria on how to evaluate the impact of new trends and technologies and to derive actions needed for us.

_____ **It sounds almost like a collaborative effort.** In a way, yes, it is. The world is getting more complex, and business is full of complexities. It is not possible to pursue all directions or develop all emerging technologies



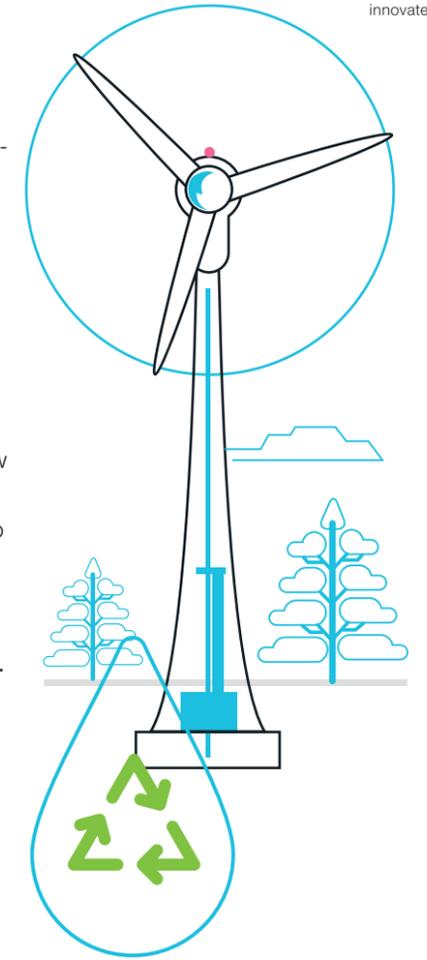
alone. As Voith is already a pioneer in papermaking, having developed core technology over decades, it is very interesting for start-ups or providers of new technologies to work together with us. We have a certain knowledge and customer base, and we can support them in identifying new areas, creating a market or technology. We're very open to cooperating and using our

knowledge base to develop technologies and, finally, markets together.

_____ **Where does the paper consumer fit in to all this?** We also exchange ideas with the customers of our customers. Companies who are close to end consumers, such as the Rewe supermarket, Zalando online stores or logistic companies, are important contact points for Voith. We look at what's happening at the end of the supply chain as well, so we can see what the future packaging requirements might be. How Amazon might be bringing the goods to their customers in the future. We think beyond the machine sector.

_____ **What improves the cooperation with your customers in this context?** For all of us, it is definitely crucial to integrate our customer's point of view into the identification and evaluation of relevant topics that drive the future of our industry. For instance, customers share their views with us, either in joint trend workshops or surveys. We value this input highly!

_____ **Any other joint activities with or for customers?** Absolutely. The analysis of megatrends, such as the shift to digital, led to the identification and implementation of important enabler technologies for customer-oriented solutions. For example, our customers can now explore our new machines with virtual reality goggles.



_____ **Can you share a favorite trend with us?** There are a number of challenges ahead in papermaking – for instance, in the area of energy and water consumption. New decentralized technologies may play an important role here in the future. Particularly fascinating is the trend towards paper replacing plastic. How can new technologies help us to do this? We are keeping a close eye on this. _____

↓
Take part in our online survey and join in the trend analysis!
<https://www.surveymonkey.de/r/7ZMBWG2>



For further information, please contact Timo Kalefe at timo.kalefe@voith.com

A talent for Textiles

modular

optimized

consistent

high-tech



Anne Klaschka

The press felt expert

From an early age, Anne Klaschka knew she would work in fabrics. Ambition, a talent for the sciences and a degree in textile engineering brought her to a career at Voith.



“New technologies can be scary for a lot of people, but at Voith we all saw the real potential.”



A global team developed the Infinity family, the next generation in press felt technology. At the head of the product is Anne Klaschka, a seasoned textile engineer with a passion for innovation.

“The first time I walked into the Voith production site, I was really taken by surprise. It was definitely not what I had been led to expect during my university studies,” explains Anne Klaschka, Global Product Manager Press Section – Press Felt. “But I knew it was where I belonged.”

The biggest surprise was the size, speed and sophistication. At Voith, you have machinery that you don’t normally see in textile engineering. While in most areas of textile production the weave looms are generally around 5 meters wide, when Klaschka joined Voith in 2004, Voith’s widest loom – in Düren, Germany – had a width of 32 meters. Today, the machines are generally a lot smaller, but also much more technologically advanced, as well as a whole lot faster. At the production site in Kunshan, China, the yarn is fed into the weave looms at 100 kilometers an hour. “It is like driving down the Autobahn,” says Klaschka. “Textiles on steroids is how I would describe it.”

Taking on the challenge

Initially a tailor by training, Klaschka started out in the fashion industry, but she always knew she wanted to move on to a more challenging environment. She joined as a trainee, traveled the world via various Voith locations and built up an incredible network and expertise in press felt technology and usage. She helped design, create and launch the state-of-the-art Infinity family of press fabrics, as well as the

production sites where the fabrics are manufactured.

The family keeps growing

The Infinity family is recognized worldwide as the very best in highly durable press fabrics for steady-state operation, used as seam and endless. Thanks to its stable and uniform characteristics, the seam is the number one on the US market. Recently, three new Infinity family members joined the portfolio: Infinity reloaded with cable, ToughLine and FineLine. As with the established members, these press felts are based on a modular concept and can also be tailored according to the requirements of the customer. Based on customer and machine specifications – including machine condition, speed, lifetime and performance – Voith application engineers make the most suitable recommendations. Thanks to Infinity, anything is possible.

“This is what we foster at Voith. It is important for the product life cycle that you want to be one of the innovators, not the copier,” says Klaschka. Together with her global team, she is definitely among the innovators. The Infinity family was first developed at the Voith US plant in Appleton. As the lead engineer, Klaschka was responsible for overseeing the development of new production methods and the implementation of the machine development. The new Infinity family required a complete overhaul of the manufacturing method, from →

The Infinity Family



The new additions to our modular felt concept

The true laminated structure of the Infinity family ensures excellent compressibility resistance.



Infinity reloaded with cable

Thanks to the high-tech cabled yarn, the structure of Voith Infinity seam and endless press fabrics ensures better batt fiber anchorage and allows consistent performance over the entire service life. For all grades.



ToughLine

The newest concept in void volume control. Designed specifically for challenging applications, Voith's Infinity ToughLine can withstand the most extreme conditions. For pulp and board and packaging applications.



