

twogether

Paper Technology Journal | Special Issue Specialty Papers

Leading technologies for specialty papers | Voith Paper offers customized solutions from banknotes to cigarette papers



Special Issue
Specialty Papers



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Cover picture

Tea bag paper is a special paper produced by the wet laid non-woven process.

You can learn more about wet laid nonwoven papers on page 38 ff.

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Germany
Land of Ideas



Official Partner

*Kurt Brandauer,
President Paper Machines.*



Dear customer, dear reader,

Specialty papers are both fascinating and versatile. This special issue of our “twogether” magazine is dedicated entirely to this paper sector. Voith Paper is heavily involved in the production of specialty papers and for decades has been developing new technologies and products to enable its more efficient and higher quality manufacture.

Our title story provides an insight into the current market situation of the nine specialty paper segments, and this special magazine issue is structured by type. Overall, specialty papers currently represent a lucrative growth market worldwide. As a leading vendor of specialty paper machines, we are dedicated to this market. Our comprehensive know-how allows us to meet the specific requirements imposed by each kind of specialty paper.

First of all, décor paper. You will read how décor paper is produced and what must happen to get laminate sheeting into the DIY stores. You can

also read about the latest advancements on making banknotes more counterfeit-proof, as well as the impact of cigarette paper on the taste of a cigarette.

In addition, we report about new technologies: such as, curtain coating. Voith Paper has refined the coating process so that it can also be used for labels and flexible packing papers.

This insight into current developments in specialty paper production is peppered with “brief cultural histories.” You will find out, for example, about the significance of the self-extinguishing cigarette and how adhesive tape was invented.

Have an interesting read!

Kurt Brandauer

On behalf of the Voith Paper Team





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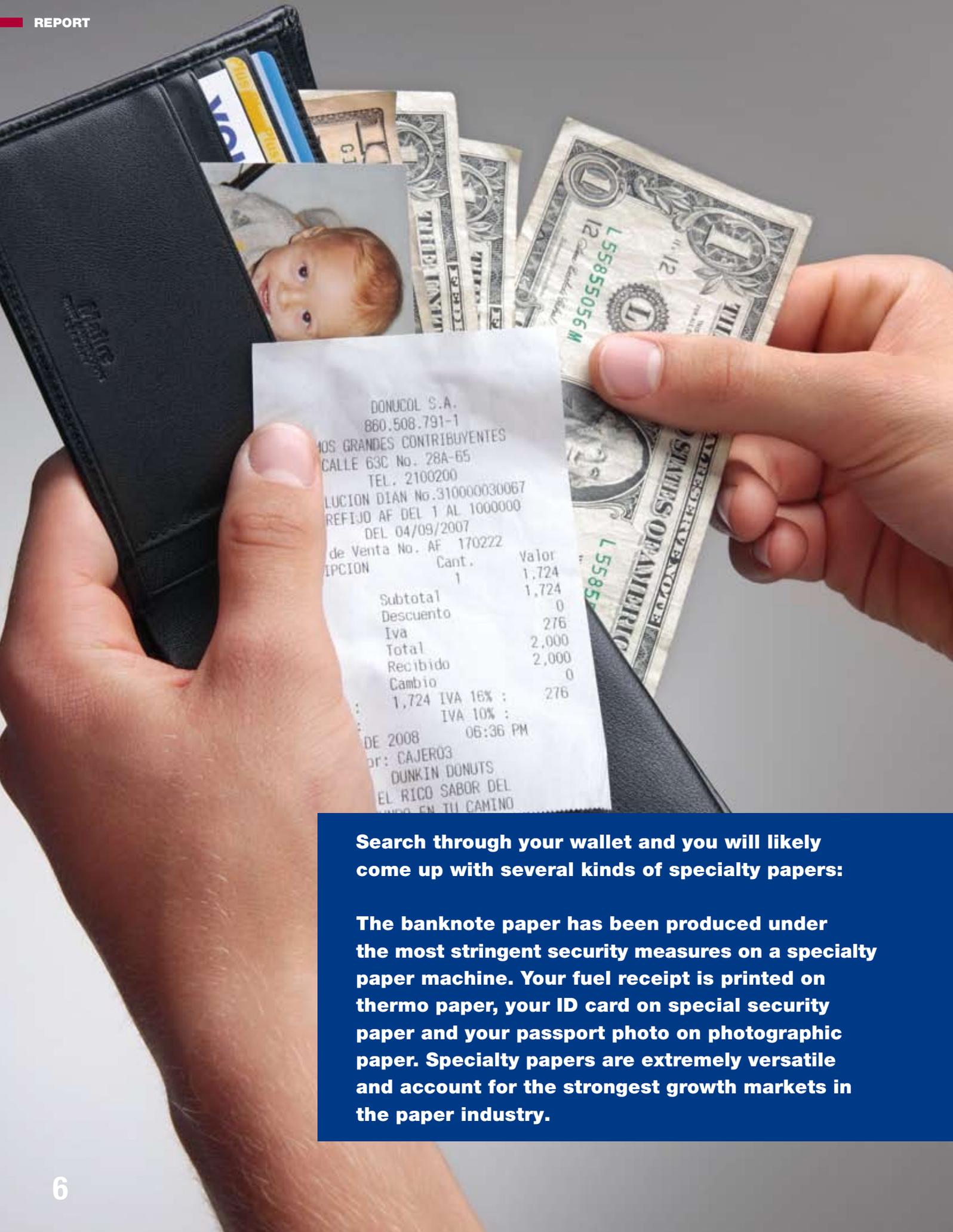
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Specialty papers – an expanding market worldwide





Search through your wallet and you will likely come up with several kinds of specialty papers:

The banknote paper has been produced under the most stringent security measures on a specialty paper machine. Your fuel receipt is printed on thermo paper, your ID card on special security paper and your passport photo on photographic paper. Specialty papers are extremely versatile and account for the strongest growth markets in the paper industry.

Paper machines not only produce mass paper, they also make paper for tea bags and gasoline filters, banknotes and bottle labels, wallpaper and décor coverings for furniture, and backing paper for vinyl wallpapers.

There are about 2,900 types of specialty paper worldwide that can be subdivided into nine segments depending on application and market sector. For example, as label and release papers have the same field of application they belong to the same segment, although the manufacturing process and quality criteria are different.

Other segments are décor paper and overlay, wet laid nonwovens and filter papers, photographic and digital imaging paper, non-carbon paper, thermo paper, security paper and paper for cigarettes. Lightweight, thin printing papers and MG paper belong to the ninth segment, miscellaneous paper types.

Good growth prospect

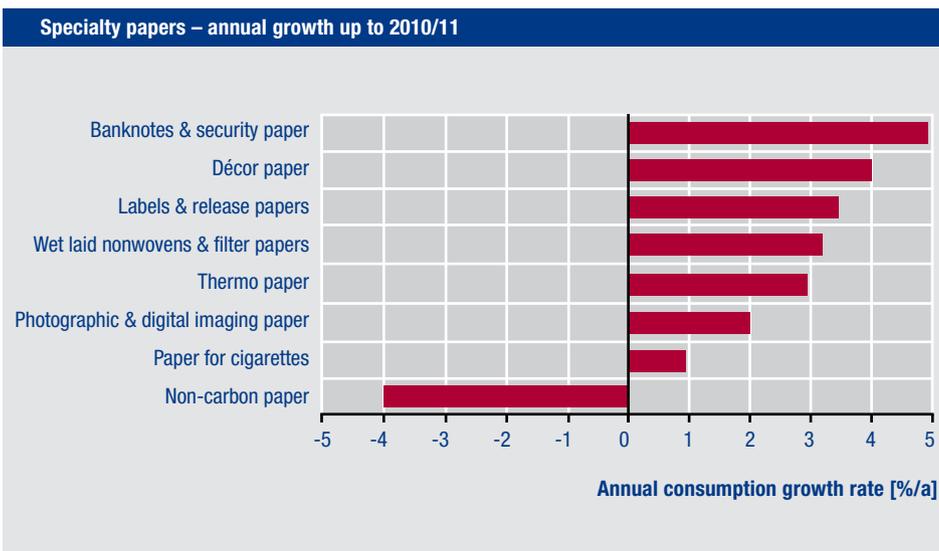
Every year more than 19 million metric tons of specialty papers are used – and this figure is likely to increase. For security papers the annual growth in consumption is almost five percent. The demand for established specialty papers is growing steadily, and the development of new varieties is running in high gear. One current research project, for example, is investigating papers for intelligent product labeling. This kind of marking could be used on supermarket shelves, for example, to show how fresh the meat in the packaging actually is. In up-and-coming economic regions the demand for filter papers is increasing, which explains why there is above average growth forecast for this segment, as well.

The group with the highest consumption is label and release papers at approximately three million metric tons worldwide. Almost all specialty paper segments exhibit positive growth



Checkout receipts are printed on thermo paper.

With the exception of non-carbon paper, specialty papers exhibit excellent growth potential.





*Memories on paper:
Worldwide consumption of
photographic and digital imaging
paper is around 1.3 million tons
per annum.*

rates. Only non-carbon papers show a downturn, although they currently represent the second largest segment. Every year a million metric tons each of thermo paper and photographic and digital imaging paper are produced. Wet laid non-wovens and filter papers total a hefty 1.5 million tons worldwide. Around 750,000 tons each of cigarette paper and décor paper are consumed. Banknotes, commercial and security papers account for almost 200,000 tons per annum. The remaining con-

sumption is in the ninth segment, of miscellaneous specialty papers.

The fact that the specialty paper segment accounts for only a total of five percent of total global paper consumption might lead to the view that these paper types are unappealing in business terms. However, compared with conventional papers, the specialty papers have a higher added-value with equivalent price level: Specialty papers account for 10 percent of the revenue from paper sales.

Cost efficiency in small batches

The peculiarities of specialty papers mean that the paper production machines have to meet stringent requirements. Generally, specialty papers are produced on narrow paper machines to minimize the change-over times and broke when switching to different grades of paper.

It is perfectly possible to have production batches of only one metric ton. For example, there are more paper machines producing securities than production plants for thermo papers, as the thermo papers are produced on wider, quicker paper machines due to their larger production batches.

By the way, the majority of the approximately 600 specialty paper machines worldwide produce paper for cigarettes. This is due to the historical market structure of this paper

segment, as well as these machines' versatility to also produce low basis weight printing papers – such as thin paper for bibles.

Voith Paper has specialized not only in paper machines for mass papers but also in the manufacture of specialty papers. Voith is active in all segments. Research and development in specialty papers is being pushed ahead in our research centers in Heidenheim, Düren and Ravensburg.

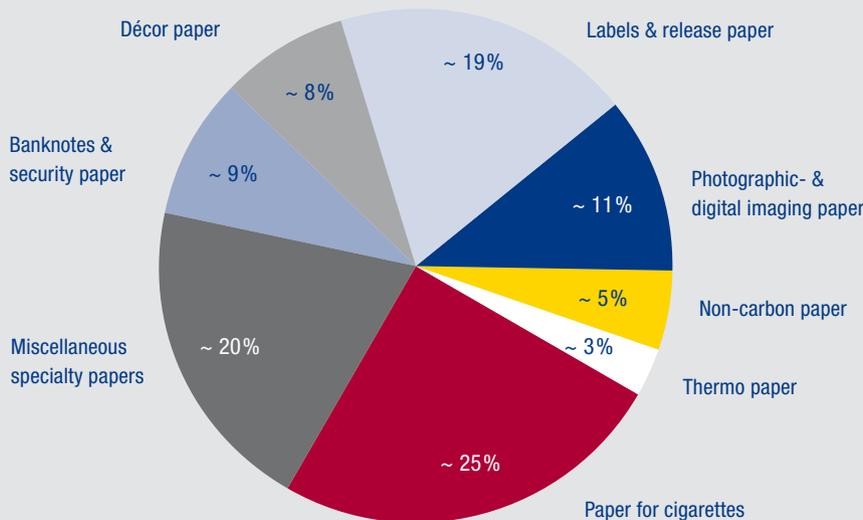
Contact



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Distribution of specialty papers according to number of paper machines (total around 600)



Tea bag paper is manufactured using the wet laid nonwoven process.



*“Our know-how supports
the success of our
customers in their segment!”*

*Dr. Jens Müller, Senior Vice President for Products & Services
in the Voith Paper Fiber & Environmental Solutions Division*

The specialty paper market imposes stringent requirements

Hand in hand with the customer to achieve market growth

The manufacture of specialty papers demands extensive know-how and many years of experience. Voith Paper produces paper machines for all kinds of specialty papers. In this interview, Dr. Jens Müller and Dr. Michael Trefz, experts on specialty papers at Voith Paper, talk about current growth potential and the effective application of products.



