

# twogether

Paper Technology Journal

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*Dr. Hans-Peter Sollinger,  
Member of the Management Board  
Voith AG and President of Voith Paper.*

**Dear customer, dear reader,**

*I would like to invite you to take a moment to flip through the new twogether magazine and just read the headings. You will quickly see what matters to Voith Paper: more efficiency in using your paper machine, greater cost-effectiveness and thus a lower use of resources. We have been committed to these goals for quite some time and are now bundling them together under the term 'Green Technology'.*

*Over the last few months, companies all over the world have been fighting against the recession. But even in these economically difficult times, the worldwide largest production facility for newsprint has been put into operation in King's Lynn, and after just 16 months. Integrated into the facility is the world's largest deinking system.*

*Whether it's new installations or conversions – Green Technology pays off economically and ecologically, even in hard times. A few examples from this issue: At Norske Skog Saugbrugs in the Norwegian municipality of Halden, the savings on heating energy costs due to our rebuilds in the wet section amount to 1.3 million € per year. Further, 1,500 l/min of fresh water are saved and 90% of the pulp per year is saved. And installation of our optimized press felts will pay off with 720,000 € in additional receipts for the machine owners, thanks to the higher tissue paper production they allow.*

*With such positive numbers and product innovations, Voith Paper is confronting the challenges of the market. I wish you peaceful and reflective days over the coming Christmas and much success for the coming year.*

*I wish you lots of fun while reading!*

*H.P. Sollinger*

*On behalf of the Voith Paper Team*

New paper machine at King's Lynn in operation

# Challenges of a successful large-scale investment

## Included in the Lynn PM 7 delivery:

<b>Deinking system</b>	Pulping drum (TwinDrum) 2 Flotation lines (EcoCell) Dispersing system (EcoDirect) and peroxide bleach Water preparation (Deltapurge) Systems for dewatering and transport of rejects
<b>Wet end process</b>	Cleaning (EcoMizer) Sorting (MultiScreen) Deaeration (VoithVac) Fiber preparation/recovery (machine pulper)
<b>Paper machine</b>	Headbox (MasterJet) Wire section (DuoFormer TQv) Press section (DuoCentri-NipcoFlex with 4th press) Dryer section (TopDuoRun) Finishing (2 EcoSoft Delta calenders) Reel (Sirius)
<b>Winder</b>	2 VariTop
<b>Auxiliary units</b>	Machine and plant ventilation technology, steam and condensate systems, lubrication systems and mechanical drives
<b>Automation</b>	Basic & detail engineering Hydraulic & pneumatic systems Machine-oriented control Software programming of the system Process control system (OnControl) Drive control (OnC DriveCommand) Quality control system (OnQuality) Information system (OnView)
<b>Clothing</b>	Forming fabrics, press felts, dryer fabrics
<b>Rolls</b>	EvoTec and CarboTec rolls, roll covers and SkyLine doctors
<b>Press sleeves</b>	QualiFlex QX 95
<b>Service</b>	System and electrical engineering, assembly monitoring, start-up and training







**King's Lynn is where the Great Ouse River flows into the Wash. It's a small and, at first glance, rather sleepy-looking town in the county of Norfolk, a good 100 miles northeast of London. And yet the largest production facility for newsprint in the world came into being here in just barely 16 months: the main buildings of the plant alone are 580 meters long with a maximum height of 27 meters. There were 10,500 pre-fabricated parts, 340,000 tons of concrete, 16,000 tons of reinforcing steel and 12,000 tons of paper machine parts used between April 2008 and August 2009. The challenges were many: adaptation of the technology to British requirements, achieving the best paper quality with a high production quantity, training of a completely new team, elaborate preparation of the building site and coordination of up to 1,400 people at the construction site were only some of the demanding tasks that had to be mastered at the King's Lynn site.**

### Portrait of King's Lynn

King's Lynn was once a significant port. It is in the county of Norfolk not far from the Wash, the big inlet of the North Sea. Its roots go back to the year 1101, when Bishop Herbert de Losinga founded St. Margaret's Church. At that time the settlement was still called Bishop's Lynn, with Lynn presumably derived from Gaelic and meaning something like 'small waterfall'. Only after the expropriation of the Catholic Church by Henry VIII (1538) did Bishop's Lynn finally become King's Lynn. Nearly 35,000 people live in King's Lynn today.

Incidentally, the town is proud of not just its past as a Hanseatic city. Of course, the fact that Princess Di once went to school here is almost like a knighthood for the whole town. Almost more significant than the fact that the first English prime minister, Sir Robert Walpole, was from King's Lynn. Other historical and well-known personalities can be added to these. For example, Lord Nelson, the hero of Trafalgar, or Captain George Vancouver, eponym of the Canadian city and important cartographer of the American west coast. Even examples from the recent past can be found: Formula 1 driver Martin Brundle or Queen drummer Roger Taylor.

*Today many very well-preserved medieval and Gregorian buildings still attest to the heyday of the Hanseatic city King's Lynn, which lasted until the end of the 18th century.*

King's Lynn, September 22, 2009: Artur Stöckler, Executive Vice President at the Papierfabrik Palm GmbH & Co. KG (Palm Paper Mill in Aalen, Germany), Dr. Thomas Welt, Managing Director Production at Palm Paper Limited (King's Lynn) and Production Director Stephan Gruber are sitting in Dr. Welt's spacious office and are here for an extensive conversation with two together. We are talking about the planning and start-up of the PM 7, whose annual production of newsprint will reconfigure the British paper market. No small task, and anything but routine business.

But despite the many months of hard work and the stresses of the start-up phase, the three seem comparatively serene. Perhaps a bit tired, but com-

posed and confident. It seems as if everything is going as planned.

"That's right," says plant manager Dr. Thomas Welt, "we're on schedule and perhaps even a bit ahead," he says with Swabian understatement. Ultimately, the system went into operation three weeks earlier than planned. Twenty days after the start of the machines, there are between 600 and 1,000 tons of paper running daily onto the reels. After the start-up speed of 1,580 m/min was attained without any problem, the meters were already showing 1,650 m/min on September 20. Therefore, Dr. Welt and his team are confident that the required start-up curve will be achieved as planned. A good 400,000 tons of paper are to be produced annually in the former Hanseatic city. Newsprint of such high quality that it can even be used for the >>> [flexographic printing process](#) that is widespread in the UK. About 10% of the newspapers published there are printed using this method. The process has especially high requirements for the quality of the paper surface. That's a factor that already shaped the planning phase and has left behind clear traces in the ideas for the

#### >>> Info: Flexographic printing process

A printing process for roll rotation with flexible printing plates and low-viscosity, mostly water-based printing inks. The process is used predominantly in package printing on plastic, paper and board, but in Italy and Great Britain it also has a certain market share in the production of newspapers and periodicals. In Great Britain the share is about 10%. The water-based printing inks especially cause problems in the deinking process. With conventional flotation systems, they can be processed only with difficulty and can form undesirable agglomerates in the water circulation system. The higher portion of pigments that are noticeably smaller than in solvent-containing printing inks are responsible for this. In addition, the binding agents used are often alkali-soluble and hydrophilic, which noticeably complicates separation. With a 10% flexographic portion in the source material, what is currently the world's largest deinking system in King's Lynn has a very high tolerance that corresponds to the average portion from recovered paper collections.

stock preparation, the paper machine and the winder. And it's a factor that has driven the level of investment to 500 million €. And in England of all places, one might add. Haven't we instead been reading more about plant closures on the British Isles? So why now a brand-new production facility right here?

Stöckler, the manager at Palm, answers this: "Great Britain is on one hand an importer of newsprint and on the other hand an exporter of recovered paper. If we concentrate on the British paper market, then we have the best preconditions: a domestic market that isn't saturated, a well-filled pool of raw material and relatively short paths to the customers."

Nonetheless, there are developments that have to be viewed critically. Even in the UK, consumption of newsprint is declining despite the varied newspaper and magazine landscape. Here, too, the global financial and economic crisis and the increasing use of online media are not without consequences. The consolidation in the publishing and printing industries reinforced by the crisis and noticeably reduced advertising budgets are exerting pressure on the consumption of newsprint. So is Palm's decision to invest at odds with the market development after all? Palm's manager doesn't think so: "With consumption dropping, not only the availability of raw materials speaks in favor of this investment, but also the high import quota to date.

Discussions with British publishers have made it clear that there is a

need for another supplier in England and that it would be positively received by the market. A solid foundation where everything else only depends on how good the paper is that Palm Paper can offer.

With marketing, the long-established company from Aalen in southern Germany can fall back on customer relationships of many years. For a long time now, newsprint has been supplied to British publishers and printing plants. It's no surprise that shortly after the start of production the first printing attempts were undertaken on the new paper – with success. So there are more and more indications that production of the local newspaper, Lynn News, will be converted to the 'local' paper this year. A first step, which others will quickly follow.

But the PM 7 would not be a typical Palm project if there weren't some safeguarding factors. Because the idea rests on the pillars of quality, reliability of the production process and flexibility. The rumors that were heard in the industry also underscore just how seriously the Palm management team takes these factors. For instance, that Palm would set up a luxury facility – a Rolls Royce of paper mills, so to speak.

Production Manager Gruber acknowledges the comparison with a wink: "Make it an Aston Martin, then we're closer to it." In fact, he adds, the PM 7 represents a proven idea, a recognized design, top quality, a high level of user-friendliness and an attractive pace. "And that fits an Aston Martin much better than a Rolls."

## Pre-engineering project ensures reliability

What Rolls and Aston Martin have in common is not just limited to their origin in the UK. Moreover, the two are not exactly known for being cheap. And because that is the case and a new paper machine is no everyday investment, the project was meticulously prepared within the framework of a detailed pre-engineering project. German Ruf, the Technical Manager at the time, was responsible for it on behalf of Papierfabrik Palm. His counterpart in Sales



*Managing Director Production Dr. Thomas Welt (right) and Production Director Stephan Gruber in front of one of the first reels.*

at Voith was Dr. Thomas Elenz. In just six months, between October 2006 and March 2007, the project was thoroughly planned in all technical, structural and regulatory aspects. The result was a solid basis for the risk and investment planning. "Already in the pre-engineering project, it became clear that Palm wanted to build a machine at King's Lynn that would produce the highest quality. At the same time, it was also supposed to be designed so flexibly that it could be adapted over a long period of time to changing market conditions," remembers Dr. Elenz. According to him, for Voith that had the advantage



**Proportion of production and recycling after use in Great Britain (2008):**

Paper grade	Production	Recycling material	
Graphic paper	2.06 million tons	1.62 million tons	(78%)
Packaging paper (incl. board)	1.84 million tons	1.69 million tons	(92%)
Tissue	0.78 million tons	0.49 million tons	(63%)
Specialty paper	0.30 million tons	0.21 million tons	(70%)
<b>Total:</b>	<b>4.98 million tons</b>	<b>4.00 million tons</b>	<b>(80%)</b>

The high availability of recovered paper in England is a location advantage for Palm Paper.



The largest newsprint machine in the world produces high-quality newsprint for the English market.

of achieving a close relationship with Palm, even at this early stage.

The decision in favor of Voith as main supplier came after laborious negotiations. At their conclusion toward the end of July 2007, Dr. Palm said: "It was clear that a very special team spirit existed here, because the entire Voith team wanted the order and went to work with impressive commitment." Palm and Voith had already collaborated quite well in a whole series of other projects. In the case of King's Lynn, one thing in Voith's favor was that it already had some experience in this exact area

of preparing recovered paper in Great Britain. Two other deinking systems had already been installed in the UK in which the Voith engineers successfully implemented preparation of recovered paper with a high portion of flexographic printing. Also, the three fastest paper machines for newsprint are from Voith. Four thick folders with hundreds of technical descriptions and drawings were the tangible result of the pre-engineering project. But for Elenz it is clear that other aspects were much more important than the paper that came about: "Confidence and safety were the two essential results of the

preliminary project," Elenz emphasizes. According to him, one ultimately shouldn't forget that the PM 7 was no everyday project for Voith, either. "After all, that was the biggest paper mill that we've ever built in Europe!"

**Records in the system concept**

The deinking system played a prominent role in this. It is currently the largest system of its kind in the world, with a daily output of 1,500 tons (oven-dried). Two deinking lines, that are supplied by the largest TwinDrum pulping drum that has ever been built

in the world to date, work systematically and in parallel. They ensure that maintenance and upkeep work can be carried out with the PM operating at full tilt. A two-stage flotation, sorting, dispersing, dewatering and bleaching system, the automatic de-wiring and reject disposal system and the Voith advanced wet end process (ComMix, HydroMix, Voith-Vac, EcoMizer cleaner, MultiScreen sorter, CompactPulper and bagless disk filter) are also included in the delivery of the stock preparation.

The deinking process was specifically designed for processing the higher portion of recovered paper used in flexographic printing.

The paper machine was built according to the One Platform Concept and, along with a vertical former (DuoFormer TQv) and the MasterJet headbox, includes above all a DuoCentri-NipcoFlex press with a fourth press, the dryer with the TopDuoRun, two EcoSoft Delta calenders and the Sirius roll-up system. The process as well as the paper quality are regulated and controlled by a consistent automation system.

The press section is especially to be emphasized here. Because these particular components are said to be emblematic of the claim to high

quality that Palm wants to put into practice here. "You see, with most new machines people today pay more attention to the pace of production and go after records. With this one that's considerably more difficult. Here, the main focus is on paper quality," explains Patric Romes, Voith Project Manager for the Palm PM 7. Nonetheless, according to him, the DuoCentri with a fourth press is of course hardly slow. Anyway, as he explained, the average speed aimed for is a good 1,800 m/min, which comes to almost 110 km of paper per hour. "Slow is something else," jokes Romes.

*One Platform Concept: from the largest TwinDrum pulping drum in the world via automation to the VariTop winder.*



#### **Newspaper and periodical market in Great Britain:**

There is a lot of variety in the periodicals offered. Annually 200-300 new titles are published. Nine out of ten adults regularly read a local newspaper. Nowhere in Europe are the per capita expenditures for newspapers and periodicals higher. Just under 1,292 local newspapers were published in 2008 with a weekly circulation of ca. 60 million copies. Added to this are another 600 special newspapers. There are 21 national newspapers (weekly circulation: 80 million copies) published daily. The 450 independently published magazines complete the picture. Altogether, the 84 British publishing houses have annual sales of 4 billion English pounds.

Not even two thirds of the paper requirement for newspapers and periodicals are produced in the country (1.53 million tons); more than 40% is imported. The manufacturers resort to 100% recovered paper as raw material. Paper Chain, an initiative of the British paper manufacturers, indicates that 70% (9 million tons) of newspapers and packages made of paper are recycled. That pushes the use of recovered paper to 80%, while it only reaches 49% in the rest of Europe.

*The Palm Paper mill site in King's Lynn.*





### Focus on quality assurance

Already during pressurized dewatering, the press section with the four press nips and two smooth rolls give a paper web that is as smooth and homogeneous as possible. That can no longer be adjusted at the calender further downstream if everything wasn't done right during pressing. The catch that has been consciously taken into account with this press configuration concerns the pace of production. Since an open draw between the third and fourth nip is unavoidable in this concept, there is a possible predeter-

mined breaking point that is all the more delicate the faster production takes place. "But the last word hasn't been said here," explains Romes. Since there are a whole range of possibilities in the setting of the draw width, according to him, it remains to be seen which variant will ultimately bring the optimal combination of speed and paper quality.

The priority of quality assurance runs through the entire concept and through all components. That applies to felts, fabrics, roll covers and doctors as well as to broke preparation,

fiber recovery and other ancillary systems. The core of quality assurance is the automation system supplied by Voith. So that the 17,000 input and output signals of the paper machine can be systematically processed, it needs more than just 600 tons of copper cable. Rather, the process control system has to be optimally adapted to the machine by means of well-founded process knowledge. Also, part of the order was the control for the 64 drives. Voith integrated the OnC DriveCommand software developed for this into the process control system so that easy operation

**Lynn PM 7 – dates and facts:**

<b>Capacity:</b>	400,000 tons/year
<b>Paper grades:</b>	newsprint
<b>Basis weights:</b>	42.5 to 48.8 g/m <sup>2</sup>
<b>Paper web width:</b>	10.6 m
<b>Design speed:</b>	2,200 m/min
<b>Deinking system:</b>	1,500 tons (oven-dried)
<b>Employees:</b>	150

**The successful start-up team:**

is assured. Moreover, this close dovetailing of automation and paper machine played a considerable role in the quick start-up of the PM 7. So that the paper produced is always of the required quality, a quality control system is used. All important paper web values are collected and regulated by it. The information system ultimately helps Palm to not lose track of things.

Back in the office with Stöckler, Welt and Gruber. The view from the window goes out over the dike onto the Great Ouse River. There is abundant water in this area of England. The hinterland of King's Lynn is crisscrossed by hundreds of canals that transport the water from the boggy swath of land to the sea. Palm Paper also makes use of one of these canals. After being used, the water that has been clarified in several stages goes into the Great Ouse. The availability of water is a decisive factor in choosing a location for a new paper mill.

**New industry for King's Lynn**

There is no tradition of papermaking in King's Lynn. The town, which in the 14th century was among the most important English ports, cannot offer any workers qualified in paper manufacturing. Since there are also hardly any industrial settlements of note to be seen, the search for employees was among the biggest challenges in the planning and construction of the new mill.

"It was clear to us from the beginning that training employees here in King's Lynn would be an overriding and long-term task," Plant Manager Welt emphasizes.

"We're not just talking here about different mentalities, driving on the left and Guinness instead of Pilsner. We're talking about starting from zero and nonetheless ensuring the required production."

**Solid foundation**

Asked about the biggest surprises in the implementation of the project, the discussion comes to the building site. "The elaborate preparation of the building site surprised us," says Artur Stöckler. Initially it looked like the planned building time and start-up deadline were seriously endangered due to the elaborate preparation. Only optimization of workflows and meticulous coordination of all sections involved was ultimately able to make up for the greater part of the delays. Dr. Welt, who according to Stöckler proved his coordination talent during the construction and start-up of the PM 3 at the plant in Eltmann, pulled off a real feat, as Stöckler says in praise of his plant manager. "We profited very heavily from the good teamwork with Voith," says Welt by way of placation. According to him, Chief Erecting Engineer Thomas Held and his team played a

very big role there. Welt claims that three weeks of the four-week delay were made up for due to his excellent planning and coordination activity. With the result, of course, that even more took place simultaneously on the construction site. At times there were more than 1,000 people there at the same time. If that is to come off well, then the timing has to be right. Says Welt: "That's a bit like it is with trapeze artists. If the one who catches the others isn't at the right place at the right time with both hands, the others have a real problem." In such a situation,

communication is central and indispensable for the smooth running of the project. It turned out that collaboration with the Voith teams went absolutely smoothly. In this respect, what was already begun in the pre-engineering project was continued in the implementation phase and became the stable foundation of the collaboration.

King's Lynn had all sorts of challenges in every regard: Technological requirement, unbelievable size, the best paper quality, the highest production reliability and

the training of a new team in a region that previously had no experience with paper manufacturing. This all added up to a huge task, which up to 1,400 people employed by Palm, Voith and the suppliers involved mastered so well that the success of the new facility is already apparent.



*"I have rarely experienced so little friction with a project ..."*

*Dr. Wolfgang Palm, owner and CEO of Palm Paper Mill*

**twogether:** Dr. Palm, you chose a machine concept for King's Lynn that really emphasizes quality. What is the background to this decision?

**Dr. Palm:** We want to produce for the British market with the PM 7. There is demand here from the local printing plants for standard newsprint used in the offset-coldset, offset-heatset and flexo printing processes. Therefore, our main focus was being able to serve all three printing processes without any problems.

**twogether:** Why did you decide on England as the location?

**Dr. Palm:** In Great Britain, there is very little domestic production. Consumption of newsprint is 1.8 million tons, but only 1 million tons are produced in the country. A lot of importation is necessary, which can mean a problem for long-term reliable supply due to the fact of the country being an island. At the same time, there is high availability of recovered paper; collection is 8.5 million tons, while only about 4 million are consumed. The England location thus offers us good preconditions.

**twogether:** Why did you decide to implement the project with Voith?

**Dr. Palm:** Placement of an order is always a tough decision. In this case, however, we decided in favor of Voith because we had the feeling that the overall concept was right. We have a lot of confidence in the Voith technology.

**twogether:** How do you judge the cooperation in the preliminary project and in the implementation?

**Dr. Palm:** The cooperation between the teams was excellent. I have rarely experienced so little friction with a project as with this one.

An optimum plant with integrated system competence

## “We are a partner to the paper industry.”

The key to lower energy and production costs on the one hand and greater quality and productivity in the paper industry on the other is in integrated system solutions. Four Voith Paper managing directors explain why Voith plants are especially suited to offer customers this added value.







**Kurt Brandauer,**  
President Paper Machines

*“Only integrated processes carried out by specialists with many years of experience lead to a resource conserving and equally economically optimized plant.”*



**Dr. Antti Kaunonen,**  
President Automation

*“With our automation systems we can combine processes and are in a position to offer optimized solutions to lower energy and raw materials costs for fibers and water.”*

Commissioning the new paper machine for Palm Paper in King’s Lynn, England was the perfect example of how to do things.

“Three essential aspects came into play here: the customer bought an optimally coordinated system, we were able to shorten the time before commissioning and could start up the plant in an optimum manner.” Kurt Brandauer, President Paper Machines, sees these aspects as ‘elementary’. They combine all the relevant processes. The Voith paper machine was not delivered as a single unit but coordinated with additional Voith components such as machine clothing, roll covers and doctor blades, the entire fiber line as well as integrated automation solutions.

Working with the Palm paper mill, a pre-engineering team had determined the needs and the resulting optimal process systems. Brandauer is certain that: “Only integrated processes carried out by specialists with many years of experience lead to a resource conserving and equally economically optimized plant. So it is all about reconciling economy with ecology. This is exactly what Green Technology means to us.” This is how Voith Paper is able to give the paper industry the corresponding quality guarantees. That means to think of integrated system solutions which include the maintenance, the preventative upkeep or even the customer’s training concepts for employees. To achieve this end, Voith Paper increased its efforts to dovetail the product and service business even more.