FineLine

The finest seam on the market. FineLine is our newest member of the Infinity family for tissue, specialty and graphic paper.



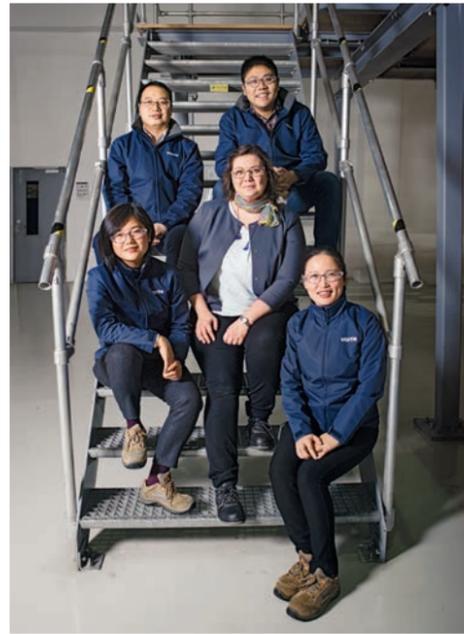
www.voith.com/infinity



repeatable

stable

tailored



Michael Zhou
Application Engineer



Ann Wu
Quality and Design Manager



Carfield Wang
Technology and Process Manager



Fannie Tang
Operations Manager



TEAMWORK

The global team of innovators provide tailor-made technical textiles to order.

conventional weaving to the modern high-tech fast manufacturing weave looms. "New technologies can be scary, because change is not loved by everyone, but at Voith we all saw the real potential. With the board completely behind us, we pushed through the changes within a year. That is incredibly fast for such a transformative shift."

A global overhaul

Once the plant was on track in the US, Klaschka relocated to China, and supported the global team in the redesign of the production plant in Kunshan, which led to the doubling of the press felt production capacity within a few years. Seen from both an environmental and a production perspective, it was a most radical upgrade. It is also one of very few buildings in China to be LEED* Gold certified and has gained international acknowledgement for environmental best practices. The plant produces a much more stable base

fabric, extremely uniform and repetitive, the ideal in press felts and fabrics.

"Repeatability is the goal and backbone of every production line," says Klaschka. "Every piece we produce on our weave looms is exactly the same as any one before. This is what we have achieved with the new weave technique." About the same time as the product launch in Asia-Pacific, Infinity was rolled out globally. Whatever customers need, wherever they are, they can order a tailor-made technical textile to the highest of standards. Depending on how the run goes, the applied design can be optimized according to the needs of the customer. It is a tailored operation.

"Textiles is definitely in my DNA," Klaschka admits. "If you are a textile engineer at heart, this is where you want to be. Voith brings out the passion in an engineer." Fashionistas might see it differently, but Voith textiles have a much cooler vibe.

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transform

An overview of key developments in the papermaking industry

Press felt conditioning upgraded

Blocked or distorted low-pressure nozzles in standard lubrication shower systems lead to felt damage, uneven moisture profiles and dangerously slippery walkways. In contrast, FilmLube, the innovative felt lubrication system from the Voith AdvancedPRODUCTS PressMax portfolio, is fitted with an integrated lubrication gap in front of the Uhle box. This ensures constant, optimum and efficient water application over the entire machine width, a steady-state felt performance and uniform moisture profiles. As an upgrade product, it transforms the performance of any Uhle box.



* Leadership in Energy and Environmental Design (US certification program for green buildings)



Open for tissue trials



São Paulo

Voith Tissue Innovation Center

- The R&D center can be set up to mirror your real-life scenarios and conditions.
- The trials with Voith expertise help secure market differentiation.
- The key to success is the ability to transfer results to your own mills.
- Our customers have complete, direct access to the machines during trials.

The Voith Paper Tissue Innovation Center has a long history and an excellent track record in providing extensive testing opportunities all along the entire tissue manufacturing process. Discover the options on our state-of-the-art machinery.

Open, yet confidential. Comprehensive, yet focused. Innovative, yet risk-free. While these descriptions appear contradictory, they all aptly describe the set-up at the Voith Tissue Innovation Center (TIC) in São Paulo, Brazil, the most technologically advanced tissue R&D center in the world. “We cover the entire tissue manufacturing process, from stock preparation to reel and every step along the way,” says Caio Penteado, R&D Operations Manager at the TIC. “We have a long history, an excellent track record and the best testing facilities. All within the kind of trusted and high-tech environment that customers demand for their own pilot trials.”

Before you invest, prove it in practice

The Voith Tissue Innovation Center is completely open to trying out whatever the customer wants in terms of process settings. Yet everything that happens in the center remains absolutely confidential. “When it comes to raw materials, or chemical make-up of a pulp, sometimes we don’t know exactly what is behind the trial from the customer’s point of view, but we can analyze the results, make informed comparisons and recommendations,” says Penteado. “We follow clear trial agendas and target settings agreed with our customers and are open to adapt our trials, also completely on the fly, to suit the customer’s specifications.”

This tailoring of trials is something that customers really appreciate, as Magnus Bengtsson, development manager at Duni, the market-leader of eco-conscious premium tissue products, can confirm. In 2015, Bengtsson oversaw two successful trials of Voith’s new TissueLev technology using the company’s own pulp. “The personnel are dedicated, flexible and

supportive. Whatever wishes we had, they ran the set-ups accordingly,” highlights Bengtsson. “They were also excellent hosts, taking care of us on both a personal and professional level.”

The positive experience and results led to Duni’s decision to place an order for the TissueLev technology from Voith in the same year. “The pilot machine played a key role for our decision to install TissueLev on two of our machines at our plant in Sweden. Thanks to the trials, we were able to see that using our pulp with TissueLev would get the result we were looking for – increased capacity and the opportunity to develop new eco-friendlier types of napkin tissue. Crucial for the whole project was the open and transparent cooperation with Voith and the strong mutual trust between us.”

→ Please feel free to contact Caio Penteado to discuss your own individually tailored trials at caio.penteado@voith.com



Located in Brazil and open for global customers: the renowned Voith Tissue Innovation Center

Our insights from the inside

World Tissue Consumption:
34.9 million tons*

56% Toilet paper
21% Kitchen towels

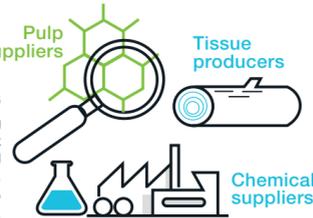
20%
Energy savings

in conventional tissue production by using the NipcoFlex T shoe press.