For almost five years Dr. Jens Müller was divisional manager for specialty papers at Voith Paper. On October 1, 2008 he was appointed Senior Vice President of Products & Services in the Voith Paper Fiber & Environmental Solutions Division. Dr. Müller's previous task will be assumed by Dr. Michael Trefz, up to now Head of Coating Technology. This means that Voith Paper is bringing the specialty paper and coating areas closer together, with the goal of achieving even more efficiency for our specialty paper clients.

twogether: Mr. Müller, on the whole, specialty papers are an up-and-coming market. What trends do you see for the near future?

Müller: The specifications for the manufacture of specialty papers are very sophisticated and specialized. This is why there are many highly specialized companies, often family owned, that focus on just a few kinds of paper. This is not likely to change. Expertise in the manufacture of specialty papers continues to be found mainly in Europe.

In recent years we generally observe that due to the expanding market in specialty papers some paper manuf-

acturers are converting their graphic paper machines to produce specialty papers. Although Asian countries have up to now generally produced commodity paper, such as graphic paper or packaging paper, I observe steady growth here, too.

twogether: In the papermaking industry Voith Paper is often regarded as a big company specializing in large paper plants. What expertise do you have to support specialty paper manufacturers?

Müller: Our engineers specialize in specialty paper machines. We have systematically dedicated ourselves to this sector since our inception.

This is why Voith Paper has the largest number of installed references for specialty papers worldwide. This market is very important to us, and we work with all paper plants, regardless of their production capacity and machine size. Specialty paper machines in particular have complex specifications that have to be met. Very often the challenges and the opportunity for extra added value are to be found in the coating technology. This is why I am absolutely delighted that with the appointment of Dr. Trefz we will be bringing the specialty paper and coating technology segments far closer than was previously the case.



“It is also one of our aims to make paper manufacture increasingly environmentally compatible and cost efficient. That applies in particular to the processing of high-quality specialty papers.”

Dr. Michael Trefz, Vice President for Specialty Papers at Voith Paper

Specialty paper manufacturers should focus on reducing their consumption of a number of raw materials: Energy, water and fibers.

Trefz: Our customers benefit from our extensive know-how. However, above all we take into account what our customers need and want. Together we are navigating the potentials of the respective paper machines, preparing precise budget plans and carrying out rebuilds. What is crucial is that in our case everything comes from one source, and we can access a solid base of knowledge and experience. That is our “powerhouse”. We use our products in a needs-based way and position new components to the best advantage of our customers.

twogether: Can you give an example for the effective application of products?

Müller: We always make sure that quality and process stability are in tune. For example, the curtain coater can simplify the paper manufacturing

process and save the cost of expensive coating color, while the quality of the coating improves. In this conjunction I would also like to mention the HydroFormer, an inclined wire former that has proven effective in the manufacture of wet laid nonwovens and highly porous, long-fiber filter papers. This is an ideal product for the expanding market in this sector. Opportunities include automotive filters, coffee filters, glass fibers as a base for bitumen boards and peel-off wallpapers, which are a mixture of long vinyl fibers and paper fibers. However, it is not just individual products that are important but improvement of the entire process. For example, we tailor the headbox and WEP (wet end process) to one another.

twogether: Many specialty paper manufacturers are considering how

they can make their production more efficient and more profitable. What do you recommend they do?

Müller: They should focus on reducing their consumption of raw materials:

Energy, water and fibers. In recent times the issue of energy in particular has become extremely important. We have to drastically reduce our previously high energy consumption in paper manufacturing. We have to reduce the use of fibers and replace them with less expensive alternatives. Recycled paper is not a realistic option, as specialty papers have to meet stringent requirements, i.e. automotive filter paper in terms of fiber length. It is absolutely essential to incorporate the treatment of water and waste material into our planning.



Dr. Michael Trefz, assumed responsibility for Specialty Papers on October 1, 2008.

Trefz: Voith Paper has established a separate business unit for the development of appropriate products for this purpose: Voith Paper Environmental Solutions. In addition, we offer our customers the opportunity to carry out trials in our Paper Technology Center (PTC) in Heidenheim and in the HydroFormer pilot line in Düren to verify specific optimization possibilities for their specialty paper machines.

twogether: What is the current order situation in your sector of specialty papers?

Müller: As the specialty paper market is an expanding one, the prospects are good. For specialty papers investments take place in proximity to the market. This means that our customers go where there is

market growth. And we go there, too. For example, the demand for gasoline filter papers in China and India is on the rise due to the increasing number of cars on the road and the emerging automobile industry in these countries. We have sales engineers all over the world visiting and advising our customers in person.

Trefz: We can mention quite specifically some interesting startups and orders this year. In the décor paper sector we won the order to convert a photographic paper machine to produce innovative décor papers. In Eastern Europe we are going to equip a paper manufacturer with a new installation for producing one-sided smooth papers. The most efficient machine for single-ply tea bag paper is now being designed in Germany. And in Scandinavia we

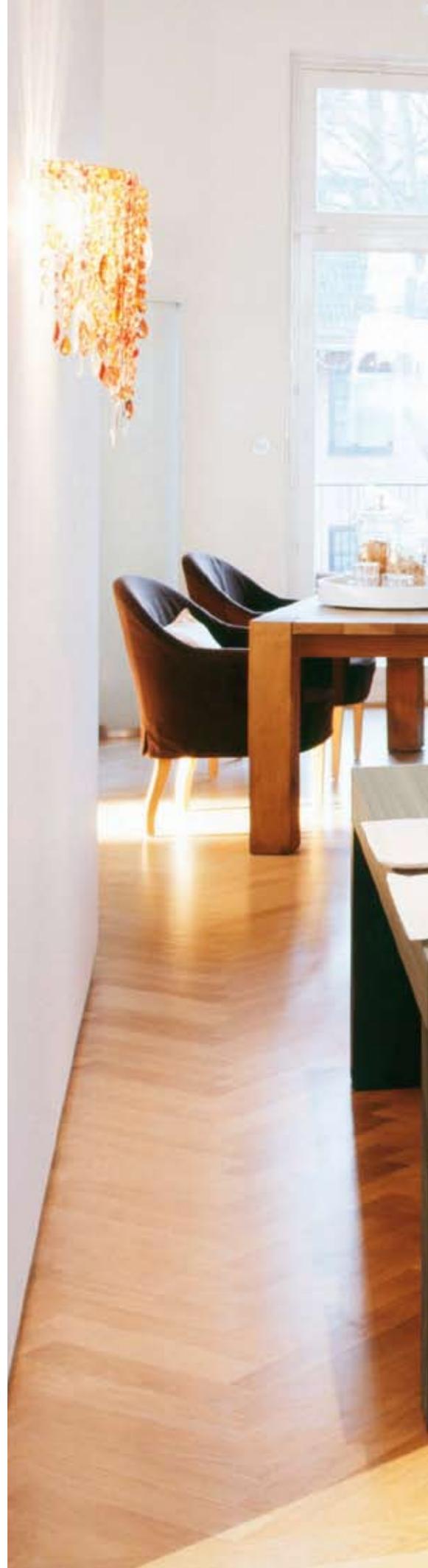
have commissioned a new system for one-sided smooth special packaging papers. In the plug wrap and cigarette paper sector, two of the machines supplied by us to Asia went into production this year.

twogether: Mr. Trefz, what goals and visions do you have for the future?

Trefz: We want to continue to deploy the entire spectrum of Voith Paper and our know-how to benefit our customers in the best possible way. Our customers should have the opportunity to be the market leader in their segments. With every new project, our goal is to find tailor-made solutions. It is also one of our aims to make paper manufacture increasingly environmentally compatible and cost efficient. And that also applies in particular to the processing of high-quality specialty papers.

There's a lot of paper in here!

You'd be surprised how much paper there is in your home. Décor papers and overlay papers are found in furniture surfaces, kitchen cabinet panels and laminate flooring.





The MasterJet F/B Headbox delivers optimum performance in the décor paper sector

Enhance quality with new technologies

Compared with graphic paper grades, décor and overlay papers have very special properties and need appropriate production machines. Voith Paper has developed technologies that not only enhance the quality of these specialty papers but also make their production more efficient. This includes the MasterJet F/B headbox and the new -EdgeModule edge feed-in system. Voith Paper's ModuleJet and the DuoShake ensure a perfect profile and improved formation of the paper. Voith Paper installed these technologies for a revamp at Munksjö Paper GmbH in Unterkochen. Since then the PM 3 has been one of the most productive décor paper machines.

“It is in those often overlooked specialty paper niches where new technological developments and trends can be spotted.”

Jan Lepper, Sales Engineer Specialty Papers, Voith Paper



Décor paper is used in the furniture industry for kitchen cabinet panels.



The PM 3 at Munksjö Paper GmbH in Unterkochen is one of the most productive décor paper machines.

Décor papers are characterized by very high, uniform dimensional stability. This means that they have to have very good CD and MD profiles. They need good smoothness on one side for good printability. Easy impregnability and a high resistance to mechanical and chemical loads are further properties of décor papers.

Décor papers are produced in very small batches at a machine speed of 250 to 800 m/min. This means that grade changes are the order of the day. The grades differ mainly in terms of ash content and color, with the result that the total system has to be cleaned after every color change. To keep these cleaning times as short as possible, the design of the entire system is focused on smallest possible volumes for piping and vats. The necessary extremely high opacity of the papers is achieved with a high proportion of titanium dioxide of up to 42 percent. Specialty paper machines for décor papers are generally produ-

ced on a width of up to 2.6 meters. However, the web width varies depending on the order specification, and it is not unusual to run webs on widths of only 1.6 meters for short periods. Even just this small selection of particular features shows that the production of décor paper necessitates special design and sophisticated machine concepts.

Intensive workshop on specialty papers

Recently Voith Paper has been inviting industry experts to workshops to discuss specific aspects of specialty paper manufacturing. As Jan Lepper, sales engineer for specialty papers, observes, "It is in those often overlooked specialty paper niches where new technological developments and trends can be spotted."

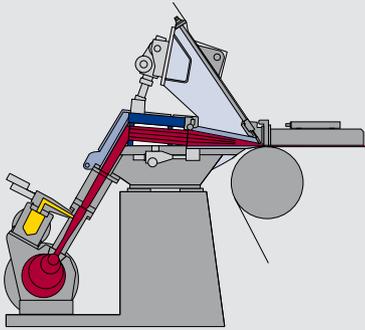
For example, experts from the décor paper industry gathered at Voith Paper in the spring of 2008 to attend

the intensive workshop on headbox technology for décor papers. Participants looked into the successful Voith Paper installations at Köhler in Kehl, Munksjö in Unterkochen and Felix Schoeller in Pensa.

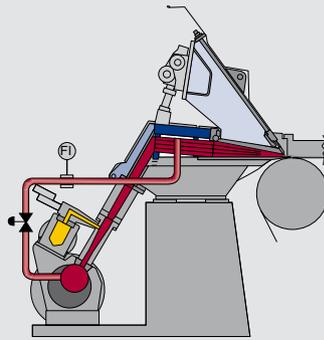
In terms of the headbox, the turbulence generation principle using rectifier rolls (RollJet K) was long considered the measure of all things in décor paper production. In recent years, however, the hydraulic headbox, particularly the Master Jet F/B developed by Voith Paper, has established itself as the technologically far superior solution. Consequently, this key element was the main topic at the décor papers workshop.

To discuss these trends the workshop participants also gained an insight into Voith Paper's R&D activities. This includes the PTC (Paper Technology Center) in Heidenheim, where the latest developments are tested at the large paper pilot plant. The décor

MasterJet F/B



EdgeModule



DuoShake



For décor paper machines Voith Paper uses the MasterJet headbox in conjunction with the EdgeModule edge feed-in system to achieve optimum fiber orientation at the web edge. The DuoShake shaker ensures a particularly homogeneous distribution of the fibers in the sheet.

paper manufacturers in attendance were impressed by the system's research and investment potential, even if they did have a bit of a chuckle about the paper machine speed: "2,400 meters per minute? We can manage that too – on the winder!"