“Our people and our production

sites as well are located in Europe, in Asia, in North and South America as well as in India,” says Martin Scherrer, Executive Vice President Fabric & Roll Systems. He sees the global positioning of Voith Paper as an essential competitive advantage as well as the fact that “in our Paper Technology Center we can test the integrated systems under real conditions in trials without the customer having to endure machine downtimes.” Just recently roll covers and press felts as well as doctor blades were optimally coordinated with each other, leading to outstanding results. “In our press concept we have system-optimized covers, felts and doctor blades. Therefore, we can give start-up guarantees that pay off for the customer very quickly but also further optimize existing paper machines.”

All mechanical engineers are driven by the concept of ‘Total Cost of Ownership’. Reducing costs by minimizing unnecessary interfaces, increasing the efficiency of the systems and continuously improving the reliability of the plant is Voith Paper’s goal. “Many different processes take place in a PM. With our automation systems we can combine them and are in a position to offer optimized solutions to reduce energy and raw materials costs for fibers and water,” says Dr. Antti Kaunonen, President Automation. “No matter what area is involved, Voith Paper is a competent partner. It is an unnecessary challenge for a customer to have to work with a number of different suppliers for his plant.”

Dr. Antti Kaunonen and Martin Scherrer agree on the goal to further stress the

*“No matter what area is involved,  
Voith Paper is a competent partner.”*

*Dr. Antti Kaunonen, President Automation*

advantages of integrated system solutions to the customer. “This is where the strength of Voith Paper has lain for decades and this is unique. We also have the ability to achieve significant improvements with respect to energy savings and quality, not only with new plants but above all in running plants as well.”

Is it therefore only possible to implement Green Technology with integrated system competence? “The customer can save a lot of money if, for example, he optimizes the water loops between the PM, wastewater treatment facilities and stock preparation. With anaerobic wastewater treatment or by burning rejects energy can be reclaimed. The payback for the initially higher machine costs is very quickly realized,” says Stephan Bocken, President Fiber & Environmental Solutions. To him, integrated system competence and Green Technology are symbiotic. “One doesn’t work without the other. We are currently working harder than ever on enhancements, for example, to further link the automation technology with mechanical process technologies to reduce the consumption of chemicals.” It is thus possible, for example, to reduce the amount of defoaming agents in the process water. “The strain on the water cycles of the plant is thereby further reduced.” Today the environmental

aspect is now more than ever a component of the total process know-how.

Voith Paper is a pioneer in this area as well. Integrated system competence is thus the point of departure for successfully and in this sense sustainably thinking about the concept of an integrated paper mill and being able to make it a reality. To this end, Voith Paper supplies the customer not only with paper machines with matching rolls, covers, machine clothing, doctor blades and the appropriate automation technology but also with a complete plant for processing recycled paper, treating the process water, the wastewater and for generating energy from biowaste.

Kurt Brandauer sums it up: “A total concept requires coordinated components. If individual components are replaced, the cheapest aren’t always the best. The supposedly cheaper components can very quickly become the most expensive because the results are no longer right.” The example of King’s Lynn and many others have shown clearly that: “We are more productive than the competition.” And he closes with an appeal: “Voith Paper is a partner to the paper industry. If the paper industry trusts its partner, enormous improvement and value-added potential can still be realized in this partnership.”



**Martin Scherrer, Executive Vice President  
Fabric & Roll Systems**

*“In our Paper Technology Center we can test integrated systems under real conditions in trials without the customer having to endure machine downtimes.”*



**Stephan Bocken, President  
Fiber & Environmental Solutions**

*“Integrated system competence and Green Technology are symbiotic. One doesn’t work without the other.”*



*Dr. Hans-Peter Sollinger, Member of the Management Board Voith AG and President of Voith Paper.*

*“We can reduce  
the use of resources”*

**Interview with Dr. Hans-Peter Sollinger on the topic of ‘Green Technology’.**

**Many industries are now interested in sustainability and energy savings due to rising energy costs and new legal requirements. These terms are now being used in an almost inflated sense. For Voith Paper, Green Technology means economically and ecologically sensible paper production. In this interview, Dr. Hans-Peter Sollinger explains exactly what lies behind it.**

**twogether:** Everybody is talking about sustainability. Is green technology a fad, with Voith Paper jumping on the current sustainability bandwagon?

**Dr. Sollinger:** Voith Paper is not a company that is oriented to fashion trends. Rather, we have always seen ourselves as technological pioneers in our industry. Likewise with the topic of sustainability. This term involves not only environmental questions, but also social and economic goals. In this respect, we at Voith Paper have had a sustainable orientation for many years – even if it wasn't previously called that. Already in the 1950s, Voith Paper developed applications for producing paper grades from recovered paper.

Much has happened since then, but we always kept up the development of environmentally friendly and efficient products. Our research and development team had designed energy-saving machines long before the sudden and dramatic increase in energy prices.

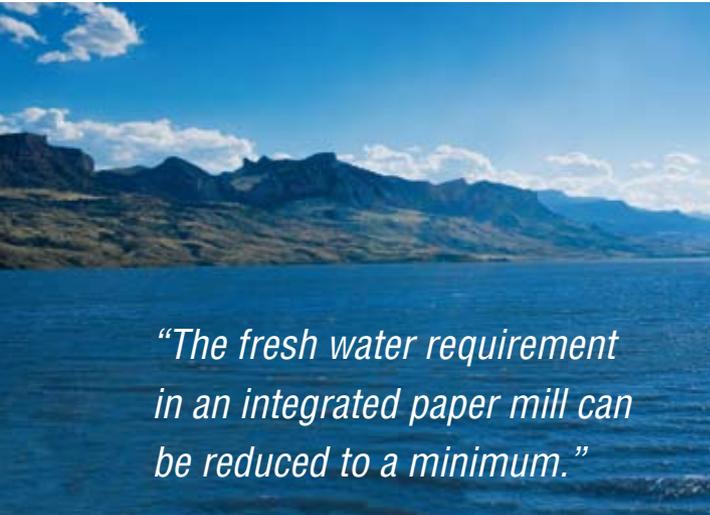
**twogether:** Environmentally friendly products – that sounds like a luxury, which the paper industry can't afford in the current economic situation.

**Dr. Sollinger:** That is exactly the wrong approach. It's about the compatibility of economy and ecology here. That is what Green Technology means to us. We can significantly reduce the use of resources in paper manufacturing – and thus save our

customers cash. The costs for energy, pulp and water are on average over 70% of production costs for most paper grades. Products and processes that achieve improvements in these areas not only relieve the environment but also our customers. That makes Green Technology all the more important. There is already a high portion of recovered paper used for packaging paper today. But even for graphic paper, a trend toward using more recovered paper is already in full swing. We have paper machines in use with various customers that produce both high-quality newsprint and copy paper as well as high-quality tissue paper with a very high portion of recovered paper fiber. Thanks to our technology, their fiber costs are dropping significantly. At Steinbeis Temming in

*“Only the integrated paper mill allows optimal resource-conservation and environmentally friendly paper manufacturing.”*

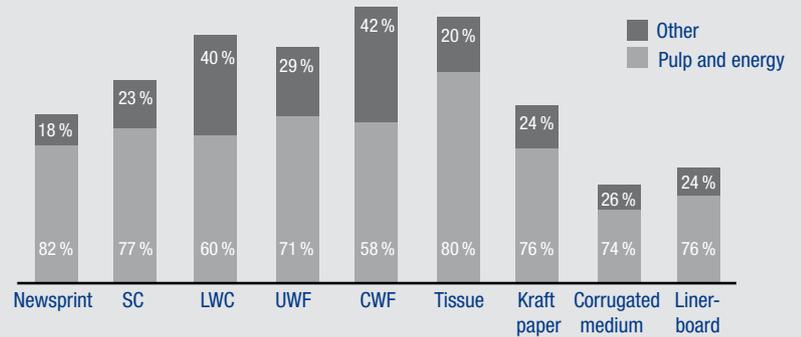




*“The fresh water requirement in an integrated paper mill can be reduced to a minimum.”*

#### Average production costs worldwide\*

Manufacturing costs per ton of paper produced (without capital costs)



\*at machine level

Source: Fisher Database

*The costs for energy, pulp and water are generally over 70% of the production costs for most paper grades.*

Glückstadt, for example, the use of pulp was reduced and thus also their energy consumption. This corresponds to a saving of several million € per year. The higher investment costs for a recycling system pay for themselves very quickly in comparison to a fresh fiber preparation system.

**twogether:** Is Green Technology therefore a new strategic approach?

**Dr. Sollinger:** Yes, because with Green Technology we sharpen our orientation to environmentally friendly technologies. Our focus is on new products and systems that show an ecological improvement over preceding models and at the same time have clear economic advantages. These improvements must involve at least one of our main areas, that is, fiber, water, energy or residual materials. We concentrate on three components. Voith Paper wants to contribute to the maximization of the global recovered paper rate in paper production. In addition, we want to cut primary energy consumption in

half over the entire paper chain, seen globally, and significantly reduce fresh water consumption. In view of the current numbers, we can certainly still achieve a lot here – after all, globally the paper industry currently requires on average 20,000 liters of fresh water and up to 3,000 kWh of power to produce 1 ton of paper.

**twogether:** So are we getting a bit closer to the vision of the integrated paper mill?

**Dr. Sollinger:** Only the integrated paper mill allows optimal resource-conservation and environmentally friendly paper manufacturing. This means, for example, that we preferably use recovered paper as pulp with the aim of reducing the amount of fresh pulp to such an extent that wood, a valuable resource, can be used more ideally and more efficiently in the paper lifecycle and sustainable forestry. This is especially true in view of the fact that China and India, with more than 2 billion people, will continue to develop in the future and also

consume more paper and packaging. Of course, you can't completely do without using fresh fiber, since recovered paper can't be reused to an unlimited extent, i.e., fresh fiber and recovered paper need one another. In addition, the fresh water requirement in an integrated paper mill can be reduced to a minimum, as effective preparation means the process water can be run in a closed loop. Moreover, comprehensive energy management within the plant gives a noticeable reduction of primary energy. In addition, we can use a large part of the waste for energy recovery and generate bio-energy. Some Voith Paper innovations have already brought us much closer to these goals. Now it's a matter of continuing to pursue the vision of the integrated paper mill with the Green Technology strategy and sustainably, ensuring economic success for ourselves and our customers.

**twogether:** Many thanks for the interview.



Step by step towards top performance

## Dunaújváros – a game of chess

Everybody who is familiar with chess knows it. You have to think several moves ahead to be successful. Well, the game of chess that Project and Mill Manager Attila Bencs has played in Dunaújváros had completely different dimensions: There were 1,400 players on the board at the same time, it was € 200 million worth, and the game lasted 16 months.



This special game was called Dunaújváros PM 7, and Attila Bencs and his team accepted the challenge. His opponents were the well-known project risks: shortage of time, unforeseeable events and rising costs.

For a long time, Dunaújváros (formerly Dunapentele, later Sztálinváros) has been a small Hungarian village with just under 4,000 inhabitants. After the Turkish occupation, the ancient Roman settlement sank into a deep slumber until the metallurgical industry awakened it in the early 1950s. The paper industry followed ten years later. At first, pulp was produced from straw, but then, the range was widened to include paper production and converting. In 1990, the mill was privatized by the Austrian industrialist Thomas Prinzhorn, and since then, the local paper industry has been prospering.

In the 'New City upon the Danube', as Dunaújváros is translated into English, Hamburger Hungaria operates Hungary's largest paper mill. In the long run, base paper will be processed under the name of Duna-pack at two locations: in the south of Budapest and in Dunaújváros.

### **Ecological and economical paper**

In total, the two machines in Dunaújváros – the old PM 3 and the brand-new PM 7 – will produce 600,000 tons/year. This means that the former Dunapack corrugated board base paper capacity is doubled, although two machines have been shut down at the Budapest-Csepel mill.



#### Facts and figures – Dunaújváros PM 7:

<b>Wire width</b>	8,600 mm
<b>Design speed:</b>	1,500 m/min
<b>Production:</b>	400,000 tons/year
<b>Paper grade:</b>	Testliner, corrugating medium
<b>Basis weight:</b>	70-150 g/m <sup>2</sup>

#### Voith Paper scope of supply:

Stock preparation system including recycled paper feeding unit, complete paper machine, automation system of entire.

*Crane operator Argon Csöszer was on duty during the PM 7 construction time.*

“Yes, it might be a challenge to sell 300,000 tons/year more,” says Attila Bencs, Project and Mill Manager in Dunaújváros.

However, since the sales markets are located in Central and Eastern Europe, this task will not be altogether impossible. Logistically, Dunaújváros is in an optimal position in the center of Hungary. A new motorway was built, the capital of Budapest is only 30 minutes away, and the name giver of the city – the Danube – is just around the corner. Rail service is also available.

Now, if Dunaújváros paper mill produces what the market demands – that is high-quality, light-weight packaging paper – success is bound to follow.

The raw material for the machines – selected recovered paper – comes mainly from the domestic market. Attila Bencs believes that waste paper collection has still growth potential. Its organization is a long-term task and is the responsibility of a separate company. “Waste paper collection has another advantage in Hungary. Since local collection rates are still below those demanded in EU Directives, rates are increasing continuously,” explains Attila Bencs.

For the project manager, recovered paper is a very ecological raw material. Paper is made from material that would otherwise end up in the trash. Less waste is dumped, and this is exactly what the EU and the Hungarian government want.

“Light-weight packaging papers are the future. They are both ecological and economical products,” Attila Bencs explains the market development. The parent company, Hamburger Containerboard, attaches great importance to sustainability. Environmental protection and industrial safety certifications are under way. Within the shortest possible time, Hamburger Hungaria wants to meet the requirements of the standards ISO 9001 (Quality Management), ISO 14001 (Environmental Management) and OHSAS 18001 (Occupational Health and Safety Management), as well as the EMAS Regulation (for Eco Audit).

#### The team has made it

The PM 7 project was started early in 2008. Unexpected delays occurred

during the construction phase, among other things because of archaeological finds from Roman times. The Romans had founded a military settlement named Intercita in the place of today's Dunaújváros, and some remains are still found today. Nevertheless, the paper machine was set up on schedule. Installation started in September, and in October 2008, the topping-out ceremony was celebrated. Performance tests were made in April and May 2009, and the first paper was produced at the end of June. In the hottest phase, more than 1,400 people were on site at the same time. Many nations were represented, mostly Austrians and Hungarians, but also suppliers from Finland, Spain, Sweden, Germany, Slovakia and Switzerland.

Bencs' core team comprised approximately 20 people who were made available for the project. "Thanks to the Division Management, especially Harald Ganster, head of the Hamburger Containerboard Division, we were able to access the know-how of the entire Hamburger Group," emphasizes Bencs. Hamburger could rely on the skills of operators and other staff members who have experience of 30 years and more in the paper industry. Still, there has to be one person who keeps track of all players involved. This person was Attila Bencs. He explains how he did it: "Set priorities! Make sure that you have reliable colleagues and suppliers! These are the most important building blocks for well-planned and controlled construction. I would also like to thank the entire Voith team. Together we have made it, thanks to the good working atmosphere and cooperation."

### Chess and the right players

Attila Bencs compares the project with a game of chess. "You always have to be one move ahead. And drastic decisions may also be sometimes necessary." The rules of the game must be clear to all people involved. Bencs confirms that correct task sharing is extremely important for a project of this size. In Dunaújváros, external experts were involved as well whenever it was necessary.

"To be honest, my mailbox was always full. I got 200 e-mails per day on average. Still, dinner with my family was often possible, even when the days were long. It was an extraordinary time, no question. I had to cut down other tasks, but I will have enough time to take a break later," explains Attila Bencs, with a laugh.

What was the highlight of this project? Bencs does not need much time to think: "The first paper! When the paper machine actually comes to life after 16 months – even if all goes according to plan. That was the absolute highlight." The moment came even a

little earlier than expected. The champagne that the team had brought along, was still warm. "We had put it in the fridge at about 3 p.m. No one thought that the very first paper would be produced already on this day, the 19th of June 2009," remembers Bencs. To be on the safe side, the drinks for the first turn-up were put into the fridge at once.

#### Location

##### Hungary



Dunaújváros is located about 70 km south of the capital Budapest in the region of Central Transdanubia. The region has been inhabited since the Bronze Age. Dunaújváros is a university city and has approximately 53,000 inhabitants.

#### Contact



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*Project Manager Attila Bencs of Dunaújváros (right) and Günther Prinz of Voith Paper meet every day to discuss current topics. Attila Bencs has been working for Hamburger Containerboard for more than ten years and has spent almost half of this time abroad.*



Daily routine at a construction site

## In the land of goulash and paprika

It takes several months for a new paper machine to be installed until it can finally be put into operation. During this time, many hands and heads work together to ensure smooth work progress on site, just as in Dunaújváros, Hungary.

*The paper mill is one of the major local employers.*



In this phase, many different people come together, and each of them has his own history, of course. Voith Paper Senior Fitter Anton Kreimel is one of them, for example. Dunaújváros is going to be his last site. Kreimel will enter his well-deserved retirement after 22 years of service at Voith.

He has been gathering an abundance of experiences and knowledge, as well as a certain amount of vocabulary. "I always learn some words of the national language, no matter where I am," says Anton Kreimel and orders a goulash for lunch in fluent Hungarian. By the way, the real name is 'pörkölt'. You can also get it in a tiny restaurant near the paper mill, which could not be more cosmopolitan. At noon, every table is occupied by men in overalls revealing where they come from. Today, the color blue is dominant. The menu is hand-written, the selection is local. On the pizza, there is a large dose of paprika.



*Big joy – the first parent roll is finished.*

Back on the building site: Kreimel is one of those nomads wandering from site to site who know Beijing, China, better than their home in St. Pölten, Austria. The past years in Russia, Iran, China and other countries have shown him how to get through in the respective country and to make the most of it.

The large-scale project PM 7 had kept the Hamburger staff busy even before the supplier came into play. Dunaújváros Project and Mill Manager Attila Bencs and his team had done a good job by the time the Voith crew arrived in Hungary to start building the production line. But the first Voith man, Site Manager Martin Weiss, had been on site long before that. "I arrived in Dunaújváros on Monday, September 8, 2008. And I was the last one to go," he says.

Weiss is the one supervising who works where and when. About 40 Voith Paper staff members are employed on site during start-up. Weiss has his headquarters in a container beside the PM hall just as all the other external companies. The equipment and interior furnishing resemble an electronic shop with a touch of changing room. There are many things that come in handy on a building site.

Some employees even change sides for some time: Hannes Lagler has hung up his blue jacket and put on a beige one. He works as a site coordinator during this project – for Hamburger. As soon as everything is in place and installed, the start-up engineers are next in line. It is the responsibility of Helmut Widauer and

his team to ensure that the paper machine runs at least as well as the customer expects. Widauer is in a hurry. There is always something that needs repairing, adjusting and improving. The responsibility is heavy and the expectations on the team are huge. But the start-up personnel did not sweat in vain: PM 7 starts with a speed of 1,225 m/min, thus breaking another record. When the first paper is wound on the reel, everybody is enthusiastic and cheers – it is a tremendous concerted effort of all people involved.

What Helmut Widauer is for the paper machine, Clemens Zöllner is for the complete stock preparation system. The automation system also had its own commander-in-chief. Bernhard Sekyra has made sure that the control system of the entire production line works perfectly. That's how it goes for the customer as well. For every important task, there is one specialist in the project team who closely works

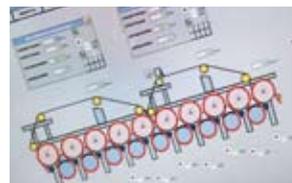
together with the suppliers and other partners. György Szilas, Bela Kurucz, Attila Solymosi, Josef Hruby, Jenő Vass, Pál Adamik, János Ecsedi, Szabolcs Dobák, János Paulik – without the Hamburger playmakers, the whole game would not have been so smooth.

In a large-scale project, it is extremely important to have the same contact person throughout its duration. The central figures are the two project managers: Voith Paper Project Manager Günther Prinz has – just as his equivalent in Dunaújváros, Attila Bencs – the overall responsibility. Therefore, good communication is ensured on both sides and excellent teamwork is made possible, as the successful start-up of PM 7 demonstrates.

#### Contact



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*PM 7 has been equipped with many innovative products and solutions.*



*Anton Kreimel has 22 years of experience.*

*(F.l.t.r.) Vladimir Shpak and Bernhard Sekyra from Voith Paper and Gerald Schröck from TBP are happy with the first turn-up.*



Norske Skog Saugbrugs works with new Bagless Disc Filter sectors

## A success for the environment and the purse

At Norske Skog Saugbrugs in Halden, Norway, the Wet End Process for PM 6 is running at full speed. Voith's upgrade of the Saveall Disc Filter helps keep up the high performance. White water recovery is now much more effective, saving 400 gpm (25 l/s) of fresh water, 90% of the fibers, and more than a million € a year in energy costs. It's hardly surprising that the project had a payback of less than six months.

### Savings after rebuild:

<b>Fresh water savings:</b>	400 gpm (25 l/s)
<b>Waste water reduction:</b>	400 gpm (25 l/s)
<b>Heat savings:</b>	\$ 1.88 mio./year (1.3 mio. €/year)
<b>Fiber savings:</b>	134 t/year

*Bagless sectors with fiber mat in operation.*

A well-functioning Saveall system is increasingly important. High energy costs and tougher pollution restrictions have been eye openers lately for the importance of this part of the Wet End Process, connecting stock preparation and paper machine.