15% Facial tissue
7% Napkins
1% Other

Pluralis refiner fillings

For optimization of pulp refining to your needs. Higher headbox freeness results in machine speed increase of up to 100 m/min. Bulk increases by 3% to 5% while maintaining tensile specs.

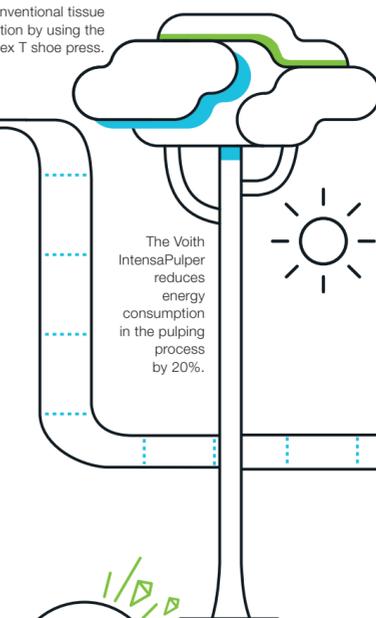


Differentiation



Optimized outcomes

Tighter environmental regulations and a tougher competitive environment are often the trigger for customer trials on our complete high-speed pilot machine.



The Voith IntensaPulper reduces energy consumption in the pulping process by 20%.

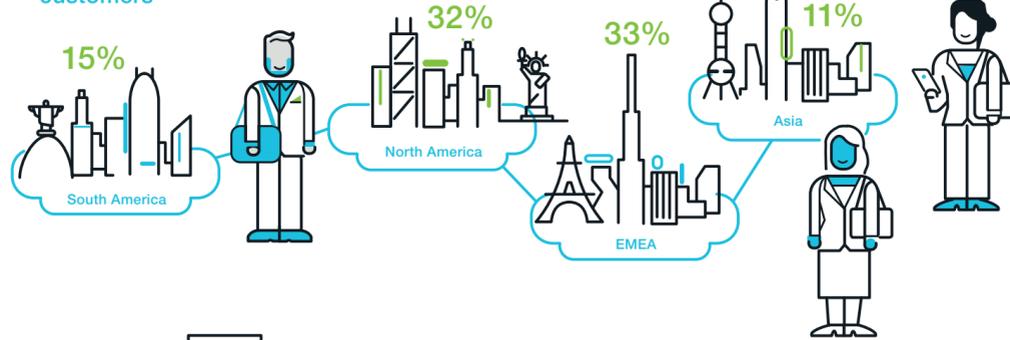


IntensaPulper

Part of the BlueLine product range, the IntensaPulper ensures excellent pulping efficiency with virgin fibers, high reliability and lower maintenance, and, as a result, secures significantly lower running costs. TIC trials available.

*Source: RISI (www.risinfo.com), 2015

Home of our pilot-trial customers



Close to 150 trial days per year

Verify the compatibility of your processes and raw materials with equipment you are planning to acquire.

Looking for green?

With ATMOS, the Voith technology for structured paper, you can go from conventional to ultra-premium qualities in a sustainable environment. For all grades, uses and fibers, and also with 100% recycled paper. Even ultra-premium production can be awarded with energy-friendly certification.

Global trials

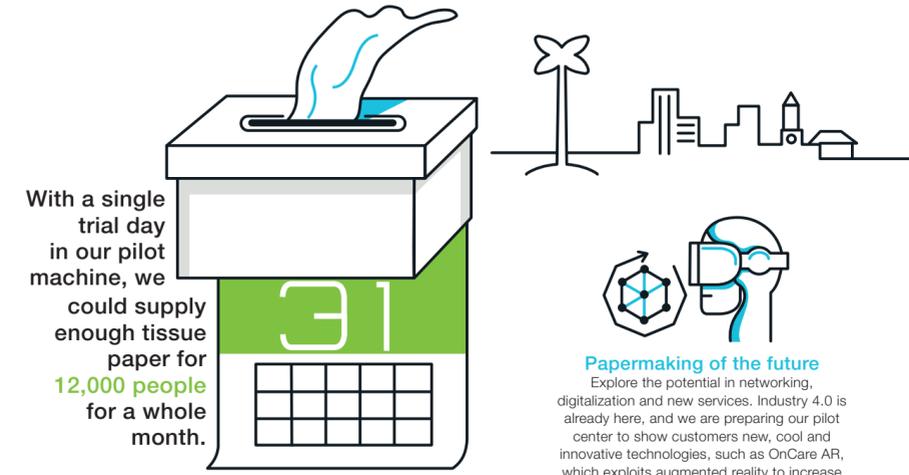


Close to 2,000 jumbo reels produced annually in our trials

Taking care of customers and internal R&D

50%
External customers
Average percentage of trials carried out for customers

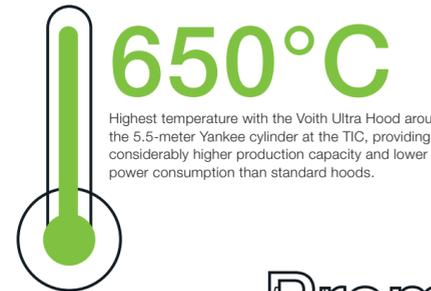
50%
Internal R&D
Average percentage of trials carried out for Voith R&D



With a single trial day in our pilot machine, we could supply enough tissue paper for 12,000 people for a whole month.

Papermaking of the future

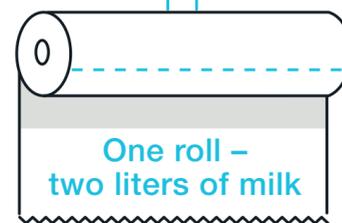
Explore the potential in networking, digitalization and new services. Industry 4.0 is already here, and we are preparing our pilot center to show customers new, cool and innovative technologies, such as OnCare AR, which exploits augmented reality to increase the real value of data by visualizing real-time information on site.



650°C

Highest temperature with the Voith Ultra Hood around the 5.5-meter Yankee cylinder at the TIC, providing considerably higher production capacity and lower power consumption than standard hoods.

