twogether

Paper Technology Journal

"Paper is my life!" – Hans Müller, a member of the Corporate Board of Management, has retired.

News from the Divisions:
Austrian papermaker banks on Voith innovation.

Papresa doubles capacity – PM 6 went successfully on stream.

100% Voith for Tissue.

The NipcoFlex shoe calender – Development and operating experience.

Paper Culture:
Paper kites – Magic, mythology and sport.

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Title page – Colourful paper dragons in the sky – a pleasure for young and old in countless civilisations across the world, both now and in the past.

Hans Müller

Dear customers, Dear friends, Dear readers,

My almost 40 years of association with the pulp and paper industry and, in particular, the cooperation with people from all over the world brought me a great deal of satisfaction and sustained friendships and can best be summarised by the words of Wilhelm von Humboldt:

"In principle it is the relations with people that give life its real value."

I am very grateful that so many influential people supported and fostered me in the build-up of my professional life. I never took that for granted and always endeavoured to return the favour by, among other things, investing my time in the development of young, talented people.

My special recognition and my thanks go, of course, also to all of you and, in particular, to our customers and suppliers. The pulp and paper industry will, in my opinion, remain an interesting and undoubtedly high-tech industry that will continue to play an important role in the development of mankind. Communication is and remains an important cornerstone in the bringing-together or globalisation of the different cultures. Whether printing, writing or packaging papers, most papers are, in the broadest sense of the word, first a means of communication. Despite growing electronic communication, there is still a lot to discover in paper and its derivates.

Dr Sollinger, as the new Chairman of the Voith Paper Corporate Management Board, along with Mr Staudenmaier and Mr Nettesheim, has already taken over the destiny of Voith Paper and – I am quite certain – together they will professionally and innovatively master the future. The combination of these three gentlemen is the right one at the right time.

Thank you very much again for having given me the opportunity of leaving a small mark on the ongoing development process of this fascinating industry.

I hope you will all remain favourably disposed to Voith.
Yours

"Paper is my life!" – Hans Müller, a member of the Corporate Board of Management, has retired

In April, a formal ceremony was held in honour of Hans Müller on the occasion of his retirement. He was a member of the Corporate Board of Management of Voith AG for eleven years and Chairman of the Executive Board of Voith Paper and Voith Fabrics. Over 200 guests were present at the event. About a third of them were customers from the paper industry, who had travelled from every corner of the world, from India to North America, to honour and thank "Mr Paper".

Hans Müller has worked in and influenced the paper industry for over 40 years. With him, the company has lost an experienced specialist and expert in this sector. Paper played a central role in Hans Müller's professional life. *"Paper cast its spell on me in my early childhood. I was born right next door to a paper mill, my father worked there and sometimes, at the weekend, he would secretly take me with him into the mill"*, recounts Hans Müller. *"Ever since then paper has been my passion, and I have never escaped from its spell."*

Hans Müller was born in Balsthal, Switzerland, on 6th January 1942. In 1966 he completed his studies in paper technology at the Fachhochschule in Munich as a Diplom-Ingenieur (Masters degree in engineering). During the years that followed, Hans Müller worked as a development engineer at Consolidated Bathurst Ltd in Canada. His next position was production manager of Balsthal's Niederbipp Paper Mill, Switzerland. In 1971 Hans Müller moved to Sulzer Escher Wyss in Ravensburg, where he worked as a start-up and project engineer. In 1975, Hans Müller was appointed head of sales in the Paper and Process Technology Division of Sulzer Canada in Montreal. From 1980 to 1992 he first acted as Senior Vice President of Sales and Engineering and later as President at Escher Wyss in Middletown/Ohio, USA. In 1992 Hans Müller returned to Sulzer Escher Wyss in Ravensburg as a member of the Management Board and product manager for paper technology. In 1993 he was elected President of the Management Board. In the course of the joint venture in the paper technology sector together with what

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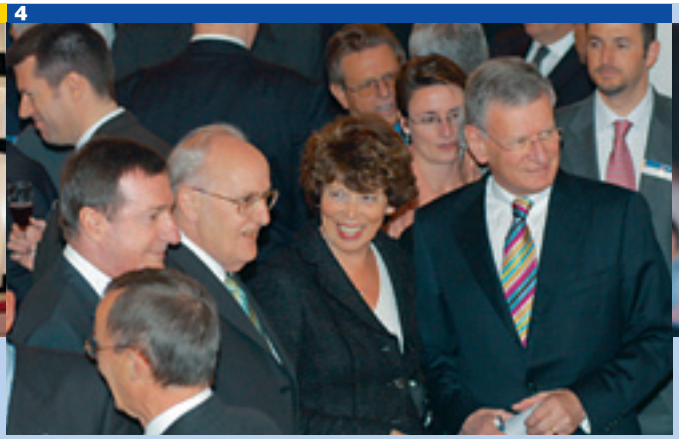

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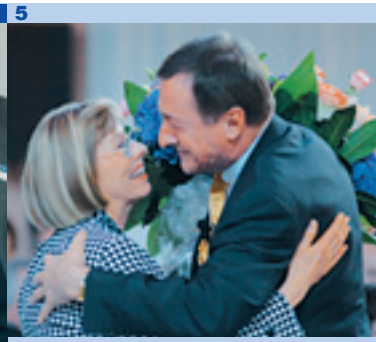

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Fig. 1: *View of the banquet hall at the "Konzerthaus" in Heidenheim.*

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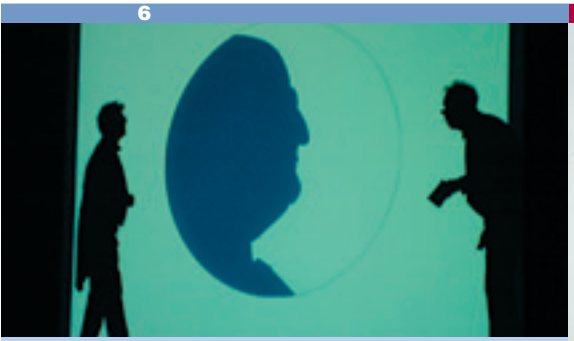
Fig. 2: *Hans Müller expresses his heartfelt thanks.*

was, at that time, J.M. Voith GmbH, Hans Müller became President and CEO of the joint venture in October 1994 with the formation of Voith Sulzer Papiertechnik GmbH. Since 1995 Hans Müller was a member of the Corporate Board of Management of today's Voith AG and was responsible for the Group divisions Voith Paper and, since July 2000, also Voith Fabrics.

During the past decade, Hans Müller has left an indelible mark on Voith Paper and played a decisive role in structuring it. The successful merger of the two companies, Sulzer Escher Wyss and Voith, in the field of paper technology, which was carried out under the presidency of Hans Müller, bears his signature. In 1999, when Voith acquired the paper machine clothing business division of the British company Scapa, and thereby significantly expanded its product range of paper machine clothing, Hans Müller took up yet another challenge. In addition to his previous responsibilities, he also assumed presidency of the newly formed Group division, Voith Fabrics. Further acquisitions, like Jagenberg and Finckh, followed. Hans Müller's strategic goal was always to be able to offer the customer the complete paper production process from a single source.

One year ago, Hans Müller launched a final, future-oriented milestone on the company's way to becoming a process supplier, together with his colleague on the board, Dr. Hans-Peter Sollinger: the Paper Technology Center PTC, a unique research and development centre worldwide for which Voith in Heidenheim has invested over EUR 50 million. With this, a foundation stone has been laid for a successful future at Voith Paper.

"I look back on the eleven years at Voith with a feeling of satisfaction. During these years we have achieved a great deal as a team. Voith, as a family-owned company, cultivates its own culture, which I had the honour of experiencing over the past years and consider to be extremely pleasant. For the future I wish that Voith will continue to remain independent as a family-owned business and that our customers from the paper industry may profit from the innovations that the PTC will produce. I am convinced that at Voith the interests of the customer will be at the forefront of everything that the company does", were the words of Hans Müller.



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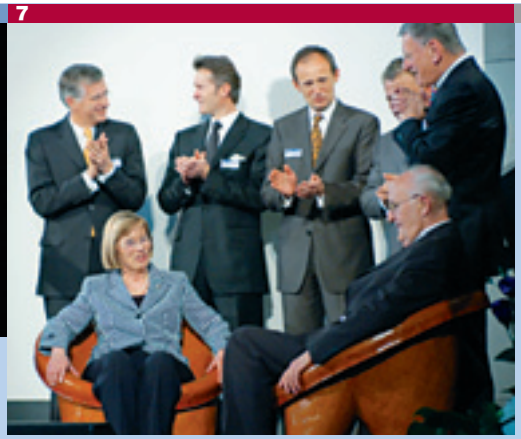

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Fig. 3: *Setting the mood in music for Switzerland, Mr Müller's homeland.*

Fig. 4: *Dr Rogowski thanks Marianne Müller with a bouquet of flowers.*

Fig. 5: *Dr Michael Rogowski, Hans Müller, Angela Voith and Dr Hermut Kormann enjoy a walkabout.*

Fig. 6: *A shadow play recalls Hans Müller's life.*

Fig. 7: *Going-away present from the Corporate Board of Management of Voith AG: Marianne and Hans Müller immediately take a seat in the cocktail armchairs made of paper.*

Extracts from the welcoming speech given by Dr Hermut Kormann, President and CEO of the Corporate Board of Management of Voith AG

"Thank you very much for accepting our invitation to the headquarters of our company in the beautiful Swabian Alps."

"Don't get this wrong: the alp horns that have welcomed you here today are certainly not typical instruments of the Eastern Swabian Alps. The welcome was a first homage, setting the mood for wonderful Switzerland, the homeland of the Voithian to whom we are today saying 'Thank you' and 'Goodbye: Hans Müller, our 'Mr. Paper', who, after having worked for more than 40 years in the paper industry, goes into well-earned retirement."

"When I look around me, I see many well-known and familiar faces from near and far. That fills me with pride. It is a great honour for our company to play host to so many customers and long-standing business partners. I would almost tend to say: The entire 'Who is Who' of the paper sector is here with us today."

"I am particularly pleased to also be able to welcome a member of the Hanns Voith family here today. It is a sign of the closeness of our shareholders to their company that they do not wish to miss occasions like the one today to be present personally and to thank the persons who have done so much for the Voith company."

Excerpts from the laudatory speech by Dr Michael Rogowski, Chairman of the Supervisory Board of Voith AG and President of the Shareholders' Committee of Voith

"It is a great honour and pleasure for me to give an official speech here for Mr Müller."

"It is nice to see so many companions here today, many of whom accompanied Mr Müller over decades through his professional life. When I look through the hall, I see so many faces from old Sulzer-Escher-Wyss times and, of course, many Voithians. And it particularly pleases me that so many of our company's customers have come here. The presence of so many passionate papermakers is the best evidence of the reputation that our 'Mr Paper' has gained in the sector and the standing he enjoys with you all."

"'Paper is my life' – it was with these words that Hans Müller once characterised himself and his relationship to his work. They have long become a standard quotation at Voith.

'Paper is my life' – there could not be a better heading for over sixty years of life with paper – more than forty of which spent working in the paper industry."

"Looking back I can now say: It was a lucky stroke for Voith when Hans Müller joined us in 1994. He knew the sector like the back of his hand far more than anyone else. He was an expert and entrepreneur. His name stood for reliability and trust."

"I am quite sure: Much of what Hans Müller has done for Voith will have a lasting effect and he will be given an honourable place in the chronicle of our company."

"Dear Mr Müller, you were and are a first-class colleague! We all know that the Voith Company would not be where it is today without your service and your commitment. It only remains for me to say a big and heartfelt 'thank you' for everything that you have done for Voith. For your commitment, your know-how, and the experience that you have made available in your service to our company.

We wish you and your family all the best, happiness, good health and satisfaction for the years ahead."

Hans Müller – an institution in the paper industry, and a pillar of strength

Dr Marietta Jass-Teichmann, Executive Managing Partner of the Adolf Jass Paper Mill in Fulda, Hessen, Germany gave a moving thank-you speech – from the customer's point of view – for Hans Müller's farewell. A few exerpts follow.

"Dear guests,
That Voith can today supply a paper mill with all the machinery, equipment and auxiliary materials it needs is the 'strategic' face of Hans Müller. How have we as customers, dear Mrs Müller, got to know your husband personally?

It is not just PM 1 in Schwarza, that went on stream on 12th February this year, that brought us together with Hans Müller. Our first encounter was at the Jass Company in Fulda in 1993, shortly after you, Mr Müller, had taken up chairmanship of the Management Board of Sulzer Escher Wyss GmbH in Ravensburg.

From the point of view of a paper machine manufacturer this was a period that had little to offer at Jass. The last major investment, the fundamental renewal and rebuild of PM 4 together with Sulzer Escher Wyss, was completed successfully in 1991. The time was not yet ripe for another major investment. Nevertheless, you took a whole day of time for us, and we appreciated it very much.
I remember with pleasure how we went together with you for a meal after the tour of the mill, with your family and the members of the management.