"In Saugbrugs, the super clear filtrate from the Disc Filter was not good enough to be used as shower water on the PM 6," Anders Hauge Johansen, Superintendent of PM 6 from Norske Skog Saugbrugs,

explains. Broken bags, leaks in gaskets, and cracking sector holders used to be the everyday situation of the Saveall Disc Filters at PM 6. This had severe consequences: The super clear filtrate was no longer suitable as shower water for the paper machine.

### High amounts of fresh water

Therefore, fresh water had to be used, causing high costs for heating and increased load to the effluent treatment.

Freshwater for the mill comes directly from the river that crosses the mill site. But with a temperature varying from 40 °F to 60 °F (5 °C to 15 °C), this water had to be heated to 140 °F (60 °C) before it could be used on the paper machine. The high energy costs for heating this flow of 400 gpm (25 l/s) can easily be calculated. With a reduction of almost 6 megawatts, the savings are approximately \$1.88 million (1.3 million €) per year. Today the super clear filtrate already has the suitable temperature of 60 °C.

### A worthwhile upgrade

Upgrading a Disc Filter from another supplier is often very challenging. But Voith Paper and Norske Skog Saugbrugs can look back on a long-lasting, successful relationship in this respect. As early as 1992, Voith Paper performed its first rebuild of a Disc Filter in Saugbrugs. In 2007, three Disc Filters for dewatering TMP (thermo-mechanical pulp) were upgraded. This project, which included 60 Bagless discs, proved to be a big success in both performance and installation.

Installed in 1993, PM 6 is the newest of three SC paper machines in Saugbrugs. After the latest modifications and investments in quality improvement, the paper it produces is

considered the best of its kind in Europe. The original setup at PM 6 consisted of two parallel Saveall Disc Filters, each providing space for 30 discs. Because one of the filters was always a stand-by unit, it was possible to do the upgrade during normal operation. In only five days, 600 Bagless sectors (30 discs with 20 sectors each) and a new Thune filtrate valve, type AVVV were installed.

The rapid installation was possible through the superb cooperation between the paper mill and Voith Paper. With supervision from Voith Paper, the mill's own mechanics could do the whole installation during day shifts only. Warranties for both capacity and quality were attained within the first day.

### Less fiber loss, less water, less energy

The installation of the new Bagless discs had significant effects on fiber, water, and energy consumption. Each Bagless sector consists of two corrugated stainless steel plates with a fine perforation and 20 percent more filtering area than conventional filter bags. The upgrade of the Disc Filters eliminated leakages caused by broken bags and worn-out sectors. Accordingly, the upgrade reduced fiber content in the super clear filtrate by almost 90 percent. The fiber savings amount to more than 100 tons per year.

Because of the Bagless sectors, there will be no more shutdowns for replacing worn bags, thus saving both time

*View of a Voith Thune Disc Filter.*



*Bagless sectors of the Saveall.*





The new Thune AVVV filtrate valve secures a high and stable vacuum.

*“The filtrate quality is better than guaranteed; we have had no problems and are very satisfied with the upgrade.”*

*Anders Hauge Johansen, Superintendent PM 6 from Norske Skog Saugbrugs*

and money. At the same time, the upgrade avoids the risk of higher fiber content in the filtrate when bags are damaged.

The new Bagless discs and new AVVV filtrate valve improved the filtrate quality. This valve secures a high, stable vacuum, which increases Disc Filter capacity and improves flow distribution, too.

Because of the successful rebuild, the capacity of the Disc Filter has increased by 40 percent, and the super clear filtrate can safely be used as shower water on the paper machine.

“After a tuning of the vacuum in the valve, the average solid content in the super clear filtrate is 20 ppm. The fiber content in the filtrate is more

important for us than the ppm, and after the rebuild there is almost no fiber content,” says Anders Hauge Johansen from Norske Skog. “Since then, the Disc Filter has run excellently.”

#### **Payback in less than six months**

After the upgrade, the estimated \$1.88 million (1.3 million €) per year that it costs to heat this fresh water is now completely saved. Just by not having to heat the fresh water, the upgrade paid for itself in less than six months. If the reduced cost for fresh water, water treatment and the fibre savings had been considered, the payback time would be even shorter.

“The filtrate quality is better than guaranteed; we have had no

#### **Location**

##### **Norway**



Halden is situated in the south of Norway, right at the Swedish border. The picturesque town has more than 28,000 inhabitants and is widely known for its medieval fortress Fredriksten and the bridge across Svinesund, serving as border crossing over the Ringdals fjord/Iddefjord.

Thanks to the large international research institute ‘Institut for energiteknikk’, Halden often hosts scientists from all over the world.

#### **Contact**



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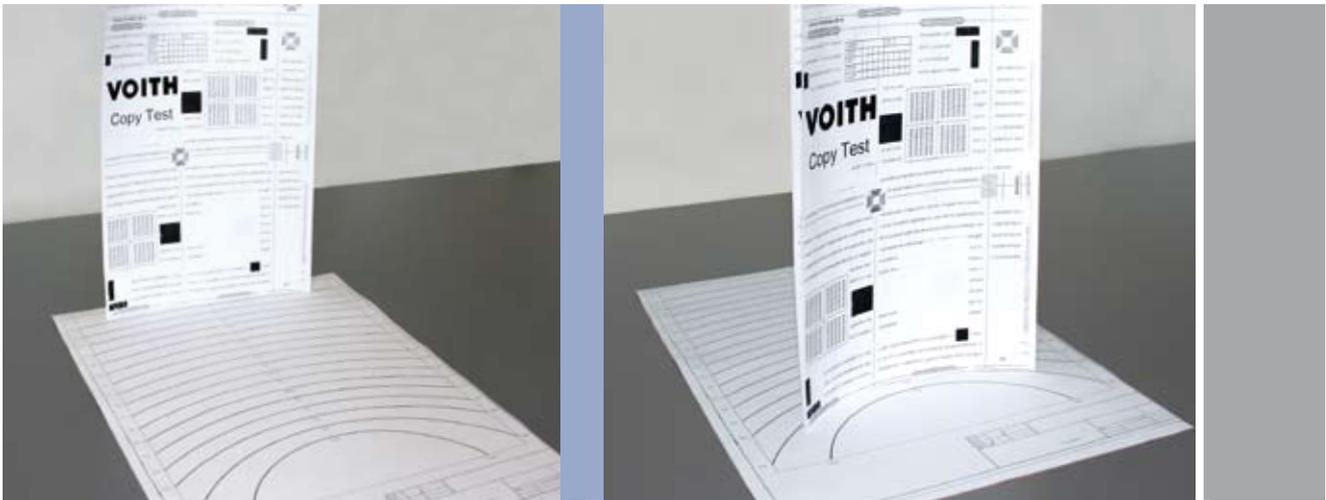
problems and are very satisfied with the upgrade,” sums up Anders Hauge Johansen of Norske Skog.



New technologies make two-sided identical copying characteristics possible

## ParaSlice – quality leap with copy paper

Too high curl values still cause a lot of trouble for manufacturers of copy paper. The increasing market demand for two-sided identical copying characteristics puts further pressure on papermakers. Voith Paper has seen this as an opportunity and developed the ParaSlice. The new headbox nozzle allows optimal sheet symmetry and thus the best possible copying characteristics within a wide operating window.



The quality of copy paper is revealed during the copying test. The sample produced with ParaSlice (left) shows a noticeably reduced deformation in comparison to conventionally produced paper.

The basis for optimal curl values is a symmetrical sheet structure in the z-direction of the paper. This is already well known from the available literature and was documented during numerous tests at the Paper Technology Center in Heidenheim. Influencing copying capability is also possible with other machine sections such as the size press or dryer section. However, if the paper has a basic structural two-sidedness, then optimization with the aid of

these process steps cannot be achieved in a very satisfactory way.

**Headbox nozzle is key to curl control**

During the dewatering process in the former, the fibers are deposited and thus define the structure of the sheet. This process is decisively influenced by shear forces caused by dewatering elements in the former, but especially by the pre-orientation

of the fibers in the headbox jet. Optimization of sheet structure by means of former settings is only of limited effectiveness, and is generally not possible due to the influence of additional quality parameters. For that reason, a high quality headbox jet is the best precondition for an optimal sheet structure and thus good copying characteristics.

Conventional nozzles are hardly suitable for this. The side of the

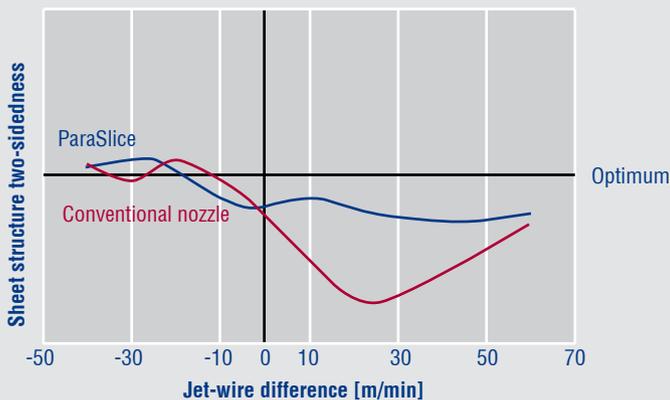


Fig. 1: Analysis of paper structure sheds light on sheet two-sidedness.

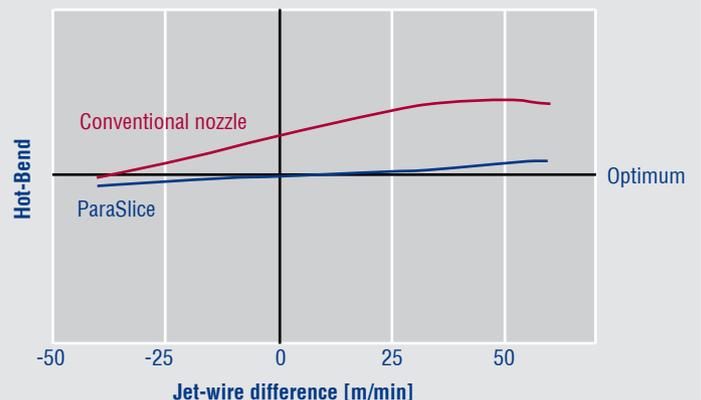


Fig. 2: The hot bend test evaluates thermal reactivity – the decisive parameter for good copy paper.

paper turned toward the slice blade has a stronger orientation in machine direction (MD) than the bottom-lip side. This is reflected in the sheet as a pronounced structural two-sidedness.

The new ParaSlice reduces this asymmetry to a minimum. Therefore, differences in the orientation of the paper sides are prevented as much as possible.

**Symmetrical sheet structure**

The positive influence on sheet symmetry is proven through targeted analysis of the paper structure. For this, numerous paper samples were split and their orientation measured in the respective individual layers. The results are shown in Fig. 1. The diagram shows the occurrence of structural two-sidedness with various jet-wire differential speeds. Improvement through use of the ParaSlice can be clearly seen. Especially in rush mode, important for copy paper, the asymmetry has been noticeably reduced.

The reduced two-sidedness in turn leads to substantially improved thermal stability. Fig. 2 shows the results of the hot bend test for this. In this procedure, test strips are briefly heated and then their curvature is measured. The main advantage of the test is in its close correlation with the real copying process. During copying, thermal stability is the essential key parameter due to the intense heat involved. The samples produced with ParaSlice show a noticeably reduced deformation in comparison to conventionally produced paper. In particular, the curve runs almost independently of the jet-wire differential speed. This guarantees a wide operating window for the system with relation to copying characteristics. The jet-wire difference is available for optimization of additional quality parameters such as formation.

**First practical experiences**

The potentials for improvement demonstrated at the Paper Technology Center in Heidenheim were confirmed in production machines. Fig. 3 and 4

show the development of the paper's copying characteristics after installation of ParaSlice. The curling tendency was evaluated on the basis of the Xerox method. In this procedure, test copies are created under defined conditions and then their curvature is measured. Very good copying results in general mean Xerox values  $\leq 20$ .

High-quality copy paper is produced at around 1,350 m/min in the system. Sheet formation takes place in a gap former. Only curl values are shown after duplex copy, i.e., two-sided copying. They react very sensitively to machine or furnish parameters and are usually more critical in contrast to curl after simplex copy.

In both diagrams, both with an initially copied top as well as bottom side, a clear reduction in curl values appears in the course of the rebuild. The improvement is considerable – in the range of 10 to 15 Xerox points.

Furthermore, copying characteristics on both sides are nearly symmetrical

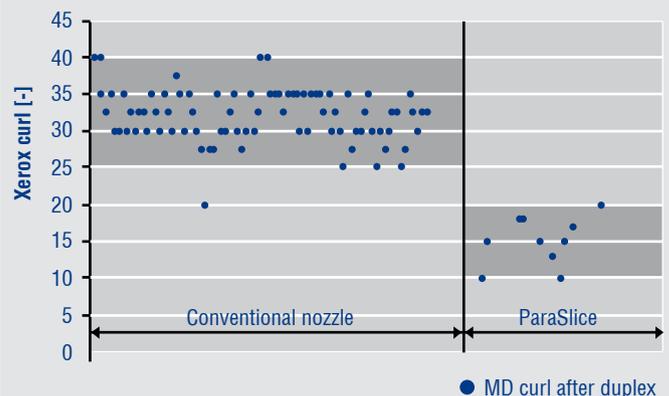
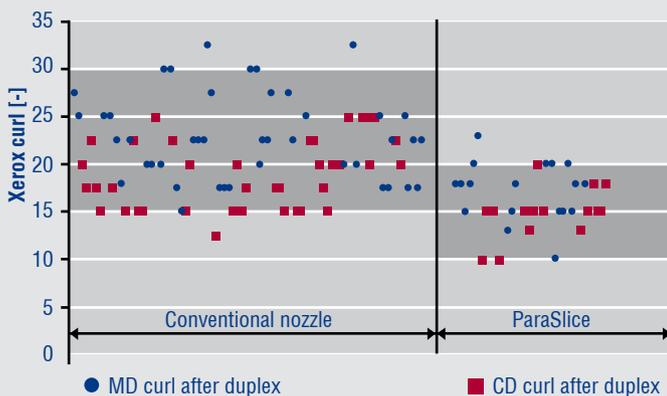


Fig. 3 and 4: Both on the bottom (Fig. 3) and top side (Fig. 4), a noticeably improved copying result appears due to installation of ParaSlice.

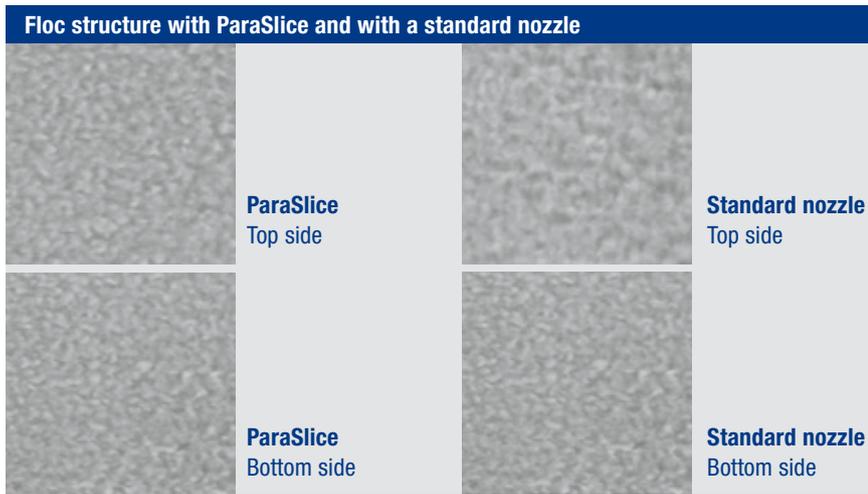


Fig. 5: Different flocculation on the top and bottom side of the jet is minimized with ParaSlice.

due to installation of ParaSlice. The two values are on similar levels, while clearly different ranges appear with the standard nozzle. The improvements shown are also confirmed in the long-term trend. The system produces successfully with ParaSlice. Along with the improved copying characteristics, the expanded operating window is especially appreciated. The compromise previously often necessary between copying characteristics and quality parameters is a thing of the past. Similar improvements were observed with subsequent installations. Use in combination with gap former sheet forming has proven to be especially advantageous. The optimized jet characteristics are immediately frozen here and thus lead to the maximum improvement potential of the sheet structure.

**Influence of ParaSlice on jet quality**

Along with the noticeable improvements in curling characteristics,

the new nozzle type also has advantages in floc structure and the surface of the free jet. Different flocculation on the top and bottom side of the jet is nearly eliminated (Fig. 5). This can lead to reduced two-sidedness of formation or porosity.

Furthermore, an improved jet surface appears, shown in Fig. 6. The occurrence of jet disturbances, which can lead to streaky formation in the end product or to tiger stripes in packaging papers is significantly reduced. This makes ParaSlice an interesting option even for applications beyond copy paper.

**New system or rebuild**

ParaSlice can be used in new machines and can also be retrofitted in existing headboxes. Both methods have already been successfully implemented many times. Therefore, it is a very efficient optimization method that can be installed easily and with low risk, even when budgets are tight.



Fig. 6: ParaSlice (top) reduces the occurrence of jet disturbances.

**On Focus: ParaSlice**

ProRunnability

ProQuality

ProSpeed

Section: sheet forming  
Width: all  
Paper grade: copy paper

**Contact**

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Increase of cost effectiveness and energy efficiency in tissue production

## EcoChange T and Yankee head insulation are impressive

**In order to increase productivity in tissue production, Voith Paper is offering two products that impress with a return on investment in less than one year. The EcoChange Tissue (T) is a full sheet turn-up system that clearly reduces the quantity of broke and at the same time increases work safety. The Yankee head insulation prevents high heat losses from the cylinder head to the environment and contributes to energy-efficient tissue production.**

In the tissue production process, considerable efforts are made to reproducibly create stable operating conditions and uniform quality. However, in this continuous production process there must be regular partially automated interventions in order to enable further transport of a certain quantity of tissue produced by the production line. This process requires the highest level of precision and concentration from both people

and machines in order to carry it out as safely, quickly and efficiently as possible. The turn-up of the parent roll at the reel is a dangerous task.

### Reliable reel change

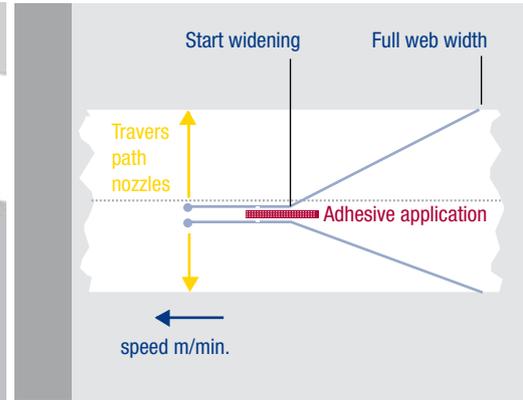
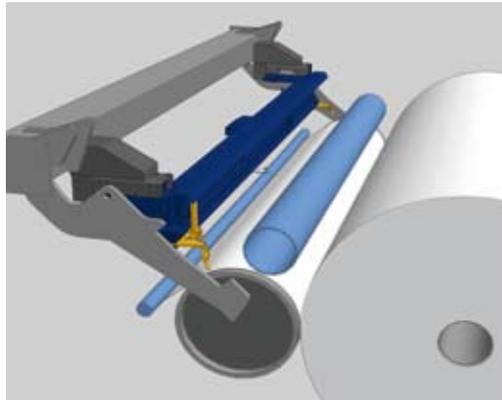
The EcoChange full sheet turn-up system with high-pressure water jet technology had already been introduced in other product lines. Voith Paper then adapted the

EcoChange system to the particular requirements of tissue production and developed the EcoChange T. The consistently automated and reliable EcoChange T ensures the highest changing reliability with minimum broke quantities at the reel core and the highest operational safety. The changing process takes place in a few seconds with the full web width running. Two water jet spray nozzles travel from the edges crosswise to

**On Focus: EcoChange T**

ProSafety	+++
ProEnvironment	+ □ □ □
ProRunnability	+++
ProQuality	+ + □ □
ProSpeed	+ + □ □

Section: reeling  
 Width: all  
 Paper grade: Tissue



*EcoChange Tissue system.*

*How the EcoChange Tissue functions.*

the tissue web and then begin to cut the tail to be threaded in the center. Through a micro-atomizer nozzle, this narrow part of the web is fixed on the new reel with a small amount of adhesive. By means of the control and the special technology, harmful dripping from the nozzle is prevented. Fractions of a second later, the two cutting nozzles shoot from the center of the machine to the edges and create a wedge-shaped web section that follows the clinging tail onto the new reel. Thus, the first layers begin to be wound symmetrically and evenly. The full

reel is ejected with a cleanly cut end and slowed down.

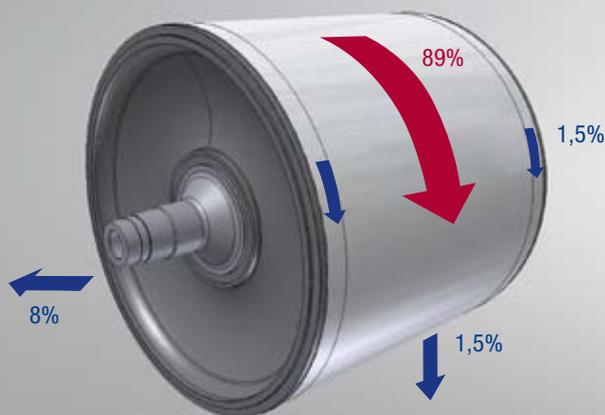
The EcoChange T works with Voith's innovative high-pressure water technology and is designed to be especially user-friendly. One aspect of this is the special cutting nozzle bracket with quick change connector. In addition, easy maintenance of the complex system was emphasized. In contrast to the conventional changing procedure with an asymmetrical tail cut in the wet section, as much as 30 seconds or more can be saved during each

change. In addition, change reliability is significantly increased without human intervention due to constant operation, so that installation of the EcoChange T is already paid off in less than a year. Safety in the reel area is likewise clearly improved, since potentially dangerous handling by the operation personnel during reel change is no longer required.