Premium



One roll - two liters of milk

TissueLev results for premium specs

Developed and designed by Voith Paper Tissue R&D, TissueLev is an innovative add-on that achieves a higher post-press dryness compared with using just the shoe press operation. Retrofitting to older machines, it can increase the machine speed and capacity for a relatively small investment. The higher dryness can be transferred into a higher-quality soft tissue paper with higher bulk and strength. Achieving 4.5% higher solids allows 18% more speed or energy savings.



4.5%
Dryer material after press



350 m/min
Increase in machine speed

Two years

Duni developed a concept for its own production line with Voith in São Paulo over two years. Product development is now ongoing based on the opportunities created from the installation of Voith TissueLev.

2 liters

One roll of premium paper towel can absorb more than 2 liters of spilled milk. A simpler towel product will be able to absorb only half of that. To keep a soft sheet strong, suppliers use multiple plies.

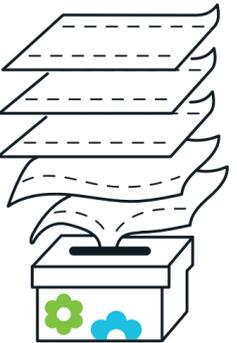


by softness What is soft for you? The concept of softness depends on the different cultures. Some like a soft surface, others prefer paper that drapes like a cloth, while others look for fluffiness. Europeans prefer stronger paper than Americans.

Quality

by length

In America and Europe, toilet paper is sold by the number of sheets. Manufacturers therefore look at ways to reduce fiber consumption.



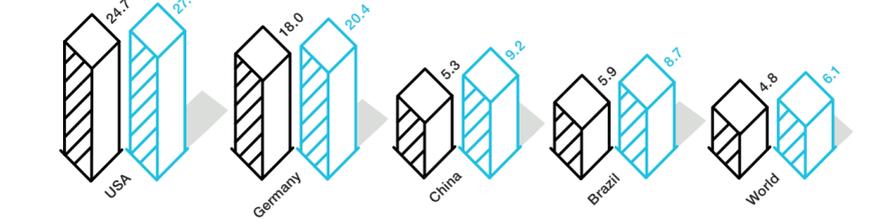
by weight

In some parts of Asia, weight is more important - not length. The rolls have to be very firm. Manufacturers look for ways to optimize production using less energy and applying alternative fibers, such as bamboo or straw pulp.



Annual tissue consumption per capita (kg/person)*

Different countries, demands and growth rates. Tissue makers explore ways to differentiate their products from the competition.



2015 2025

“By solving a tricky problem for one partner, we opened up new opportunities for all.”

Reinhard Leigraf
Process Technology Engineer for Special Papers at Voith

Hard to believe, perhaps, but at the heart of the most hard-wearing, water- and scratch-resistant laminate flooring is a thin layer of décor paper. The most attractive designs require a specialty paper that meets the highest demands, and not just for appearances. Absolute smoothness, easy impregnability, and high resistance to mechanical and chemical loads are all necessary properties of such paper.

“Getting there requires a superior manufacturing process, quite different to other paper grades,” says Michael Haffke, technology manager at the Osnabrück mill of the Felix Schoeller Group, the renowned specialty paper manufacturer based in Germany. The customers of Felix Schoeller require a quality of paper that can be impregnated with a special resin to create the core of the high-pressure laminate. How the paper behaves in this step is important to the final results. “Any waviness in the paper structure and the quality suffers. When you get it right, the results are stunning,” explains Haffke. Thanks to a close cooperation with Voith, Felix Schoeller has most definitely got it right.

The background

Over the years, as the machines speeded up, getting their décor paper to continue to lie absolutely flat became an issue. Felix Schoeller called on Voith for their expertise and support. Reinhard Leigraf, Process Technology Engineer for Special Papers at Voith, was in charge of the investigative process. Using light analyses, Felix Schoeller and Voith found the root cause. “The problem came from the heart of the paper machine: The turbulence generator within the headbox,” says Leigraf.

To understand where the problem stems from, it helps to take a closer look at décor paper for laminate

flooring. Achieving the high opacity level needed to cover the underlying layers in laminate requires a lot of titanium dioxide. In decorative paper, 20% to 40% is necessary. Other specialty grades use maybe 10% to 15% of a much cheaper clay. The better you can distribute this titanium oxide, the less is needed.

But it is not just about cost-efficiency – it also has to be achieved without compromising paper quality. This is why the design and functionality of the turbulence generator define the lasting outcome on the finished flooring.

“Paper with this high amount of titanium dioxide has a very different rheology to graphic paper. We found that it is not good to have too much turbulence in the headbox for décor paper,” explains Leigraf. “So we designed a brand-new one, the MasterJet Pro with ModuleJet.” The adaptations to the headbox resulted in a more homogeneous distribution of fibers in the sheet and the desired quality of paper at the reel with a very good basis weight profile.

The outcome

“This unique headbox design made such a difference to our production that we have since ordered another two,” confirms Hans-Christoph Gallenkamp, COO Felix Schoeller Group. A happy customer makes a happy supplier. And as Leigraf stresses, the same solution is now available for all manufacturers of décor paper: “By solving a tricky problem for one partner, we opened up new opportunities for all manufacturers of décor paper.” And not just for laminate flooring: the same advantages are achieved for furniture surfaces and kitchen cabinet panels. Since the new design was launched, more than eight orders have been placed from various manufacturers. _____

Follow
in our
footsteps

Decorative paper for hard-wearing laminate flooring and furniture requires distinctive properties. A close cooperation between Voith and Felix Schoeller has led to a manufacturing breakthrough for this particular specialty grade.

A worldwide impression

Whatever the preferred properties or cultural demands, Voith is the respected and experienced supplier of complete tissue machines and high-quality components, from stock preparation through to finishing. We present the customers' viewpoint.



this type of machine is that we can achieve higher bulk and softness without sacrificing strength. To support the production of printed special-occasion napkins, we have developed a proprietary process for bonding multiple plies together. This process is offline from the tissue machine. The collaboration with the various teams from Voith was excellent and allowed us to prepare for a very tight installation schedule. The commissioning and start-up was extremely helpful in identifying issues and working to resolution in a very professional and timely manner.”

In October 2017, Voith concluded the start-up of the XcellLine VTM 3 tissue machine supplied to Little Rapids Corporation, the US tissue and specialty paper manufacturer. The new machine replaced the company's old PM 3 at its Shawano production facility in Wisconsin. Ron Thiry, Vice President and General Manager, is satisfied with the results.