In 1997, you met our request to implement the fundamental renewal and expansion of PM 3 in 1998, in the old tradition again under the overall control of Ravensburg.

Dear guests, how does a typical meeting with Hans Müller go? First it should be remembered: We have spoken and you, Mr Müller, have listened. For you are a good listener. A man of few words. You follow the teachings of Laozi: 'True rulers do not set great store by words.' Instead, you take note on a sheet of paper of all of the problems that your customers have in order to persistently ensure that one day each item can be crossed off.
To achieve this you are prepared to go deeply into detail. In the end you personally check with the customer to see whether the crossing-off, to show that the matter has been settled, is justified.

And another thing has also been noticed by several of your customers. Sparks may fly on a high-speed paper machine, but in a meeting in the presence of Hans Müller there is no dispute. Problems are solved objectively.

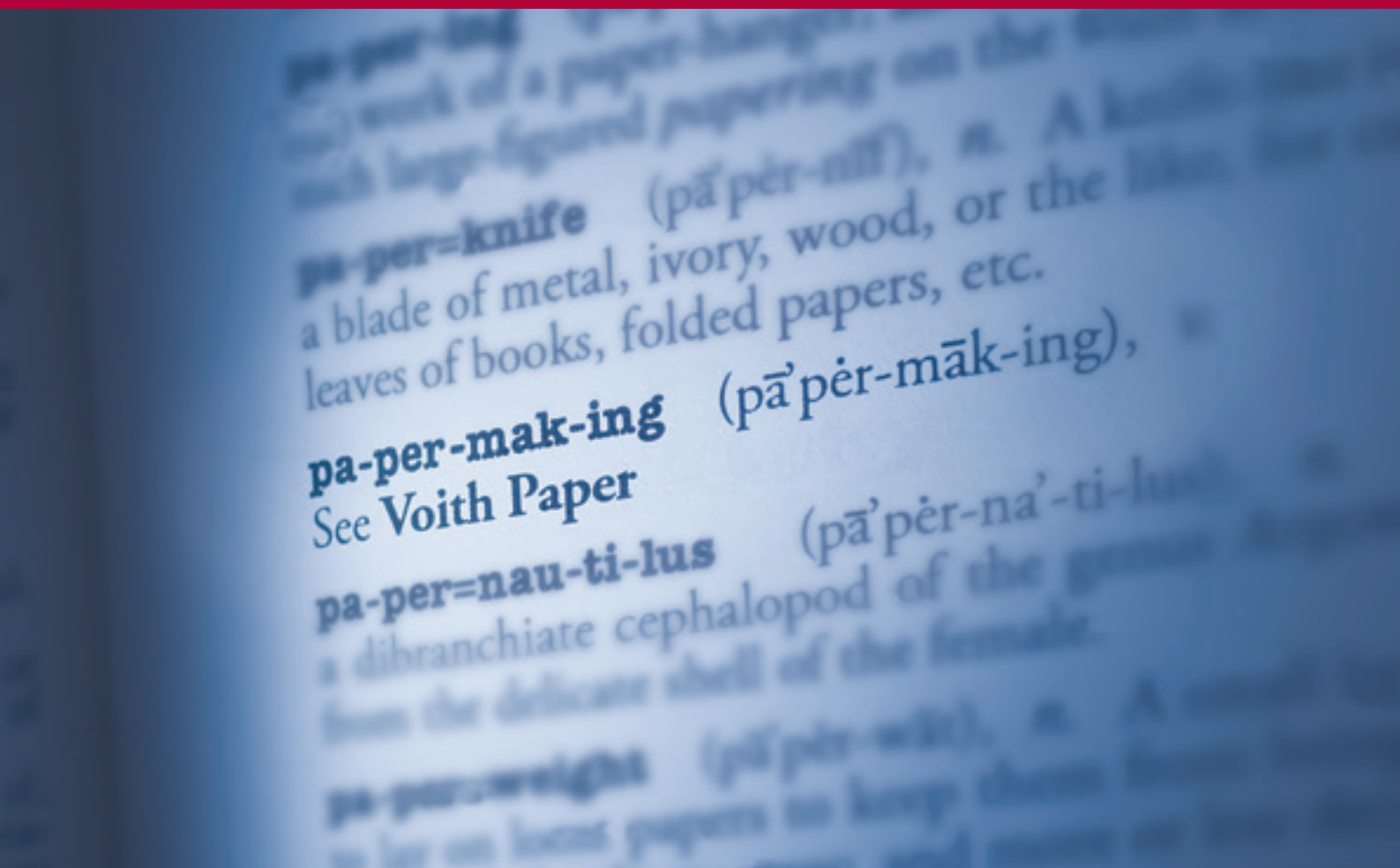
And so Hans Müller is not only an institution in the paper industry, but also a pillar of strength. A man who, through sincerity and reliability, can convince others. One man – one word. In important questions you have stood beside us even at weekends and on holiday. This is what I personally very much appreciate about you.

Dr Marietta Jass-Teichmann, Papierfabrik Adolf Jass, Schwarza, Germany

Today we say – with a little nostalgia – a very hearty thank you. Thank you for what you have achieved for us, for the paper industry. Thank you for your excellent and fruitful cooperation. I know that you are looking forward to the new chapter in your life. We wish you, your wife and your family all the very best for the coming years, good health and God's blessing. Perhaps now, back home in beautiful Switzerland, you will regain 'das Wandern ist des Müllers Lust' (hiking is the miller's delight). And should you ever have a yearning for the pleasant odour of warm paper, you will always be most welcome to visit us in Fulda and Schwarza!"

Voith Paper
New Organization Structure – Looking to the Future

In connection with the retirement of Hans Müller, a number of changes have been made to the organization of Voith Paper. Dr Hans-Peter Sollinger succeeded Hans Müller on 1st May 2005. He took over the chairmanship of the new Corporate Board of Management of Voith Paper, the "Executive Board". Together with Bertram Staudenmaier and Norbert Nettesheim he, therefore, shares the responsibility for Voith Paper.



Fiber Systems

Paper Machines
Graphic Papers & Specialty Papers

Paper Machines
Board & Packaging Papers

Fabrics

The members of the Board of Management of Voith Paper, Rudolf Estermann, Andreas Endters, Dr Roland Münch, Kurt Brandauer, Thomas Koller, Bertram Staudenmaier, Dr Hans-Peter Sollinger, Norbert Nettesheim and Dr Lothar Pfalzer (from left to right).

Within the Board of Management of Voith Paper, the tasks are split between these three members: **Dr Hans-Peter Sollinger** will focus on the divisions for system business, which includes fiber systems, graphic and specialty paper machines, board & packaging paper machines, finishing and automation.
Bertram Staudenmaier will assume responsibility for the Voith Paper Fabrics division (forming fabrics, wet felts and dryer fabrics for the paper industry) as well as the Voith Paper Rolls division (rolls and covers, including roll service).
Norbert Nettesheim will be in charge of Finances and Controlling.

Dr Hans-Peter Sollinger and Bertram Staudenmaier have been appointed to the Corporate Board of Management of Voith AG. In future, Voith Paper will be represented by two members.

There are also organisational changes in the new structure: the merger of Voith Paper and Voith Fabrics. In the past, Voith Fabrics was an independent division of Voith AG. As a worldwide leading supplier of paper machine clothing, it is now a division of Voith Paper and goes under the name of Voith Paper Fabrics. Therefore, Fabrics will in future be integrated into Voith Paper, which will lead to closer cooperation and enable faster start-ups to the advantage of our customers. The previous Group name for Voith Paper and Voith Fabrics, Voith Paper Technology, will be discontinued.

The following seven division managers will be members of the Voith Paper Board of Management:

Dr Lothar Pfalzer – Fiber Systems,
Kurt Brandauer – Paper Machines - Graphic and Specialty Papers,
Rudolf Estermann – Paper Machines - Board & Packaging Papers,
Bertram Staudenmaier – Fabrics,
Thomas Koller – Finishing,
Andreas Endters – Rolls (formerly Service) and
Dr Roland Münch – Automation.

As a "collegial" management organisation, this successful concept with seven closely meshed divisions is geared to optimally networking the know-how and the

Norbert Nettesheim, member of the Executive Board of Voith Paper (Finances and Controlling); Dr Hans-Peter Sollinger, Chairman of the Executive Board of Voith Paper and member of the Corporate Board of Management of Voith AG; Bertram Staudenmaier, member of the Executive Board of Voith Paper and member of the Corporate Board of Management of Voith AG (from left to right).

business strategies of the individual divisions. The divisions share knowledge and experience, the best practices and process solutions and, therefore, mutually support one another so as to be the best in their field. As a leader in innovation and the only process and service supplier in the paper industry, Voith Paper is the competent partner for the complete range of products and services for the enhancement of the paper production process.

Finishing

Rolls

Automation

Austrian papermaker banks on Voith innovation –

Experience and know-how: the key to dependable secondary fibre preparation

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Steffen Henkel
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The Austrian paper group W. Hamburger AG, founded by Wilhelm Hamburger, specializes in the production of high grade corrugating medium and packaging papers.

Today the W. Hamburger Group has four production plants in three countries:

- The parent company in Pitten, Austria
- Papierfabrik Rieger in Trostberg, Bavaria, Germany
- Dunapack, Hungary and
- The new mill Papierfabrik Hamburger Spremberg in Germany.

This latest member of the Hamburger Group is located in Spremberg's "Schwarze Pumpe" industrial zone on a former power station site in Lausitz/Brandenburg.

In November 2003 Hamburger Spremberg ordered from Voith Paper three separate stock preparation lines for topliner, underliner and backliner, including approach flow screening and broke pulpers.

The overall system design capacity is 1,500 t/24 h handling a 100% recovered paper furnish. Included in the scope of supply for these three stock preparation lines were pulping, screening, fractionation, cleaning, dispersion, flotation, thickening, refining, process water and reject handling systems, plus a comprehensive set of spare parts.

The pulping system for the underliner and backliner comprises a UniPulper, Junkomat, Contaminex pulper detrasher, and ragger. For coarse screening, the first two stages in each line are equipped with disc screens (Turboseparators), with Combisorters as the final stage. Refining of the long fibres is undertaken in the

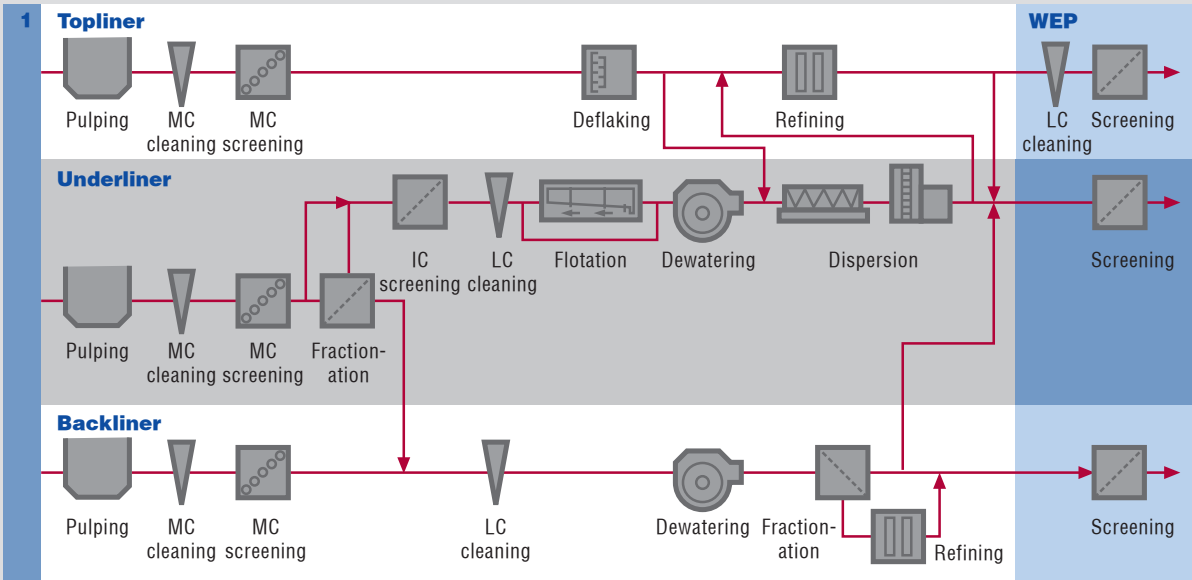

Fig. 1: *Schematic layout of the 3-line stock preparation system in Spremberg.*

Fig. 2: *Turboseparator coarse screening.*

Fig. 3: *Combisorter final stage screening.*

Fig. 4: *KS 900 cleaner installation with EcoMizer technology.*

underliner and backliner systems using Voith TwinFlo double disc refiners.