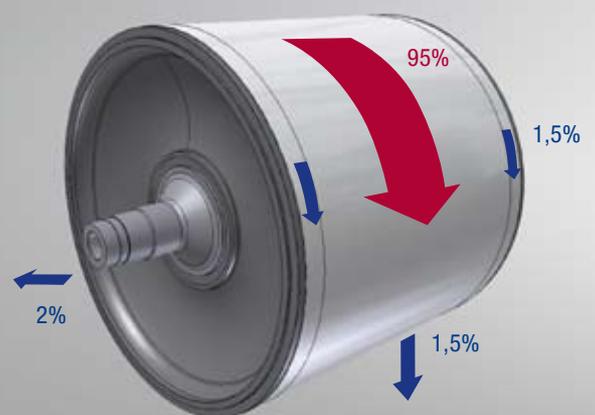
**Ideal combination**

An outstanding combination can be made by combining the EcoChange T with the MasterCut. The joint control

**Without insulation**



**With insulation**



*Voith Paper Yankee – energy loss without (left) and with (right) head insulation.*

and pressure generation make this combination an ideal system. The MasterCut cuts the web before the reel in the direction the machine is running by means of effective high-pressure water jet technology, without mechanical cutting units on the paper web. Clear improvement in dust-free and lasting high cut quality, even with fast tissue machines, is an essential feature of the MasterCut center cut process.

For over 15 years, Voith Paper has been using high-pressure water technology for paper cutting. EcoChange systems with over ten years of operational experience are part of the standard equipment in paper machines. EcoChange T and MasterCut were successfully introduced in the tissue industry in 2008 and are a must for modern, fast and safe machines.

**Energy reduction by means of Yankee head insulation**

Energy saving is an important topic in tissue production, too. Especially

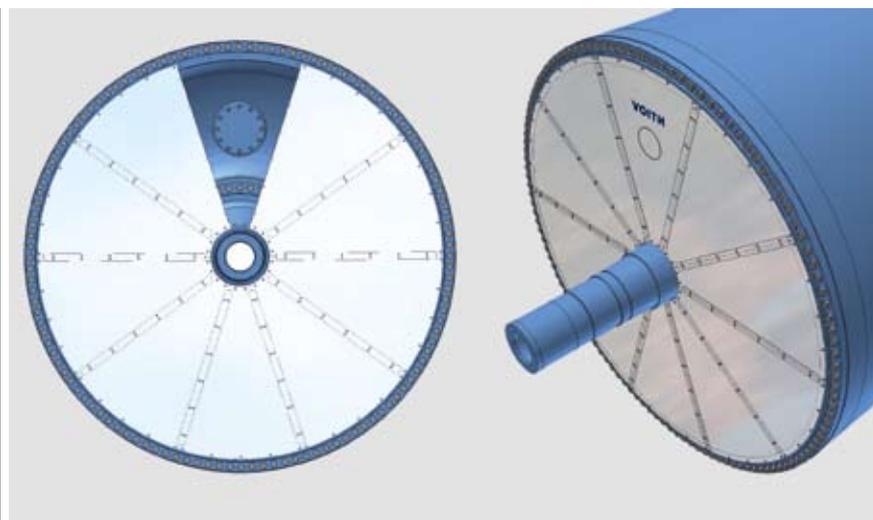
in the drying process, large amounts of thermal energy are consumed by the tissue machine in order to dry the web on the creping (Yankee) cylinder and give it the required product characteristics. A high release of thermal energy to the tissue web should be achieved here on the sleeve side. However, a considerable portion of energy goes unused and is lost via the cylinder heads.

This energy loss can be significantly reduced by insulating the heads of Yankee cylinders. Insulation cartridges are reliably attached to the heads of Yankee cylinders. The cartridges are designed to be shock-proof and splash-proof and offer ideal additional protection against deposits of dust on the Yankee head. The design takes into account all forces present in the system (e.g., centrifugal forces) and is optimized to the application of extremely varying thermal stresses.

The heat losses on the Yankee can be reduced by 3 to 8%, depending

on the diameter, speed and working width of the tissue machine. Installation of the head insulations thus pays off in less than a year. Assembly doesn't even take a day and can be done either as full assembly or with only assembly monitoring by Voith Paper. In addition, acceptance is carried out with the responsible certification authority, with the effect of mechanical processing on the tensions in the head being calculated by means of the finite elements method. Likewise, all possible influences are taken into account in a swell calculation.

Voith Paper looks back on over 30 years of experience in this area. Well-known tissue manufacturers have decided in favor of head insulation from Voith Paper. They can either be retrofitted on existing Yankee cylinders from all manufacturers or be delivered with new Yankee cylinders.



*The cartridge solution for Yankee head insulations: reliable and energy-efficient.*

**On Focus: Yankee head insulation**

ProSafety	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
ProEnvironment	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>
ProSpeed	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Section: dryer section  
 Width: all  
 Paper grade: tissue

**Contact**



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New felt designs especially for tissue machines

## Optimization of press felts pays off

**'Especially soft, extremely absorbent, and highly tear-resistant' – advertising for tissue paper never lacks for superlatives. High quality is one of the most important characteristics of tissues and toilet paper. Tissue production is just as challenging. Voith Paper has developed efficient press felts for this special application and their acquisition is demonstrably worthwhile.**



*Absorptive and tear-resistant are the main characteristics of a kitchen roll. A facial tissue has different functions, but it should always be smooth and soft. As well as toilet paper – life without it is unthinkable. More versatile cleaning is possible with moist tissue.*

In recent years, many tissue paper manufacturers have attempted to reduce energy, water, and fibers in production while maintaining or increasing paper quality. One important aspect, which is often underestimated, is the use of press felts. Higher production speed, more reliable and increased production, lower energy use, better quality and dewatering – press felts can bring about all of these improvements in tissue machines.

**Special felts for tissue machines**

Which felt design is best depends on the machine design, stock, and the product being produced. Thin, light felts are important for tissue machines, offering high stability across the usually long and wide machines. Voith Paper has developed five different felt types especially for this application: TissueFlex O, TissueFlex V, TissueFlex D, TissueFlex A, and TissueFlex S. Their material and design can be precisely adapted to

the individual needs of every paper machine. The press felts are tailored for every press configuration. In order to achieve the greatest potential from the clothing, the experts from Voith Paper Fabric and Roll Systems test the effects of various felts together with their customers. Thanks to a computer simulation, the characteristics of the felt and paper can be evaluated before production.

One of the best known felts is the TissueFlex O2. This laminated felt has two base weaves for a high pore volume and bi-component fibers for improved fiber anchoring. With its low tendency for compaction, this standard design from Voith Paper has proven its worth many times over. Its permeability and dewatering capacity are maintained throughout the entire running time. In order to improve the fiber anchoring even more, multifilaments (yarn made from several very fine filaments) can be included in the roll side of the base weave – then the TissueFlex O2P is called for.

**Tri-axial structure is the secret to success**

Increased running time from 60 to 112 days – the TissueFlex V3 press felt by Voith Paper achieved this success on a paper machine, which produces tissue paper with basis weights from 15 to 24 g/m<sup>2</sup> at a speed of 1,600 m/min. In addition, the use of the high pressure shower was reduced to one hour in the first 80 operating days. Increased production and improved moisture profiles complete the improvements achieved by the new press felt.

TissueFlex V3 is a press felt developed by Voith Paper for demanding press positions. The design with the tri-axial Vector structure has been successfully in use since 2005. It provides stability and smoother performance on the paper machine. The TissueFlex V3 is easy to clean with standard conditioning and can handle large amounts of water in the nip. Even under difficult conditions, it ensures easy operation and good

The five press felt types, developed for all requirements of tissue production:



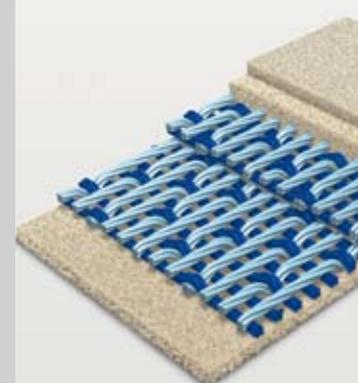
**TissueFlex A**

Light, single-layer felt, which can be used for machines with lower width and speed.



**TissueFlex D**

Woven, double-layer felt design, suitable for every machine type and speed range.



**TissueFlex O**

Laminate felt, which can be tailored to any application through a wide variety of weave structures.

running times. Thanks to the batt-like construction of its polyamide structure, the felt provides a smoother impression on the paper.

**Additional revenue of 720,000 € per year**

But what about the cost of the felt? Many paper manufacturers balk at higher clothing costs. However, they often forget to figure in the cost efficiency in the complete process. One example shows the value of such a calculation. On a Crescent Former, the use of a TissueFlex V3 felt allowed the production speed of 1,500 m/min to be increased by 50 m/min. The result was that the machine produced 120 metric tons more paper per felt and earned 120,000 € more sales. Using only six felts per year results in additional revenue of 720,000 € per year. Extending the running time by 10 days means one less felt and one less downtime per year saving 32,000 €. The significantly lower

use of water and energy leads to additional savings.

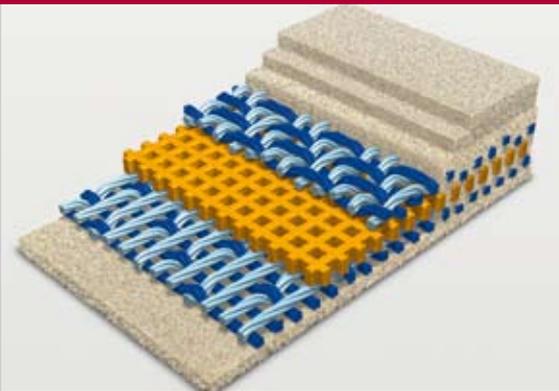
**Effective cleaning**

Van Houtum Papier in Swalmen, Netherlands, started a trial with felts from Voith Paper in 2007. The tissue manufacturer produces 45,000 metric tons of paper tissues and toilet paper annually, using recycled fibers. Voith Paper supplied TissueFlex V3 to the PM 4 Crescent Former and significantly reduced the paper mill's costs. Felt cleaning is particularly simple: the paper machine does not have to be shut down in order to wash the felt and the cost of the preparation is minimal. The felt is washed at low pressure with less water and approximately 50% fewer chemicals per cycle. That reduces costs and extends the running time of the felt by four to six days. Overall, the lifetime of the felts at Van Houtum Papier increased by 20% compared to previous used felts. In addition, production capacity

was increased by 16.2% and the production speed was raised. A further increase of the speed by 4% was achieved by using the TissueForm E forming fabric, which is an ideal addition to the TissueFlex V3.

**Unsuspected potential**

“Our experience shows that coordinating press felts and the surrounding components such as rolls, covers, and wires is worthwhile,” says Martin Ringer, Product Manager Tissue Forming at Voith Paper Fabric and Roll Systems. At the paper manufacturer SCA Edet in Sweden, the TissueForm GP forming fabric and the TissueFlex V3 felt were tested on PM 5 in an initial trial in the fall of 2008. They did not have to wait long for new records. After two weeks, there was already a new production record of 102 metric tons of paper per day. Over the entire running time, the maximum production of 200 to 400 kg per hour was higher than before. The



**TissueFlex S**

*This felt stands for maximum bulk retention and highest dewatering performance in the nip, as well as longevity in use.*

**TissueFlex V**

*In this felt, the Vector layer is built in. It is a non-woven, tri-axial substrate layer with high elastic behavior along the x, y, and z axes. The product comes as both double-layer and triple-layer felt; available as seam fabric and endless felt.*

2.5-layer forming fabric and the felt with tri-axial Vector technology from Voith Paper led to optimum operating conditions.

Production records were also recorded at SCA Prudhoe in the United Kingdom. Voith Paper conducted several optimizations on PM 1 in 2008 by modifying the TissueFlex shoe press and supplying an improved TissueFlex V3 press felt and a QualiFlex press sleeve. The responsible person for PM 1 at SCA Prudhoe, reports, “Thanks to the improvements, we saved 20% energy in the dryer. We are pleased with both the financial savings we achieved and the positive environmental aspects.” The dewatering performance is improved and record breaking production output has already been achieved.

**Current development making progress**

“Turn the wheel and spin the thread!”

– that’s an old German weaving song. The song fits with Voith Paper Fabric and Roll Systems in Dueren, Germany, because not only are most of Voith’s tissue felts produced there, but also the necessary fibers. Complex polyamide fibers are processed into high quality felts on industrial weaving machines. The clothing experts produce some 140 metric tons of tissue felts annually.

Development has not stopped. “Currently, we are working all out on a new felt,” reveals Hubert Walkenhaus, Development Engineer at Voith Paper Fabric and Roll Systems. “The structure is greatly improved and provides an optimized pore volume and a large contact area to the paper.” Initial trials with the polyurethane SolarSoft roll cover and the new press felt are currently underway at the Voith Paper research center in Sao Paulo, Brazil. Despite the reduction of vacuum, this clothing concept achieves the same dry content. Other initial

production trials are very promising. For example, on a 5 m wide tissue machine with a production speed of 1,900 m/min, the felt saves 60 to 100 kWh of energy per metric ton of paper produced.

**On Focus: TissueFlex**

ProRunnability	++++
ProQuality	+++
ProSpeed	++++

Section: press  
Width: all  
Paper grade: tissue

**Contact**



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New protector system for reliable stock preparation

# Centrifugal force does the job at Langerbrugge

Every year, Stora Enso produces 400,000 tons of newsprint from 100% recovered paper at its mill in Langerbrugge in the Belgian port of Ghent. Since December 2008, Voith Paper's two-stage centrifugal separator protector system, HiPRO, has operated at the Ghent stock preparation facility.

PM 4 in Langerbrugge has been in operation since 2003, when it debuted as the largest known newsprint machine in the world. After some years of operation it was decided to upgrade the coarse screening. Heavy contaminants and staples caused plugging and excessive wear to baskets, rotors and stators. "On average we had to open up one screen a week to remove mostly staples," says Patrick De Wilde, DIP Process Engineer at Stora Enso Langerbrugge. As a consequence, a very strict maintenance schedule had to be applied and also the production capacity was limited.

### Reducing the workload on the coarse screening system

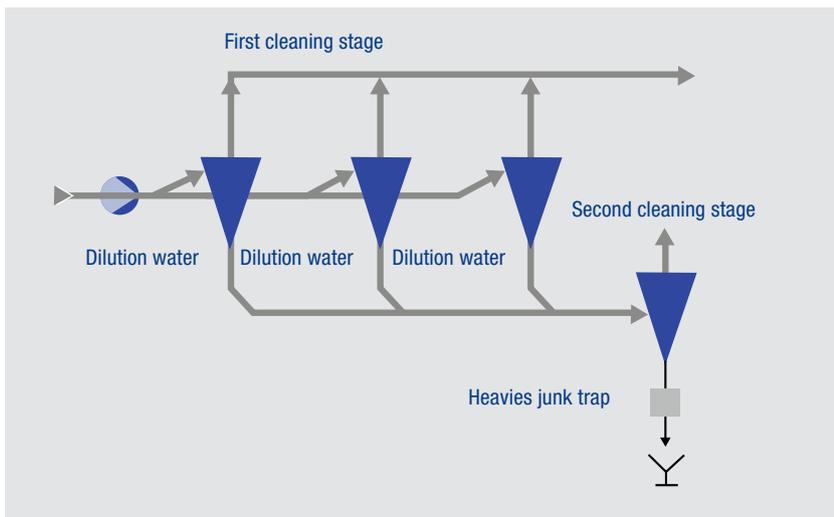
Voith Paper's solution to the problem is its HiPRO 600-3.1 centrifugal separator protector system, which is already proven effective in many deinking units. Installed upstream of the coarse screening system, these machines remove many of the specifically heavy components from the fiber suspension — easing the load on the downstream coarse screening system. In Langerbrugge, a two-stage protector system is installed in each of two parallel lines. Every day these two systems process

a flow rate currently standing at 1,570 t/day (oven-dry).

Centrifugal force removes the rejects from the fiber suspension in the primary HiPRO Protector system stage. The rejects then move in diluted form to the secondary cleaning stage. There the centrifugal cleaner again separates contaminants and fibers. "This configuration keeps fiber losses to a minimum," explains Rolf Hartmann, product manager for cleaning systems at Voith Paper. Compared with one-stage systems, this centrifugal separator halves the contamination

Stora Enso produces 400,000 t/year newsprint paper from 100% recovered paper.

Schematic principle of operation of a HiPRO Protector System.





*“If you can filter out heavy contaminants early in the stock preparation process, you prevent problems further down the process chain.”*

*Rolf Hartmann, product manager for cleaning systems at Voith Paper*

*3D view of a HiPRO 600-1 Protector System.*

in the accepts and the fiber losses. The cleaned suspension goes directly to the coarse screening system, while a junk trap for heavy rejects removes the heavy contaminants.

To achieve overall constant separation efficiency between the inlet and outlet of the protector system, a differential pressure regulator for variable-speed pumps was

installed. This helps to substantially reduce the power consumption.

Stora Enso experts were able to install the necessary additional piping and pumps for the new protector system while the existing system was still running. This enabled the new HiPRO system to be rapidly connected and commissioned.

**No more production disturbances**

The system not only ensures excellent coarse screening, but its hydraulically optimized components – make it highly reliable. With no rotor or intermediate pump, and just one junk trap, the HiPRO protector system needs minimal maintenance and control requirements.



Left: Typical reject material from the heavy junk trap of a protector system.

Right: This detail shows the highly efficient collection of removed staples.

The second cleaning stage is ideally protected against wear by a ceramic liner in the conical section of the separator.

The new system has already proven effective in Langerbrugge, the coarse screens do not clog up and result in production interruptions, and also there has been a substantial reduction in the wear and tear on the screen baskets. "There have been no more production interruptions because of clogged coarse screens since the system was commissioned in December 2008," says De Wilde.

This proves that modern deinking plants need a two-stage, high-density cleaning system as a relevant process stage upstream of a hole screen.

**Small machine – big effect**

What seems like a minor project has a huge impact on the availability of the entire plant and on maintenance costs. The HiPRO protector system is well worth using in all stock-preparation units that work

with recovered fibers, because the system ensures a stable production process and prevents unnecessary disruptions in the downstream processing machines.

"If you can filter out heavy contaminants early in the stock-preparation process, you prevent problems further down the process chain," says Rolf Hartmann.

Thanks to its compact, modular structure, the system is also suitable for use even where space is tight.

**On Focus: Protector System HiPRO**

ProSafety	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
ProRunnability	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
ProQuality	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
ProSpace	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>

Section: total paper machine  
Width: all  
Paper grade: all

**Contact**



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*"There have been no more production interruptions because of clogged coarse screens since the system was commissioned in December 2008."*

*Patrick De Wilde, DIP Process Engineer, Stora Enso Langerbrugge*

Improving the quality of wastewater

## Biodegradation as the key to successful wastewater treatment

**Water is precious. For this reason, Voith Paper has the aim of consuming less process water in paper production. It only works with the aid of effective wastewater treatment – and this is different in every paper mill.**

Whether a paper manufacturer produces graphic paper or packaging, whether it uses recovered paper or fresh fibers and whether it conveys the wastewater from paper production into a municipal clarification facility or directly into a body of water – all that has a decisive effect on its wastewater treatment plan. Voith Paper Environmental Solutions (VPES) has by now a broad portfolio of technologies and offers solutions for all kinds of wastewater treatment.

### The initial situation is decisive

The requirements for a wastewater system depend on certain parameters. First, the amount of wastewater must be determined. This results from the specific water consumption and the production output. Organic contamination of the water is measured in COD (chemical oxygen demand) or BOD (biochemical oxygen demand), which both depend heavily on production processes and the use of raw material. In addition, the raw material used influences the wastewater, which is why the input quantity into the stock preparation and the specific organic contaminant load quantity of the raw material are viewed as essential parameters. The final contaminant load in the water results from the input

quantity minus the contaminant load discharged with the rejects, residual materials and the paper that is produced. The kind of wastewater discharge also plays a big role in the selection of a wastewater plan. Depending on the requirements of authorities, paper mills can discharge the wastewater indirectly into a municipal clarification facility or as direct dischargers into a body of water, e.g., a river, after complete treatment. The engineers at VPES prepare an individual plan for each paper mill with balancing software specifically developed for this and with 3-D engineering tools. The result is a process technology that is optimized for the respective paper mill.

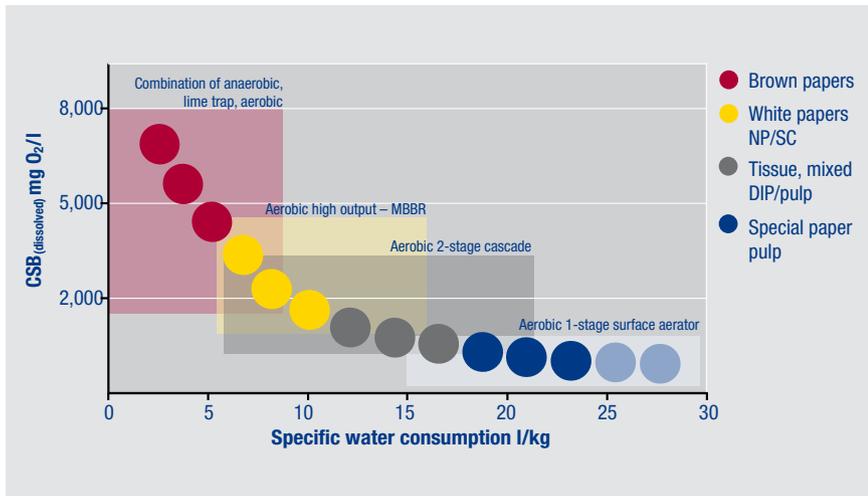
### Four main process groups

Most wastewater systems consist of the four main process groups of preliminary treatment, biological stage, secondary treatment and sludge treatment. In some cases, wastewater cooling or an additional process group is required as a third treatment stage.