“On this XcellLine VTM 3, we will be producing dry crepe tissue grades for medical applications, such as products commonly found in US physician offices and in medical procedure kits. We will also produce tissue that is used in special-occasion napkins and personal-care items. A key benefit of

“A key benefit of this type of machine is that we can achieve higher bulk and softness without sacrificing strength.”

Ron Thiry
Vice President and General Manager at Little Rapids Corporation

Capacity
220 tons
a day, per machine

Tissue type
toilet paper



With an annual production capacity of 4.7 million metric tons, Suzano Pulp and Paper is one of the largest producers of pulp and paper in Latin America. In 2017, Voith delivered and installed two complete XcellLine tissue machines for the company. Within the Process Line Package, Voith also supplies the auxiliary equipment and services. Fabio Prado, Executive Director for Consumer Goods, explains why Voith was the preferred partner.

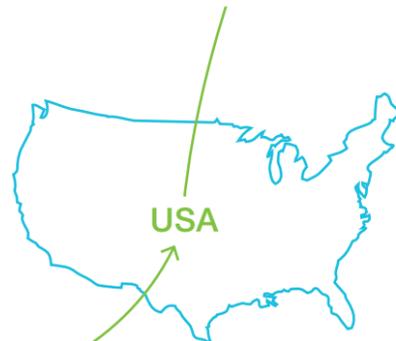
“Brazil's toilet paper market is currently changing, as it is migrating from single to double and triple sheets. This trend, which has already taken place in several Latin American countries, is now seen more clearly in Brazil. This proves that consumers are increasingly concerned about product quality. Consumers notice that besides quality, migrating to the double and triple sheets really adds value for them. This is because the higher the product's quality, the lower its cost per use. Since con-

sumption is measured per sheet, the migration from single to double sheet brings nearly 10% of cost-per-use savings. From double to triple sheet provides an additional 10% savings.

Voith has been our partner for decades. Along with the coordination services for the supply of Voith's auxiliary equipment, we are absolutely convinced that the Voith high-performing tissue machines for our sanitary paper mills in the Brazilian Northeast region will provide excellent productivity rates and the best paper in the Brazilian market. That is our strategy: to offer a product that combines high quality, higher softness, great efficiency, that can be purchased in the most important points of sale in the regions we cover. Our location allows us to improve the supply of products in the Brazilian North and Northeast regions, where per capita consumption of toilet paper currently represents less than half of the national average.”

Start-up
30 days

Tissue type
medical applications



“The high-performing Voith tissue machines will provide excellent productivity rates and the best paper in Brazil.”

Fabio Prado
Executive Director for Consumer Goods at Suzano Pulp and Paper





Capacity
30,000 tons
a year, per machine

Tissue type
high-quality napkins

_____ Duni/Rexcell is the market-leader of eco-conscious premium tabletop products. Over two years, Voith and Duni developed a tailored solution for the company's two existing tissue machines using TissueLev technology, the Voith add-on that can be retrofitted to machines. After repeated trials in 2015, confirming the promising results, an order was placed in summer 2015. Each rebuild took only 5 days at the

beginning of 2016, with only 4 weeks between the first and second machine. Stefan Åbom, the Managing Director at Duni/Rexcell, highlights the keys to success.

"We manufacture paper for tissue in one, two or three layers, between 15 and 25 grams per square meter and in more than 30 different colors. Rexcell tissue is exclusively used for tabletop products, such as napkins. With our 'goodfoodmood' initiative, we intend to grow into the world's most attractive provider of inspirational tabletop concepts. This ambition is carried by outstanding quality and premium products. Beside colors and designs, the most important feature for our end-users is thickness and softness/stiffness. The TissueLev technology developed with Voith improves all of these features, but especially the thickness. Voith innovations support us by making it possible to realize our ideas about the next generation of tissue, which improves the qualities appreciated by our customer, as well as increases our capacity on existing grades. I would highlight three things. The professional

"Voith innovations support us by making it possible to realize our ideas about the next generation of tissue."

Stefan Åbom
Managing Director, Duni/Rexcell

cooperation between our companies. The equipment, as Voith technology is at the leading edge. Finally, the people. Our partnership shows how two organizations can work together, both supporting and challenging each other to reach our mutual goals." _____



_____ In 2017, four XcelLine tissue machines were launched by Voith for Lee & Man, including TM 12. The tissue machines are very flexible in production to meet different needs of the end customers. The tissue weighs between 13 to 17 grams per square meter. The annual output of TM 12 is 60,000 tons, and the wire width is 5,600 mm, while its maximum operational speed is 2,000 m/min. During the start-up, from "stock on wire" to "paper on reel" it took only 28 minutes. From the very first parent roll produced, the tissue was of saleable quality. Harry Ng, General Manager, Lee & Man Tissue, and Alfred Lai, Operation Manager, highlight their positive experience of working with Voith.

"Cantonese customers in southern China prefer tissues with a soft feel, while in Chongqing, central China,



Harry Ng
General Manager of Lee & Man Tissue

↓
20
tissue machines

Over the past two years, 20 Voith tissue machines have been sold globally, including the fastest in the world with a steam heated high-performance hood.



"We're impressed with their swift response and professional service. We've built up a good rapport over our multiple cooperations. The team at Voith has tracked the whole process, handling machine-related issues in a timely manner, with excellent technology and high efficiency. Their support allows me to see their expertise. To sum up, Voith Paper is a very good partner."

Capacity
60,000 tons
annually

Start-up
1 day

Tissue type
household tissue paper

weight is more important. As a result, the tissue paper produced in the Chongqing base is mainly targeted at consumer groups in Chongqing and the surrounding area, while the tissues produced in Dongguan cover the consumer groups in Guangdong and nearby areas. We take measures to adapt the production to local conditions." _____



"We've built up a good rapport over our multiple cooperations."

Alfred Lai
Operation Manager of Lee & Man Tissue

It is time for tissue



A combination of changing lifestyles and a much better awareness of health care is driving the growing global demand for tissue paper. Ronaldo Parucker, Voith Paper's Strategic Technology Manager for Tissue, outlines his vision for the future.

_____The tissue market is on a roll. "So far, this is a paper grade that really does not have an effective technology replacement," says Ronaldo Parucker. With the biggest growth rate among the paper grades, tissue consumption is expected to grow by about 3.5% every year for the next five years. Worldwide, around 37 million metric tons of tissue have been consumed last year alone. And with cultural habits in the use of tissue paper changing, and more than 50% of the world's population still not using toilet tissue, there is certainly huge potential for further growth.