Depending on the product – fluting, testliner or white top testliner – the underliner system can be fed with stock from brown or white recovered paper grades. The white furnish is first cleaned using EcoMizer technology and then deinked by EcoCell flotation. This is followed by a DX disc dispersion stage for efficient detachment of residual ink from the fibres, plus dirt speck and stickies reduction.

Thickening is by Voith bagless disc filter and Thune screw press technology. Here too, Hamburger has opted for the most advanced thickening equipment available today.

Meri Entsorgungstechnik Munich, a joint-venture partner with Voith Paper, was responsible for the entire reject handling and water treatment systems, including Compax compactor, Elephant thickener, Sedimator, Screenex and various conveying equipment. The approach flows – critically important for sustainable high product quality – have MultiScreens with C-bar baskets. Voith also supplied CompactPulpers, a new generation of broke pulpers under the paper machine.

Likewise included in Voith's scope of supply was basic engineering for the control and instrumentation systems, including parameter listings, instrumentation layout and function planning for the complete stock preparation system.

This engineering enabled the complex automated operation of the individual stock preparation lines to be efficiently integrated together.

In addition to the equipment and control and instrumentation engineering, Voith was also actively involved in engineering the stock preparation plant as well as supervising its erection and commissioning.

The underliner and topliner systems started up in April 2005. Only a few days after commissioning, high grade testliner stock was being pumped to the storage chests. White top testliner production started in June.

By choosing this state-of-the-art technology, W. Hamburger AG has set another important milestone in its long and successful tradition of recycling. Voith Paper is proud to have partnered the company in this exacting project.

Reject handling by Meri

Since the new Technical Instruction on Municipal Waste came into force on 01.06.2005, adequate reject handling has


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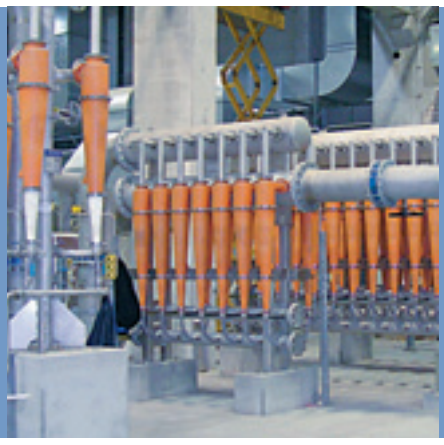
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Fig. 5: *MultiFractor for fractionation.*

Fig. 6: *EcoCell flotation system.*

Fig. 7: *Bagless disc filter with HCH5 cleaner plant on the right, also with EcoMizer technology.*

Fig. 8: *Part of the Voith stock preparation system with Thune screw press (center).*

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become even more important in the paper industry. Apart from the environmental protection aspects of reject handling, greater attention is now being paid to the costs in this area since only after correct pre-treatment can rejects be incinerated without further handling. To ensure correct pre-treatment, the Hamburger Spremberg paper mill was partnered by Meri Entsorgungstechnik.

Light rejects from the drum screens and Combisorters pass via conveyors to a Compax compactor where they are compacted to the maximum possible dry content. The dewatered rejects are then fed to the reject bunker via a third conveyor. Thanks to their high dry content, the pretreated rejects can then be transported cost-effectively for trouble-free disposal.

The plant layout allows enough space ahead of the Compax compactor for installing a Meri metal separator and Lion shredder at a later date. This provides for more stringent disposal demands in future.

Solids are separated from sewer water in the pulping zone by two Elephant disc thickeners, with drainage exclusively by gravity.

Coarse rejects from the screens and from the HC, MC and LC cleaners are handled

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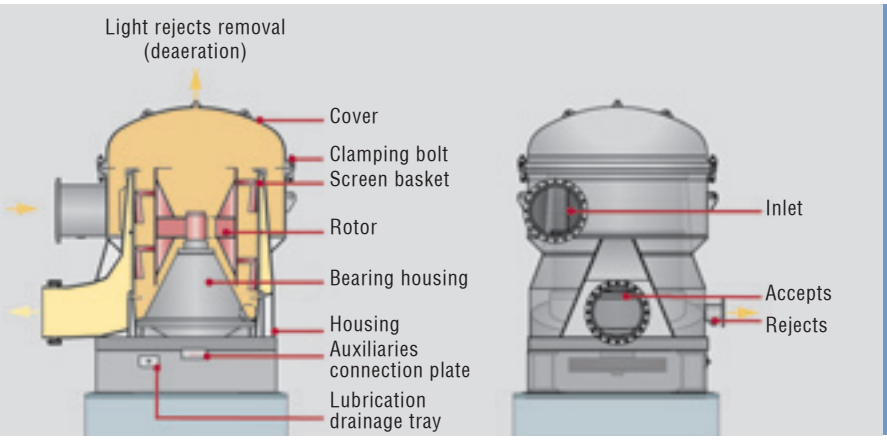
Fig. 9: *Principle of the MSA screen as installed in Spremberg's approach flow systems.*

Fig. 10: *Compax for compacting and dewatering rejects.*

Fig. 11: *Sedimator for dewatering small, heavy rejects.*



Harald Ganster

Director, Production and Technology W. Hamburger AG

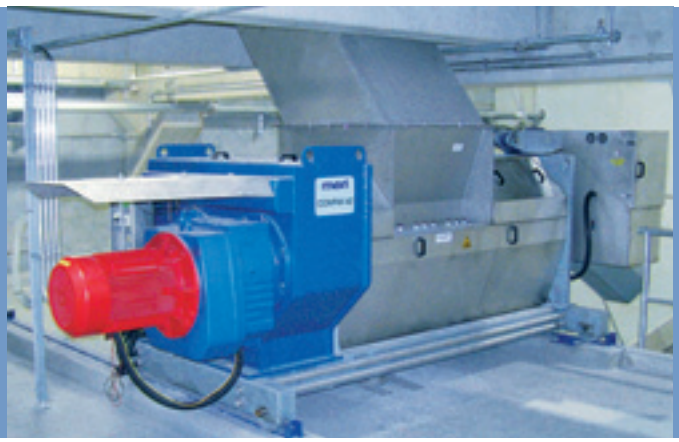
"We are extremely satisfied with the entire handling of this project, the success of which is very much attributable to the Voith team. In delivering the complete stock preparation system including approach flow screens and broke pulpers, Voith has played a key role in the successful completion of our ambitious project. We are very impressed by their professional project management."

by a Sedimator. This machine has been specially developed to remove small and heavy rejects such as paper clips, glass, small stones and sand, metal and heavy plastic particles from reject flows.

The pulper rejects are dewatered by two Screenex units. These machines are designed for draining the water out of coarse rejects from batch-operated pulping systems. The Screenex can process a wide variety of rejects, including plastic, bottles, stones, wet strength paper, metal, wood, textiles and the like. Thanks to the large buffer storage capacity of the inlet hopper, the machine can handle large amounts of rejects and flushing water. The dewatered heavy rejects from the two Screenex units are then transported by belt conveyor to a disposal container.

Enough space has also been allowed for the future to shred the pieces of rope trash after the rope cutter using a Lion shredder. The trash can then be transported by belt conveyor to the container to join the rejects from the Screenex units.

The teamwork between Hamburger Spremberg and Meri Entsorgungstechnik has resulted in a reject handling system that not only enables trouble-free disposal according to the new regulations, but also a much more cost-effective reject transport thanks to greater compactness and weight savings.



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Fiber Systems in Japan –
Customized solutions for small to medium size stock preparation lines, too

Andreas Sauer

Fiber Systems
andreas.sauer@voith.com

Customer requirements, expectations and circumstances in Japan are different from those in other countries. These differences range from printability demands right back through the papermaking process to stock preparation. Demands on end product quality and on machine runnability are very high. Plant space requirements is a particularly important factor.

Due to the high population density and earthquake safety requirements in Japan, building costs are also high, so that installation and maintenance access space is usually restricted. In addition, normal mass production solutions with large paper production tonnages are not always applicable. As against the average DIP production of 200-400 t/24 h in Japan, the DIP output of many Japanese mills is only about 50-150 t/24 h, and such plants are still being planned and installed. Moreover, Japan has one of the world's highest domestic recycling quo-

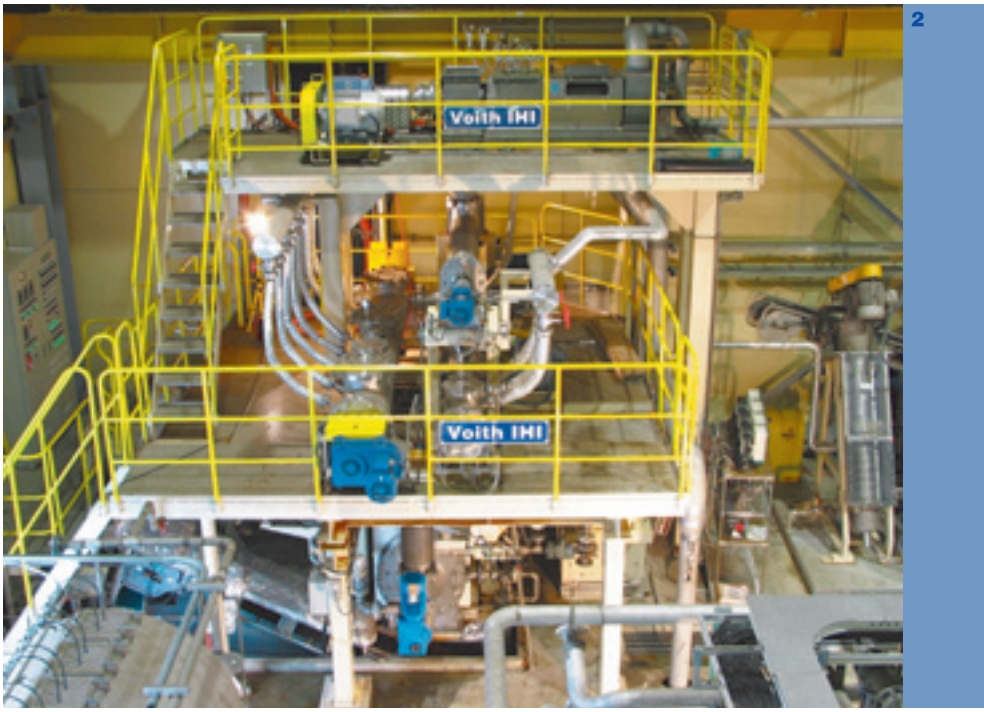
Fig. 1: *Each subsystem in the trial facility can be individually tested.*

Fig. 2: *Trial dispersion system for thickening and dispersion at temperatures up to 125 °C.*

tas, which means different local printing ink binders and ink speck sizes have to be taken into account, too.

Voith Paper has been working closely together with Japanese customers for many decades, helping to develop cost-effective and optimized concepts. For example, Voith Paper has introduced new technologies in Japan, such as the two loop principle (pre- and postflotation). The stock preparation lines commissioned in Japan for graphic grades and board and packaging papers meet all expectations and are highly commended by Voith's customers.

Voith IHI Paper Technology provides customers in Japan with the full range of Voith Paper production plants, including optimal machines and solutions for tissue stock preparation lines.



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Significant orders in Japan for Voith Fiber Systems

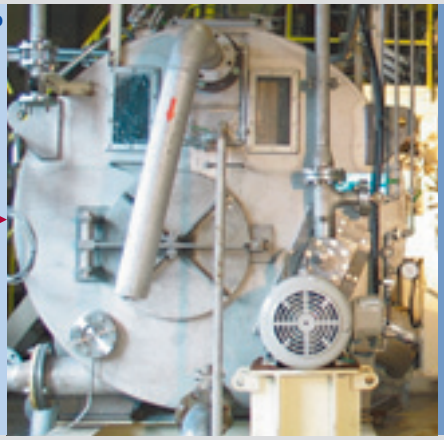
- Complete bale feed systems with the latest in automated bale dewiring machinery. Due to the very high cost of labour, maintenance-friendly plants are particularly important in Japan.
- High consistency pulping systems for OCC lines. These systems offer customers better paper strength characteristics than conventional low consistency pulping systems.
- Fiberizers to replace pulper detrashing machines supplied by others. For the same power consumption, production and screenplate hole size, customers report half the fibre losses, with higher quality at the same time.
- HiPRO high consistency cleaning systems for OCC, DIP and chemical pulp plant. Customers report twice the screen basket life in downstream machines after replacing cleaners from other suppliers.
- 250 rebuilds of screens supplied by others. The successful MultiFoil rotor and C-bar screen basket combination has resulted in substantial power savings, with better stickies removal at the same time.
- Within a single year 10 rebuilds of competition screens to Voith's new low profile screen technology. MC slotted screen capacity then rose threefold, with higher product quality and lower power consumption.
- Disc filters (now with the patented bagless segments) for OCC, TMP, DIP and the wet end process. Within just four years these machines are now so successful that more of them are sold in Japan than any other make.
- 70% of all pre-, post- and filtrate flotation systems in Japan have been ordered from Voith IHI. EcoCell and the improved MT II flotation technology have convinced customers for production tonnages exceeding 50 t/24 h.
- Repeat washer orders for DIP, OCC and tissue lines. Compact Washer with improved design.