In preliminary treatment, it is a matter of removing contaminants and solids from the wastewater with the aid of rake classifiers, disk thickeners (Elephant filters), micro-flotation or sedimentation (Zenith series). For mechanical and chemical-physical



*The R2S reactor at Daehan Paper in Korea.*



Water consumption and COD load for paper production with correlation of biological treatment processes. The possible ranges of use for typical wastewater treatment processes are indicated in color and differ essentially with regard to investment costs, operating costs, space requirements, and technical design, which also explains the overlapping of the processes. Reduction of the specific water consumption generally leads to more demanding treatment processes.

preliminary treatment, VPES can implement the most varied processes with its own technologies. Optimal process temperatures are produced through direct or indirect cooling.

At the biological stage, anaerobic processes (without oxygen) and modern aerobic processes or also high-rate processes are used, e.g., with substrates. The anaerobic stage always generates a biogas that is treated with a chemical or biological gas scrubbing for further recovery. For anaerobic treatment, VPES developed the 2-stage R2S anaerobic reactor with internal and external recirculation, which is especially suitable for wastewater that is organically heavily loaded and also has a high lime load. Since the R2S anaerobic reactor came on the market in the summer of 2007, it has already proven itself in various countries. Other technologies for the anaerobic stage are the E2E reactor for the mid-load range and

cost-efficient UASB modules for retrofitting and conversion of existing systems.

After the anaerobic stage, a stripping reactor and the lime trap remove the lime. For aerobic treatment of the wastewater, either the process of high-rate carrier biology (moving bed bio-reactor – MBBR) or conventional activated sludge process with fine-bubble, coarse-bubble or jet aeration, or also with surface aeration is used. Secondary treatment of wastewater takes place by means of sedimentation with suction rakes. Then the process sludge has to be treated. It is mixed with primary sludge and a small portion of bio-sludge and reaches the pre-dewatering designed, for example, as a gravity table. It is pressed in downstream filter band presses or screw presses. With bio-sludge or mixed sludge with a high biological portion, centrifuges are recommended.

## Wastewater treatment in practice – three examples

Different amounts of water and organic contaminant loads make projecting a wastewater system an ever-changing challenge. Parameters such as the production quantity, the raw material used, the specific water consumption and the legal and local general requirements are decisive. Three examples show which solutions VPES has available in its own portfolio.

### Example 1: Graphic paper: Newsprint/SC based on 100% recovered paper

System parameters:

- Production: 1,000 tons/day
- Recovered paper input: 1,450 tons/day
- Specific COD load of the raw material: 15-24 kg/ton
- Specific water consumption: 8-12 liters/kg

The results for the wastewater are:

- Amount of water: ca. 11,000 m<sup>3</sup>/day
- COD load: 28 tons/day (corresponds to a concentration of ca. 2,500 mg/liter)

VPES wastewater treatment plan:

- Preliminary treatment: with Smart Loop consisting of Elephant disk thickener and micro-flotation; counter-flow cooling downstream
- 2-stage activated sludge process with upstream MBBR as high-rate stage (substrate biology)
- Secondary treatment: sedimentation with suction rake
- Sludge treatment: sludge thickening with the aid of pre-thickening, filter band presses, screw extrusion presses or centrifuges

**Example 2:**

**Special paper on the basis of pulp**

System parameters:

- Production: 400 tons/day
- Pulp input: 400 tons/day
- Specific COD load of the raw material: 5-8 kg/ton
- Specific water consumption: 15-20 liters/kg

The results for the wastewater are:

- Amount of water: ca. 6,500 m³/day
- COD load: 3 tons/day (corresponds to a concentration of ca. 500 mg/liter)

VPES wastewater treatment plan:

- Preliminary treatment: by means of flotation
- Biological stage: aerobic 1-stage activated sludge biology, e.g., with surface aerators
- Secondary treatment: conventional sedimentation

**Example 3: Packaging paper, based on 100% recovered paper**

System parameters:

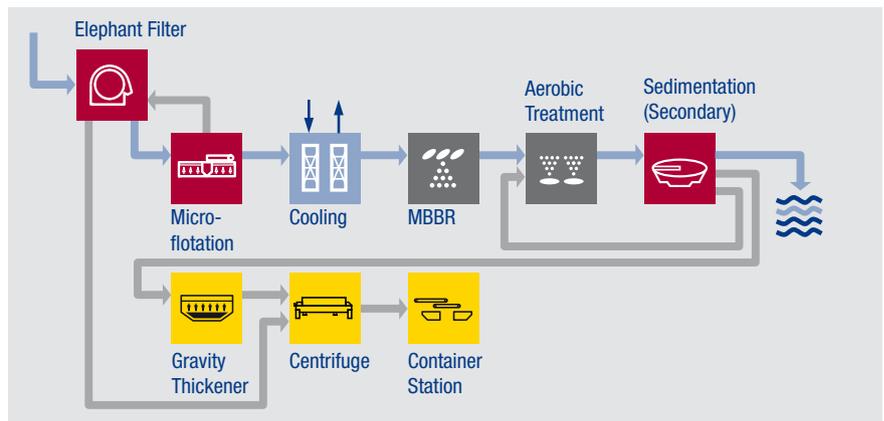
- Production: 1,300 tons/day
- Recovered paper input: 1,450 tons/day
- Specific COD load of the raw material: 25-30 kg/ton (ca. 36-40 tons/day)
- Specific water consumption: 3-5 liters/kg

The results for the wastewater are:

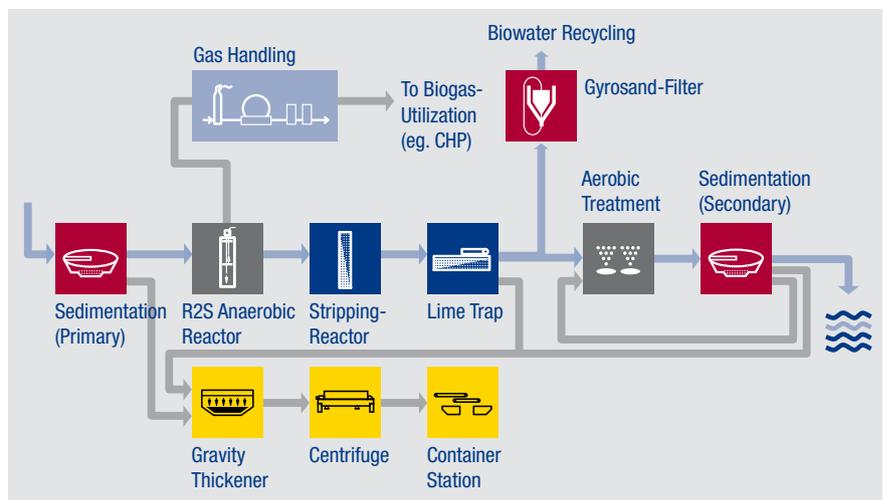
- Amount of water: ca. 5,200 m³/day
- COD concentration: 7,000-10,000 mg/liter

VPES wastewater treatment plan:

- Preliminary treatment: conventional sedimentation (shield scraping) or Smart Loop (see Ex. 1), cooling



Example 1: Wastewater treatment for graphic paper production.



Example 3: Wastewater treatment for packaging paper on the basis of 100% recovered paper.

- due to the low specific water consumption
- Biological stage: preliminary acidification with anaerobic biological high-rate process (R2S anaerobic reactor), lime trap for lime elimination, aerobic activation biology as second biological stage
- Secondary treatment: sedimentation with suction rake or shield scraper
- Sludge treatment: sludge thickening via pre-thickening and filter band presses, screw extrusion presses or centrifuges

**On Focus: Wastewater concept**

ProRunnability	+++
ProQuality	++
ProSpace	+++

Section: total paper machine

Width: all

Paper grade: all

**Contact**



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Successful collaboration between UPM and Voith

## New drive concept reduces long-term costs

**Just because you are used to something that does not necessarily mean it is good. With this in mind, UPM and Voith could see that the standard sectional drive concept for paper machines was capable of being improved and together they developed a new, energy-efficient concept.**

Just over a year ago personnel from UPM-Kymmene and Voith Paper

formed a task force to resolve the following question: What would a

sectional paper machine drive with optimum energy efficiency look like? Over a period of six months the team analyzed the prevailing state-of-the-art, discussed advantages and disadvantages, and developed a new concept to enable the machine to be driven at reduced cost.

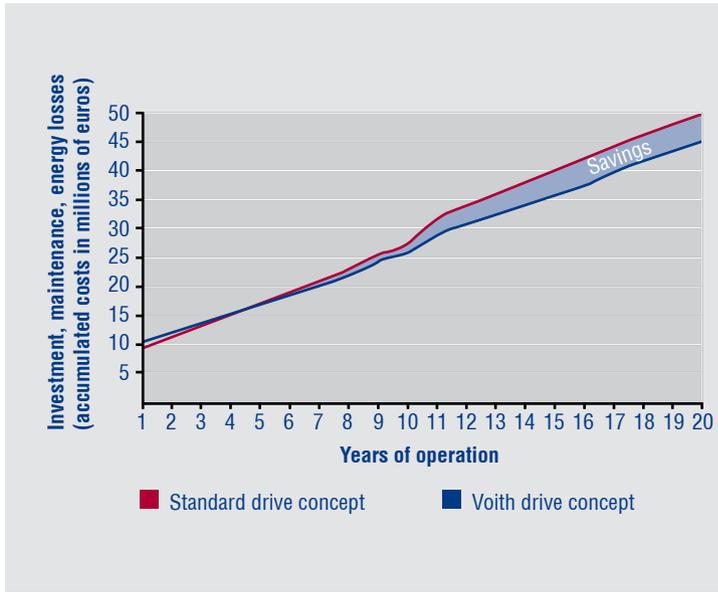
### Focus on total costs

The basis of the investigation initiated by UPM was a consideration of the overall cost or >>> Total Cost of Ownership (TCO). To ensure as

*The concept does not just score highly in terms of better economy, it also offers technical benefits.*

Conventional asynchronous drives on a Janus calender.





More profitable: synchronous motor in use (Voith Drive).

After just three to four years, the higher investment costs for the new drive concept have paid off.

detailed and thorough an analysis as possible of the standard drive concept currently used worldwide, the task force decided to base its considerations on a typical paper machine for coated, wood-free paper. The TCO of the sectional drive over a period of 20 years was calculated based on 60 drives with asynchronous motors with a total drive output of 25,000 kW.

**Synchronous motors save costs**

As a next step the team of UPM and Voith specialists investigated the extent to which a new drive concept would be feasible and profitable. The main component of the alternative concept is the replacement of as many asynchronous motors as possible with synchronous motors. These motors would be used along the paper machine to drive the rolls. Only in the wet section of the machine were asynchronous motors

partially retained even at the analysis stage, as the blanket use of synchronous machines proved impractical for technical reasons.

Based on the given paper machine, the team worked out alternative scenarios to the familiar drive concept. During the process, particular emphasis was placed on taking all influencing variables into account. At the end of the process even the participants themselves were surprised by the unequivocal outcome: It emerged that although initially a somewhat higher investment was needed for the new synchronous motor concept, its lower operating costs made it more profitable than

the previous drive systems even after a short period of time. The reason for this lies above all in the lower energy consumption facilitated by the new solution. If rated correctly, a synchronous motor is a convincing winner over the asynchronous motor due to its lower energy losses resulting from its generally higher efficiency. In addition, the transmission gearing required on previous systems is frequently superfluous and can be dispensed with due to the high torque offered by synchronous motors. Therefore, the paper manufacturer profits not only from fewer energy losses but also from lower maintenance outlay. Moreover, on top of these crucial benefits UPM

**>>> Info: Total Cost of Ownership (TCO)**

A TCO analysis does not just consider the pure investment costs but also the operating costs incurred following start-up, which cover expenditure on maintenance and energy. Usually a period of 20 years is considered in this kind of analysis to be able to determine the total costs during the service life of a product. Unlike a comparison of investment costs only, this approach therefore provides much more information, as hidden costs occurring subsequently can also be taken into account.

and Voith also established additional savings potential in the periphery. In its analysis, for example, the team used a motor type that does not need a power filter due to the electric strength of its windings. This leads to a direct reduction of investment and energy costs.

In addition, the investigation identified that the concept for cooling motors and switchgear has a major impact on the cost. In the case of the paper machine used for the analysis, for example, heat in the range of 2,500-3,750 kW has to be removed from the system, so that an efficient cooling system enables a substantial reduction in costs.

**In the black after three years**

By now adding up all savings potentials offered by the new drive concept, the higher investment costs compared to the current standard solution are absolutely sustainable and will provide long term profit. In particular, the difference in procurement costs is offset by the considerably lower operating costs after a period of around only

three to four years. It is from this point in time that the paper manufacturer gains an economic advantage, or to express it in figures: In the case of the paper machine used as a basis for the analysis, the savings would amount to almost € 5,000,000 in 20 years! The total cost of ownership, i.e. the overall cost, is therefore a convincing argument in favor of the newly developed approach. All calculations were based on constant 2009 energy prices. In the event of increasing energy prices the financial advantages of the new drive system are even higher.

However, the concept does not just score highly in terms of better economy, it also offers technical benefits. Synchronous motors allow higher control accuracy, which can also be implemented due to the omission of gearing. In addition, there is less mechanical load on the drive train, reducing the likelihood of potential operational malfunctions. Crucial to the successful development of the drive concept was the close, hands-on cooperation between

UPM as paper manufacturer and Voith Paper as machine and automation vendor. The incorporation of technological know-how about process, machine and drive systems allowed a holistic approach to be taken, with customer requirements taking center-stage.

The drive concept is suitable not only for new machines but is also particularly attractive when renewing drive systems on existing machines.

**On Focus: Drive concept**

- ProRunnability +++
- ProEnvironment ++++
- ProSpace +++

Section: total paper machine  
Width: all  
Paper grade: all

**Contact**



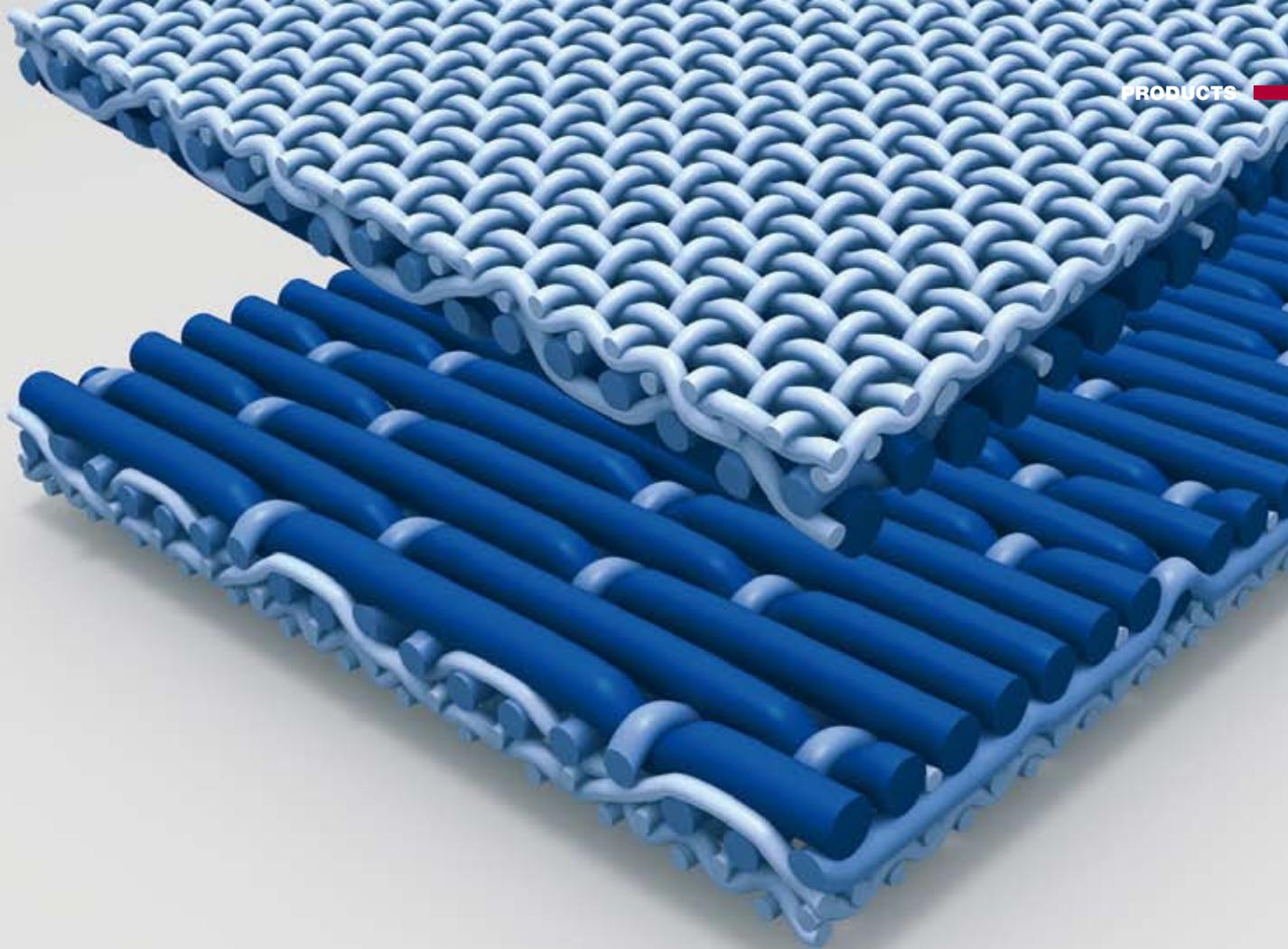
**Wolfgang Klotzbücher**  
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*“The present TCO model will play a crucial role in our future acquisitions in the drive area.”*

*Fritz Wolf, Sourcing Manager Electrification, UPM-Kymmene Papier GmbH & Co. KG*

*“For the TCO analysis, it was extremely important for the cross-functional team to include all costs incurred. The detailed know-how obtained in this process is of decisive importance to us. Therefore the present TCO model will play a crucial role in our future acquisitions in this area.”*



New forming fabric PrintForm IS with a unique SSB design

## Improved sheet quality without negative side effects

**While an increasing number of papermakers are moving towards finer mesh SSB forming fabrics, a significant number have stayed with coarser products. The reason for this is the widespread opinion that reduced wear potential and stability could lead to adverse effects. Voith Paper has developed a new SSB forming fabric concept that eliminates the need to decide between coarse or fine mesh fabrics.**

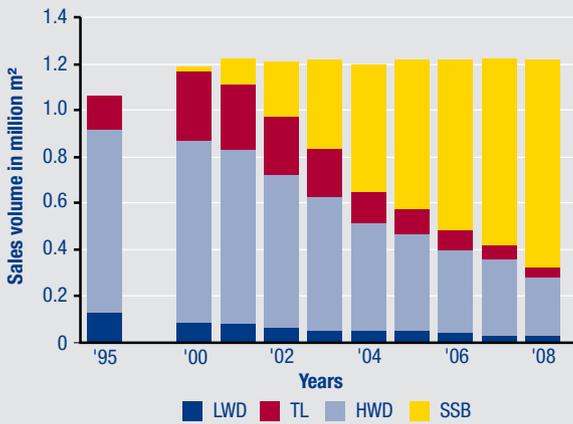
Today, the forming fabric market is dominated by SSB designs. That is a market share of approximately 50-70%, depending on geographic region. The majority has changed little since its market introduction. Although there have been new developments in alternative binder yarn bindings and weaves, which increase the float on the bottom side, the original 1:1 warp ratio remains the central characteristic of almost all SSB products.

### **The development of SSB designs**

The main focus in SSB development has been on the design of different mesh structures, coarser products for board and packaging grades and increasingly finer mesh for high-end graphics papers. Finer mesh SSB products are especially attractive for paper manufacturers of lighter basis weight grades, which operate with mechanical pulp and increased filler levels, and producing coated grades.

Sheet porosity is critical here. Finer mesh products also offer potential retention benefits. Most forming fabric manufacturers now also offer finer mesh SSB products for this market segment.

However, the main hurdle to wider acceptance of these finer SSB products is their stability and durability. Improvements in retention, sheet quality, and cleaner former operation are positive factors for paper

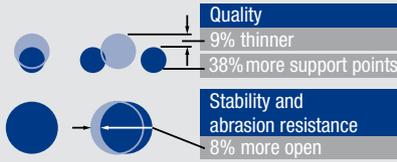


Sales trend forming fabrics in Europe.

Standard SSB warp yarn ratio



PrintForm I warp yarn ratio



Comparison of the warp yarn ratios of a standard SSB fabric with a 1:1 ratio and PrintForm I with a 3:2 ratio.

manufacturers. Nevertheless, many customers in the competitive paper market are not prepared to accept the previously existing disadvantages to achieve their goals.

For this reason, many paper manufacturers have stayed with their standard 0.13/0.21 mm machine direction warp diameter and 58-60/cm warp density. To date, paper manufacturers have had to choose between either fabric life, durability, and stability or the improved performance characteristics associated with finer papermaking surfaces. Fabric manufacturers were not able to combine all of these features into one design – until now.