Hydraulic headbox – proven technology with new features

In discussing the headbox, the customer workshop was picking up a central theme. After all, for papermakers it is considered to be the heart of the paper machine. Only by using a correctly designed, precision engineered and adjusted headbox, which applies the suspension evenly onto the fourdrinier wire, can important paper properties be maintained - for example, the CD basis weight profile, main fiber orientation, homogeneous formation and flatness of the paper. The MasterJet F/B headbox is a modern, flexible design from Voith Paper. Thanks to its special ribbed design for upper lip holder and table it does not need any components over the machine width apart from the upper and lower lip. The so-called C-clamp design princi-

ple also ensures minimal force transmission to the machine foundations by preventing the nozzle forces from being supported by the side walls. When upper and lower lip undergo thermal expansion, the geometry of the slice opening changes only slightly. There is no need for a complex heating system and heating chambers at the headbox.

In order to deflocculate the fiber suspension, the hydraulic headbox has to generate turbulence. This is done by passing the suspension through turbulence pipes with escalating diameter increments, the well known step diffuser. The resulting pressure shocks generate high shearing forces, which deflocculate the suspension. The high micro-turbulence in the MasterJet F/B headbox, allows optimum jet stability even at high speeds. For the greatest possible accessibility to the rear wall, the distributor pipe and the upper lip holder of the MasterJet can be opened over the width of the machine.

The EdgeModule edge feed-in system is an innovation for these paper grades and can be installed in new

MasterJet headboxes. With this EdgeModule, it is possible to adjust the volumetric flow of the suspension at the edges of the headbox to an optimum. The module thus allows the web edge, which is particularly critical for this grade, to be controlled. The control range of the EdgeModules is up to two meters towards the machine center. The main fiber orientation at the edge can be adjusted by up to eight degrees. The EdgeModule technology offers advantages for all grades of paper in which good fiber orientation is demanded. The EdgeModule is used on headboxes for fourdrinier, hybrid-former and gapformer paper machines and has already proven effective in practice, including in décor paper production.

ModuleJet guarantees optimum CD basis weight profile

Another crucial factor in décor paper production is controlling the CD basis weight profile according to the dilution water principle. This principle is not only applied for hydraulic headboxes, but also for the rectifier headboxes still found in older machines. Here,

Voith Paper offers the ModuleJet technology, which is also ideal for rebuilds. This dilution technology produces very good CD basis weight profiles with optimum fiber orientation (TSO – Tensile Strength Orientation), around 20 to 50 percent better than that achieved using the slice adjustment method. In addition, the system ensures stable web run, good flatness properties and improved productivity. Following a grade change a substantially shorter settling time is also achieved.

The heart of the ModuleJet is special valves, which inject low consistency white water by zones according to requirements. The dilution water is supplied to the valves via a cross flow header. It is mixed with the HC stock in the mixing chamber. A downstream throttle valve again ensures that the suspension is well mixed. Despite sensitive detection methods there is no evidence of an unequal ash CD profile resulting from the CD

consistency differences generated by the ModuleJet controls.

High shake frequencies with DuoShake

A shaking unit is used for décor papers to reduce the MD/CD ratio of the breaking length and to improve formation. Voith Paper has developed the DuoShake, in which the vibrating mass of the breast roll is counterbalanced with counterweights. This prevents forces being transferred into the machine foundation and allows larger strokes and higher shaking frequencies than were possible using conventional shaking units. The effect of the DuoShake was investigated using a sheet split analysis. On the basis of the main fiber angle and the anisotropy value (measure for the intensity of fiber orientation) Voith Paper determined in several investigations that the DuoShake generates a high turbulence particularly on the layer close to the wire. On the whole

this produces a far more homogeneous distribution of the fibers in the sheet.

Successful deployment at Munksjö Paper

Several Voith Paper components have been installed at the same time into the PM 3 for décor paper at Munksjö Paper GmbH in Unterkochen. Together with the existing DuoShake, the MasterJet F/B headbox now ensures excellent sheet formation. The MasterJet F/B is additionally fitted with an EdgeModule. The ModuleJet dilution technology guarantees excellent CD basis weight profiles. The automation system at the Unterkochen plant was also extensively rebuilt by Voith Paper Automation. This allows the best possible use of the profiling technology. As well as the robust OnQ scanner for precise measurement of profiles, the OnQ Profilmatic control software is also used. It controls the profiles with features

The MasterJet F/B headbox with ModuleJet and EdgeModule guarantees excellent profiles and balanced turbulences.



such as adaptive tuning and auto-mapping. In addition, the OnView platform allows a much better insight in the data collected on the PM 3. It enables the machine operators to react faster and more effectively to the process conditions.

Multi-layer sheet formation for overlay paper

To manufacture wear-resistant surfaces, such as flooring, a corundum-filled overlay paper is pressed together with an already impregnated décor paper and the panel, MDF-board or other substrate. This paper exhibits quite different properties from the décor paper and is produced using a different production technology.

Overlay paper consists of extremely long fibers, which makes it necessary to use a special sheet forming device with an inclined wire former, the so-called HydroFormer. Compared

with the production of décor paper, an extremely low headbox consistencies of 0.01 to 0.08 percent is necessary for overlay papers, resulting in a high throughput of 6,000 to 85,000 l/min*m. For comparison with décor paper production, the throughput at same width is 3 to 12 times lower (1,800 to 6,500 l/min*m). The pipe dimensions of the HydroFormer are correspondingly large.

For good wear resistance, as much corundum as possible needs to be bound into the sheet. To achieve this, Voith has developed multi-layer sheet formation for the HydroFormer. This technology requires three stock feed systems and a headbox with lamellas that keeps the layers separate until dewatering. Trials with colored fiber stock have shown that the layer separation works extremely well. The sheet structure can therefore be configured in individual layers with different properties. For example the middle layer can contain corundum.

Due to the fibers on top and bottom of the corundum layer, the embedded corundum is prevented from dissolving out of the compound during the subsequent processing. The increased corundum content provides the product with an extremely high wear resistance.

Contact

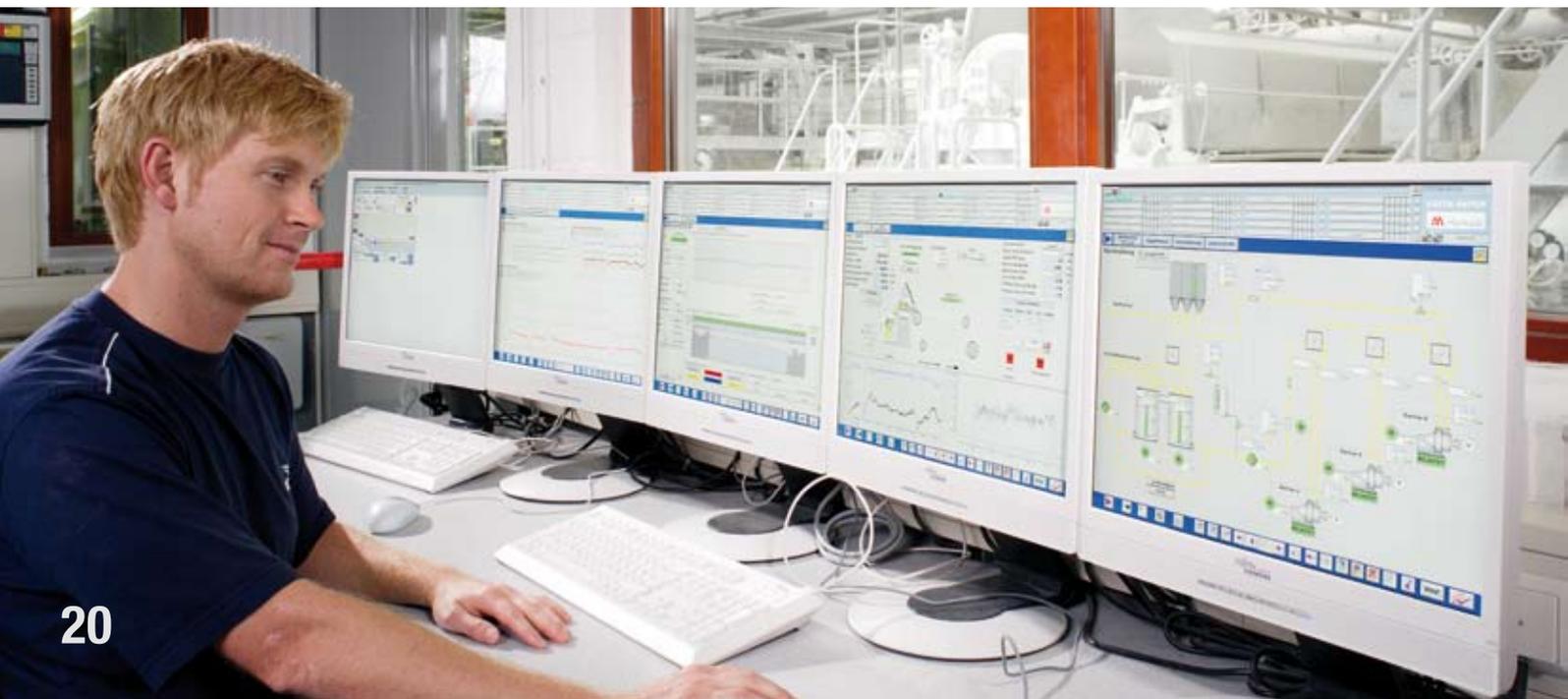


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At Munksjö Paper in Unterkochen all process parameters can be analyzed and adjusted quickly and easily using the OnView platform.



Voith Paper rolls are used for printing décor paper and pressing particle board

Laminate – from start to finish

The use of laminate is showing steady growth rates in the construction and furniture industries worldwide. But how are laminate floors and furniture finishes actually made? Several Voith Paper components are found in the process of making this popular design material. These components include the Nipco-Print-D impression roller system and the NipcoPanel system for grouting MDF and particle board.

*“In the various print phases,
NipcoPrint-D creates a result that is
always uniform and reproducible.”*

Leo Bisping, Spokesperson at Interprint

One component in laminate is décor paper, which is produced on special paper machines from Voith Paper.

Décor paper forms the basis for the manufacturing of laminate. “The highly opaque printing base paper serves as a carrier for the big variation of décorations that are applied later,” explains Reinhard Leigraf of Special Paper Technology at Voith Paper. Laminate is used not only for floors and furniture but also for the interior work in buildings and means of transport such as buses, trains, boats, aircraft and caravans. Décor paper is produced using paper machines made just for this

purpose or machines that have been rebuilt for this type of production. Voith Paper is an expert in both cases and has frequently converted existing paper machines for the production of décor paper. For example, Voith Paper delivered an entirely new décor paper machine to the Kehl-based paper producer August Koehler (see page 24 for more information about the partnership between Koehler and Voith Paper). The PM 6 was commissioned in 2000. The machine is 2,300 mm wide

and produces décor paper at a speed of up to 820 m/min. The basis weight of the paper produced ranges from 50 to 110 g/m². Up to 40,000 tons of décor paper is produced annually here. One of Koehler's purchasers is the Interprint décor printer with its headquarters in Arnsberg, Germany. Here the décor paper is printed using the gravure printing method. The designs are often replications of wood or stone patterns. Floral and graphical designs are also popular.

A Voith Paper component is also used in the printing process. The Nipco-Print-D impression roller system presses the paper web evenly against the inked gravure cylinder.

Gravure printing all the way to the edge

The gravure print cylinders are usually engraved electromechanically with a diamond graver. The laser graver is a new innovation, which Interprint has been using as the world's first and only décor printer since early 2006. This method uses a laser beam to create the recessed cells for the ink (also known as dots) on the surface of the cylinders.