Figs. 3a and 3b: *Flotator development from the MT (3a) to the MT II (3b).*

Fig. 4: *Overall losses and brightness gain in the primary stage of a pre-flotation system (70% ONP, 30% OMG, 15% ash, soap as collecting agent).*

3a

3b



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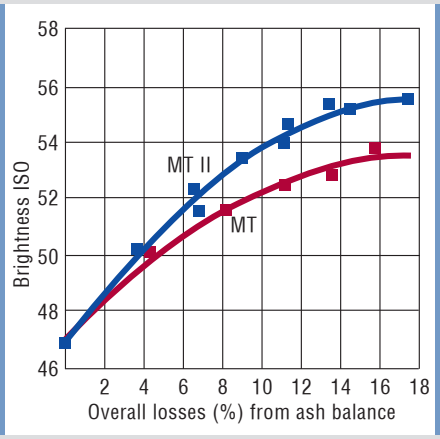


Fiber Systems customer trial facility in Japan

Voith IHI Paper Technology serves customers and research institutes with a trial facility for simulating machine and stock behaviour under virtual mill conditions. Many customers buy this service from Voith, since it enables them to precisely check out both positive and negative influences and effects, thus ensuring a sound basis for their investment decisions.

All stock preparation subsystems are available in this test facility **(Fig. 1)**, at the heart of which is a dispersion system. Both the high consistency discharge (chute) and pump operation for 3 bar high-temperature dispersion can be run, e.g. for investigating freeness and dirt speck development **(Fig. 2)**. Many customers also use our facility for selecting the correct screen slot width. For this, approximately two dozen screen baskets are available for establishing the optimal compromise between quality, fibre losses and fractionation. Here, Voith also investigates other influences during the trial work such as screen basket profile angle and rotor speed.

The MT II Flotator: specially designed for small to medium production tonnages

Voith's EcoCell flotation is a very flexible process in many respects. Thanks to its simple, modular design, the EcoCell flotation system can easily be expanded to cater for production increases. For difficult or slow flotation conditions the number of cells can also be suitably adjusted. This and many other factors make the EcoCell the most efficient and cost-effective flotation machine for production outputs exceeding 150 t/24 h.

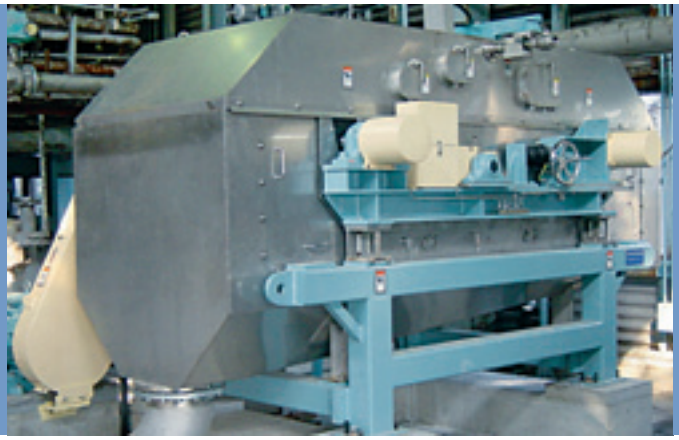
As mentioned, there are numerous mills in Japan with relatively small production capacities between 50 and 150 t/24 h. For tissue production and filtrate flotation, compact machines are also needed. The MT Flotator **(Fig. 3a)** has a capacity of 20 to 50 m^3. Developed mainly for highly specialized customers, this machine achieves excellent quality levels.

Its design has now been completely revised for greater ease of maintenance. The new MT II Flotator **(Fig. 3b)** offers the following main benefits:

- Adjustable air bubble spectrum and air flow control.
- Greater collision probability between air bubbles and ink specks – adjustable to suit requirements.
- Self-cleaning aeration system.
- Automatic foam overflow.
- Compact design for lower investment costs and less space requirement.
- Improved quality results for the same dwelltime, or reduced size for the same quality if this is already sufficient.

Fig. 5: *The new Compact Washer.*

Fig. 6: *The maintenance-friendly headbox of the new Compact Washer.*



The MT II Flotator ensures excellent brightness development **(Fig. 4)** and low losses in the smallest possible space. In addition, its specific energy consumption in this production area is the lowest of all flotation concepts.

The Compact Washer: specifically for small to medium production tonnages

While washers are used in Europe exclusively for tissue and market pulp production, the machine is a favourite in Japan for other purposes as well. For board and packaging paper production from recovered fibres, it offers the advantages of greater product strength characteristics, better drainage behaviour and fewer web breaks on the paper machine. In DIP lines the Compact Washer is used for improving brightness, dirt speck removal and microstickies reduction. Fluctuations in ash content and freeness, due among other reasons in Japan to the generally small size of raw material storage capacities, invite new solutions based on intelligent control concepts. Here too, Voith also offers customized solutions for small to medium size production lines.

The Voith VarioSplit is a high-speed washer with drainage by wire tension around a smooth roll. By integrating two headboxes and two drainage rolls into the same machine, higher capacities are possible with only one unit. The machine is very compact, and at normal stock consistencies up to 1.3% very high deashing efficiencies are reached. The efficiency can be simply adjusted by altering the wire speed.

For small to medium production systems, and particularly for stock consistencies between 1% and 4%, Voith Paper has onward developed an existing machine concept and the result, the Compact Washer, has proved to be highly successful in practice **(Figs. 5 and 6)**. Drainage in this machine is by centrifugal force on a grooved roll, and by wire tension. Deashing is regulated by varying the inlet stock consistency.

The new Compact Washer offers the following benefits, all of which have been confirmed in practice:

- Lower operating costs thanks to longer wire life.
- New improved headbox design:
  – Forced cross machine distribution ensures better wire utilization for a more uniform wash effect.
  – Modular headbox design for easier dismantling and cleaning.
- More maintenance-friendly thanks to easier accessibility.
- Closed machine concept keeps the surroundings clean.
- New tray design eliminates dead zones and prevents deposits.

Papresa doubles capacity –
PM 6 went successfully on stream

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In the Basque town of Renteria, Spain, Papresa S.A., a manufacturer independent of large industrial groups, produces 170,000 t/year of newsprint on two paper machines, PM 4 and PM 5. 80% of the production goes to the Spanish market, covering with it a market share of 20%. The remaining 20% of production is exported to neighbouring countries. With the start-up of the new PM 6 production line, the capacity of the paper mill has been more than doubled, with the goal of increasing the Spanish market share to 30% and the export rate to 40%.

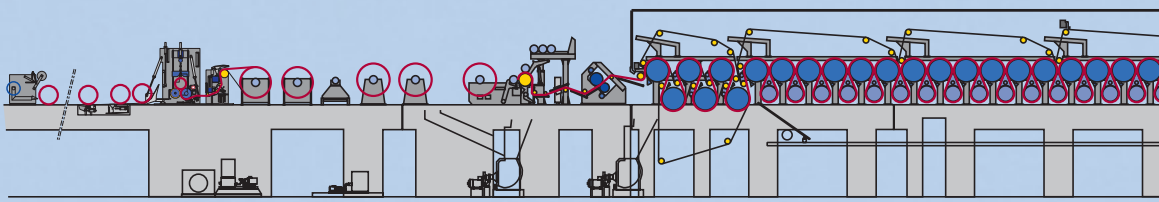

Fig. 1: *Papresa S.A. in the Basque town of Renteria, Spain.*

Fig. 2: *Operator Team PM 6, Management of Papresa S.A., Management of Voith Paper S.A., Tolosa, Project Management Team of Voith Paper.*

Fig. 3: *Schematic PM 6.*

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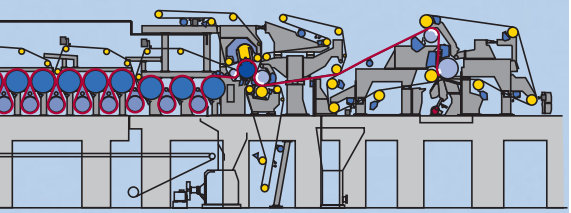

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The project, originally intended in 2002 as an extensive rebuild of PM 5, very rapidly gained dynamic and Papresa decided to install a completely new production line, PM 6, on the site of the shutdown PM 3. The goal was, with a total investment of EUR 100 million, to increase annual capacity for the production of newsprint in Renteria to 350,000 t/year.

Papresa ordered the turnkey production line from Voith Paper S.A., Tolosa, which was completed according to the Process Line Package concept. Besides the machine and the wet end process, the order included almost all ancillary systems, the electrical equipment and control system. In addition, Voith Paper was entrusted with the complete machine and plant engineering. The furnish, consisting of 100% recovered paper, is mostly prepared in two stock preparation systems, which were supplied by Voith Paper S.A., Tolosa and put into operation in 1997 (DIP 2) and 2003 (DIP 3).

Paper machine

It is intended to produce 180,000 t/year of newsprint on the new PM 6 with a wire width of 5,900 mm and a design speed of 1,500 m/min. The maximum parent roll diameter is 2,500 mm.

The production line is based on the Voith One Platform Concept. This means that only proven high-tech modules that have already been deployed very successfully in many machines world-wide were used. This ensures, among other things, a fast and trouble-free start-up and optimization of the production line.

The paper machine includes a headbox with ModuleJet dilution water line and Profilmatic CD profile control, which is used on a DuoFormer TQv. This combination ensures that a uniformly controlled CD basis weight profile is reached early on in the process. This is followed by a DuoCentri NipcoFlex Press, a CombiDuo-

Lourdes Marquet

Technical Director Papresa S.A.

"We are extremely satisfied with the fast and troublefree start-up and optimisation of the production line.

Looking back, we can say that the decision to entrust Voith Paper with overall responsibility was right. We operate a machine that has almost completely reached the design data, but apparently still has a lot of additional potential that we will now utilise jointly step by step."

Fig. 4: *PM 6 with an annual production capacity of 180,000 t of newsprint.*

Fig. 5: *Extract of 3-D plan Wet End Process.*

Fig. 6: *EcoSoft-Delta Calender.*

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Run dryer section, a 1x2-roll EcoSoft Delta calender with CalTronic CD profile control, which provides the web surface values necessary for the required good printability even at moderate pressures and temperatures and ensures optimal runnability by uniform densification. A MasterReel wind-up system ensures excellent winding quality thanks to the directly measured linear load.

Finishing

In addition, two VariFlex M winders, one Twister roll wrapping machine and the associated transport units were delivered.

The winders are of the two-drum type of the latest generation. The roll-forming drum systems have been specifically designed for newsprint, i.e. the first drum

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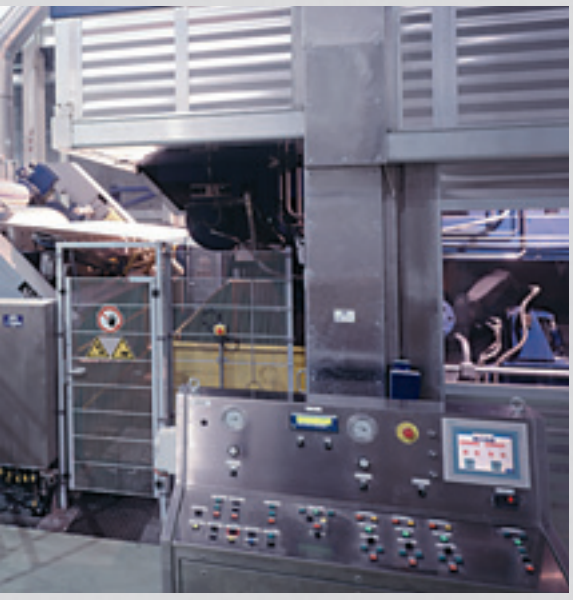
has its own specially developed, flexible Elastomer cover of the MultiDrive type, and the second drum is a tungsten-carbide-coated steel roll. The rider roll, in turn, has a soft MultiDrive cover.

Through this combination it is ensured that the finished paper rolls are absolutely free of the disturbing creping wrinkles that occur frequently on newsprint rolls and that the cores are seated centrally in the rolls – both are a prerequisite for optimal runnability of the rolls in the printing presses.



The roll handling system consists of a manually operated, rail-bound transport car for the parent rolls and a roll wrapping system with upstream and downstream transport sections.

As far as the roll wrapping machine is concerned, the customer has again decided on the installation of a spiral winding principle based Twister.