**The new PrintForm IS forming fabric**

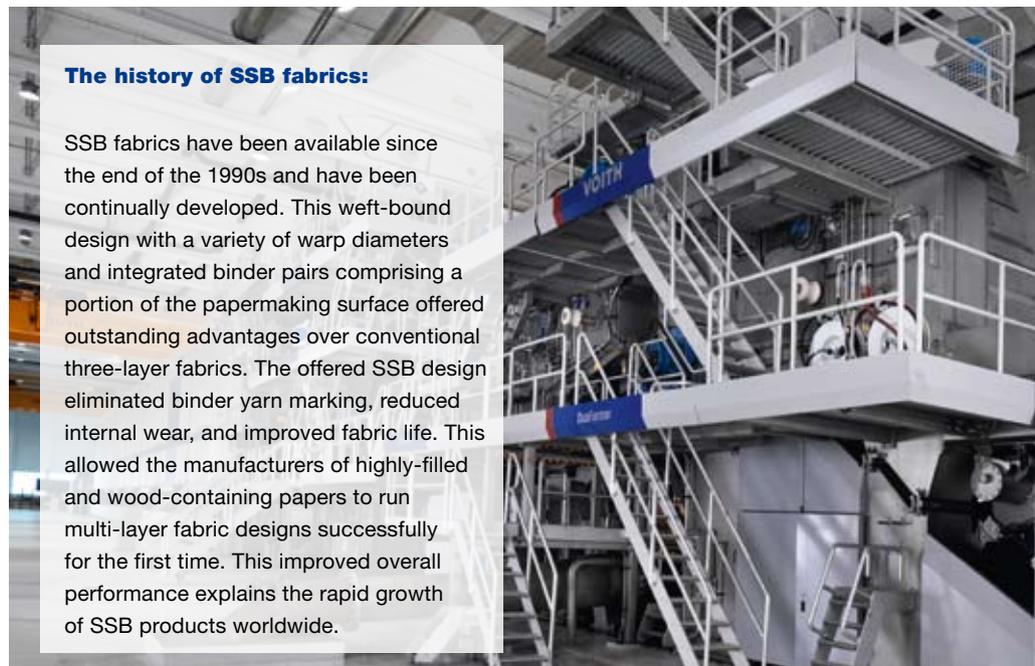
The latest development from Voith Paper, the PrintForm IS, offers paper manufacturers a way around having to choose fabric life, on the one hand, and sheet quality and mechanical retention on the other. The PrintForm IS combines an extraordinarily fine papermaking surface and a very stable wear-side surface with high run-time

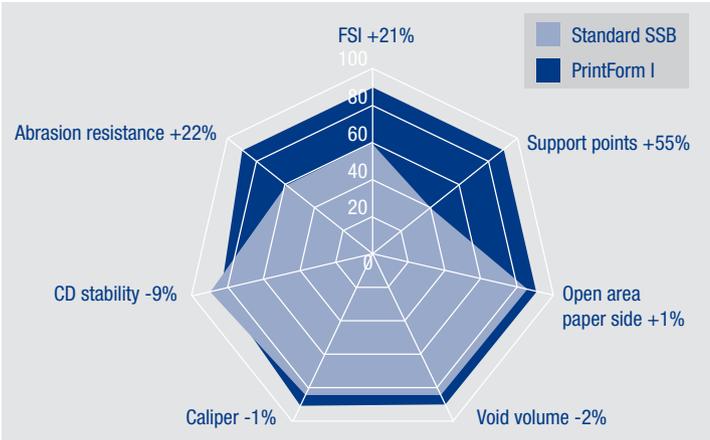
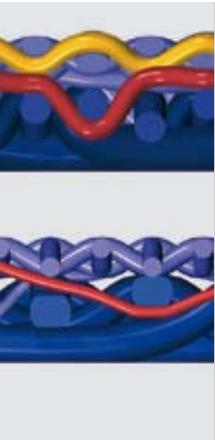
potential. The key to maximizing all these fabric characteristics in one and the same product was to reject the standard 1:1 warp ratio.

The PrintForm IS is woven using a 3:2 warp ratio. Additionally, the papermaking side warp yarn diameter is super-fine, while the wear side warp yarn diameter remains relatively coarse. This unique construction allows the development of forming

fabrics with two characteristics, which are usually contradictory: a super-fine papermaking surface, with Fiber Support Index (FSI) values of +220, and a wear side with a high life potential.

Compared to standard SSB designs with 0.13/0.21 mm warp diameter, the PrintForm IS shows a significantly improved paper side surface, a much longer life potential, and a high CD stiffness. At the same time, no compro-





Comparison of the technical data for a standard SSB and PrintForm I.

mise has been made in openness, caliper, and CD stability. The PrintForm IS is available with a weft ratio of 2:1 (ISY) and 3:2 (ISW). A wide range of permeabilities (cfm values) and wear side weft yarn diameters is also available. With these tools, the PrintForm IS can be fine-tuned to any of the paper manufacturer's needs and wishes.

The PrintForm IS offers significant performance improvements in every

area, which cannot be matched by conventional SSB products. It is especially suitable for paper manufacturers who want to use finer mesh SSB designs, but have concerns about wear potential and stability. Real savings are being achieved through reduced retention aid usage, fewer breaks thanks to improved forming fabric cleanliness, lower sheet porosity and thus less coater bleed, longer fabric lifecycles and improved CD profiles.

**Field results:**

- Uncoated, wood-free paper grades were produced on a Beloit PM equipped with a BelBaie IV former (8.5 m wide, 1,100 m/min). The PrintForm IS is implemented in the bottom fabric position. The goal of the tests is improved sheet formation and fabric running time. The previous fabric in this position was a competitor's SSB design with a warp diameter of 0.13/0.21 mm. The PrintForm IS test was concluded after an average life, while laboratory analysis revealed that a remaining life potential of +50% could be achieved. The PrintForm IS is now the standard design on this position and demonstrates significantly improved formation and very clean running.
- Newsprint from mechanical pulp is produced on a Beloit PM equipped with a BelBaie II former (6.3 m wide, 900 m/min). The standard 0.17 mm 60 warps/cm double layer design on the bottom fabric position was replaced by a competitor's SSB design with a 0.13/0.21 mm warp diameter during 2005. Wire marking was reduced and formation improved. Running time was extended by approximately 15%. A first trial with a PrintForm IS showed further substantial savings in retention aid chemicals, reduced fiber carrying, and improved formation. Standard running times were reached without problems.
- Surface-sized, wood-free paper is manufactured on a Metso SpeedFormer HHS (7.1 m wide, 1,000 m/min). The bottom position normally ran a fine mesh SSB design (0.12/0.18 mm warp diameter). In principle, it is not surprising that the PrintForm IS easily reached its budgeted running time, but still had 40% life potential remaining. The fabric positively affected the sheet quality. In particular, formation could especially be improved at lighter grades.



**On Focus: PrintForm I**

ProEnvironment	+++
ProRunnability	++++
ProQuality	++++
ProSpeed	++

Section: forming  
 Width: all  
 Paper grade: graphic paper, high quality board & packaging

**Contact**



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Perfect interaction of fabrics, roll covers and doctor blades

## New dimensions in press dewatering

Voith Paper has developed two new suction press roll covers, AquaFlow and SolarFlow, which help to achieve the highest dry contents and lowest energy consumption. The last few months have seen promising field trials and tests being run in the Paper Technology Center.

*Efficient nip dewatering.*

The new roll covers have already demonstrated their advantages at the Leinfelder paper mill in Schwedt:

“The use of SolarFlow and SolarPress is a complete success. The dry content after the press on the PM 3 was increased by 1%,” reports Arno Liendl, Technical Director at Leinfelder Schwedt. Together with other optimization measures, the speed and the output of the

paper machine that produces linerboard paper was also increased.

### **New cover structure is the secret of its success**

The higher dry contents are no longer a coincidence, but come about because the covers consist of innovative, functional layers. The fiber-reinforced multi-layer base with increased material density and aligned

e-module structure lies on the metal core of the roll with the interface. Then the WebNet technology follows, a newly developed three-dimensional polymer layer. It cross-links the multi-layer base with the polyurethane functional layer.

The WebNet technology and the polyurethane functional layer, in particular, have outstanding characteristics. Voith Paper optimized the

latter for the new covers, AquaFlow and SolarFlow. A denser molecular structure increases its elasticity, mechanical strength and abrasion resistance. In addition, the hydrolytic behavior and stability are improved. The WebNet technology comes from the aviation and automobile industries. The Interpenetrated Network (IPN) has been in use there for a long time as a process for connecting different polymers. Now Voith Paper is using this process for its new suction press roll covers. The advantages are enormous: because of the three-dimensional cross-linking of the polymers, the connection between functional layer and roll core is greatly improved. The roll covers show better temperature resistance and clearly higher resistance to chemical and mechanical loads than was previously possible. With these optimized characteristics, the WebNet technology replaces the AST bonding layer developed by Voith Paper in the 1990s.

*“The dry content after the press on the PM 3 was increased by 1%.”*

Arno Liendl, Technical Director at Leinfelder Schwedt

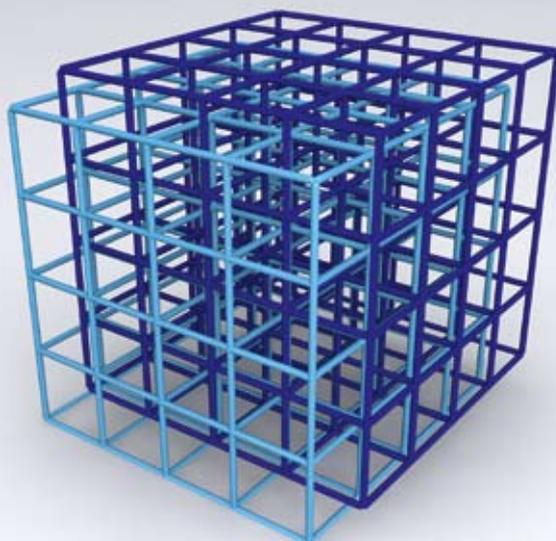
**AquaFlow or SolarFlow?**

The Voith Paper experts individually determine which cover is the best for the given application. “With the NipMaster simulation program, we carry out a dewatering balance with our customers that includes all relevant practical parameters, including the press felts,” explains Michael Weinzettl, Product Manager for polyurethane rolls at Voith Paper. On this basis, it is decided whether AquaFlow, SolarFlow or another roll cover should be used and which surface design would provide optimal dewatering.

Incidentally, the biggest difference between the new roll covers is in the

material used for the functional layer. “The polyurethane that we use for the AquaFlow cover we have even further improved for the SolarFlow cover,” Weinzettl reveals. Therefore, the SolarFlow has even higher surface stability which ensures the best possible operative storage volume in the operating state and load case. This is important given that it is mainly used in the extremely stressed suction press roll position.

Both with AquaFlow as well as with SolarFlow, the structure of the new polyurethane functional layer facilitates deeper grooves for more efficient dewatering. Specifically, this means: the groove depth in the case of the AquaFlow cover extends to



*WebNet technology – a three-dimensional cross-linking of polymers.*

2.3 millimeters with a groove width of 0.5 to 0.9 millimeters. The land width in between can be 2.0 to 2.5 millimeters wide. In the case of SolarFlow, these dimensions are even more ideal: The grooves are up to 3.0 millimeters deep and 0.4 to 0.9 millimeters wide – with land widths between 1.8 and 2.5 millimeters. The storage volume of the covers is expanded by means of the deep grooves and the water can run off more quickly into the save-all.

**Higher level of dewatering and a longer service life**

The result is very efficient nip dewatering with reduced hydraulic pressure build-up in the press nip. Blind holes in the cover surface can be omitted, if applicable. Uhle box dewatering for the felt conditioning can be reduced – and therefore a lot of energy is also saved. In addition, up to now blind holes could led to

shadow marking in the paper produced. In a paper machine that produces photocopying paper with the aid of SolarFlow, shadow marking was eliminated using this method and the dry content increased by 0.7 to 1%.

resistance until a new cover is required. At the same time, the dewatering conditions remain more constant in the press nip, since sufficient dewatering capacity is available due to the innovative groove geometry.

*“We see a lot of potential in the interplay between roll cover, felt and doctor.”*

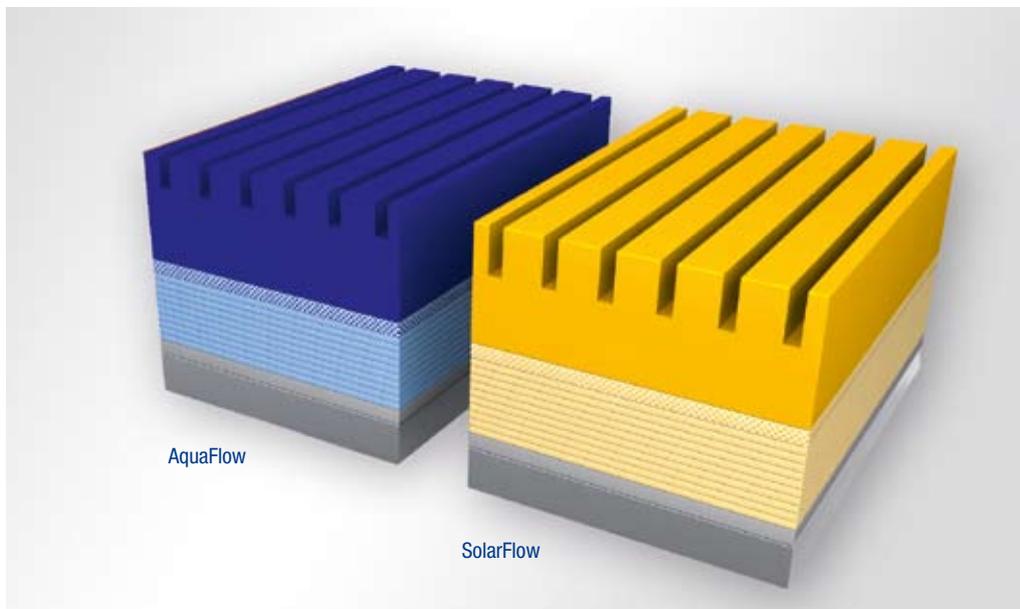
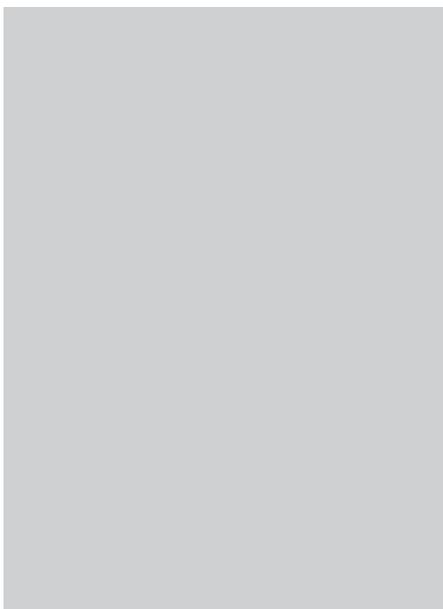
Peter Moedl, Product Manager press felts, Voith Paper

An improved service life is another advantage of the new covers. That has also proved to be the case in practice. In the case of a paper machine that produces testliner and corrugated medium, the grinding interval has doubled due to the use of a new cover, with a simultaneous increase in nip dewatering. That is because of the high-quality polyurethane which lengthens the grinding intervals by means of its abrasion

**Research with felt and doctor**

A paper mill in Europe had similar experiences in the production of wood-free coated premium paper. Here, the cover had a positive effect on the felt used. The running time of the pick-up felt was increased from 21 to 32 days and the felt start-up was substantially improved. Several tests by Voith Paper – both in paper mills and also on test paper

*AquaFlow and SolarFlow – deeper grooves for more efficient dewatering.*



machines – have shown how strong an effect the roll cover has on the press felt. At one paper mill, the running time of the felts was increased by one of the new roll covers from 14 to 45 days. But Voith Paper’s research work doesn’t stop with the interplay between roll cover and felt. “We see a lot of potential in the interplay between roll cover, felt and doctor,” explains Peter Moedl, Product Manager for press felts at Voith Paper. Maximum dewatering can only be achieved if all three components are optimally coordinated with one another. “If my roll cover is ingenious but felt and doctor don’t support its functions or even impair them, I don’t utilize the full potential,” says Moedl.

**New E-Flex felts tested**

Test runs at Voith Paper also included the newly developed E-Flex press felts. These are structure optimized

felts by adding polymer particles to surface or base structure thus enhancing the ‘bridging’ effect over the roll cover grooves. They provide the most homogeneous pressure transfer. Resilience is improved, which leads to fast start up, high nip dewatering and steady state performance over the entire felt life. The pore volume distribution in the felt can be adapted to the position need.

**Promising tests**

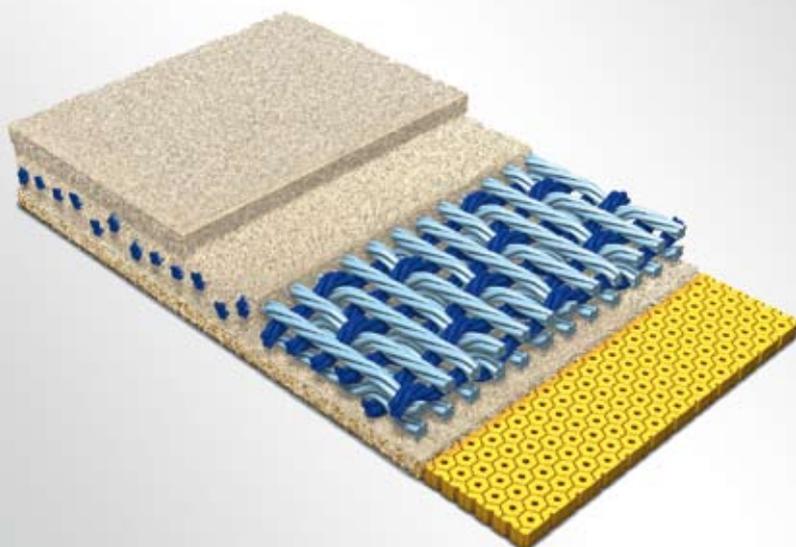
Voith Paper has already tested several combinations of roll covers and felt designs on the VPM 6 test paper machine at the Paper Technology Center in Heidenheim. With optimal coordination of these two components, the greatest dewatering potential by far is the result. The tests show that the groove capacity of AquaFlow and SolarFlow can be fully utilized with E-Flex press felts, even under pressure. If, in addition,

the doctoring is coordinated with the composition of the roll cover, the best results are realized. Along with an increase in the dry content, the tests also show a big potential for further energy savings in the press section.

With consistent dewatering via the groove, there can be noticeably reduced uhle box vacuum and suction press roll vacuum. In addition, this has a positive effect on the drive energy required in the press.

SolarMax will soon be the rising star in the market by combining a new groove design of polyurethane suction press roll cover with a matching press fabric. SolarMax is designed for energy efficient dewatering in the press section.

*E-Flex – structurally optimized press felts.*



**On Focus: AquaFlow and SolarFlow**

ProEnvironment	+++
ProRunnability	++++
ProQuality	++
ProSpeed	++++

Section: press  
Width: all  
Paper grade: all

**Contact**



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Coating quality at the highest level

## SkyCoat HM: a good choice

**The uniformity of the color application determines the quality of coated paper. Accordingly, the requirements for a coating blade are high. The new SkyCoat HM coating blade achieves uniform coating quality and saves costs by reducing production downtime.**

During the last two years, Voith Paper has worked intensively on the development of the hard metal-coated SkyCoat HM coating blade. The test phase in the market is now over and it is being successfully used in paper mills. Customer experiences so far show that SkyCoat HM can keep up with the leaders regarding coating quality and even outperforms them in running time.

### Coated or uncoated?

Hard metal-coated coating blades such as SkyCoat HM offer tremendous

advantages compared to traditional uncoated steel blades. The wear-resistant hard metal coating can achieve a running time that is up to 10 times as long (Fig. 1). Because of this low wear rate, the coating quality remains constant over the entire life of the blade. This means fewer corrective measures are necessary (e.g., angle, coating profile and pressure adjustments). With the aid of the coating's finer microstructure in comparison with steel, a smoother surface on the bevel and better

paper quality can be achieved with regard to gloss, smoothness and CD profile. Customer experience shows that raw material costs can be saved by using SkyCoat HM since, for example, a wider particle size distribution of calcium carbonate becomes possible.

### Fewer production shortfalls

Voith Paper's many years of experience in the coating of rolls was the key to modifying the material systems in use for application in



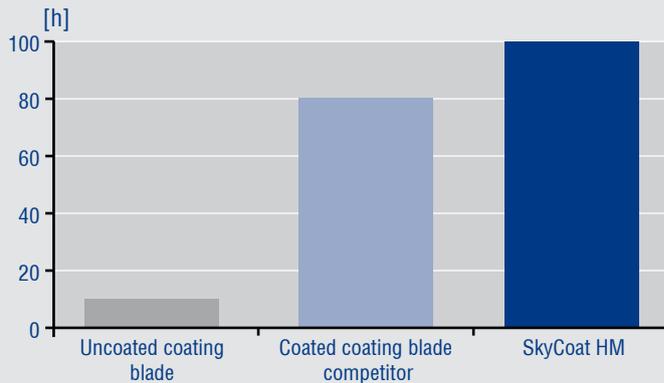


Fig. 1: Running time comparison of uncoated coating blade, coated competitor's blade and SkyCoat HM.

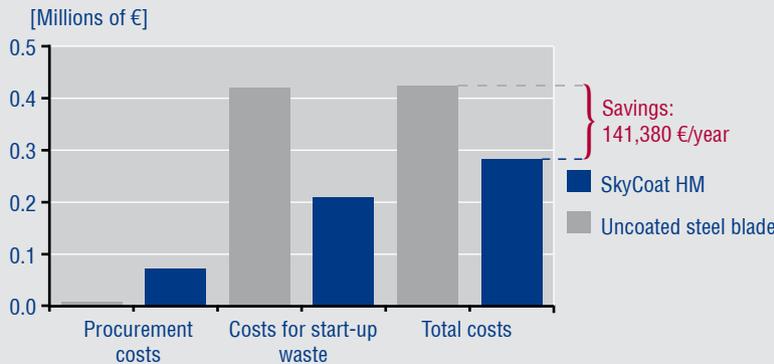


Fig. 2: Total cost of ownership using SkyCoat HM as compared to uncoated coating blades.

coating blades. The coating consists of a hard material such as tungsten carbide (WC) and a ductile metallic such as cobalt (Co). The particle size distribution and also the proportion of binder (Co) to hard material (WC) of SkyCoat HM were adjusted to maximize wear resistance. The blade therefore has to be replaced less often, which reduces production

downtime and saves considerable costs. (see Fig. 2)

**Less tension – shorter start-up phase**

With the aid of a new manufacturing process for coating blades, internal stresses on the blade during production and coating could be

**>>> Info: Micro-Lining**

Micro-lining means the reproduction of cracks in the blade coating onto the paper web. When the blade is applied, it heats up and is cooled off very quickly with the feeding of the coating color. Thus cracks appear in the ceramic coating that are transferred to the paper and impair the paper quality.