A pattern generally consists of three different colors and is therefore printed

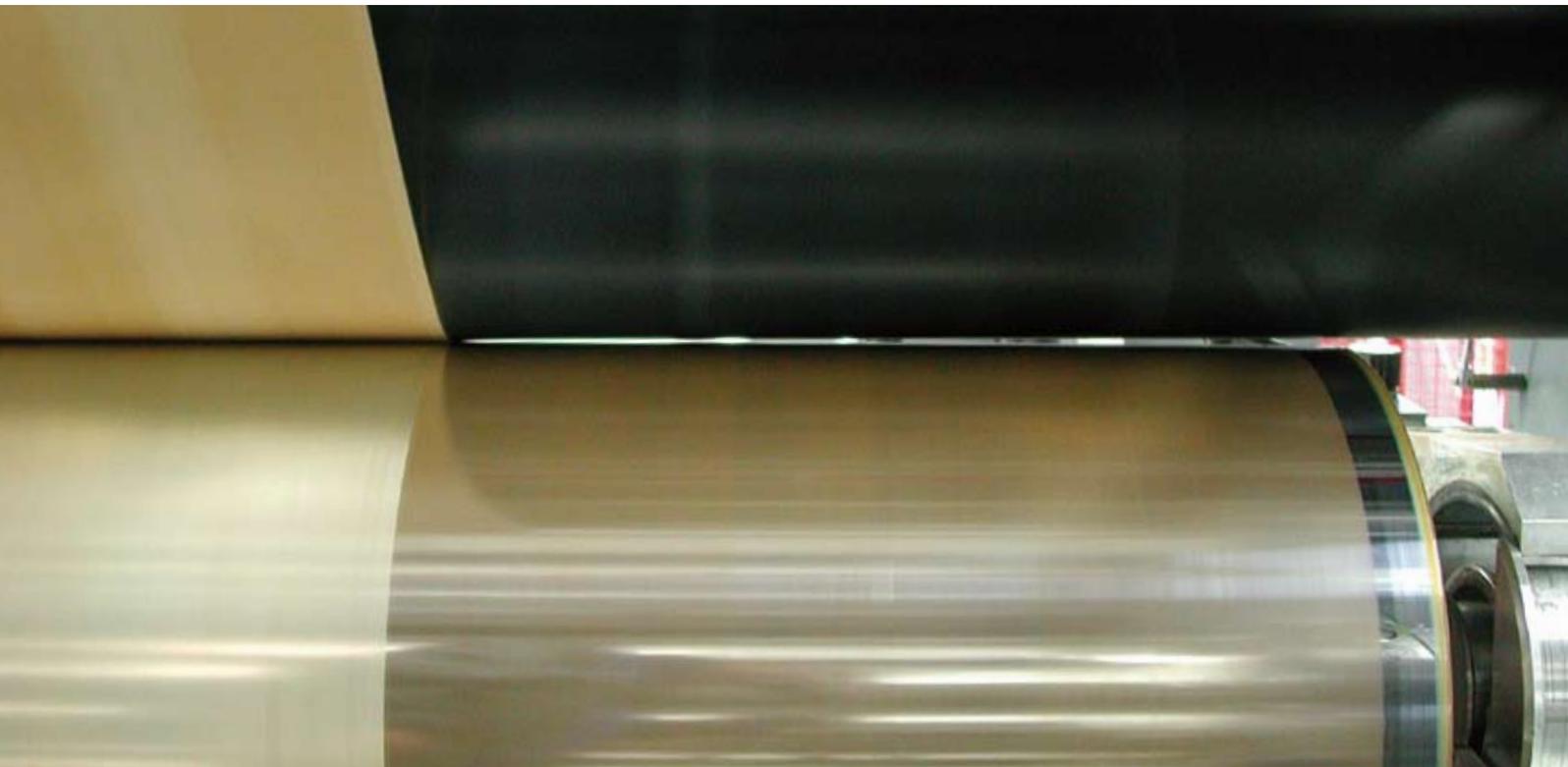
using three different print cylinders. If special effects such as nacre or metallic are desired, the pattern can be made using up to five different colors.

The width of the paper web that is to be printed can vary greatly for décor printing. A specially offset impression roller for the different printing widths is used in order to press the paper on the inked gravure print cylinder. This means that many décor printers have a large stock of various pressing roll range. In turn, this width variation causes time consuming changes of the impression roll each time the web width is changed. "The Nipco-Print-D impression roll system from Voith Paper solves this problem with a precisely adjustable contact width," explains Peter Marleaux, Sales Mana-

ger of Voith Paper Walztechnik AG in Zurich.

Outside the paper web, the Nipco-Print-D sleeve is lifted off of the engraved cylinder in such a way that no ink is transferred to the impression roll. It is possible to print up to the web edge even with thin décor paper. And even for an asymmetrical web position, the NipcoPrint-D ensures the ideal web guide. "This makes expensive and large impression rolls inventory, as well as the frequent changing of pressure rollers, obsolete," explains Marleaux. "Our current use of 12 NipcoPrint-D impression roller systems has been greatly successful: eight in Arnsberg, three in Poland and one in Russia," reports Leo Bisping, spokesperson at Interprint. "In the various printing

The NipcoPrint-D impression roller system from Voith Paper presses the paper web evenly against the inked gravure cylinder.





The laminate panels run through several production stages before they are complete. These range from the décor paper production, to the printing and impregnation and all the way to the grouting with MDF and particle board.

stages, the NipcoPrint-D always achieves an even and reproducible result.”

The path to the home-improvement store

After printing, the décor paper is delivered to the wood products manufacturer. A Voith Paper component can also be found here: The NipcoPanel system presses MDF and particle board together. Instead of the standard, very large rolls, Voith Paper Walztechnik AG uses several small NipcoPanel rolls in order to vary the pressure distribution across the width of the board. The material is compressed steadily and especially evenly through the small space between the NipcoPanel rolls. In this way the MDF and particle board achieve an excel-

lent transverse tensile strength and optimum thickness profile.

The printed décor paper first will be impregnated with melamine resin in special impregnating lines usually done by the wood products manufacturer. Next step, it is laminated under high pressure with particle board, MDF board or other substrates. In case of demanded high wear resistance (e.g. floor panels) an additional layer of overlay paper is added to this (see page 20 on the topic of overlay paper). The haptic characteristics of the finish are created during the press operation by the press steel plate (called the caul plate) that can give the final finish a diverse range of structures, regardless of the décor. After this processing stage, the laminated material is made

Brief cultural history:

Décor paper



The predecessor of today's décor paper has a history dating back over 100 years. In 1907 the Belgian chemist by the name of Baekeland obtained the first patent for a product called Bakelite. The original décor paper was a mixture of wood flour or fiber and phenolic resins that could be pressed into metallic molds and hardened at the same time by heating.

A technique that can be compared with modern-day laminating existed as early as the Ottoman Empire. The Ottomans impregnated paper with vegetable-based or animal fats in order to preserve the paper.

available to the furniture industry or commercially in the form of engineered wood boards. The customer will also find commercially available finished products in the form of laminate flooring because it is a building material that is easy to work with and durable. An additional material used for the finish is the finishing film used for furniture or interior work. This material is usually impregnated already in the paper machine and is known as a preimpregnate.

Contact



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For years, Koehler has been implementing
Voith innovations

Partners in thermo paper market leadership



AL FARO
bar-gelateria

MILLENNIUM 2000 SNC
LUNGOLAGO REGINA ADELAIDE 34
PARTITA IVA 02996820235

OPERATORE 01

R #0000

GELATI
TOTALE
Euro

2.500
1.2.500
1,29



The August Koehler AG company based in Kehl uses Voith paper machines to produce its thermo papers.

*“The Koehler PM 2 is state-of-the-art
when it comes to thermo paper.”*

Tobias Müller, Sales Engineer in the thermo papers segment at Voith Paper

In coming years the production of thermo papers will represent a significant growth market, and the August Koehler AG paper mill has certainly achieved an excellent position in this international market. The intense cooperation with Voith Paper has made a significant contribution to the remarkable market success of the company.

“The PM 2 at Koehler is state-of-the-art when it comes to thermo paper,” says Tobias Müller, sales engineer in the field of thermo papers at Voith Paper. Müller’s statement underlines how important the systems used at Koehler are for Voith as reference projects. The two companies have been close partners for over 20 years with technical innovations from Voith used effectively at the production facilities of the August Koehler AG company, located in Kehl. Voith was a supplier from the first hour with its delivery of a paper machine and an offline coating machine back when

the Kehl plant was being built in 1988. In 2001, an additional Voith paper machine and offline coating machine with an annual capacity of 120,000 tons followed with production line 2. The PM 2 has a wire width of 4,750 mm and a design speed of 1,500 m/min, producing only thermo base paper in a basis weight range of 40 to 80 g/m².

The first film press for thermo pre-coating was also used in the PM 2. At the time, this was completely unique in the field of thermo papermaking. Applying a one-sided precoat with a

SpeedSizer ensures that the necessary barrier and insulating properties are provided for the subsequent thermo coat.

Reduced curl and optimized web lead

The thermo-sensitive coat is applied in the SM 1 and SM 2 coating machines at the Koehler facilities in Kehl. Both machines were converted by Voith in 2001 to curtain coater technology. Instead of using an applicator roll, the coating color is now applied directly like a



The ModulePro C jet spray dampener moistens the paper web in the coating machine.



The SM 2 coating machine at the Koehler facilities in Kehl applies the thermo-sensitive coat to the paper.



liquid curtain to the paper web. In order to reduce curling that occurs for papers with one-sided coating (warping in the paper), each of the two coating machines were equipped with a ModulePro C jet spray applicator system in 2006. The ModulePro C compensates for the roll tendency of the paper by releasing frozen warps that remoisten the web on the non coated side. The new technology

uses a contactless mechanism, which has made it possible to increase the operating speed by 100 meters per minute.

In the summer of 2006, the pre-drying section of the PM 2 in Kehl was equipped with seven ProRelease⁺ stabilizers, an innovation from Voith Paper. The stabilizers ensure that the web run is optimized in the first

drying group, which is particularly sensitive. This resulted in a considerable reduction of the paper draw and an additional increase of the production speed by about 30 meters per minute. These successes were determining factors in the decision a few months later to also equip the PM 1 with seven ProRelease⁺ stabilizers. Around the same time when the ProRelease⁺ stabilizers



The PM 2 at the Koehler facilities in Kehl is used exclusively for the production of thermo papers in the basis weight range of 40 to 80 g/m² and at a production speed of 1,600 m/min.

were built into the paper mills, a NipcoFlex calender was built into each the SM 1 and SM 2 coating machines. These replaced the soft calender originally integrated into the coating machines. Using the NipcoFlex calender it was possible to significantly improve the smoothing process, which is made apparent by the finish quality of today's thermo papers.

In past years, Koehler AG was able to further secure its position as market leader in the field of thermo papers. More than half of the thermo papers produced worldwide are made by Koehler. The development of the PM 2 in Kehl is likewise impressive:

Originally built for a design speed of 1,500 meters per minute, today the machine runs at more than 100 me-

A brief cultural history:

Thermo paper



Thermo paper can be found on bananas, in hospitals and at concerts. The reason for this is that today labels, ECG printouts and admission tickets are printed for the most part on thermo paper.

The color inlay technique, for example, is used with thermo paper to achieve counterfeit-proof results. Colorful inlays in the paper reveal a different colored layer when the paper is torn in two. Counterfeiters don't have a chance!

Thermo direct printing involves heating the thermo paper in particular spots to blacken the paper. Color printing, in contrast, requires a thermo transfer ribbon. A color ribbon is placed between the paper and the thermo printhead. The heat melts the wax particles in the ribbon and the pigments are transferred to the paper. Intense sunlight can considerably reduce the durability of thermo printing. Keeping thermo printed materials in cellophane or in wallets can also reduce the life of the print. This results from the use of chemical plasticizers and tanning agents. However, thermo paper with a 25 year shelf life guarantee does exist.

ters above this capacity, thus making it possible to increase the daily capacity of the machine to over 400 tons of thermo paper.

Contact



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Curtain coating for label papers and flexible packaging papers

Higher efficiency and quality thanks to contactless coating

For high coat weights with especially high requirements in terms of finish quality, the curtain coater outclasses the standard method.

You find them on shampoo bottles, luggage for air travel, letters, fruit baggies at the supermarket and advertising stickers on cars: label papers. Whether waterproof, tear-proof or easily printable, labels are used in a variety of different applications. For the purposes of coating label papers or flexible packaging papers, Voith Paper successfully tested a cost-saving method known as curtain coating. In the past, it was used primarily for specialty papers such as thermo and NCR paper. The curtain coater applies the coating color with perfection and improves the efficiency of the production process.

Label papers and flexible packaging papers are often characterized by a relatively low basis weight of the base paper while having high coat weights at the same time. Multiple coats are normally applied to the paper. Usually a precoat with 6 to 8 g/m² is followed by one or two top coats with 8 to 12 g/m². This usually involves multiple blade coats or a combination of film and blade coats. For high coat weights, if there are especially high requirements in terms of the finish quality, the curtain coater outclasses the standard method. Coat weights of 20 g/m² per

side or more can only be applied using a contactless method such as the curtain coater, if defects in the finish such as film splitting, misting or doctor streaks are to be prevented.