The first Twister supplied to Papresa had already proven successful. The new machine is a Twister 1 Line.

At this type the individual sections are set up along a continuous conveyor belt so that the rolls are wrapped “as they pass”, so to speak.

This makes the machine fast and also protects the rolls because the ejection and insertion, customary up to now, is no longer required.

Process Line Package

That the PM 6, as mentioned above, is designed according to the “One Platform Concept”, and is therefore a proven and safe machine concept, was, however, not the only criterion that made the Voith offer so attractive for Papresa. Added to this was the fact that Voith was prepared to assume full responsibility for the new line to stand up from the very beginning for the success of the process based on the “Process Line Package Concept”, i.e. from stock preparation to the finished, single roll.

That means that Papresa did not need to bother with interface problems, which frequently provide the reason for arguments, whenever something does not “run the way it really should”. Project handling has shown that this approach was correct and that the idea of the “Process Line Package” followed by Voith is a guarantee for success.

Voith Paper S.A., Tolosa supplied the following systems within the “Process Line Package”:

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Fig. 7: *VariFlex M Winder.*

Fig. 8: *Twister 1 Line.*

- The entire wet end process with approach flow system, broke preparation, fibre recovery and water systems
- Vacuum system
- Machine air system
- Lubrication systems
- Steam and condensate system
- Compressed-air system (ropeless threading)
- Mechanical drives
- Electric drives
- Electrical equipment (medium and low-voltage distribution, MCCs)
- Process control system.

Among the services within the "Process Line Package" that were provided for Papresa are:

- The entire plant and machine engineering (basic and detail engineering), beginning from the demands made on the building and the crane systems up to the engineering of systems that were purchased directly by the customer
- The project management containing, among other things, the entire project coordination and time scheduling
- Installation
- Training
- Commissioning/start-up
- Optimisation.

Papresa cared much about maintaining the limits for noise emissions, as the mill adjoins a residential area. This called for detailed studies of the sources of noise in order to determine the optimal arrangement of the equipment and the necessary noise insulation. As a result of this, machine sections were then installed inside the building that normally would have been installed outside, and special noise insulation material was used on the building.

8

Project handling

For Voith Paper S.A., Tolosa this order was a great challenge in terms of size and scope of services. To achieve the goals set, a consortium was formed with other Voith Paper companies.

Last but not least, the geographical proximity of Papresa and Voith Tolosa (about half an hour by car) resulted in very close and optimal cooperation between the project teams, which meant that many problems were detected at an early stage and could be eliminated in advance, which led to the first roll being wound up at 1,250 m/min on 10th December 2004. The paper was of saleable quality right from the first roll.

In the remaining two weeks up to the Christmas shutdown, the machine was further optimized and its speed was increased to 1,300 m/min. The technical director of Papresa, Mrs. Lourdes Marquet, then said how impressed and very satisfied she was about the troublefree and fast start-up of this complete production line.

Currently, 4 months after start-up, the machine is being operated at the design speed of 1,500 m/min and reached an average operating time efficiency of over 85%. The forecasted starting curve could, therefore, be clearly exceeded.

Traun PM 3 –
Special grades for exclusive demands

Trierenberg Holding Group – with the Traun and Wattens mills in Austria, Olsany in the Czech Republic and Tervakoski in Finland – is not only the world's leading producer and supplier of cigarette papers, filter envelope and tipping papers, but also the leading processor of these grades.

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1

Andreas Windisch-bauer

Chief Engineer Dr. Franz Feurstein GmbH

"Voith optimally supported our project team right from the early stages, thus laying solid foundations for a successful outcome. Years of experience in producing our high-quality products on PM 2, paired with the latest technology and innovations, has now led to our state-of-the-art PM 3.

Our management's ambitious project schedule was only met thanks to the outstanding commitment and capability of all concerned. For me personally, this once again shows that despite all our advanced technology, the human factor is the most important of all. In this connection I would like to thank on behalf of the Feurstein team all our Voith colleagues in the Traun PM 3 project.

The indispensable need of our customers to precisely reproduce the tipping paper qualities so far attained on PM 2 was easily complied with after start-up optimization. Meanwhile this has been confirmed by the complete approval of all customers, and we are also very interested to see what the new machine can do for us in the way of new product developments. There is no doubt that this highly successful commissioning has enabled us to set new product quality benchmarks. Our new PM 3 is perfect proof that a powerful modern paper machine can provide all the flexibility we need for our highly specialized products."

Fig. 1: *Dr. Franz Feurstein GmbH, Traun, Austria.*

Fig. 2: *Traun PM 3.*

Fig. 3: *Cigarette tipping papers also serve another important purpose – Image.*

Figs. 4 and 5: *The character of a cigarette depends on three different grades of paper.*

Not everyone knows that a cigarette is a high-tech product. Apart from the tobacco quality itself, the paper grades in particular influence the taste, strength and brand image of a cigarette. The porosity of the normally white cigarette paper and filter envelope paper makes a cigarette "light" or "heavy". The printed tipping paper gives the cigarette a certain image, and is perforated to admit exactly the amount of air defining its character.

The new PM 3 at Dr. Franz Feurstein GmbH in Traun mainly produces tipping papers. These very lightweight grades, with basis weights from 28 to 40 g/m^2, are afterwards rotogravure printed with the cigarette's exclusive image and perforated to ensure precisely the right ventilation characteristics. Small batches of thin or "bible" printing papers are also produced on PM 3.

This machine was jointly developed based on Feurstein's experience in tipping paper production and Voith's specialized papermaking process know-how. The primary focus was on product quality and machine flexibility. Consistently high paper quality is of paramount importance in cigarette-making machines. Furthermore, the paper must be as insensitive as possible to humidity and temperature fluctuations.

Quality first

Quality starts with stock preparation. To this purpose the approach flow section incorporates C-bar screens, EcoMizer cleaners and a HydroMix for efficient water-stock mixing. The result is consistent product characteristics and fast stabilization after product changes – decisive for optimal economy and market success.

Rectifier roll headboxes with ModuleJet are well proven in the Trierenberg Group. Also on the new PM 3, one of these headboxes ensures a uniform basis weight profile in the machine and cross-machine directions. And together with the dandy roll, indispensable for these paper grades in the fourdrinier section, it also guarantees excellent formation.

The press section includes a DuoCentri-I press with separate pick-up, a conventional double-felted first nip, and a single-felted second nip. This is followed by a straight-through press enabling separate smoothness adjustment on the top and bottom sides. Deflection compensation is assured by a newly developed self-loading single-zone Nipco-F1 roll.

A CombiDuoRun pre-dryer section with transfer foil unit, DuoStabilizers and Ventistabilizers, enables a reduction of web tension for optimal running at low basis weights. Web threading is ropeless.

To ensure perfect printing, tipping papers must have a very homogeneous smooth surface, whether glossy or matt, that is adequately absorbent. The unprinted side must also meet all further processing requirements, such as glue penetration capacity and suitability for adhesion. A Speedsizer between the pre-dryer and after-dryer sections enables 2-sided coating at 1-5 g/m^2 per side. Airturn with infra-red profiling and hot air dryer ensure contact-free drying prior to the next process step.

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Immediately after the two-tier after-dryer section are two DeltaSoft calenders, with single or dual nip operation and ModuleTherm with caliper cross-profile control. This ensures first-class calendering for a wide variety of grades.

Wind-up takes place on the new MasterReel with oscillation. The axial movement of the web prevents uneven reeling and local overstretching of the web. Thanks to permanent line load measurement on the reel drum and controlled nip load, this system ensures excellent wind-up quality. The parent rolls are cut on the VariFlex M two-drum winder with shortest possible paper runs at speeds up to 2,500 m/min.

For Trierenberg it goes without saying that the paper machine's appearance must match the high quality of its products. The unmistakable Voith design not only appeals to papermakers, but at least as much to Trierenberg's customers.

Customer satisfaction – the key to success

The entire erection and all testing procedures went according to plan, with stock on wire on December 6, 2004, after nearly 5 1/2 months of erection and start-up procedure, and round-the-clock production only 4 days later. After about three weeks of start-up optimization, the first sample rolls were produced in the last week of December. By the end of January 2005, twenty out of the 75 different base paper grades had been produced. Vice-director Andreas Windischbauer, chief engineer at Dr. Franz Feurstein GmbH and PM 3 project manager, was extremely satisfied with the start-up results. Thanks to the customer's valuable teamwork from an early stage, the testing and commissioning phase was relatively short.

The operating team on production line 3, partly comprising experienced members of the line 2 team, is well acquainted with tipping paper requirements – further proof of the successful teamwork between the customer, Voith and engineering partners.

Even happier than project manager Andreas Windischbauer is Trierenberg Group Chairman Ernst Brunbauer. Voith's initiative in identifying additional small improvement possibilities and implementing them to the customer's benefit has fully confirmed his choice of Voith as supplier: *"The relations between Trierenberg and Voith are exemplary."*

Technical data

Design width	5,950 mm
Design speed	1,000 m/min
Basis weight range	28-40 g/m^2
Production capacity	122 t/day
Furnish	Chemical pulp

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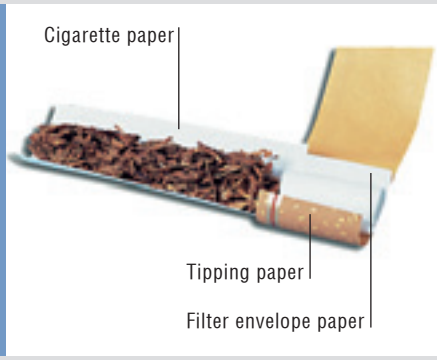

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Varel PM 5 –
Interview with Uwe Wollschläger, Managing Director Papier- und Kartonfabrik Varel

At the end of 2004 Papier- und Kartonfabrik Varel in Friesland, Germany, commissioned PM 5, their second paper machine for low basis weight corrugating paper and testliner. This increased their total capacity by 250,000 to 650,000 t.p.a. together with the other two board machines.

Trimmed width of PM 5 is 5,600 mm, with a design speed of 1,300 m/min and drying capacity of 850 t/24 h. Supplied by Voith St. Pölten, Austria, this machine was designed for a basis weight range of 75 to 120 g/m^2.

This paper machine has a DuoFormer base with MasterJet M2 2-layer headbox, DuoCentri-NipcoFlex press section, a dryer section with combined single and double tier groups with 45 dryer cylinders in total, a SpeedSizer film press, a MasterReel and a VariFlex M winder.

twogether magazine spoke with Uwe Wollschläger, managing director Papier- und Kartonfabrik Varel with responsibility for production and the Varel PM 5 investment project, about his company's strategy and experience with Voith.

Fig. 1: *Varel PM 5.*

1

When did you first think about installing a completely new corrugating paper and testliner line in Varel, and why?

Uwe Wollschläger: Our plans for a new paper machine started to take shape in 2002, mainly because of the increasing demands by our customers for corrugating paper lighter than 105 g/m^2. Since the existing PM 4 could only meet these demands at the expense of considerably less output, we realized that only a new production line would solve the problem.

In mid May 2003 you placed an order with Voith for the entire line, from paper machine to winder including control system, erection supervision and commissioning. Also included was key equipment for stock preparation and approach flow sections. By ordering all this technology from the same supplier, what benefits did you gain during the project and commissioning?

Our very ambitious budget could only be complied with by choosing what we considered to be the most cost-effective solution in each case. Maybe we could have saved more money by dividing orders among more suppliers. But since our human and technical resources are limited as a medium sized company, we needed a strong partner like Voith. We decided to order the key components of this new line from Voith, including the fabrics, in order to ensure a troublefree start-up and fast optimization. The perfect commissioning and a startup curve exceeding our expectations, with no unpleasant surprises, fully confirmed our expectations.

Your PM 5 went smoothly on line on December 21, 2004 and, since then, has mainly been producing corrugating paper and testliner at basis weights below 110 g/m^2. How is the market acceptance of these new lightweight grades?

For the first six months of operation we only planned to produce corrugating paper on PM 5, but testliner production trials have already started. Based on disperging, coloring and sizing results, we shall soon be able to produce very high quality testliner.

We were surprised how well our lightweight corrugating paper was accepted on the market, and how quickly we were able to change from 100 g/m^2 to 90 g/m^2. Clearly, we made this investment at the right time, because the market is really moving now. In the first 100 days of full production with our new PM 5, we even processed several orders for 80 g/m^2 corrugating paper.

Fig. 2: *Uwe Wollschläger: "Teamwork is indispensable for sustainable success".*

2

In a highly competitive market including a good many reputed suppliers, Papier- und Kartonfabrik Varel is remarkably successful as a small company. How do you explain this success?