When it comes to facts and figures, Parucker has them all at hand. More importantly, he also has an in-depth knowledge of papermaking and

tissue paper. Having joined Voith in 1988, he is about to celebrate his 30th anniversary at the company. His career path has crossed continents, from his native Brazil to China, and this year it will take him to the headquarters of Voith in Heidenheim, Germany, where he will continue in his role as Strategic Technology Manager Tissue, offering his knowledge in terms of technology placement to customers. He was appointed to this position in June 2017.

Supply chain and pain points

Parucker has played a key role in the development of tissue technology and has an expert understanding of the supply chain and customer pain points. "We are seeing increased, tougher competition," he says. "On top of striving to be innovative with new products, tissue manufacturers also have to deal with increasingly stricter environmental regulations, demands to reduce energy and fiber consumption and to increase everyday efficiencies in the entire value chain. End consumers, particularly supermarkets, are constantly on the lookout for price advantages," he confirms. All without compromising on quality.

"Our customers need to differentiate themselves from competitors. By increasing the quality of the paper, using different fiber sourcing, or by getting more flexibility out of the production lines to better compete in such an environment." Voith, along with the Strategic Technology Managers, aims to help customers meet these challenges head-on, with solutions that ensure more eco-friendly, cost-effective and highly efficient operations.

"My main goal, together with the strong support of the business lines and digital agenda, is to help our customers to be not just in the game, but at the top of the game." _____

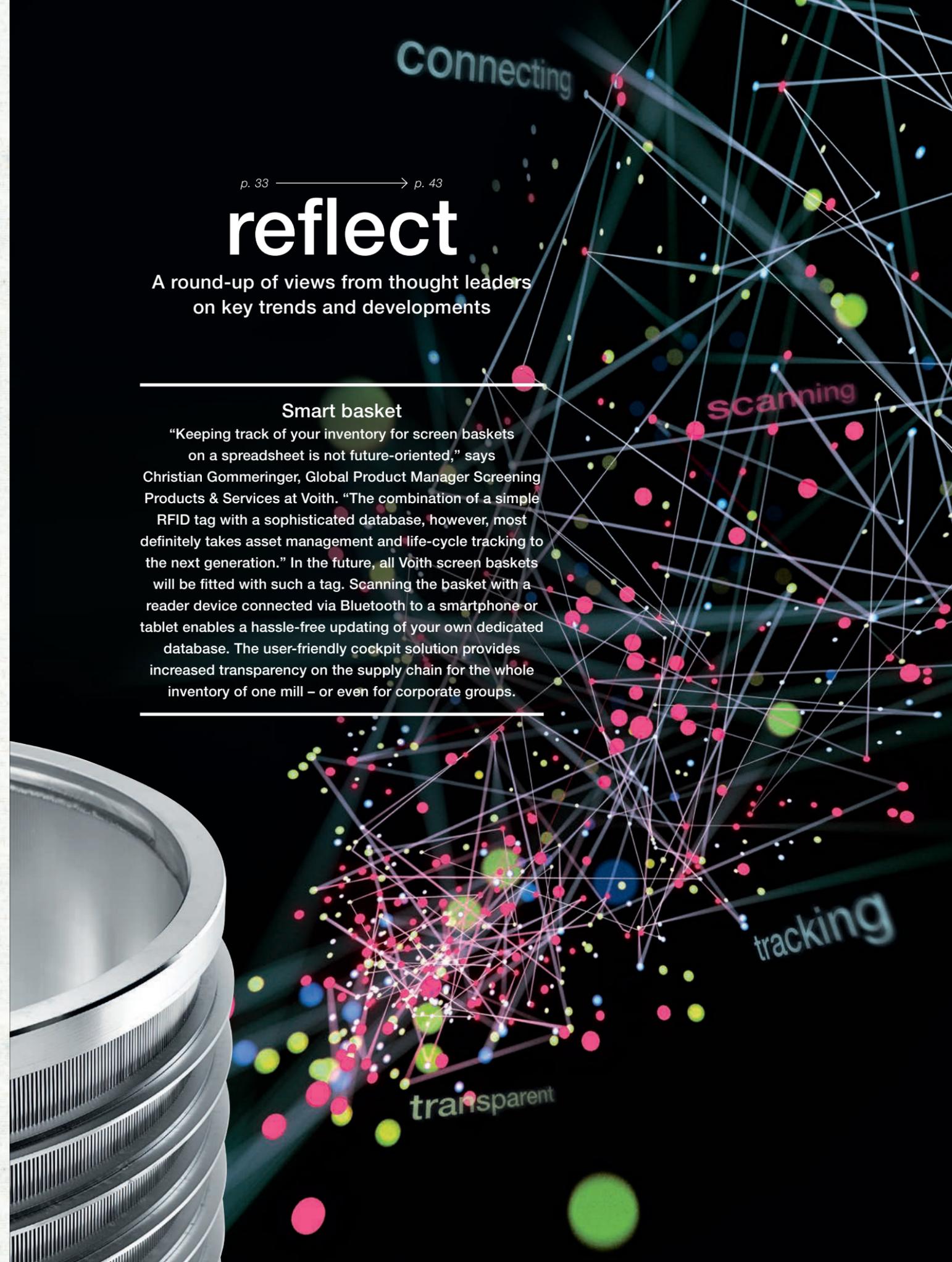
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reflect

A round-up of views from thought leaders on key trends and developments

Smart basket

"Keeping track of your inventory for screen baskets on a spreadsheet is not future-oriented," says Christian Gommeringer, Global Product Manager Screening Products & Services at Voith. "The combination of a simple RFID tag with a sophisticated database, however, most definitely takes asset management and life-cycle tracking to the next generation." In the future, all Voith screen baskets will be fitted with such a tag. Scanning the basket with a reader device connected via Bluetooth to a smartphone or tablet enables a hassle-free updating of your own dedicated database. The user-friendly cockpit solution provides increased transparency on the supply chain for the whole inventory of one mill – or even for corporate groups.



“I take on the responsibility with a real sense of respect.”

Andreas Endters
CEO of Voith Paper



A fresh, focused perspective

Faced with today's challenges, opportunities and threats, how can paper manufacturers secure their success in the future? Andreas Endters, CEO of Voith Paper, outlines his views.