Better efficiency thanks to fewer breaks

Compared to a conventional blade coat, the curtain coater from Voith Paper achieves better coverage. This also has a positive effect on the subsequent printing because a homogeneous printed image is achieved with

less mottling. The curtain coater also prevents costly breaks occurring especially with light base papers due to the mechanical stress on the paper web with a coating blade. The curtain coater not only offers higher paper quality; it also increases the efficiency of the paper machine. When starting up a new paper grade, saleable quality is achieved faster because the ideal coat weight can be immediately applied and the grinding-in time of the coating blades is eliminated. In addition, downtimes are shorter because no wearing parts such as

blades, rods or rubber covered applicator rolls have to be replaced. Cleaning times are drastically reduced as well. Tests with the Voith Paper pilot coater showed that the combination of MG base papers and a curtain coater yielded especially outstanding results. Use with label papers and flexible packaging papers is therefore a viable application. This involves applying the coat to the smooth side of the paper. In trials, the master samples were outdone in terms of the roughness as well as gloss. Because the base paper is already smooth, using the curtain coater achieves PPS values around 1.0 µm. It is possible for curtain-coated papers to match the gloss level of blade-coated papers.

The curtain coater offers a broad operating range

The coat weights and speeds that are possible with the curtain coater de-

pend on the particular application. Basically the minimum flow rate is approximately 4 to 6 l/min*m, no stable curtain is formed at lower rates. The maximum coat weight greatly depends on the properties of the coating color and on the base paper. Trials performed by Voith Paper have shown that coat weights between 5 and 20 g/m² at a machine speed between 400 and 1,500 m/min are possible without any problems. It was also possible to apply coating weights greater than 30 g/m². For borderline applications such as at very high speeds or light coats, it may be necessary to optimize the coating color. Together with BASF and Omya, Voith Paper developed the testing method and the necessary components for different coating colors. Pigment mixtures, binding agent systems and the selection of additives are practically no different from those of standard coating methods. The solid content and viscosity are of a similar level. The right selection of the binding

agent system and the additive ensures production efficiency and product quality. When it comes to specialty papers in particular, the curtain coater offers a great economic advantage because an expensive functional coating can be at least partly replaced by a less expensive base coat. The curtain coater can also be used for specialty papers by applying multiple coats with the curtain coater. Using multi-layer curtain coating it is possible to apply several different media simultaneously. In the future, Voith Paper plans to use the curtain coater not only for specialty papers but also for classic pigment coats for wood-free and wood-containing commodity papers.

Contact



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Label papers are encountered frequently in day-to-day life, for example, when buying fruits and vegetables.



“The production of banknote paper is constantly being developed in order to make banknotes more counterfeit-proof, more soil-resistant and more durable.”

Wolfgang Neuß, Specialist for banknotes and security paper machines, Voith Paper

The way to keep banknotes clean longer

Protection coat for banknotes

The life of a banknote is sometimes very short. Like the famous Thaler coins, it travels from one hand to another, transforming in the process from a clean note to a wrinkled, dirty scrap of paper. There is a new protection coat that can be used to improve the durability of banknotes and make them more impervious to soil.

Some years ago, it was a common notion that banknotes would increasingly be replaced by electronic cash. This has yet to be proven, and the banknote is still a means of payment as much as it ever was. The banknote paper sector has seen a growth rate of five percent, thus giving it a top position in the paper sector.

“The production of banknote paper is constantly being developed in order to make banknotes more counterfeit-proof, more soil-resistant and more durable,” according to Wolfgang Neuß

of Voith Paper. No other specialty paper captures so much attention in the development of new production and counterfeit-proofing methods than banknote paper. In addition to paper mills, banknote producers also include security paper printers, security inks producers as well as security threads and hologram makers. These producers strive to ensure that banknote paper is unmistakable to those using it.

Yet this specialty paper is also given a great deal of negative attention as well. Despite all security precautions

and measures taken, money counterfeiters time and again succeed in making duds that consumers are only able to recognize with great difficulty as counterfeit. In Canada, for example, 26-year-old criminal Wesley Wayne Weber was able to introduce 67,000 counterfeit 100 dollar bills into circulation between June of 2000 and July of 2001. The Canadian economy suffered total damages in the amount of 6.7 million Canadian dollars. As a reaction to the incident, the Canadian Bank introduced a new generation of 100 dollar notes having better anti-





The multi-tone watermark and safety thread that is inserted are worked into the production on the Voith paper mill in the sheet forming section.

counterfeiting attributes. Since 2001, bands of counterfeiters in Europe have mainly been focused on making 20 Euro and 50 Euro notes, which make up around 80 percent of all fake notes. About 60 percent of these fakes are made using professional offset printing machines and the remaining 40 percent with inkjet printers.

According to Europol, 11 offset printers and 58 counterfeiters were exposed in 2004, the majority of which were located in Bulgaria and Colum-

bia. In 2005, 13 offset printers were busted, ten of which were found in the Euro zone.

Authenticity through intaglio printing and specialty paper

The printing of banknotes usually involves a combination of lithographic printing (offset printing) and intaglio printing. With intaglio printing, engraved steel plates are used which carry an image in recess. The recesses of the plates are filled with security ink. The printing ink is then embossed in-

A brief cultural history:

Banknotes

Paper money was issued for the first time around 1024 in China as an emergency currency for financing a war in a time when there was a coin shortage. In 1402, paper money was abolished again in China because the emperor had large quantities of banknotes printed without paying attention to their funding.

In Europe, the first paper money appeared in 1483 in Spain, again, as a temporary replacement for lacking coinage.



MasterVat with ShortFormer B.

to the paper at a very high pressure. This creates noticeable embossed patterns that can be felt easily with your fingernails. For laymen it is an attribute of authenticity that is easy to recognize. Due to stricter security checks it is nearly impossible for counterfeiters to get their hands on the intaglio printing machines.

In the past, all counterfeits had one thing in common: They were not printed on genuine banknote paper with the typical multi-tone watermarks and with the security thread that is



embedded into the paper. Both of these authenticity attributes are worked into the paper during the forming section of the machine. The double-layer forming system from Voith Paper, which consists of the Master-Vat and the ShortFormer B, makes Voith the market leader in this technique. Nearly all European banknote paper mills produce the second paper layer using the ShortFormer B that Voith Paper has continued to develop.

Clean note policy makes everything clear

Signs of use on the banknote can make it considerably more difficult to determine authenticity. The dirtier a banknote is, the more difficult it is to identify the attributes of authenticity. For this reason, many countries have adopted what is known as a “clean note policy.” Soiled banknotes are quickly taken out of circulation and replaced by new ones when signs of wear are discovered. A 20 Euro note, for example, is taken out of circula-

tion after six to ten months. A 500 Euro note, which changes hands less frequently, can remain in circulation for several years. The clean note policy is very expensive, however. Depending on the type and authenticity attributes, it costs on average 4.5 cents to produce a banknote. The annual consumption per capita in Europe is approximately 15 banknotes. This means that in Germany, a country with a population density of approximately 80 million people, a total of 1.2 billion banknotes are consumed annually - or an expenditure of 54 million euro!

It is therefore no surprise that banks have a vested interest in procedures that make banknotes more soil-resistant and durable. Many producers of banknotes offer durable or long-life banknotes that have a protection coat. In late 2006, Voith Paper was commissioned by a renowned maker of banknotes to perform coating trials using the Voith SpeedSizer at Voith's pilot coater in Heidenheim. The tests performed both with an online and

offline method allow reliable conclusions to be made concerning how the protective film applied to the paper affects the security threads and watermarks in the paper. Outstanding results were achieved. In the online process, where the speed is limited by the watermark, speeds of up to 120 m/min were tested. In the offline process, production speeds of up to 750 m/min were possible. The Voith SpeedSizer, which is tried and tested in many other paper mills, also emerged as the right choice for the ideal coating head.

Contact



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In a special Voith Paper machine for banknote paper, the MasterVat and ShortFormer B are used for the double-ply sheet forming.



A brief cultural history:

Banknotes



Large and small currency

After the US Dollar, the Euro is the most widespread currency used worldwide. On July 31, 2008, there were about 12 billion Euro banknotes with a value of 686,546 billion euro in circulation. The Falklands Pound is a drop in the bucket in comparison: With only 5,000 users, it is the rarest currency used around the world.

Counterfeit money

During the first half of 2008, the German Central Bank registered 19,913 counterfeit Euro banknotes. Among the 6,103 fakes, 50 Euro notes were the most frequently counterfeited banknotes, closely followed by 100, 200 and 20 Euro notes. This resulted in an actual loss of approximately 1.8 million euro. Counterfeit money is not replaced. He who does not want to walk away from the bank empty-handed should therefore always verify his notes by inspecting the integrated attributes of authenticity: Do the holograms change when tilting the banknote? Can you feel the embossing texture on the note? Is there a watermark recognizable in a non-printed area?

Décorative paper machine converted to produce masking tape

Flexible paper for masking

If when painting walls you forget to mask off the doorframes, no matter how careful your brushstrokes, you will never get a clean result. This is why there is masking tape. It is flexible, prevents the penetration of paint or lacquer and is easily removed again from the surface to which it is stuck. Since the fall of 2007, the PM 4 at Munksjö Paper in Besozzo, Italy, is now able to produce masking tape in addition to décor paper as a result of a rebuild.

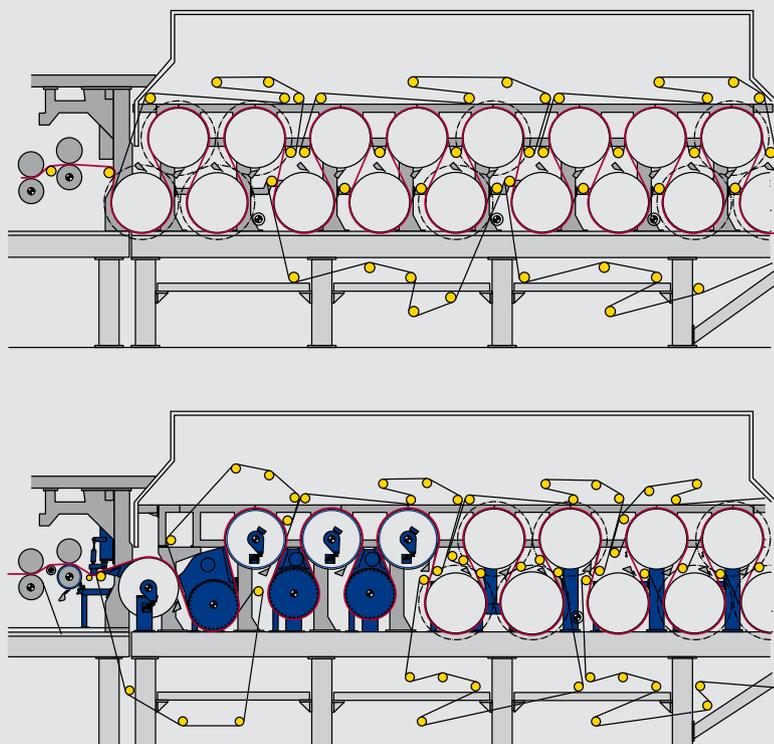
Masking tape is a paper with a self-adhesive coating on one side. Its elongation in machine direction must be high and it must be easy to tear in

order to apply it to various surfaces. The elongation is achieved by wet-creping the paper web during the paper production process. This involves

creping the paper in the wet section of the paper machine. The moist web adhering to the surface of the roll is removed by a doctor. The special

Masking tape has to be flexible. Its elongation is the result of the wet creping of the paper web.





Before the rebuild by Voith Paper, the paper machine in Besozzo was a fourdrinier machine with dandy roll producing décor paper. The rebuild now makes it possible for the PM 4 to produce masking tape as well.

The entire scope of delivery:

- CeraSize roll cover
- Crepe doctor
- 3 DuoStabilizer rolls
- 3 DuoStabilizer boxes
- Coating of drying cylinders 2, 3 and 4
- Total of 7 Voith Drives for the dryer section

“The conversion to wet-creped paper posed a special challenge in Besozzo.”

Philipp Buchhold, Engineer for Process Technology, Voith Paper

design of the creping doctor and the doctor angle causes the paper to be compressed as it is doctored off the roll. Fine wrinkles are formed in the sheet. The wrinkles run in cross machine direction and shorten the paper web, which requires a considerable speed difference between the press section and the dryer section. “The change to wet-creped paper posed a particular challenge in Besozzo,” explains Philipp Buchhold, engineer for process technology at Voith Paper. The existing PM 4 for décor paper needed to take over the production of masking tape from another location while of course delivering the same quality as well.