For many years our strategy has primarily focused on first-class product quality and immediate response to customer needs. That demands great flexibility and excellent customer service. As a relatively small privately owned company, we can make decisions and realize customers suggestions very quickly. And another reason is our well-functioning teamwork, which, in my opinion, is indispensable for sustainable success. The success of the PM 5 project is decisively attributable to our team of experienced specialists and well-trained young employees, together with our consultants who have been partnering us for years.

With your new PM 5 you have invested in the future. Where will Papier- und Kartonfabrik Varel be in 2015?

At the end of the next ten years we see ourselves as a medium size German company producing 650,000 t.p.a. or more of paper and board. We intend to go on developing with our customers and play an important role as corrugating paper and board supplier, not only in Europe. Our rapid response to changes and innovations will safeguard our market positioning.

Due to saturation of the corrugating paper market, we now face a couple of difficult years. But the market continues to grow, and capacity increases will be possible again afterwards. In the meantime we shall also develop further our secondary business of board and cardboard production, because this market is subject to changing trends and cycles.

Business success depends on entrepreneurial know-how and making the right decisions at the right time. Nevertheless, every company also depends on market developments. How do you think the packaging paper market will develop in central Europe?

There is a limit to everything, but as I said before, we think the packaging paper market will continue to grow. However, there will be new developments as well – as shown by this latest trend toward lower basis weights, which should make corrugating paper cheaper to produce and, therefore, more competitive. But in future, good surface printability will play an increasingly important role.

Many thanks for this interview, Mr Wollschläger, and all the best to you and your team!

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think in paper –
Topping-out party at the new Paper Technology Center

Anja Lehmann

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Only eight months after laying the foundation stone, the new Paper Technology Center in Heidenheim already had a roof over its head by June 17, 2005. This state-of-the-art research facility investment underlines Voith Paper's future-oriented innovation strategy.

Karl Josef Böck, managing director Voith Paper Heidenheim, thanked the architects, building contractors and everyone else involved for their outstanding performance. Even the size of this impressive building faced them with a considerable challenge – 115 m long and 22 m high, with 850 tons of steel and about 8,000 cubic meters of concrete. That is about 150 times more concrete than for an average house.

After completing the building so quickly, paper machine installation can already go ahead in July this year, ready for the scheduled commissioning in February 2006. To meet that deadline, all available forces will be mobilized for on-time inauguration. This new Voith Paper technology center – the world's most modern – incorporates equipment as it were a complete graphic paper line for process modifications and analysis, ranging from stock preparation to finished product. The technical data of this facility are equally impressive: with a design speed of 3,000 m/min or 180 km/h, 50 m of paper can be produced per second – five times faster than the 100 m world sprint record.

With this Paper Technology Center, Voith's technology leadership will be further consolidated for meeting customer needs even earlier, with innovative future-oriented solutions.

Fig. 1: *Construction work on the new Paper Technology Center is progressing rapidly.*

Fig. 2: *Congratulations on a highly successful topping-out (left to right): Herbert Stahlhut, Glass GmbH building contractors; Jörg Wilhelm, project manager Voith Paper; Josef Schuster, Schuster Engineering; Heinz-Jörg Hüper, Hüper Plan; Ulrich Gönnenwein, Züblin GmbH; Ulrich Begemann, R&D manager Voith Paper; Dieter Tegeder, Glass GmbH; Karl Josef Böck, managing director Voith Paper Heidenheim, Germany.*

Fig. 3: *Inside the new PM hall.*

Fig. 4: *The topping-out address was held by foreman Horst Steiner of Züblin GmbH, Germany.*

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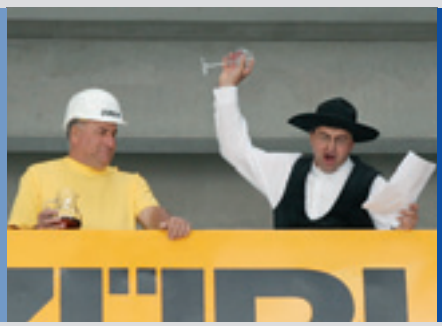

4

Rebuilds with Voith –
Improved quality, productivity and economy for greater customer benefit

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As one of the most capital-intensive industries worldwide, the paper industry demands concentrated efforts to maximize productivity and profitability. On the one hand this requires continuous advances in high-performance technology for cost-effective raw material utilization. On the other hand, the commercial viability of existing plants must be assured by quality and productivity enhancement measures, efficient maintenance, and compliance with environmental protection regulations. All these aspects are equally important for staying abreast of market competition.

Net global market growth of the paper industry is currently forecast at about 2.5% per annum. But taking account of capacity replacement for old production lines, the figure rises to about 3.5% p.a.

As shown in Fig. 1, this comprises new mill capacity plus increases through rebuilds and optimization measures. The importance of upgrading existing lines for increased productivity is very clear.

Voith meets this challenge by systematically developing custom-made rebuild concepts for existing installations, focusing thereby on individual customer needs in order to ensure optimal benefit from each rebuild.

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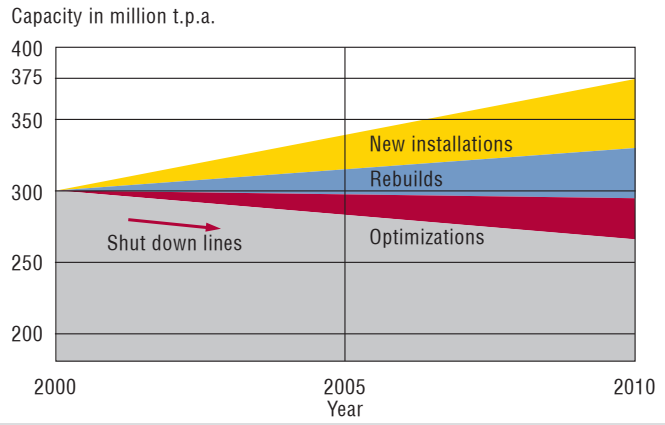

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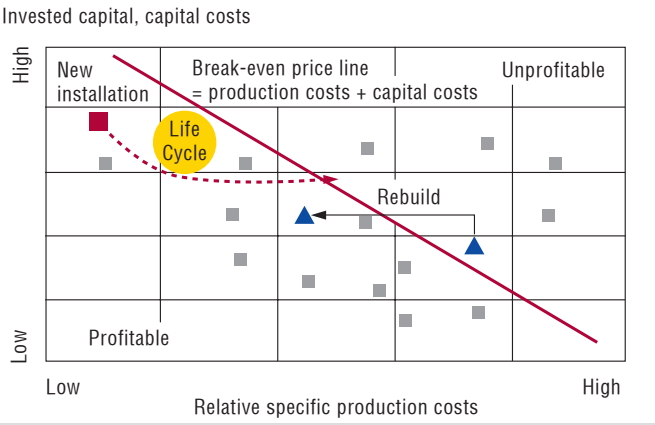

Fig. 1: *Global paper industry capacity and investment developments.*

Fig. 2: *Market positioning.*

Fig. 3: *Operating earnings as a function of the ratio of reinvestment capital to production line depreciation.*

Fig. 4: *Rebuild project drivers.*

Rebuilds are a worthwhile investment

The profitability of a rebuild project depends on competition in the respective market segment (e.g. copying paper). **Fig. 2** is taken from a JP Management Consulting study comparing the market positioning of various different production lines (plotted in grey). The specific production costs and capital investment needs can be typified as a function of individual requirements per paper grade. This serves for determining the relative market positioning of each line.

New installations are typically the most competitive due to technical advances in paper technology and productivity, thus setting quality and cost benchmarks accordingly. For long-term viability, existing lines must, therefore, be upgraded by taking suitable rebuild measures. In many cases their relative market positioning can even be raised to the level of new installations, but with far less expenses. Assuming that product quality complies with market demands, the resultant increase in productivity significantly improves their cost-effectiveness. Conversely, the relative market positioning of a new production line declines during its lifetime due to technical outdating. From the life cycle management point of view, today's new installations are, therefore, the rebuild candidates of tomorrow.

In 2002 a cost-effectiveness analysis of 9 global papermaking groups established that operating earnings are closely related to investment behaviour as a ratio of reinvestment capital to depreciation on technical installations **(Fig. 3)**. Ongoing reinvestments in production lines to stay abreast of technology are, therefore, indispensable for market success in the paper industry.

Rebuild project drivers

The purpose of rebuild projects is to improve and maintain longterm a respective market position of the line concerned. The primary focus thereby is on productivity, quality, safety/reliability and environmental aspects, as well as production costs **(Fig. 4)**. For optimal benefit from rebuild projects, simultaneous account must be taken of all these parameters in connection with overall project costs (total cost of ownership including costs arising during shut down, construction costs, peripheral and other costs).

Meeting customer requirements

For maximum customer satisfaction with optimal rebuild solutions, sixteen selected operators of technically outdated graphic paper machines were systematically interviewed by Voith engineers **(Fig. 5)**. The primary goals of numerous rebuild projects are higher efficiency and higher operating speed while retaining or even improving product quality. The main emphasis for reaching both these goals is on rebuild measures in the press or dryer section. Quality improvement measures mainly include runnability increase for

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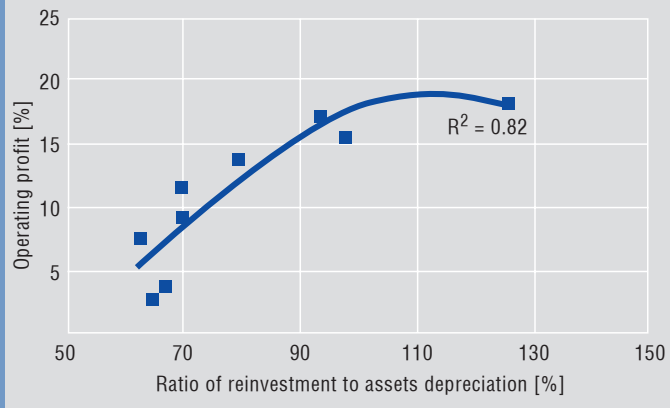

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Fig. 5: *Machine operator opinion – the primary drivers and goals of rebuild projects.*

Fig. 6: *Voith rebuild concepts.*

Fig. 7: *Braviken PM 52 rebuild concept.*

Fig. 8: *DuoFormer C rebuild concept to DuoFormer TQb.*

5 **Optimization and rebuild measures by priority**

Efficiency	Operating speed	Quality	Other
Web break number		Roll profile	
Web break time		Web defects	
Rejects volume		Printability	
…		Dimensional stability	
– Dryer section	– Press section	– Wire section	– Vibrations
– Wire and press section	– Dryer section	– Headbox	– Reliability
– Coating line	– Calender	– Press section	– Maintenance and operation
	– Wire section	– Dryer section	– Safety

6

printing presses or processing machinery. The wire section takes priority in this connection, followed by the headbox. Printability improvement measures (sheet structure and two-sidedness) are mainly taken in the wire and press sections. Other optimization opportunities mainly include vibrations and individual equipment reliability.

Custom made solutions

In tune with customer requirements, Voith has developed rebuild concepts for various typical goals. All rebuild measures are however focused on the optimal solution for maximum customer benefit in each case **(Fig. 6)**.

Following the reports on successful rebuild projects in earlier editions of *twogether* Magazine (such as Ruzomberok PM 18 and Schongau PM 9), the Braviken PM 52 rebuild is reviewed here as latest example *(see also separate article on page 32)*.

Braviken PM 52

Together with Holmen Paper AB, a rebuild concept was developed for Braviken PM 52 (Voith, installed 1985) incorporating ProSpeed, ProQuality and ProEfficiency goals. **Fig. 7** explains these goals and their attainment.

This joint concept mainly focused on developing an upgraded former for PM 52 machine, which even prior to rebuild operated above the original design speed of 1,500 m/min. The wire section included a DuoFormer C roll-former with weak points in sheet quality. Apart from wire run, the former was improved by adding a D-section with flexible bars as already well-proven in the DuoFormer TQv **(Fig. 8)**.