Andreas Endters, having joined Voith Paper back in 1995, you were appointed CEO in 2017. You are clearly a real Voithian at heart. How do you feel about the new responsibility? To lead Voith Paper – as a crucial supplier and trusted partner to the paper industry and an essential part of Voith – is a big responsibility which I take on with a real sense of respect. At the same time, we have highly skilled and dedicated employees, excellent products and services, a unique global footprint and long-lasting customer relationships. This is a great basis on which to grow our business and to improve our performance and customer satisfaction. I am thrilled to exploit those opportunities together with my team and our customers.

What are your concrete plans? Across the whole of Voith Paper we are working hard to ensure that the value add of our products and services for our customers is maximized. By developing innovative processes, products and services, or by combining and aligning existing products and services. With Papermaking 4.0, for instance, we provide connected, smart solutions which make the papermaking process more efficient and stable. Essentially, we want to offer a more comfortable and enjoyable customer journey. We achieve this by redesigning or digitalizing processes, as we have done with



Digitalization

With Papermaking 4.0, we provide connected, smart solutions for a more efficient and stable papermaking process.

Key conclusions
drawn from over

20

years of
experience

our Voith Paper Webshop. Everything we do needs to create value for our customers.

_____ **Which critical trends are driving innovation in paper manufacturing?** Scarcity of recycled fibers and deteriorating waste-paper quality is a big topic today for our customers. Our innovative BlueLine stock preparation systems and XcelLine paper machines help our customers to cope with this challenge by managing higher dirt contents, reducing fiber losses and securing paper characteristics at lower basis weights.

In addition, our customers face consistent cost pressure. By increasing the efficiency of the papermaking

Cost

With the increased efficiency and quality in papermaking, we help customers secure their competitiveness.

process, we help to secure their competitiveness. Lower energy and water consumption support not only the cost perspective but also the true sustainability of paper as a green product. Finally, our customers are in search of qualified manpower and talent. With

improved product quality with the minimum necessary basis weight, combined with a reduction of energy input. We have excellent products in this area, and we are consistently investing into R&D in order to push this further. Our consumer and market foresight



Andreas Endters discusses the megatrends in the paper industry: from recycling waste paper to replacing plastic.

connected, smart solutions such as Papermaking 4.0, state-of-the-art training programs and support from papermaking experts, we can help our customers address this issue too.

_____ **And in the tissue industry in particular?** The trends for tissue are

shows that an increasing portion of tissue products are being traded online, which puts brand differentiation at risk and increases cost pressure. The business in tissue machines is increasingly important to us, which is why we are further strengthening our activities in this area. In the last 24 months, we have sold more than 20 XcelLine tissue machines across all regions. We have some very successful, record-setting start-ups to our credit.

_____ **What about growth opportunities?** Our clear target is to grow our process enhancement products and maintenance and technology services, which help our customers to focus on the papermaking process. We are growing our service footprint in order to provide those services close to our customers. We have excellent products for all paper grades in paper machine clothing and roll covers that

match perfectly. With Papermaking 4.0 we have a huge opportunity to make the papermaking process more efficient and stable, and this offers tremendous growth potential for Voith as a whole.

At the moment, I see a huge opportunity to grow paper as a truly green product for packaging and board applications, which are booming thanks to

_____ **And Voith? You are renowned and respected in the industry as pioneers in traditional papermaking across the board. Is the same still true for the digital revolution?** By developing our product and service portfolio further to be “4.0 ready” and with the formation of our Voith Digital Solutions Group Division,

Tissue

Our technology and expertise in tissue production enables brand differentiation in an increasingly competitive marketplace.

e-commerce. Since paper is based on renewable fibers and is really biodegradable, it has a lot of potential to replace plastic. However, as I mentioned before, virgin as well as recycled fiber has to be available in reasonable quality at an economic cost to support this substitution. Our BlueLine stock preparation technology helps to make recycled fibers available with minimum fiber losses in the most cost-efficient way.

_____ **Are paper manufacturers open to opportunities via digitalization?** Considering the pressures our customers are under, I’ve observed that they are extremely receptive to use digitalization as a way to reduce their operating costs. But also as a way to respond to the loss of talent and skills, a growing concern as the more experienced staff retire in greater numbers. In each case, the opportunities and challenges are different, but overall our customers are eager to explore the possibilities. Accordingly, we have built several trusted partnerships with customers around the world to support them in exploiting the full benefits of Papermaking 4.0.

we have created the prerequisites to shape the digital revolution actively. By digitalizing our internal processes and by making the papermaking process more efficient with Papermaking 4.0, we are taking our customers to the next level of performance. For instance, when customers buy a new XcelLine paper machine today, they can explore their new machine in a virtual reality space and really work with it virtually. In the future, trainings will be performed by means of VR in the machine. The associated cost and time savings are incredible. If you don’t exploit the opportunities offered by digitalization, you are wasting your potential and will not be competitive in the medium term. _____

Environment

Through lower energy and water consumption, we also support the true sustainability of paper as a green product.



TOP OF THE LINE



Significantly improved topography

Optimum white ply surface quality

High dry content

No dryer fabric markings

Reduced machine length

Reduced machine clothing cost



A straight run through the coater!

With this new wet end concept, the required web run in the basement for turning the web is obsolete, improving operations.

How to make top-quality box board or white top liner? With the newly launched paper machine wet end concept, part of the Voith XcelLine, papermakers can significantly improve paper quality and productivity levels.

Do you ever pay attention to the front and back of the cereal box? The visual appearance is of utmost importance. It needs to have a surface that is bright, smooth and of superior quality for perfect printability – and to stand out on the shelves. High-quality board or liner creates an eye-catching product on the outside. Inside – where functionality, not looks, is a priority – brown fresh-fiber or recycled fiber is usually used. As a result, board or liner is frequently a multi-ply product.

“The current manufacturing process for quality white top test liner is complex and costly. But it is about to be significantly improved,” says Johann Moser, Strategic Technology Manager for Board and Packaging at Voith Paper. The innovation is for the wet end, and is based on a thoroughly customer-oriented approach to problem-solving.

A brand-new wet end

State-of-the-art paper machines for quality white top test liner production comprise two wire sections. One for the white top ply, one for the brown back ply. Both are combined, and further dewatering occurs down the table through the brown back ply, which ensures top-ply purity. Pressing is performed with a DuoCentri NipcoFlex press section plus straight-through press, which is fitted with a smooth mating roll on top to ensure felt marks on the white ply are less prominent. A further dry content increase with the press does not, however, materialize!