**On Focus: SkyCoat HM coating blade**

SkyCoat HM is a coating blade made of hard metal-coated carbon steel DIN-C100S (strength 1620-2180 MPa), which is manufactured for use in the coating machine with very close tolerances. The hard metal coating consists of a cobalt matrix, a tungsten carbide hard material and special alloy additions for increasing wear resistance. With the coating system that has been developed, rapid attainment of the desired profile, a wear rate that is constant over the whole blade width and a long life are ensured.

- ProRunnability ++++
- ProQuality ++++
- ProSpeed +++

Section: coating  
Width: all  
Paper grade: coated paper

**Contact**



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minimized. Form deviations during application are thus kept to a minimum. Precise coordination of the bevel geometry and a close angular tolerance ensure rapid attainment of the operating angle and the required paper quality.

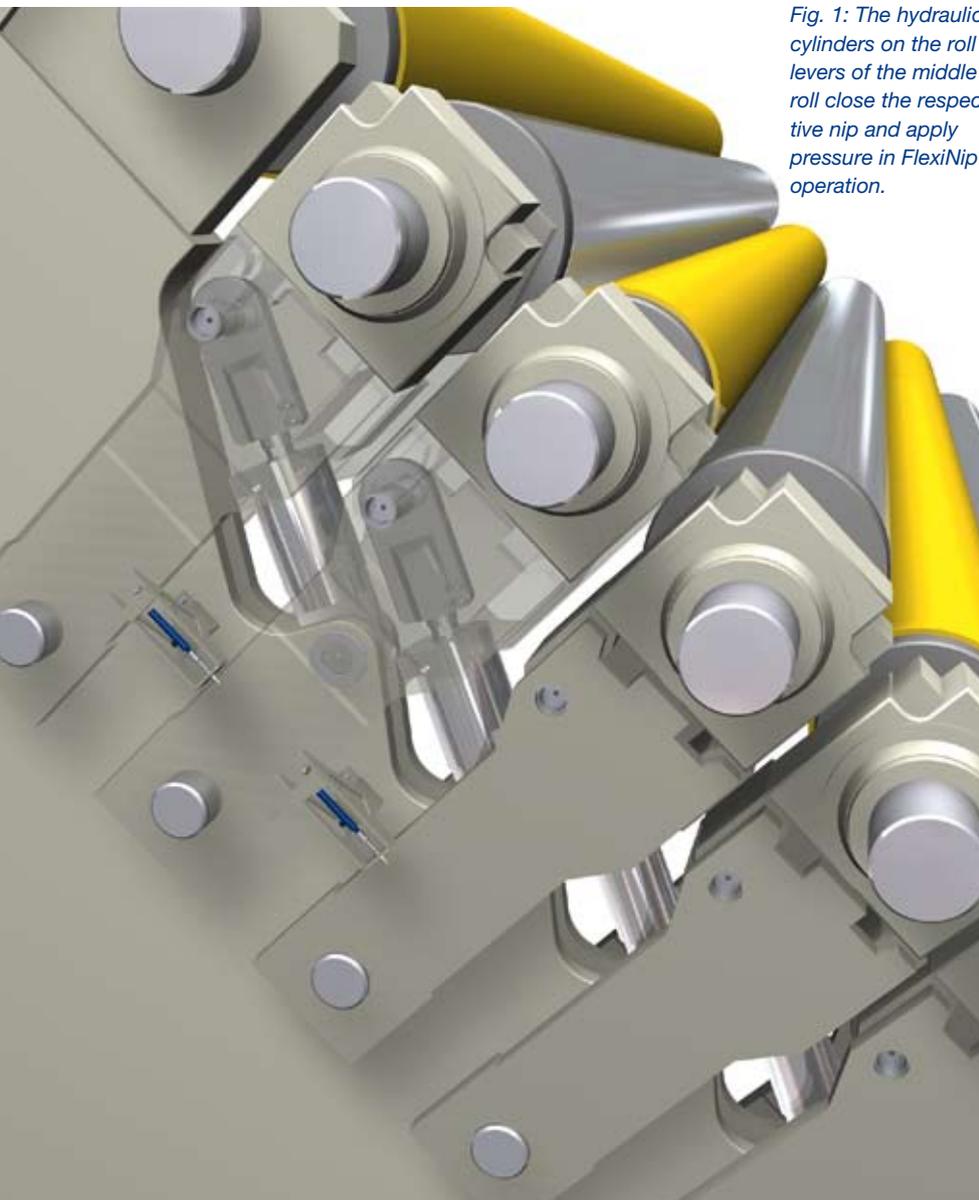
Due to the higher thermal shock resistance of the coating in comparison to oxide ceramic materials, >>> micro-lining is reduced to a minimum.

Produce different paper grades on one calender

## FlexiNip concept in the Janus MK2 calender increases flexibility

The demands placed on multi-roll calenders are becoming ever more complex. Apart from augmenting speed and working widths, there are increasing demands for the capability to produce different paper grades on one calender. To meet these demands Voith Paper has developed the FlexiNip concept.

*Fig. 1: The hydraulic cylinders on the roll levers of the middle roll close the respective nip and apply pressure in FlexiNip operation.*



In the case of wood-free coated papers, for example, the new concept enables matte and satin finishes to be produced in addition to high-gloss grades. In the case of uncoated papers, newsprint or improved newsprint can be produced in addition to SC qualities (SC-A, SC-B). This is in line with market requirements.

### The correct production mix is crucial

Single-nip operation in a Janus calender is already well established as a fixed concept. The first Janus MK2 calender of this kind was supplied to Myllykoski in Ettringen, Germany for its PM 5 in 1999. It offers the option to produce standard newsprint, in addition to SC grades, in either the very top or very bottom calender nip.

Double-sided calendering is achieved by simultaneously closing the top and bottom nip. The roll nips not used stay open. In the case of paper machines with online calenders, the web run is not changed in this process, i.e. the web runs through both the closed and open nips of the roll stack. In offline calenders, on the other hand, the open nips are bypassed (Fig. 2).

Using the example of wood-free coated papers, Figure 3 shows the quality range that can be achieved with a 10-roll Janus MK2 compared with single nip operation in the top and bottom nip. It is clear that papers with gloss values between 35-55 gloss points cannot be produced. Paper grades calendered with 10 rolls are too glossy. Those paper grades

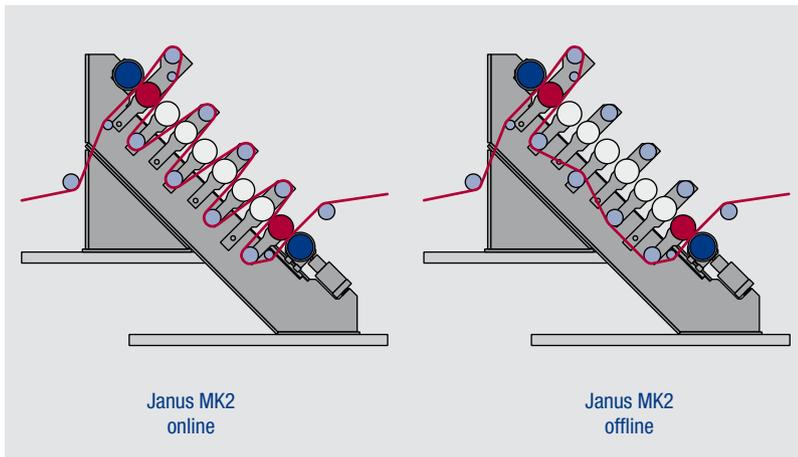


Fig. 2: Unlike online installations, the open nips are bypassed in offline calendars.

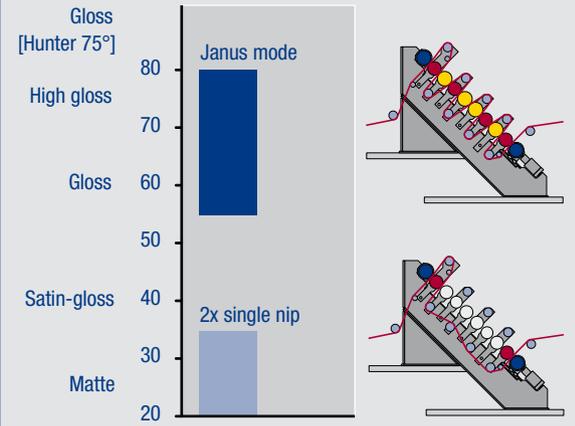


Fig. 3: Matte qualities are also achievable using the 2x single nip mode.

that run through only two very lightly loaded single nips naturally remain very matte.

**Maximize potential**

Voith Paper has systematically extended the concept for using single nips in the roll stack. The latest generation of Janus MK2 calendars opens up the possibility of closing either single nip, 2x single nip,

2x double nip or 2x3 nips – this is the FlexiNip concept (Fig. 4).

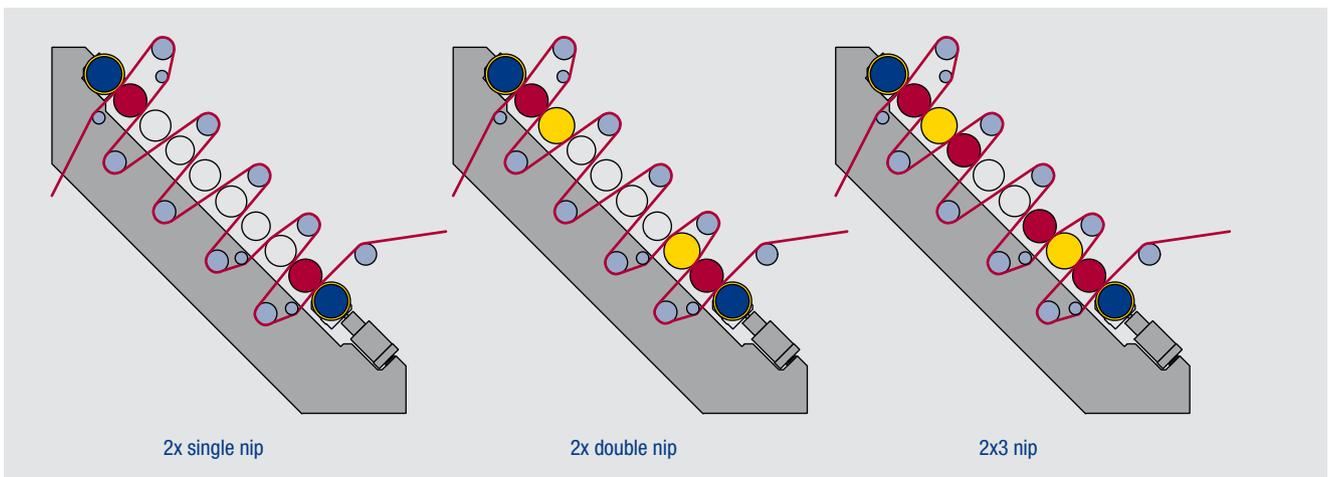
The number of nips for influencing the top and bottom side of the paper can be combined as required. For example, in the case of a strong, double-sided paper in extreme circumstances the top side of the web could be calendered with three nips closed and the bottom side with only one nip closed, and vice-

versa. This clearly demonstrates that this concept is truly worthy of its “FlexiNip” name.

**Simple functioning principle**

Figure 1 shows how individual nips in the roll stack can be used separately. Hydraulic cylinders are installed on all roll levers to compensate the weights of the respective rolls in Janus operation.

Fig. 4: The number of nips used can be selected according to paper quality.



Customer	Number of rolls	Date of delivery	Operation mode single nip
Mylykoski – Ettringen PM 5	8	1999	single nip top single nip bottom
Mylykoski – Alsip PM 1	8	2001	single nip bottom
Leipa Schwedt PM 4	10	2004	single nip bottom
APP – Dagang PM 3 (two Offline-Janus MK2)	10	2005	2x single nip
Daio Mishima PM 10	10	2007	2x single nip
Stora Enso Huatai PM 6	8	2007	2x single nip
Bhigwan PM 2	10	2008	2x single nip
APP Hainan PM 2 (two Offline-Janus MK2)	10	2009	2x single nip

Fig. 5: The single nip mode has already been realized in the installations listed above.

Customer	Numbers of rolls	Date of delivery	Operation mode single nip
N.N. North America	7	2007	1x single nip 1x double nip
Oji Nantong PM 1 (two Offline-Janus MK2)	10	2009	2x single nip 2x double nip
Shouguang Mei Lun Paper PM 6 (two Offline-Janus MK2)	10	2010	2x single nip 2x double nip 2x3 nip
Donghae PM 1 (two Offline-Janus MK2)	10	2010	2x single nip 2x double nip

Fig. 6: Four customers have already ordered a Janus MK2 calender with FlexiNip.

In FlexiNip operation these lever cylinders also perform the function of closing the respective nip and applying pressure. Optionally, one, two or three nips can be closed in the upper and lower roll positions. Position sensors on the levers control the movements of the rolls. As a component of the NipProtect system, a quick-release function prevents damage to rolls, e.g. after a web break.

A production change can be done simply and quickly, as every FlexiNip variant needed can be selected via a preset control program.

**Reap the benefits**

The Janus MK2 with FlexiNip concept covers the entire range of different paper grades in a calender and is therefore also ideally suited to meeting changing market conditions and product requirements. The desired paper quality can be achieved in every paper segment by choosing

the correct number of nips. The diagram in Figure 7 shows at a glance the operating modes that are now possible thanks to FlexiNip. Where blocks overlap the operator can choose whether to work with the lower instead of the higher number of nips. In addition, energy costs can be reduced with this targeted use of the required number of nips. This

extra flexibility – “quality-driven” versus “cost-driven” operation – is an additional benefit offered by the FlexiNip concept.

This means that the FlexiNip concept in the Janus MK2 calender represents maximum flexibility with quality-driven and cost-driven use of the required roll nips.

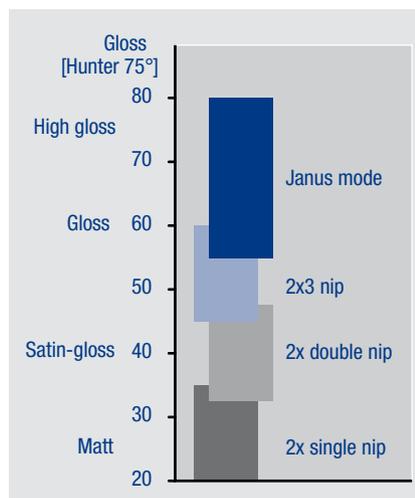


Fig. 7: Quality ranges made possible by FlexiNip.

**On Focus: FlexiNip concept**

- ProRunnability
- ProQuality
- ProEnvironment

Section: calender  
Width: all  
Paper grade: SC, LWC and WFC

**Contact**



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VariFit – a new member of the Voith winder family

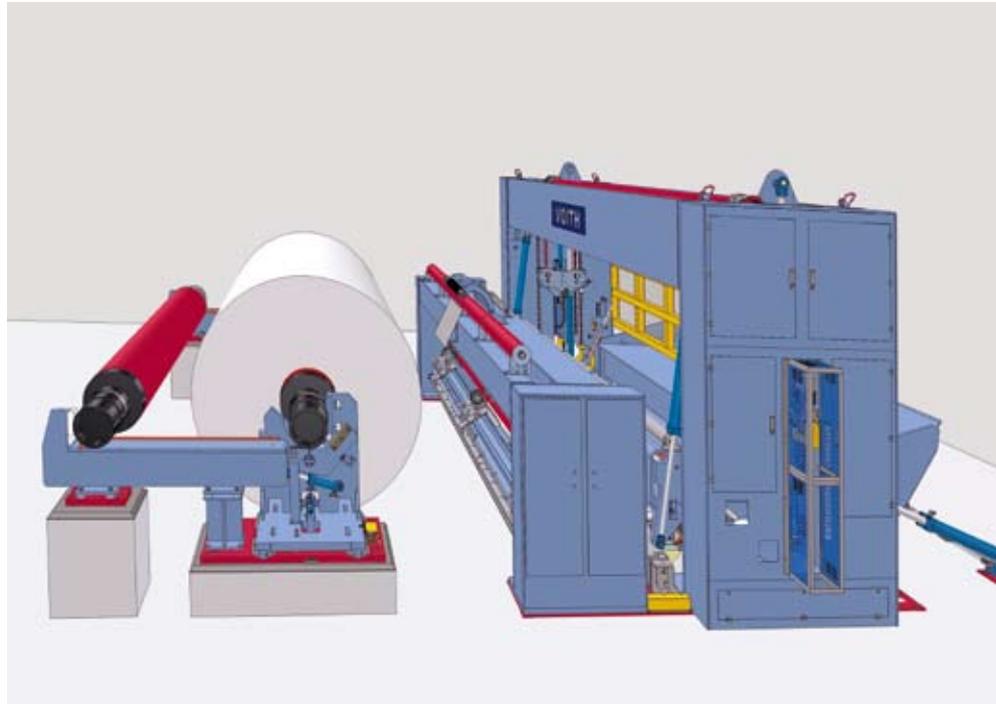
## The highest roll quality for all paper grades

**The new VariFit winder ideally meets customer requirements: Both technically and economically, it's the perfect solution for every application. Designed for a maximum width of 6.6 m at a design speed of 2,800 m/min, it ensures the highest roll quality for all paper grades.**

Winders are the last link in paper manufacturing. They have the important task of slitting the paper web produced in a PM that is often several hundred meters long into individual webs while maintaining the quality and winding them up into finished rolls. The finished roll must in turn meet the requirements for downstream processes such as those of printing plants, sheet cutters or other machines for further processing.

With the VariTop and VariPlus single-drum winders in the high-end range, Voith has a leading position in the market, especially for very wide and fast production lines. This is evidenced by a market share of over 60% in the last five years. But also in the case of wide and fast two drum winders, Voith has an outstanding position in the market with the VariFlex, as evidenced by twelve reference machines over 7 m in width delivered in the last five years.

Such impressive numbers were and are, of course, not possible without constant further development. In the most recent period, they are particularly concentrated in the area of narrow and medium-wide two drum winders up to ca. 7 m in width. By overall volume, it is by far the



3-D model of VariFit.

largest sales market in which there are many suppliers. In addition, the requirements of this market segment in particular are extremely varied: both simple and high-end applications are in demand, and of course all at reasonable investment costs. The aim of the development work mentioned was also a 'Perfect Fit' solution for every imaginable application.

The result is the VariFit, the latest member of the Voith Paper winder family, designed for a

maximum width of 6.6 m at a design speed of 2.800 m/min. Conceived on the basis of the successful VariFlex, the VariFit ensures the best roll quality for all paper grades that can be wound according to the two-drum principle.

### The modular nature of the VariFit

Liner, corrugating medium, board and wood-free uncoated paper are conventionally wound with steel winder drums. However, grades such as newsprint, SC, MWC, LWC, coated board,

wood-free coated paper and special applications are processed using soft winder drum coverings.

Here the VariFit makes use of over ten years of field experience with more than 200 soft covered winder drums installed, as well as in-house cover production and development. Of course, the modular structure of the VariFit is not limited solely to the winder drum covers, but instead is continued with the machine and functional concept. This ensures that a winder concept tailored to the most varied customer requirements can be offered.

On the basis of the compact design, with a small footprint, the VariFit is suitable for both new production lines and rebuilds.

**Fast functions for the highest productivity**

The VariFit is distinguished by the highest productivity. Downtimes in

which the winder is unproductive are shortened, while performance during the productive phase is increased.

The VariFit achieves this by means of extremely fast and reliable functions during, e.g., change of finished rolls and knife positioning in combination with optimized acceleration and deceleration rates and a high production speed, thanks to the robust machine design.

**Automatic finished roll change – fast and reliable**

With the development of the VariFit, all functions and components were carefully examined in respect of design, manufacturing, assembly and start-up. In many places it was possible to simplify functions or components, but without having to make trade-offs with regard to quality and reliability. But also many functions and components that have been proven over the years were fully

incorporated, such as the Truset automatic knife positioning system used in all winder types. It guarantees short positioning times with high positioning accuracy. However, the highlight is an innovation in what is probably the most important automatic function of an efficient two drum winder – the automatic finished roll change. This, the heart of a winder, should be as fast and reliable as possible. In the VariFit, during operation, glue will be applied in cross direction onto a specially coated roll for start gluing and, alternatively, also for end gluing using only one nozzle. In addition, the roll is equipped with a perforating knife.

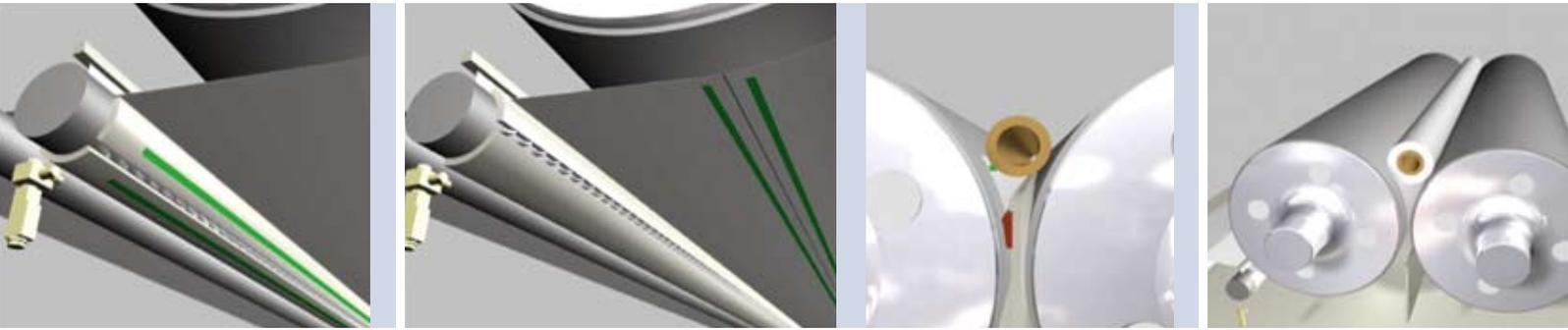
In the deceleration phase, before a finished roll change, the glue will be transferred without residue from the roll onto the paper. At the same time, the paper web is weakened with a degree of perforation that is specific to each paper grade. By ejecting the finished rolls the web breaks at the perforation.