Thanks to the new headbox and the rebuilt former, newsprint quality, at a pro-

7 **Braviken PM 52: project goals and rebuild concept**

Efficiency	Operating speed	Quality
Web break number ⬇	1,525 ➡ 1,585 m/min	Basis weight cross-profile ⬆
Web break time ⬇		Formation ⬆
ProRelease^{+} – Web stabilizers in the dryer section		MasterJet II headbox with ModuleJet
Ropeless threading	DuoFormer C ➡	DuoFormer TQb
⬇ ProEfficiency	⬇ ProSpeed	⬇ ProQuality

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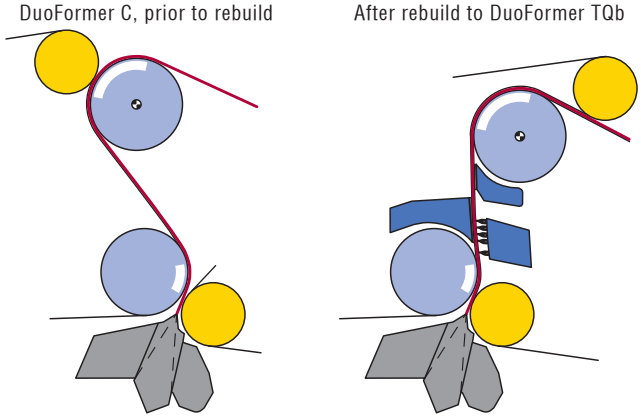

Fig. 9: *Quality improvement by rebuilding headbox and former.*

Fig. 10: *Customer orientation, custom made, perfect fit, partnership.*

Fig. 11: *Typical rebuild phases before and after receipt of order.*

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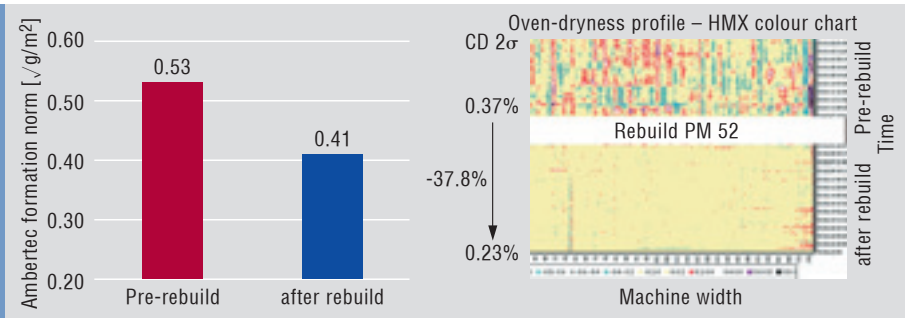

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duction speed in excess of 1,550 m/min, – was significantly improved **(Fig. 9)**.

Four months after recommissioning, all the project goals have clearly been met, so that this 20 year old paper machine can now hold its own well in the newsprint market.

Voith – the right partner

Voith is dedicated to meeting the needs of the paper industry as a project partner and process technology supplier. In order to fulfil specific customer requirements at all times, a specialist team has been formed for rebuild projects. This team is responsible for concept development and project handling to ensure the optimal "perfect fit" rebuild solution in each case **(Fig. 10)**. To that purpose, the specialists normally involved later on are already included in the project well before order placement. This ensures a smooth transition from the proposal phase to order processing.

Shown on the left in **Fig. 11** are the typical phases of a rebuild project prior to order placement. After requirements have first been clarified with the customer, the condition of the line is carefully investigated on site. Priority is always given in this connection to the re-usability of rolls, auxiliary equipment and other machinery components. If the entire plant periphery (stock preparation, media, logistics, etc.) has to be included in the project, the necessary data is gathered for preliminary studies, which may also include feasibility studies. Afterwards, the optimal "perfect fit" concept is developed with the customer to meet his productivity and quality targets. These targets define the technology concept, that first has to be confirmed by quality comparisons, pilot trials and printing tests.

Once the rebuild concept has been established, the proposal and specification are prepared as a basis for order placing.

After receipt of order, the order processing phase continues until handover and contractual fulfilment **(Fig. 11** on the right**)**.

A well-proven solution for complex rebuild projects is to delegate the entire responsibility to a single contractor for optimal coordination of all interfaces. In this connection, the Voith Process Line Package (PLP) was described in *twogether 18*.

The latest joint project successes confirm that Voith's rebuild philosophy is correct. By taking into account all the complex needs of rebuild projects, with specific measures and adjustments in the proposal and order processing phases, the focus is always on customer benefit from beginning to end.

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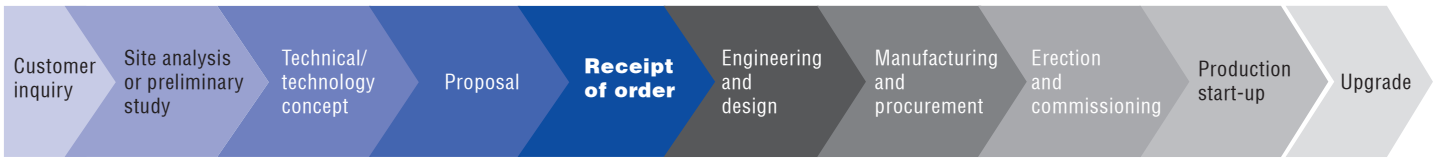

Rebuild of Braviken PM 52 –
"After the rebuild we can now take on any new newsprint machine"

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Dirk Thomas

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With this statement, Rikard Wallin, mill manager in Braviken, sums up the success of this rebuild (see comments). In the face of competition in the marketplace, rebuilds of existing production lines have developed into an attractive alternative to the buying of new machines. Rising demands on the quality and runnability of machines can be sustainably improved by this. Taking Braviken PM 52 as the current example, it is shown how a good "old" machine can be made to run even better.

In December 2003, Voith was commissioned by Holmen Paper to rebuild the wet end and dry end of PM 52 at their Braviken, Sweden, location.

The goal of the rebuild was to further improve productivity and the quality of the machine and to raise the average speed from the previous 1,525 m/min to 1,585 m/min with continuously increasing runnability.

The heart of the rebuild was a completely new MasterJet headbox with ModuleJet dilution water control and new HC/LC lines at the wet end as well as a new

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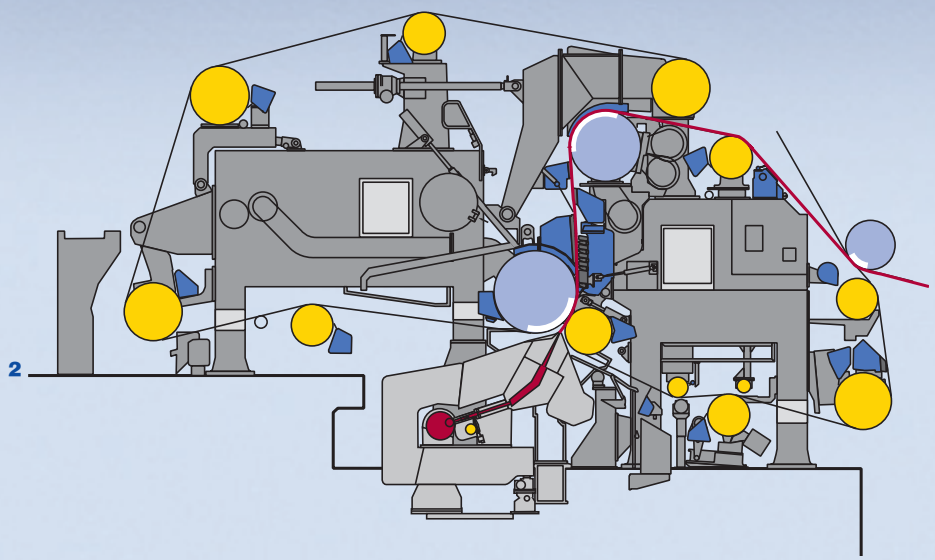

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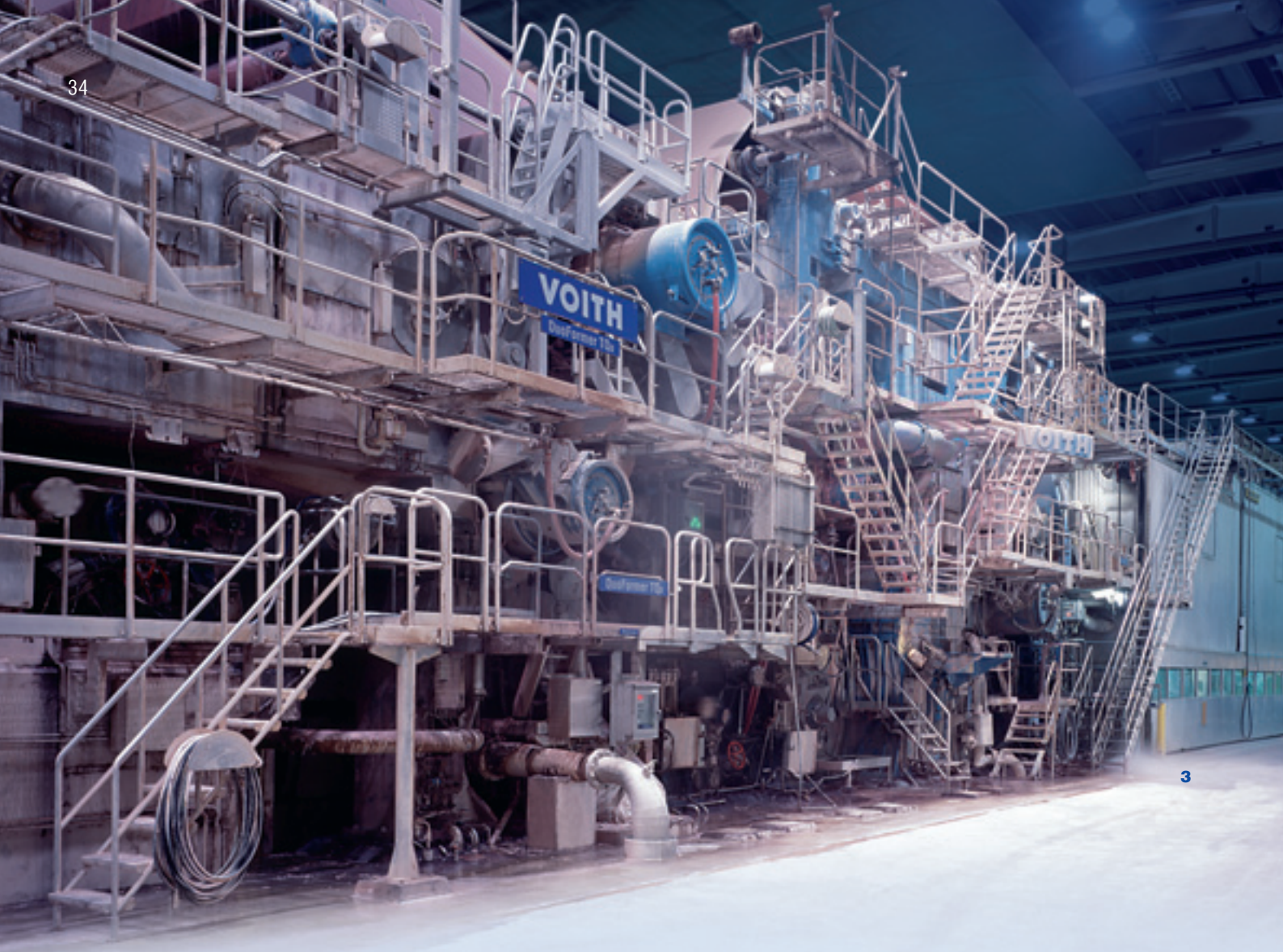
Fig. 1: *Holmen Paper in Braviken, Sweden.*

Fig. 2: *DuoFormer TQb.*

drainage section for the DuoFormer. In the area of the press section the press hydraulics and the control system were renewed. The dryer section was equipped with ProRelease Plus Stabilizer boxes in the 1st dryer group and, in addition, with stabilizers between the DuoRun dryer groups. Furthermore, the two-tier area of the dryer section was equipped with threading doctors, enabling ropeless threading. The increased speed range also called for the replacement of all fabric rolls in the dryer section.

The selected rebuild concept, above all in the DuoFormer, was to contain the latest technology, with as few modifications as possible to the web run and framing. Different methods had to be applied. The forming suction box was integrated in a very small space into the top wire and the entire drainage section was optimized with strip arrangements in the bottom wire. Not to be forgotten is the MasterJet



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headbox which, when optimally placed and equipped with the Profilmatic M control system, contributes to the good running of the paper machine.

Well-conceived and balanced project and shutdown planning also made a contribution that enabled the installation work to be completed one day ahead of schedule.

This in turn made it possible to start up the machine 3 days earlier than had been agreed in the contract. The start-up itself took place in a very short period of only 2 days and placed high demands on the entire team, as the machine drive was rebuilt at the same time and a new DCS with S7 control system was used for the NipcoFlex press and the reel.

In summary it can be said that the start-up expenditure corresponded to approx. 60% of that of a new paper machine. The large scope of supply on components and services could only be handled by a supplier with overall project responsibility.