Sophisticated rebuilt for an additional paper grade

The PM 4 in Besozzo is a fourdrinier machine with dandy roll. The transfer into the press section is realized with an open pickup. The press consists of two bottom felted, one top felted straight through presses. In order to produce wet-creped papers, Voith Paper installed a special cover and creping doctor on the smooth bottom roll of the third press nip. Blade angle, facet and protrusion of the creping doctor provided by Voith Paper can be adjusted. In connection with the release properties of the roll cover, these significantly affect the creping quality.

The wet crepe process has special requirements for the web run of the paper into the dryer section as well as inside the dryer section itself. To prevent creases from forming, the sheet run must be controlled precisely and gently. The high elongation potential of the paper requires that the draws throughout the dryer section can be adjusted individually in order to minimize the loss of crepe. In the PM 4 this problem is solved by using short dryer groups that allow minimized web tension as well as minimized felt draws. The felt run in the first part of the pre-dryer section was therefore rebuilt to slalom run. Instead of the lower drying cylinders,

Voith Paper installed three DuoStabilizer rolls. In the open draws the paper web is guided safely by three new DuoStabilizer boxes. The high degree of flexibility of the DuoStabilizers offers a great advantage in the case of the PM 4 because of the big variations of the sheet width.

The pre-drying section was additionally rebuilt to ropeless threading in order to make the tail threading more efficient and stable and to prevent breaks. Parts of the framing of the pre-dryer section were replaced in order to guarantee the ideal arrangement of rolls and doctors.

The Voith Drive, a new drive concept from Voith Paper, is also being used in Besozzo. In the past, the drying

cylinders were driven by an open spur gear. In order to realize smaller drive groups, seven Voith Drives were installed. The concept eliminates the need for the spur gears. The first four drying cylinders are driven on front side and the three DuoStabilizer rolls on drive side. The direct drive, which does not need any interposed mechanical components, is ideal for the limited space available on PM 4 in order to allow the first cylinders to be driven individually.

Voith Paper also improved the coating of the drying cylinders. Three of them now have an anti-adhesive coating made by Voith's subsidiary PicoTeknik in order to prevent a scaling of the drying cylinders. At the same time, the cylinders can still be

doctored for the production of décor paper. The wire speed during the production of masking tape with 38 g/m² on the PM 4 was increased to 500 m/min from the 350 m/min capacity of the previous production location. The quality of the crepe and the elongation of the masking tape paper were fully achieved. In addition, the PM 4 can still be used to produce décor paper at the same speed and quality level as before the rebuild.

Contact



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A brief cultural history:

Masking Tape

In 1923, engineer Richard G. Drew came across a problem: For two-toned auto paint jobs, the finished parts could only be covered with great difficulty. He spent two years experimenting with various materials, including vegetable oils, resins and rubber. In 1925 he presented his first results.

The paper base material, which was only coated with adhesive on the edges, did not stick adequately. Drew improved his tape by completely coating the base material. Hundreds of different types of modern tapes have been developed based on this original prototype of tape paper.





Mirroring of the creped paper web

Paper web

Creped paper

The paper creped by a crepe doctor below in the picture is mirrored in the roll (left in picture). The finished crepe paper is visible at the right in the picture.



Filter papers for coffee pads are produced in the wet laid nonwovens process.

Wet laid nonwovens technology is multilayer

Paper production from the tea bag to roofing

Regardless of whether it's tea bags or coffee pads, gasoline filters or air filters, roofing material or overlay paper for laminate floors – all these products are manufactured with the wet laid nonwovens process. The technology comes from paper manufacturing and is not only for manufacturing wet laid nonwovens material, but also for production of long-fiber special papers. Voith Paper offers systems for manufacturing the most varied wet laid nonwovens, among which is the HydroFormer sheet formation unit. In Düren, Germany, Voith Paper has a HydroFormer pilot line.

Long fibers are used for the composition of wet laid nonwovens. The fibers can be up to 40 mm long and must be dispersible in water. For homogeneous formation of the fibers, a suspension with low stock consistency is necessary in which the long fibers can be well-distributed. The stock consistencies are from 0.1 to 0.8 g/l. For comparison with graphic papers, stock consistencies of 5 to 8 g/l are required.

The low stock consistencies require a large throughput quantity in the headbox. In the wet laid nonwoven process, an inclined wire as sheet formation unit is necessary in order to handle the large throughput quantities. For over 40 years, Voith Paper has been building inclined wire machines with the brand name HydroFormer, which is continuously being further developed and improved. In Düren, Voith Paper operates a HydroFormer pilot line that can be used for customer trials.

Along with single-layer HydroFormers, Voith Paper has also developed HydroFormers that can produce multi-layer products. With multi-layer headboxes, the suspensions of the separate layers are individually fed into the sheet formation space via headers and tube banks. Flexible lamellas separate the flows in the last headbox section as the suspensions enter the forming area.

The capacity of wet laid nonwovens facilities can be between 2000 tons per year for light products such as tea bags (12 g/m²) and 115,000 tons per year for glass fiber mat products (122 g/m²). Machine widths between

1 and 5.3 meters are common; the basis weight ranges are between 10 and 300 g/m². Wet laid nonwovens facilities operate at production speeds between 50 and 550 m/min.

We present two exciting application examples from Voith Paper in the area of wet laid nonwovens technology.

Typical HydroFormer of a 5 meter wide glass mat machine.



Application example 1: Glass fiber mats

The largest glass fiber mat machine in the world

In the last few years, the demand for glass fiber mat in the US has noticeably increased - on the one hand, due to the booming construction industry, on the other hand, due to many hail storms and hurricanes that have destroyed residential roofs. One of the leading glass fiber mat manufacturer in the world responded to the growing market in 2007 with construction of the largest glass fiber mat machine in the world located in the United States. Voith Paper supplied the HydroFormer GV2, the binder impregnation section and the white water circulation system for this machine.

“The challenge of this project was to build a glass fiber mat machine for which there was no fan pump on the world market that was large enough.”

Dr. Klaus Afflerbach, Technical Sales Manager, Voith Paper

The three-layer glass mat was produced with the HydroFormer from Voith Paper.

Glass fiber mats are used as the base material for floor coverings, asphalt shingles and asphalt rolls, among other products. There are older glass mat machines operating in the width ranges of 2 to 5 meters. But to achieve higher production capacities the latest installation is the largest glass mat machine in the world. The formation width of the new machine is 5,300 mm with production speeds of over 400 m/min.

For machines of such wide widths annual production capacities of over 100,000 tons of glass mat can be produced with typical glass mat basis weight ranges of 50 to 140 g/m².

“The challenge of this project was to build a glass fiber mat machine for which there was no fan pump on the world market that was large enough,” explains Dr. Klaus Afflerbach, technical sales manager at Voith Paper. In manufacturing glass fiber mats for roofing, the stock in the headbox must have a very low consistency. Only in this way can the 25 - 40 mm long fibers form a uniform mat on the wire. The end product is then distinguished by high tear resistance. But the required white water circulation quantity of up to 500,000 l/min could not be attained with any available fan pump at the low pressure levels below 2 bar. The engineers of

Voith Paper developed a suitable design for the headbox and associated white water circulation system for the new forming section. The resulting system incorporates two fan pumps to achieve the high flow requirements. This arrangement also provides the possibility of producing two-layer glass fiber mats if desired. To accommodate the two fan pump flows the forming section must be equipped with a two-layer HydroFormer headbox.

The two conically parabolic headers of the headbox are arranged counter to one another. Feeding is done with one header from the drive side, and



HydroFormer

Worldwide unique technology for production of three-layer wet laid nonwovens

Voith Paper is the world market leader in wet laid nonwovens facilities and offers with the HydroFormer a unique technology for production of one-, two- and even three-layer wet laid nonwovens. The flexibility makes it possible to produce wet laid nonwovens for special applications such as filter, overlay and filter papers for coffee pads. The Voith HydroFormer is used in the most high-power wet laid nonwovens machines worldwide with production speeds up to 550 m/min and production widths up to 5,300 mm.

the other header from the tender side. Stock preparation and white water circulation system are also designed with two approach flow systems. Different fibers and fiber mixtures can thus be used in both lines of the stock preparation and the white water circulation system.

“Preliminary results from two layer glass mat production evaluations have shown that the quality of the glass fiber mats is noticeably better than on comparable older machines. Both the formation as well as the profiles of the glass fiber mats show clear improvements,” reports Dr. Klaus Afflerbach.



Application example 2: Wallpaper base paper

New headbox ensures market leadership

The Neenah Lahnstein paper plant produces wet laid nonwovens for wall coverings. Particularly wallpapers that are dry peelable, also called dimensionally stable papers, are currently much in demand. The company reacted to the growing market with a conversion of the existing PM 6 paper machine. In only 14 days, Voith Paper equipped the PM 6 with a new closed HydroFormer headbox and modified the white water circulation system. The result speaks for itself: since then, the production capacity is 20 percent higher.

“In order to be able to survive as market leader in wet laid nonwovens for wall coverings, an expansion of our capacities was urgently necessary,” Deflef Stoltefaut, manager of Neenah Lahnstein, reports about the reason for the conversion. Previously, there was a bottleneck between the open HydroFormer headbox, the fan pump with white water and extraction tank. Voith Paper met this challenge with a new closed headbox. In addition, the white water

circulation system was modified in order to adapt the dewatering capacity to the increased speed.

The rebuild itself took only 14 days. In the process, not only the new HydroFormer headbox was installed, but other areas of the paper machine were also optimized. “Up to 80 employees of different companies and in-house technicians from Neenah Lahnstein were working around the clock for

this,” says Bernd Rudolf, technical director at Neenah Lahnstein. The rebuild was finished within the scheduled time.

“From the very beginning, the quality of the specialty papers and the capacity of the machine met what Voith Paper had promised,” says Rudolf. “The good team work between Neenah Lahnstein, Voith Paper and the assembly personnel achieved the success in this project.”



The trailer delivers the top part of the white water tank and the expansion of the extraction tank for the PM 6 at Neenah Lahnstein.



Customers have the opportunity to carry out trials on the HydroFormer pilot line in Düren.

HydroFormer pilot line in Düren, Germany

Less risk through trials

When considering modifications to a wet laid nonwovens machine or investing in a new machine, there are ways to minimize risk. Voith Paper offers the possibility of running trials on the HydroFormer pilot line in Düren in order to test the technology. Voith Paper also uses the machine for development testing.

The headbox of the HydroFormer pilot line can be operated as one-, two- or three-layer. Fibers up to a length of 40 mm can be used.

The pilot line consists of a pulper, three machine chests, a closed white water tank, a 3-layer HydroFormer headbox, an inclined wire section (10° to 20°), a pickup and a press section.

“The core of our machine is the three-layer HydroFormer headbox,” explains Egon Friesenhahn, R & D engineer for special machines at Voith Paper in Düren. The wire angle and the apron board angle of

the headbox can be changed.

It is thus possible to find the best setting of the headbox and the wire section for each grade. Hand sheets can be taken from the wet rolls for further analysis.

Contact



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Technical specifications

HydroFormer pilot line in Düren

Formation width: 0.5 m

Design speed: 1,000 m/min

Working speed: 10 - 600 m/min

Basis-related weight range:
 10 g/m² to 700 g/m²

Consistency in the headbox: 0.01% to 0.3%

Max. headbox throughput: 24,000 l/min

Brief cultural history:

Tea bags

There are tea bags in all variations: square, round, pyramid-shaped, with string, stapled or knotted.

Even the ways of using the specialty filter papers filled with tea differ from country to country. While people do without tea bags altogether in China, in Great Britain they prefer flat, round bags without string that are put on the bottom of the cup. The Germans favor the square tea bags with string and staple.

The tea bag was invented over 100 years ago, accidentally, as it were. A tea merchant from the US wanted to avoid unnecessary weight when shipping his tea samples and put the tea in small, space-saving silk bags. The recipients immersed the entire bag in the water when preparing the tea, assuming that this was so intended. A few years later, tea bags were made from paper.

Today, tea bag paper is manufactured on inclined wire machines (e.g., Voith Paper HydroFormers).



Production of one filter cigarette requires three specialty papers

If the tobacco tastes good, give some credit to the paper

Specialty papers are sometimes a matter of taste. That becomes quickly clear with a good coffee filter that influences the aroma of the stimulating drink. Papers for cigarettes are of a similar significance. The paper grades used have an effect on the taste, the strength and the reputation of a cigarette. Cigarette papers, plug wrap papers and tipping papers for the most varied brands are produced on Voith specialty paper machines.

For production of the roughly 700,000 tons of paper, the highest quality requirements apply, and thus also for the three machines that Voith Paper recently delivered in Europe and to China.