The important point is good topography of the sheet coming out of the press section. Alternatively, pressing is achieved with an inverted Tri-Nip-Press with transfer belt at center roll and transfer wire. So far, so complex.

Face down

A patented wet end concept can replace this complexity, and reduce costs. By changing the layout of the top ply and back ply wire section, perfect layer purity and high web dry content are secured before the web enters the press section. Turning the web in the wet end and placing the web on a Voith transfer wire makes a difference.

At the transfer section, web dewatering may not occur, so no dewatering elements are installed. Thanks to this invention, the white ply enters the DuoCentri NipcoFlex press section face down, in contact with the smooth center press roll. This gets ultimate initial surface smoothness plus high dry content, as demanded by papermakers.

No more headaches

As such, the straight-through press, a headache for every papermaker, or the inverted press concept is no longer required. After the press section, the white top ply faces the dryer-can surfaces, so dryer fabric marking cannot occur. “It is this combination of an inventive spirit at Voith plus sophisticated design that results in a significantly improved white top ply surface quality,” concludes Moser.

A greener potential

How can the papermaking industry move further toward sustainable manufacturing? Esko Uutela, Chief Editor and Consultant at RISI, a forest-products research firm, and Zhang Yulan, Deputy Secretary-General of the China National Household Paper Industry Association, debate the options.

Worldwide, we're seeing tighter environmental regulations across all industries. How has this affected paper manufacturing?

Uutela: Compared to 30 years ago, the current situation is a lot better. Today's higher environmental standards mean that the less eco-friendly mills are closing and others are investing in their environmental footprint.

Increased transparency in the industry is also making a difference. The more transparent companies have to be about their CO₂ emissions, the more they will do to reduce them. The problem is, we have many kinds of players in the industry and not all are required to make the necessary changes. But government authorities may still implement further measures, as we've seen happen in China.

Zhang: Our national energy conservation policies have accelerated the elimination of outdated systems, allowing modern machinery in the tissue segment to scale up. As a result, many low-speed, energy-intensive cylinder machines have been phased out in favor of high-speed crescent and vacuum cylinder machines. This modernization trend is ongoing and accelerating further. China's official "Industrial Green Development Plan" (2016-2020) clearly requires that papermaking and other industries should be significantly cleaner by 2020, with a marked reduction of industrial sulfur dioxide, nitrogen hydride, chemical oxygen demand and ammonia emissions.

Best practice starts with sustainable raw materials: the official certification of forests is the key to success, argues Esko Uutela.

Uutela: As a forestry expert myself, I am particularly supportive of the certification of forests. Implementing official independent control mechanisms has been a very positive step. As for technology, the closed-loop system, which sees the reuse of process water instead of constant fresh water, has led to the biggest savings in water consumption. In tissue paper manufacturing, it is probably down to 10% compared to 30 years ago. I would also include the shoe press, which has helped improve efficiency. In principle, combined heat and power plants could be an important building block for more efficient papermaking. But they require heavy investment.

Could the industry benefit from a significant disruption?

Uutela: For almost as long as this industry has existed, the basic principles have remained more or less the same. This may be why I see no ground-breaking technologies. And even if there were, they would take decades to have an impact. Finally, I believe we should be watching what China is doing in the tissue industry. It is already highly modernized today, but is still investing heavily. In 20 years from now, the country will have the most modern technology on the planet. It will change the industry.

What are the current best practices and measures?

Zhang: Key developments include high-speed wide tissue machines, the shoe press, steel Yankee dryer and heat recovery systems. Notably, the increase of after-press dryness is one of the most effective means to reduce energy consumption. To further boost energy conservation efforts and reduce operating costs, some paper manufacturers in China have converted from coal to gas. Such measures optimize the use of energy, and reduce overall operating costs.

Zhang: Digital will bring about an important change in the industry. By understanding concepts such as Voith Papermaking 4.0 the automation of paper manufacturing can create a much more stable production process and increase product quality. This will bring about a far-reaching change and a greater potential for “green” papermaking.

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Q&A

questions and answers

Why do some cities have healthier citizens than others? Hand-hygiene habits could provide part of the answer. Fanis Papakostas, chairman of the European Tissue Symposium, explains why.

_____ **What's the best way to prevent the spread of infection and germs?** As our hands are the number one transmitter of microorganisms, hand hygiene is crucial. Hand-washing with soap and water is the single best way to reduce transmission rates of viruses or gastrointestinal illnesses. But it is not enough. What people often don't realize is that proper hand-drying matters. It is directly correlated with the spread ratio of potentially harmful microbes in society. Microbes can remain on the hands after washing, and damp hands can transmit germs more easily.

_____ **Single-use paper towels or electric dryers?** You absolutely get the best results with single-use towels. There have been many independent studies on this topic, comparing the potential for virus dispersion using jet-air dryers, warm hand dryers and single-use towels. When you use any kind of towel to dry your hands, you are doing a much better job. The microbes stick on the paper and end up in the trash. When you use the jet air dryers, the germs get blown and splattered all over the place, as water droplets can stick to the surface of the dryer. Microorganisms can end up on various surfaces of the washroom, on the floor and, unfortunately, on human beings.

_____ **What exactly have the studies shown?** During one peer-reviewed study, for instance, Professor Mark Wilcox of Leeds University



discovered that bacterial counts in the air close to jet-air dryers were 4.5 times higher than around warm-air dryers – and 27 times higher compared with using paper towels. This suggests that the jet-air dryers should probably best be kept at least out of health care settings, where the potential to infect vulnerable people is higher.

_____ **Regarding the environment, is there also a clear argument for using paper towels?** In Europe, the tissue paper industry has set its standards and all serious companies have committed to only use certified renewable forestry, recycling fiber or both. Simultaneously they all are in a continuous improvements mode regarding total energy efficiency. Although it is not always easy to calculate the total environmental impact with accuracy. Manufacturing of jet-air devices requires plastic material, metals and energy in use too. What we are absolutely certain about, however, is the hygienic argument. And that is definitely for single-use paper towels. _____



**The visionary
starts with a clean
sheet of paper
and re-imagines
the world.**

Malcolm Gladwell



VOITH

Inspiring Technology
for Generations