*The VariFit team during assembly and preliminary start-up in São Paulo, Brazil.*



*Development of the automatic set change at the pilot winder in Krefeld. From left to right: Christian Pringal, Technology; Marco Peters and Michael Schmitz, Technology Center and Hubert Brand, Development.*



Sequences of the automatic set change by means of combined gluing and perforation.

The gluing and perforating functions don't cause any downtimes, since they take place within the deceleration phase. This development relies partly on already proven technologies, which were combined in a new way. Web perforation had already been successfully used previously in several Voith winder types. Also the hot glue, specifically developed by Voith Paper for winders, meets all requirements for this application. Thus, an ingeniously simple and fast automatic set change came into being, that consists of only a few components and will set standards in this segment.

**Machine and drive control**

The control system of the VariFit is, according to the construction of the machine, modularly designed and part of the Voith Paper Automation concept for machine controls. For the control and operating system, maintenance- and user-friendliness are the main concerns. For this reason, all functions, calculations and positioning procedures are calculated and carried out by the programmable logic controller (PLC). This means for the customer an

open system in which the number of interfaces is minimized, and maintenance and fault diagnosis are simplified. The control system of the VariFit is scalable so that different degrees of the machine's automation, interfaces to external systems and customer requirements can easily be displayed.

The control of the main drives is likewise part of the VariFit concept, whereby Voith Paper has the responsibility for machine and drive control.

**Assembly and start-up**

In order to ensure quick and easy assembly and start-up for the customer, the VariFit is already completely assembled in the Voith Paper workshops and started up in advance. Complete machine sections such as the slitter station and winding station are delivered in one piece and can be assembled as quickly as possible.

The first references or current orders in Brazil, Spain, India and China show that the VariFit is finding admirers all over the world. This

success has to do with the fact that decades of winder experience at Voith locations in different markets were incorporated in the development of the VariFit.

**On Focus: VariFit**

ProRunnability	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
ProQuality	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>
ProSpeed	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
ProSpace	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Section: winder  
Width: max. 6,6 m  
Paper grade: all

**Contact**



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Complete maintenance package from one source reduces costs

## How to save on servicing or: making three go into one ...

For an automation system to function reliably over a long period, it has to be serviced regularly. The more interfaces there are between different suppliers, the more difficult and more expensive the servicing becomes for the paper mill. This is why Voith Paper Automation developed its "No Worries" complete service package, offering a comprehensive service for all installed automation components.

Three desks, three computers, three people: If your automation system has come from various suppliers, this generally also means that you have different service partners. Depending on which product needs servicing a different company is responsible. This not only leads to a considerable need for consultation and to unutilized synergy effects, it also results in high servicing costs. When there are several comprehensive service agreements in place that guarantee complete support by a service specialist on site, the personnel often can't be deployed efficiently. In addition, this entails

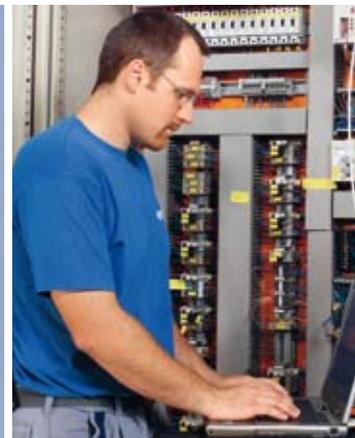
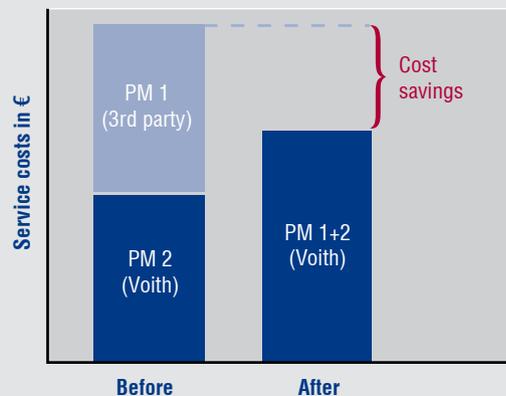
increased incidental costs, for example on infrastructure.

### 3rd party systems completely integrated

A much better scenario is a paper mill pooling its servicing requirements and entrusting them to one supplier that can also carry out an optimum service on the systems of other vendors. A prerequisite for this is corresponding specialist know-how about the various automation systems and sound knowledge of the papermaking process. Therefore, Voith Paper offers its customers a service package

Expert Voith service specialists guarantee optimum maintenance.

By pooling all servicing requirements and entrusting them to Voith, the paper manufacturer enjoys considerable cost savings.



including not only maintenance of Voith installed components but also servicing of the automation products of other suppliers. Regardless of whether the automation is installed on the same machine or another paper, coating or board machine in the mill – the servicing of the entire automation can be covered by one contractual partner. For the papermaker this holistic approach represents both a financial and a technological improvement. As only one company is responsible for servicing this generally means that fewer service specialists are necessary on site, and those that are there can now be deployed to full capacity. This can considerably reduce servicing costs. In addition, opting for one company to be responsible for servicing means that this company has a good overview of all installed systems and can analyze optimization potential from stock preparation through to winding, while implementing these measures in the best possible way for the benefit of the paper manufacturer.

### Service finances replacements

However, even if it is expertly serviced, an automation system will still

age and will have to be replaced at some point. Due to technical advancements and the worsening situation regarding the supply of spare parts, it makes sense to completely replace a quality control system, for example, after around 15 years. In order to find the best solution when investing in a new system, it is crucial for paper manufacturers to incorporate into their considerations the service concept offered. Especially in the case of paper mills with several machines this can become expensive in the long term due to different service contracts concluded separately. A holistic approach is recommended when an investment is imminent. Voith Paper Automation has developed a cost model especially for this situation. It is based on the expansion of an existing partnership and is lucrative for the paper manufacturer in many respects.

*... this means reduced coordinating effort, only one company to deal with and drastically lower costs.*

For example, if two paper machines are running in a mill, one of which already has an automation system from Voith including service contract, there is enormous potential for synergy when replacing the third party system installed in the second machine. Thanks to the long-term structure of the service concept, the investment in a new Voith quality control system will have paid for itself within three to five years. This is made possible on the one hand by the absence of service costs during the warranty period and on the other, due to the subsequently reduced expenditure on the maintenance of both machines.

Instead of two different products with two different service providers, the two machines are now serviced extremely efficiently by one company. This makes better use of the capacity of the service personnel deployed, reduces interfaces and simplifies spare parts inventory due to standardized technology. For the customer this means less time spent on coordination, only one company to deal with and above all, drastically reduced costs. In addition, by replacing the old system the customer obtains a new, technologically impressive automation solution with which to secure competitiveness. As soon as the new installation has paid for itself the customer immediately saves costs – a saving that carries on through the years.

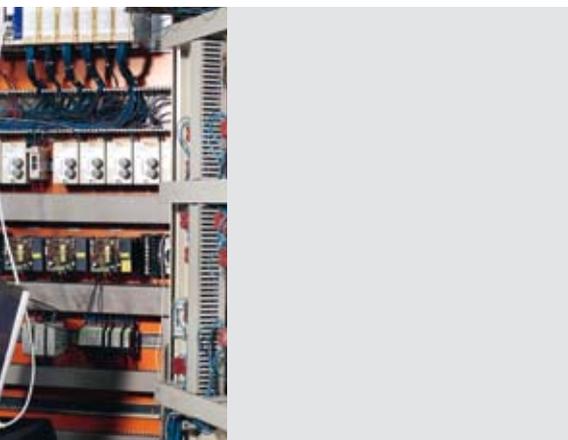
Voith's new service concept has a modular structure and can be adapted

flexibly to different requirements. Various financing concepts are offered so that, for example, by entering a long-term relationship with one service partner, the investment amount for the new system can be eliminated. The concept can be extended to as many machines as required and can also be implemented by combining several customers in one region.

#### Contact



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*Nansha is focusing on high quality service like bearing inspection, ultrasonic inspection of a roll cover and suction roll service.*

**Saving energy and increasing paper quality**

## New Service Center in China

**As the most modern Roll Service Center, Nansha offers high quality roll covers and services to ensure a reliable and fast service to the paper industry in the South of China. Together with Voith Paper's two existing service centers operating in Dongying, Shandong province in North China and in Kunshan, Jiangsu province in Central China, the Nansha site has been set up to complete and complement a well-covered service network in China.**

On Oct 1, 2009, Voith Paper's third service center in China, Nansha District, Guangzhou City, Guangdong province was opened. The new service center is designed for producing highest technology roll covers and is capable of providing services for the widest and heaviest rolls installed in

the region. The machinery can deal with the upcoming biggest paper machine in the world – APP Hainan Jinhai PM2 with total roll lengths of up to 16 meters.

"In Nansha, our customers can obtain one-stop services for whatever is

needed in the field of fabrics, roll covers, doctor blades and roll service as well as additional and specialized products and services. Nansha is an express service center that delivers Voith Paper's paper technology to our customers," commented Adam Moran, Vice President Sales Voith

*“In Nansha, our customers can obtain one-stop services for whatever is needed in the field of fabrics, roll covers, doctor blades and roll service as well as additional and specialised products and services.”*

Adam Moran, Vice President Sales Asia Voith Paper Fabric & Roll Systems Division



Paper Fabric & Roll Systems Asia. The strategic location of this new service center offers excellent logistical access to the fast developing Southern Chinese Paper Industry, including the largest producers located in the South such as B&P producers Nine Dragons, Lee & Man, as well as Graphic paper producers APP Hainan Jinhai Pulp & Paper, Guangzhou Paper, Yueyang Tiger Forest Group to name just a few. Voith Paper can offer more flexibility to the paper industry with a perfect geographic footprint of its service centers throughout the region. Especially in times of global competition when paper mills demand less spare parts inventories, and therefore

shorter turnaround times, Nansha will become an important supporting pillar for the paper industry in South China and internationally.

#### **Dedicated roll specialists**

Besides the state-of-the-art production facilities, a talented service team is committed to serve the paper mills 365 days per year, 7 days per week and 24 hours per day. During the early stages of construction, highly talented employees were recruited for key positions and sent for extensive technical training at Voith Paper's Kunshan plant. This ensured the same quality standards could be maintained for the very first roll cover

as Voith Paper provides in all other service centers worldwide. A dedicated team of 35 persons at the start-up stage will serve the paper mills. The focus will be on paper machine uptime savings, machine runability improvements and paper quality enhancements, leading to high paper quality, energy savings, measurable cost advantages and reducing Total Cost of Ownership or the paper mills.

#### **Contact**



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Breakthrough in caliper measurement

## Non-contact sensor gentle on paper

**Marks, holes, breaks – the contact between caliper sensor and web can often impair paper quality. Now, for the very first time, a sensor has been developed that measures accurately without any contact whatsoever.**



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*Put an end to marks and holes in paper:  
Voith LSC QuantumSens  
measures entirely without contact.*

It is virtually impossible to conceive of modern papermaking without the online analysis of caliper or paper thickness. Until now, paper manufacturers have had to resort to contact-type measuring methods if they needed to obtain accurate data. With these methods one sensing element above and one below the web contact it from both sides. The caliper results from the distance between the two sensing elements. The advantage of this method is a very high measuring accuracy, which has not been achievable to date using alternative solutions.

### **Risky contact**

The limitations of this measuring technique, however, are inherent in the contact itself. An ideal balance has to be achieved between stronger contact pressure with high measuring accuracy and lower contact pressure but significantly reduced accuracy.

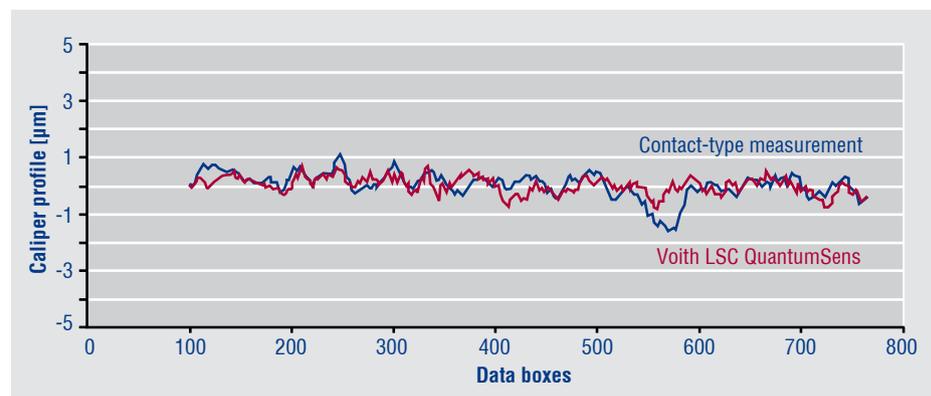
If the papermaker wants as accurate a measurement as possible, damage to the paper during the measurement due to contact with the sensor has to be expected. In coated papers in particular, this is seen in undesirable markings left in the paper by the sensor or by holes that can appear

in the paper. In the worst case scenario these holes can even cause a web break.

The sensor does not emerge unscathed from its permanent contact with paper running at speeds of up to 120 km/h. Even after a relatively short time, permanent deposits form on the sensor's contact surfaces. These have to be removed regularly by operating personnel. If the sensor is not cleaned its measuring accuracy will be substantially impaired. In addition, the contact surfaces of the sensor have a limited service life due to the high mechanical load. The use of contact-type caliper measurement is therefore not the ideal solution, particularly for low grammage paper grades. The paper manufacturer has to

contend with higher scrap production, increased manpower requirements and higher costs for spare parts. In addition there are some applications where contact with the paper cannot be tolerated, for example in the case of high-gloss papers. Until now, this has meant that an online caliper measurement has had to be dispensed with completely in such circumstances.

Due to the drawbacks of contact-type caliper measurement, paper manufacturers have been calling for an alternative measuring method, a completely non-contact measurement. However, all completely non-contact options available to date substantially reduce measuring accuracy and therefore are not suitable for all applications, such as thin, graphical papers.



*High accuracy: The new Voith LSC QuantumSens also impresses in a direct comparison with conventional, contact-type caliper measurement.*



*The Voith LSC QuantumSens makes possible, for the first time, a completely reliable and at the same time extremely accurate measurement of caliper.*

### Non-contact precision

The new Voith LSC QuantumSens is now the first caliper sensor that not only measures completely without contact but can also match the most accurate sensors on the market in terms of measuring resolution. When installed on a paper machine it works with a resolution of around 0.1  $\mu\text{m}$ , equivalent to about 0.1% of the thickness of a human hair.

The high accuracy is achieved by means of optical measurement using completely innovative components known as 'superluminescent diodes' (SLDs). These high-tech light sources offer considerably improved measurement compared with the laser diodes used by other manufacturers, which have limited accuracy due to interference effects caused by the coherent light.

The QuantumSens uses almost microscopically small optics to measure the respective distance between sensor and paper surface from both sides. In order to establish the caliper, the distance between the two sensors is also measured. The difference between these two measurements corresponds to the caliper.

### Air cushions provide stability

A decisive factor for the high accuracy of the caliper measurement is the stabilization of the web as it runs between the two sensor blocks. If the paper is not completely flat, but tilts in the measuring gap, it is difficult for the sensor to determine whether it is really the caliper or just the position of the paper that has changed.

Therefore QuantumSens relies on a patented stabilization technology, proven over many years, that uses air cushions on both sides. These air cushions form on both sides of the paper, holding it firmly in place and thus substantially reducing the potential for measuring errors. However, if there is a slight tilting of the paper, this will automatically be corrected by the intelligent software used.

### In-sensor processing

The measured values are digitized within the sensor. This allows an enormous amount of data to be included, and also the recording of as many side-effects as possible, e.g. geometrical changes. With the help of these additional readings the

caliper measurement as such can be corrected with a great degree of accuracy. For the first time, a major part of the processing takes place directly in the sensor, in a 'field programmable gate array' (FPGA). This processor allows the parallel processing of data volumes on this scale. The already digitized and processed data can be transferred more quickly and securely.

As well as non-contact caliper measurement, a double-sided gloss measurement, integrated completely into the sensor, is available as an optional extra to QuantumSens. This also makes QuantumSens ideally suited for high-quality calender applications, where it replaces the combination of two gloss sensors and one caliper sensor, a configuration that is still common today. In 2010 Voith LSC QuantumSens will be available on the market for all graphical and specialty papers. Existing Voith LSC scanners can then also be easily retrofitted.

### Contact



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1st place in the national 'Young Researchers Competition'

## Successful inventors from Krefeld

**Voith Paper trainees Sarah Hinz, Stefanie Detges and Andreas Hampe developed an automatic cleaning system for the interior sleeve surfaces of paper machine rolls during their training in Krefeld. The idea has now won them 1st place in the national 'Young Researchers Competition'. It's a considerable achievement in their second year of training that even Chancellor Angela Merkel honored, with an invitation to Berlin.**

The trainees wanted to noticeably reduce physical and health impacts on technicians with their automatic cleaning system for interior sleeve surfaces. In addition, they aimed for a faster, more thorough and more cost-effective cleaning of the interior sleeve surfaces.

Previously, in order to clean the sleeve, an employee in protective clothing had to crawl through the entire sleeve and clean the interior surface by hand. Since harmful cleaning agents (e.g., cold cleaning solvents) are used and the vapors that arise are mostly trapped in the

sleeve area, wearing inhalation protection was previously necessary. The Krefeld trainees were able to make the topic clearly accessible to the judges with their model and triumph at the national finale in Osnabrück. The model also forms the basis for the planned industrial implementation.



*The successful inventor team with their model, from left to right: Sarah Hinz, Stefanie Detges and Andreas Hampe.*



*Beaming winners in front of the Eisenhof guest house. Dr. Hubert Lienhard, Chairman of the Board of Voith, had invited the three technology champions to Heidenheim. Front row, from left to right: Andreas Hampe, Stefanie Detges, Dr. Hubert Lienhard, Sarah Hinz; back row, from left to right: Heinz-Friedrich Kammen, Training Director at Krefeld, Dr. Hans-Peter Sollinger, Chairman of Voith Paper, Dr. Hilmar Döring, Director of Personnel Management and Joachim Hinz, Director of the Calender Systems product area.*

## twogether reader survey 2010

Dear Readers,

In order to always align the twogether magazine with its diversity of topics with your requirements, we would like you to have your say. That's because we want to offer you a twogether magazine that is even more tailored to your wishes and preferences in the future.

To do this, we will carry out a random reader survey with a professional institute for empirical research at the

beginning of 2010. This survey will take place online and will only take a few minutes of your time. Let us know with just a few clicks which topics interest you, how helpful the twogether articles are for you, how you judge the quality of our technical papers and which topics you would like to read about in the future.

We will only contact selected twogether readers.

Participation of the survey is voluntary, but we would be very grateful for your collaboration and thank you in advance for your assistance. You can always let us know your opinion at any time by visiting [twogether.voithpaper@voith.com](mailto:twogether.voithpaper@voith.com) independently of this survey.

The twogether editorial staff



New 82-meter ferry on Lake Constance starting in 2010

## The ninth ferry with Voith Schneider propellers on target

Since the opening of the ferry connection between Constance and Meersburg on Lake Constance in September 1928, operating company Constance Public Services has built twelve ferries. Its 13th ship is currently under construction at the Bodan-Werft shipyard in Kressbronn. It will be the ninth ship driven with the proven Voith Schneider propellers (VSP). Starting in May 2010, the new ferry will push the largest ferry to date out of the way to take 1st place. Its sister ship, the striking 'Tábor' has held the title to date.

Both ships are equipped with identically constructed Voith Schneider propellers of the 21GII/110 size class. Even the 11th ferry – the 'Kreuzlingen' – is equipped with this type of propeller. In addition, the Constance Public Services have a reserve propeller for each of these three ships. Therefore, the downtime of the three ferries during service or maintenance work can be reduced. The new ship will be even longer than the 'Tábor'. While the 'Tábor' is 72 meters long, the new ferry will be 82.20 meters – a new record on Lake Constance. A name hasn't been chosen yet for the new giant. The two ferries are identical in width at 13 meters. In contrast to the 'Tábor' and 'Kreuzlingen', which have diesel-electric

drives, a diesel-mechanical drive was chosen for the new ferry.

During the preliminary stage of the project, intensive model tests were carried out by the Constance Public Services in collaboration with SVA (Vienna Model Basin) and Voith Turbo in Vienna. These tests will be key to facilitating a more ecologically-friendly operation of the ferry. A bulb at the bow and stern (they are identically constructed, since it is a double-end ferry) lowers the consumption of fuel. The ship is designed for 64 cars and 700 ferry passengers. Separate car and pedestrian tracks ensure that they can quickly get on and off the ship. The floors of the pedestrian tracks are heated during

the winter months to improve safety. The Constance-Meersburg ferry line currently carries over 4.3 million persons, 1.4 million cars and around 90,000 other commercial vehicles annually over Lake Constance. If these vehicles had to travel by land, around nine million more liters of fuel would be consumed annually. The fuel consumption of all ferries on this line is already included in this comparative calculation. The end result is a very positive environmental balance.

### Contact



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*The Constance-Meersburg ferry line carries over 4.3 million persons, 1.4 million cars and around 90,000 other commercial vehicles annually over Lake Constance.*



# Voith Paper

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