The tipping paper determines how strong a cigarette seems by means of the air supply.

Three different paper grades are used in the production of filter cigarettes: plug wrap paper, tipping paper and cigarette paper.

The cigarette market is currently developing internationally in different ways. While sales in Western Europe and North America are on the decline, sustained growth can be seen in Asia. Thus the market in China, for example, grew by 15 percent in 2007. The elaborate production that makes a filter cigarette a high-tech product is the same in all markets. Since the properties of a cigarette heavily depend on the paper characteristics, with these specialty papers it is a matter of a uniform basis weight profile and porosity profile. The porosity of the paper significantly determines the taste and the intensity, since it influences the amount of air that is used for burning tobacco in the cigarette.

Cigarette paper burns along with consumption

The best-known of the three paper grades is the usually white cigarette paper that encases the tobacco and burns along with it. A good CD profile with regard to porosity and basis

weight is necessary for this. With a high production speed of up to 16,000 cigarettes per minute, machine demands for mechanical strength and elongation of the paper are growing. In addition, high opacity is required that is achieved with filler material (25-35 percent). The cigarette paper in the basis weight range of 24 to 37 g/m² has a porosity between 30 and 110 Coresta (CUs). In the tobacco industry the porosity is measured by the Coresta unit. As a rule, wood-free fresh fibers are used for production, in part mixed with special fibers from flax and hemp. Most cigarettes are given an embossed marking that is already applied in the press section. In Jingfeng, China, the first spool reel was produced on the latest Voith cigarette paper machine in the third quarter of 2008. The proven components such as the RollJet K headbox, the DuoShake (shake unit, free of reaction forces for Fourdrinier machines) and the SpeedFlow also contribute to the highest reliability in this special paper machine.

Porous plug wrap paper determines cigarette strength

Optimum air porosity is required for plug wrap paper, because by means of the air supply this paper determines strength of the cigarettes. In production, the defined porosity must be achieved without deviation. It can be very high with up to 20,000 CUs, for example, with light cigarettes.

In order to achieve the required stiffness of the plug wrap paper, the very long special fibers made primarily of Manila or sisal hemp have to be optimally distributed. That can only be achieved with very low consistency in the headbox, and only the HydroFormer is able to handle the quantities of water needed to achieve the high porosity. For that reason, the two complete Voith paper machines and the last machine started up in China also have a HydroFormer. The dryer section is equipped with a DuoStabilizer for outstanding web run and with the SpeedFlow coating unit for efficient application of various additives.



This cigarette paper machine in China produces 12,000 tons of cigarette paper per year.

Appearance is decisive at the tipping

The printed tipping paper also determines the character of a cigarette; by means of its perforation, the quantity of additional air is controlled. The widest and fastest paper machine producing tipping paper runs in

Europe and was supplied by Voith. Like cigarette and plug wrap paper, tipping paper is also among the very light grades, with a basis weight of 28 to 40 g/m².

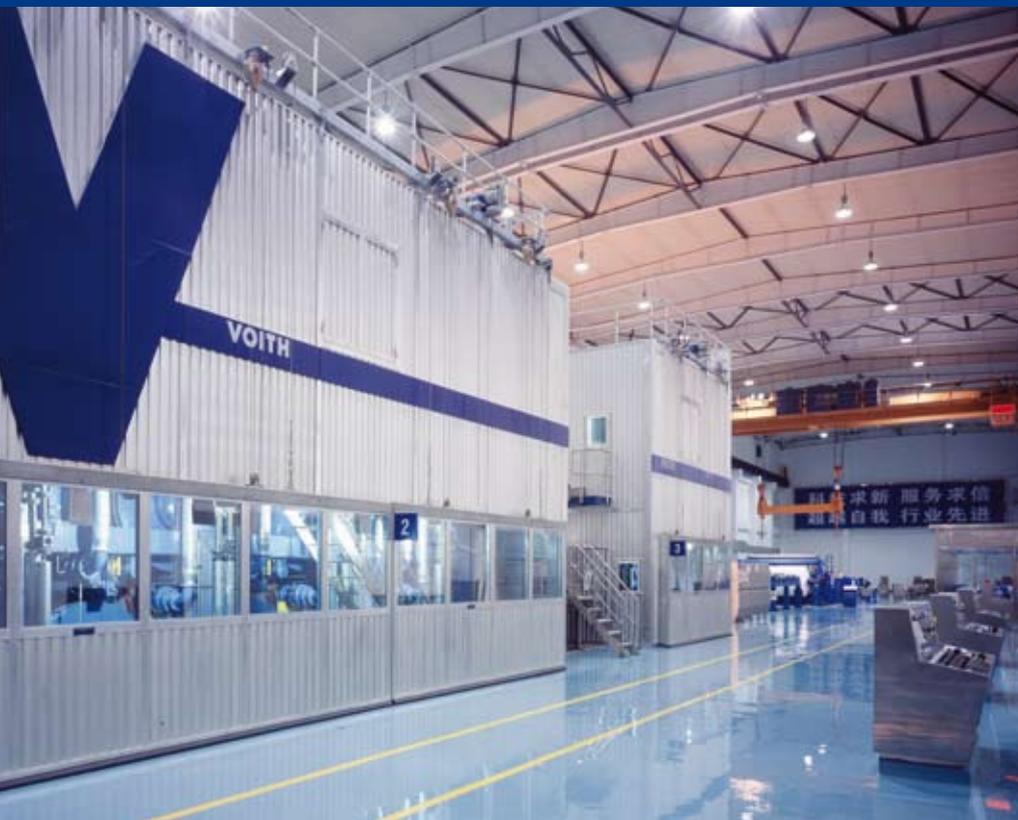
It gets its appearance in the gravure printing process, usually with a cork design, or white. Off-line perforation

brings about defined ventilation characteristics. The RollJet K rectifier roll headbox with ModuleJet ensures a uniform basis weight profile in cross direction and a good formation. A DuoCentri press is used in the press section. A subsequent straight-through press with the newly developed Nipco-F1 roll – ideal for deflec-

	Jingfeng PM 1	Hengfeng PM 14	N.N.
Paper grades	Cigarette paper	Plug wrap paper	Tipping paper
Basis weights	25-45 g/m ²	17-28 g/m ²	28-40 g/m ²
Wire width	3,800 mm	2,200 mm	5,950 mm
Uncut working width	3,300 mm	1,900 mm	5,100 mm
Design speed	600 m/min	400 m/min	1,000 m/min
Production	41 t / 24 hr	20 t / 24 hr	122 t / 24 hr

Left: Technical specifications of the Voith paper machines described.

Right: Design of a cigarette paper machine.



Brief cultural history:

Self-extinguishing cigarette



If things go the way the EU wants, in three years at the latest the self-extinguishing cigarette will be on the market to prevent fires.

And this is how the integrated fire stopper works: two rings made of cellulose or alginate that cannot be felt and are tasteless are sprayed onto the cigarette paper. If the cigarette isn't smoked for a longer period, they quench the burning ash. Depending on how far the burning ash is from one of the rings after last being smoked, the cigarette automatically goes out after a few seconds or minutes.

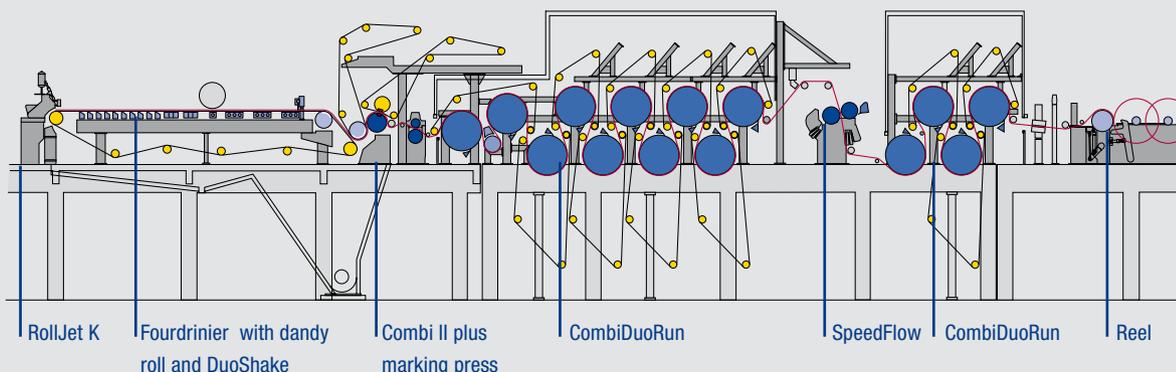
tion compensation – allows separate setting of the roughness two-sidedness. The SpeedSizer between pre- and after-dryer sections allows two-sided sizing, and for alternative grades even pigmentation. On the one hand, good printability of tipping papers requires a very homogeneous, smooth, glossy or matt surface.

On the other hand, the opposite side from the print must meet all requirements for further processing, e.g., penetration characteristics for the glue and suitability for bonding. Along with surface texture, this paper must of course be odor- and taste-neutral so that the smoker can enjoy the cigarette.

Contact

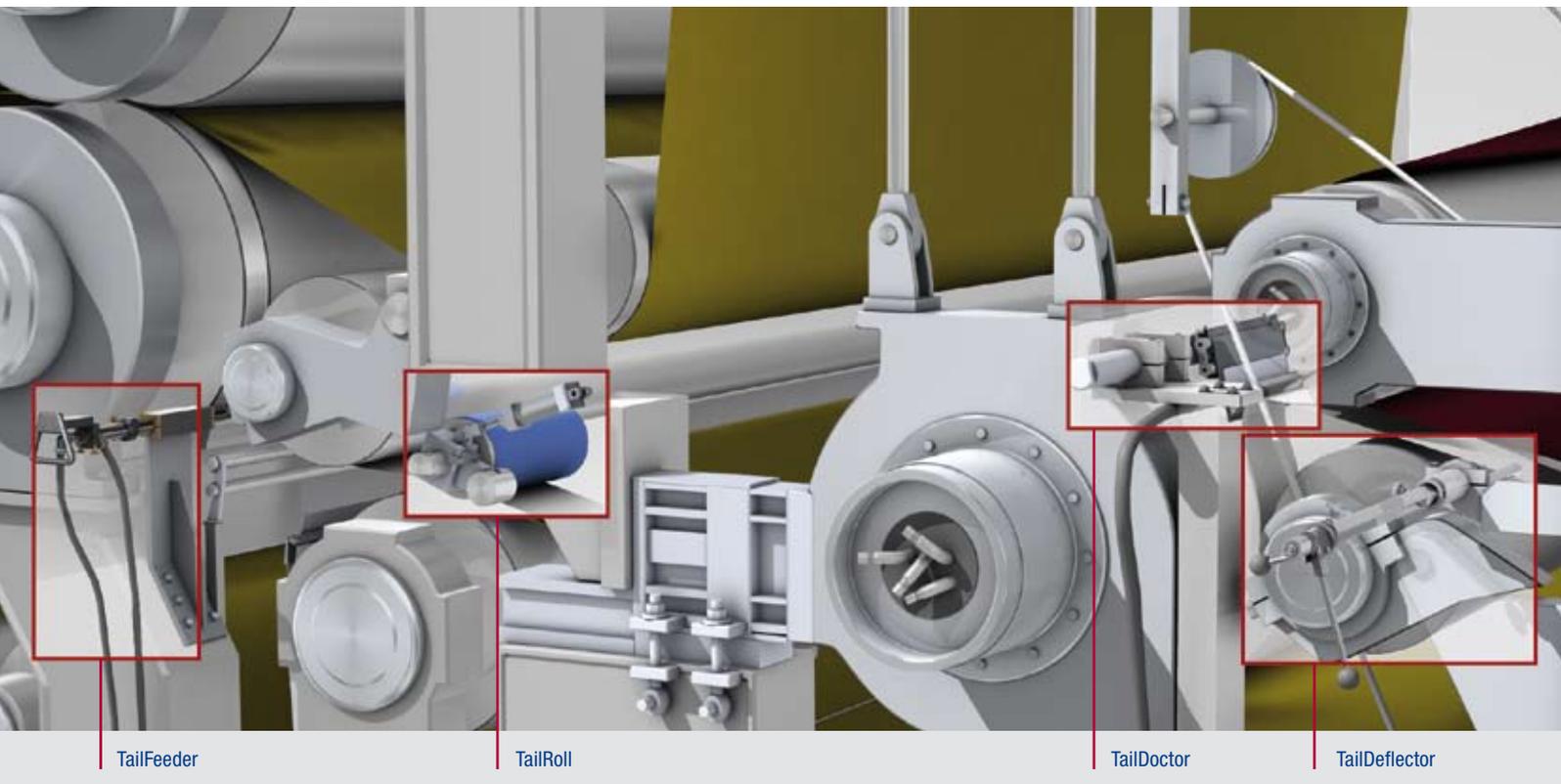


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Tailor-made products for optimization of specialty paper machines

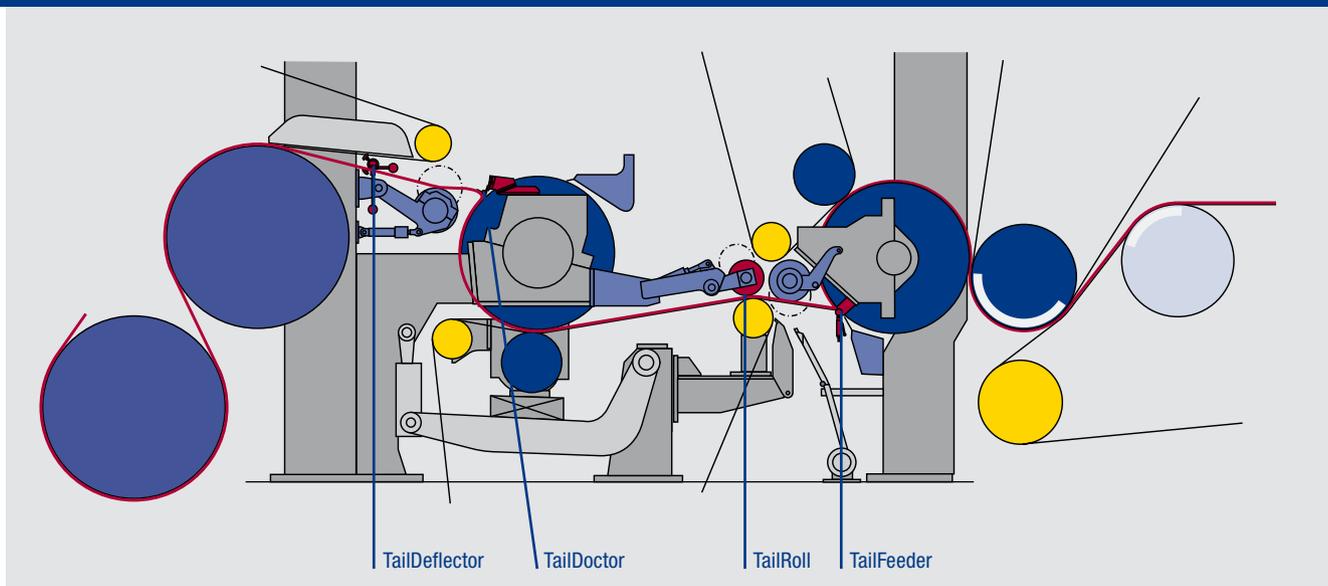
A small conversion can bring about big changes with specialty paper machines. Voith Paper offers not just complete specialty paper machines, but also products and concepts for optimization of existing machines. In this way, often substantial improvements can be achieved - with regard to efficiency, quality or productivity. Small investments usually pay off quickly. In what follows, two products are described that are frequently used for upgrading specialty paper machines: the “Value Plus Thread Concept” and the “RopeRing”.



Product 1: Thread concept – new concept provides for reliable thread transfer through the press section

Quick web feeding after a break

After a paper break in the press section, it often takes a long time for production to resume. This results in expensive downtimes. For that reason, Voith Paper has developed the “Value Plus Thread Concept.” It provides for reliable and quick transfer of the paper thread through the press section and into the dryer section.



The “Value Plus Thread Concept” (red marking) is suitable for retrofitting in existing specialty paper machines.

The tight construction in the press section for reduction of open pulls of the paper web makes it difficult and dangerous for the papermaker to guide the thread through the press section. The “Value Plus Thread Concept” solves the difficulties with slight modifications in the press sections and four newly developed modules - the TailFeeder, the TailRoll, the TailDoctor and the TailDeflector. The “Value Plus Thread Concept” can be retrofitted in every paper machine with free-standing press and rope carrier system. The two paper guide rolls before and after the free-standing press are provided with a hydraulic swivel mechanism and a direct drive in the optimization. Thus, sufficient room for the transfer results and accessibility on the drive side is improved.

When the web with the paper thread cut by the couch squirt runs into the press broke at the central roll, the feed strip is transferred with the TailFeeder into the free-standing press.

The TailFeeder is connected to the compressed air supply and acts as an air knife. Without direct contact, it lifts the paper tail off of the central roll by means of blow air. The paper tail is thus not creped and retains its stiffness. Thus, in the transfer process only a slight raising of the pull is necessary.

The TailRoll – a directly driven feed roll – is applied to the press fabric of the free-standing press on the light gap and thus the feed strip is fixed directly after contact with the press fabric. Immediate fixation prevents the formation of lumps and protects the press fabric from damage during feeding. Subsequently, the new doctor blade, TailDoctor, is applied to the top roll of the free-standing press and automatically activates its air transfer nozzles. The TailDoctor lifts the paper tail from the role and guides it directly into the downstream dryer section. The transfer through the free-standing press thus takes place in one operation and the time-consuming

cleaning out of the paper on the conventional removal doctor blade is omitted. In order to also guide the paper thread through the dryer section, it must be channeled into the rope transfer system. That is why Voith Paper developed the TailDeflector. It serves as an elongated arm of the paper maker with which the latter can easily and safely grasp the tail and guide it into the rope carrier system of the dryer section in a repeatable and safe fashion. In this way, the danger of reaching into the running machine is avoided. After the transfer, the paper web is run wide and the paper guide rolls are swiveled back into the operating position for reduction of open pulls. The “Value Plus Thread Concept” modules have been successfully used worldwide since 2007.

Contact



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Product 2: RopeRing – reliable feeding of the paper thread through the dryer section

Line rope grooves accurately to dimension with RopeRing

As a rule, paper machines for manufacturing specialty papers are equipped with a rope carrier system. The rope grooves of the dryer cylinders in the paper machine are exposed to heavy loads in this connection. Among the frequently occurring signs of wear are big rope grooves caused by feed ropes running at differential speeds. As a solution, Voith Paper developed the RopeRing that lines rope grooves and provides for safe and quick feeding of the paper thread through the dryer section.

Deep rope grooves on the cylinders cause a differential speed between transfer rope and cylinder surface in the dryer section. With increasing depth of the rope grooves, the ropes diverge and rope wear increases. The unsafe guiding and faulty clamping of the paper thread then leads as a rule to breaking of the thread. In addition, the increasing transfer times lower production capacity.

For this reason, Voith Paper has developed a new product that is optimally suited for upgrading existing dryer cylinders. The RopeRing is a molded steel ring that lines the rope groove accurately to dimension. It

guides the ropes and the tail on an ideal radius so that the differential speed between the feed ropes and the rope groove is minimized. By means of the optimal clamping of the paper thread with the RopeRing, the feeding operations are significantly improved and the feeding times are again noticeably shortened. Use of the RopeRing thus reduces downtimes and increases the runnability of the paper machine. The RopeRing is installed directly into the rope groove. Reworking of the existing rope groove is usually not necessary. The RopeRing is suitable for all rope groove forms, even for loose rope rings. The existing rope groove is gauged by

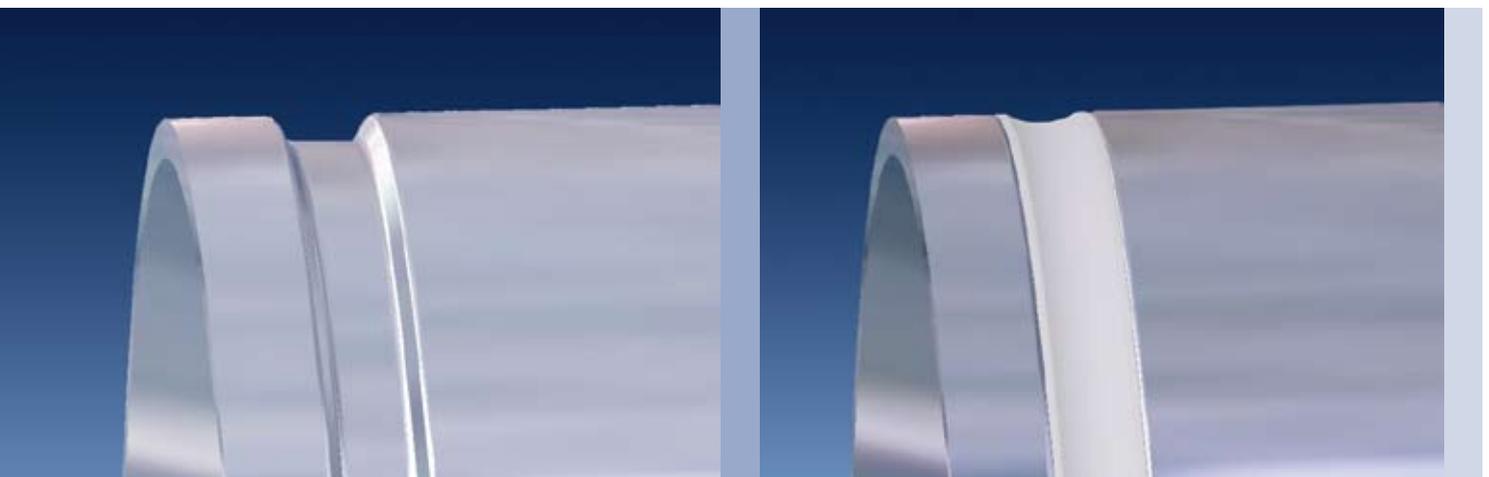
means of Voith Paper laser technology and the molded steel ring is produced custom-fit for the respective application. During mounting on the dryer cylinder, the RopeRing is welded, pinned and ground. Due to the exact preparation, eight to 10 RopeRings can thus be installed in 12 hours. Voith Paper has 500 RopeRings already being successfully used in the market.

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A cylinder without (left) and with RopeRing (right). It lines the rope grooves accurately to dimension in order to minimize differential speeds.



A little paper lexicon

In this special issue of “twogether” we introduce you to the world of specialty papers. In what follows, you will once more get a brief overview of the particularities of all specialty paper grades presented and how they are used.

Décor paper	Characteristics	Paper with good dimensional stability and very high opacity. Must be designed for impregnation and heavy loads. One-sided smoothness for good printability.
	Use	E.g., furniture surfaces, laminate, interior fittings of buildings and vehicles.
Overlay paper	Characteristics	Very robust. Consists of long fibers. Low stock consistency of 0.01 to 0.08 percent in manufacturing. Multilayered, often with embedded corundum.
	Use	Indelible surfaces, e.g., laminated floors.
Thermo paper	Characteristics	Paper with thermo-sensitive layer. This layer reacts to the influence of heat; the contact areas turn black.
	Use	E.g., bank statements, sales slips, admission tickets, baggage labels.
Label paper / Release paper	Characteristics	Label paper has an adhesive coat on one side. Low basis weight of the base paper, high coat weight. Release paper serves as anti-adhesive paper for label paper. Silicone-coated and very smooth.
	Use	E.g., address stickers, product labels, price tags.
Banknote paper	Characteristics	Anti-counterfeit paper made of cotton fibers with integrated security features. Soil resistant and waterproof.
	Use	Currency
Masking tape	Characteristics	Paper with one-sided self-adhesive coating. High elasticity, since it is creped within the wet end of the paper machine. Easily torn.
	Use	Protection against color or paint spots during renovation, painting and lacquering.
Wet laid nonwoven	Characteristics	Fleece with homogeneous controlled porosity. Production on an inclined-wire machine with very low stock consistency. Among the wet fleeces are many different grades.
	Use	E.g., tea bags, textile fleece materials for the medical and hygiene industry, gasoline filters, glass nonwovens, wallpapers, overlay paper.
Cigarette paper	Characteristics	Very light papers that are taste and odor neutral and food safe. Differentiation between tipping paper, filter wrapping paper and cigarette paper. High technological requirements such as porosity, opacity and printability.
	Use	Cigarette industry
Flexible packaging papers	Characteristics	Uncoated and coated papers and kraft paper serve as basic material. Depending on the purpose of its use, the paper can be lined with plastic, aluminum or other materials.
	Use	E.g., bakery bags, serving packages for food such as sugar or soups, package inserts, gift paper, tote bags.

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