It was only through mutual support by the engineers of the automation, design,

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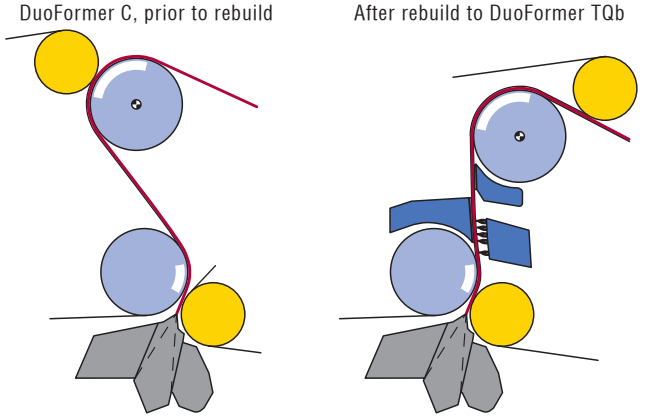

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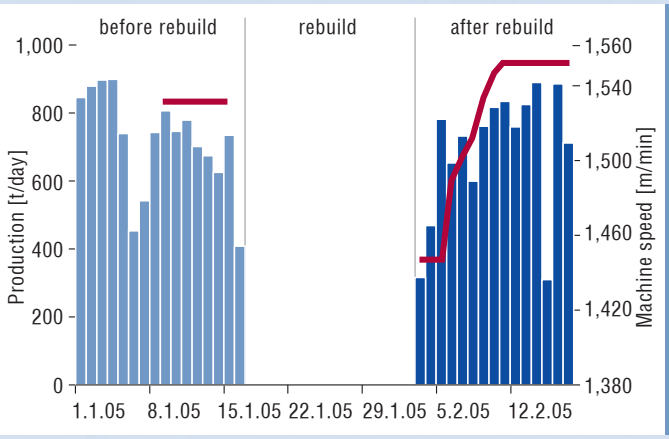

Fig. 3: *The rebuilt PM 52 at Braviken.*

Fig. 4: *Drainage section in DuoFormer before and after rebuild.*

Fig. 5: *Start-up curves*
Production
Machine speed.

Fig. 6: *Beta Formation.*

Fig. 7: *Porosity.*

optimization and start-up teams during installation, sometimes working in shifts, that this goal could be reached together in a spirit of partnership with the customer.

The result is particularly pleasing. The very stable running of the machine, which began shortly after start-up, allowed the transition to a calm and concentrated optimization phase. This came not unexpected, because now the numerous trials performed prior to the start of the project were confirmed. This is also one of the main reasons why almost all of the warranty parameters could be reached shortly after start-up.

Productivity and machine speed speak for themselves and objectively confirm the success **(Fig. 5)**.

Particularly noteworthy is the fact that the paper machine achieved an average speed of over 1,540 m/min (1,525 m/min prior to the rebuild) with about one to two sheet breaks per day after only one week.

It was especially pleasing that just a few hours after start-up we were able to begin with the optimization trials for the former setting.

The new technological concept demanded that the optimal setting of the drainage elements is found quickly.

PM 52 produces newsprint in the basis weight range of 40 to 48,8 g/m^2 on a wire width of 9,300 mm from 65% TMP and 35% DIP. The quality of the CD profiles and those of formation as well as fiber orientation within the warranty limits impressed the customer.

Voith Paper and Holmen Paper have enjoyed trustful relations in a spirit of partnership for many years. This is also reflected in the 3 production lines at the Braviken location, that were all supplied by Voith and rank among the most reliable and fastest in the world.

Rikard Wallin

Mill Manager, Holmen Paper Braviken

"We are very satisfied with the rebuild done by Voith. The MasterJet headbox and the DuoFormer TQ forming unit have brought our 20-year-old PM 52 up to the front line again in terms of quality. The quality of the paper in respect to profile and formation can now, after the rebuild, take on any new newsprint machine.

Through the use of ropeless tail threading and new fabric rolls, the sheet break times have been reduced and the speed increased. In this way we have been able to achieve additional productivity, which we need in order to remain competitive. And, as the icing on the cake, our working environment has become safer.

The cooperation between Voith and Braviken worked very well, and for me this project is a further link in the close collaboration between Braviken und Voith."

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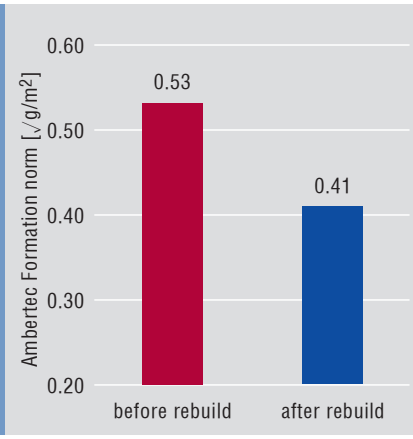

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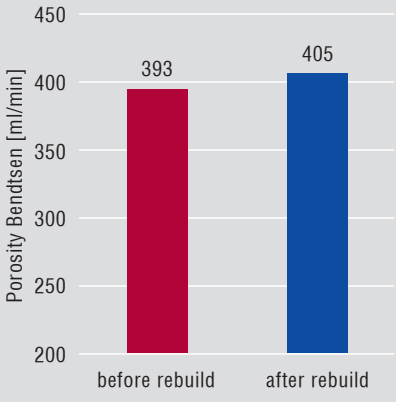

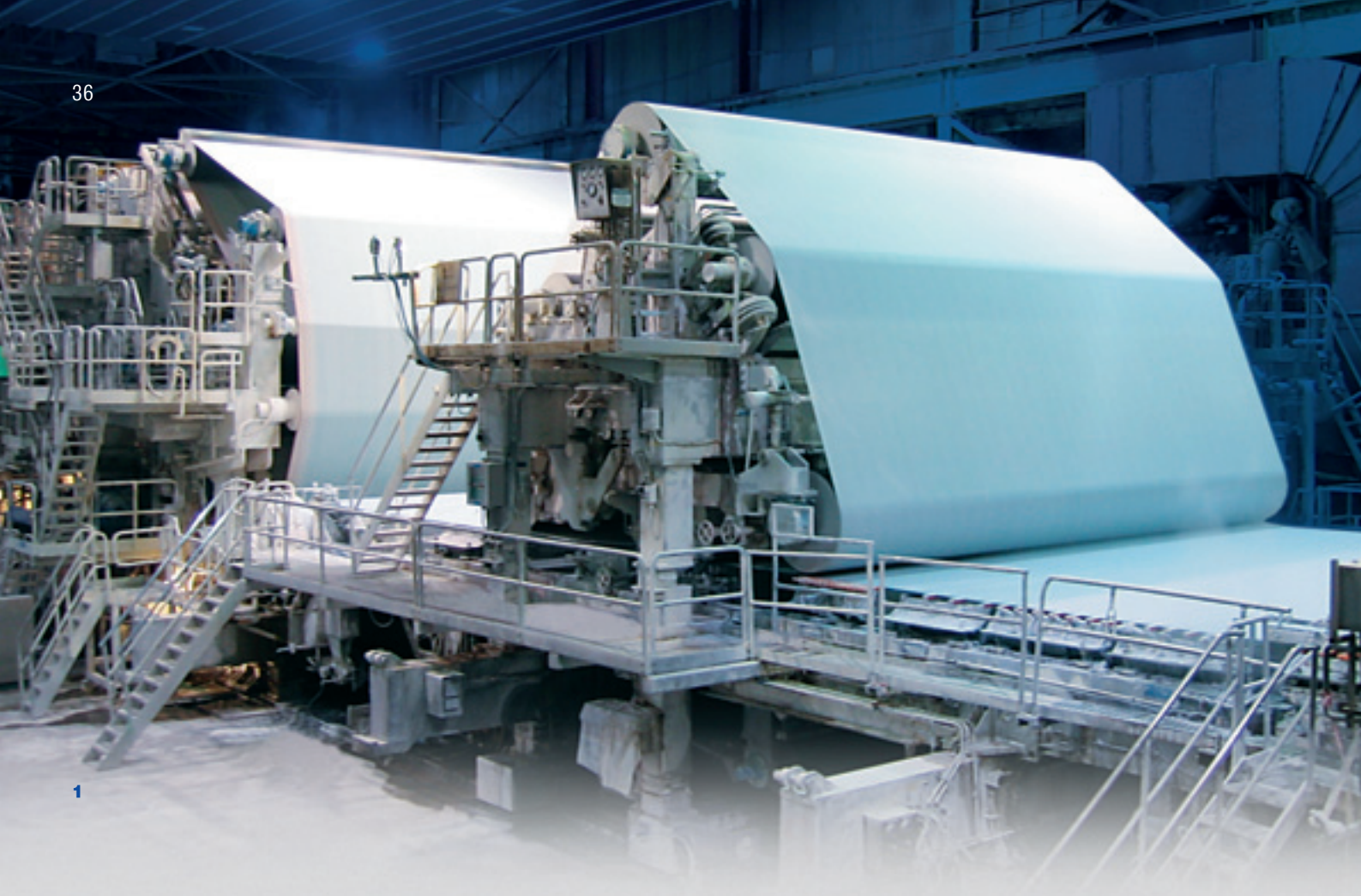

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Abitibi-Consolidated “Alma” – PM 14 conversion to coated paper

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This rebuild at the Alma mill, Canada, was entrusted to Voith by Abitibi-Consolidated (ACI), a global leader in newsprint and uncoated groundwood papers as well as a major producer of wood products, with approximately 14,000 employees in Canada, the U.S.A., the U.K., South Korea, China and Thailand.

ACI enjoyed such success with the previous conversion of Beaupré (Quebec) PM 1 to high-bright coated paper, that the market demand for this product (named “Equal Offset”) is steadily rising. With that in mind, ACI decided to significantly increase the production capacity of this grade. An analysis concluded that the best candidate for a rebuild was PM 14 newsprint machine in the Alma mill, Quebec.

When fully optimized, PM 14 will produce 230,000 t.p.a. of “Equal Offset” at a paper machine speed of 1,100 m/min. The conversion from newsprint to coated paper production entailed major process changes. In addition to the PM rebuild, the project included an increase in TMP capacity, a new peroxide bleach plant, an increase in secondary paper treatment and modifications to the finishing section

Fig. 1: *The converted PM 14.*

Fig. 2: *Abitibi-Consolidated, Alma mill, Quebec, Canada.*

2

Gratien Girard

Project and production manager Abitibi-Consolidated (ACI)

"Thanks to the support received from the Voith group, the ACI-Alma team was able to meet all performance goals of the Equal Offset project.

The sheet quality level surpasses the objectives set for the project. More importantly, we received high praise from our customers for the excellent print quality. And, with respect to PM operating speed, we already expect to achieve the design speed shortly.

We are confident that we will surpass all the expectations of our investors."

and shipping logistics. The total project cost was about 200 million Canadian dollars.

The former was originally a hybrid with BelForm top former (forming shoe). For better formation and two-sidedness control, the latter was converted to a Voith DuoFormer D (opposing multi-blade former). The three straight-through presses were replaced with a new Centri-Nipco-Flex press + straight-through 3rd press. The Centri-NipcoFlex ensures very good sheet dryness before the first open draw. The straight-through 3rd press allows two-sidedness control in smoothness.

The dryer section rebuild pays particular attention to sheet support and high dryness ahead of the on-line coater. To accomplish this, the pre-dryer section was fitted with sheet support boxes (Pro-Release, DuoStabilizer and VentiStabilizer). Here again, the mechanical components had to be modified.

The TRC transfer roll coater was supplied by Voith-IHI (Japan). This "film-transfer" coating technology had been successfully applied in Beaupré and thus was a natural choice for the Alma project. After coating, the sheet run goes over a new contactless Airturn device and an IR dryer.

PM 14 previously incorporated two multi-hard-nip A-frame calenders. The new calender incorporates four rolls in a new L-frame, the existing rolls and hydraulics being reutilized. The sheet run ends at the new TR 125 reel.

In addition to the PM rebuild, Voith also supplied three MultiSorter broke screens to treat the coated broke, and two disk filters to recover the fibers from the PM white water.

The order was awarded in January 2003. Rebuild work started on April 11, 2004 and start-up was accomplished only about seven weeks later on June 1. All the quality and quantity targets of this rebuild were attained in full. At an average operating speed of 1,125 m/min, the converted machine produces coated paper with a basis weight range of 59-74 g/m^2 and uncoated paper at 49-74 g/m^2.

Krkonosske Papirny – first SpeedSizer in the Czech Republic

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After extensive project activity and intensive rebuild preparations both on the part of Krkonosske Papirny (KRPA) and Voith Paper with the consortium partner ABB Cellier (rebuild of color kitchen), the time had come at last: The active phase of installation and start-up of the rebuild on and around PM 6 in Hostinné was finished with the "preliminary take-over-protocol" and finally successfully concluded with the signing of the "final acceptance-protocol" on 27 January 2005.

1

Fig. 1: *Start-up team.*

Fig. 2: *Upper course of the River Elbe in Hostinné.*

Fig. 3: *The new SpeedSizer.*

After proof had already been provided for the troublefree production of writing paper and the required test run for "greaseproof paper" (suitable for food-wrapping purposes), the last contractual acceptance test run for CF paper was successfully carried out on 26 January 2005.

This success was the result of intensive cooperation between KRPA and Voith Paper. All phases of the rebuild project were marked by mutual trust and clear orientation toward goals.

KRPA is a company that is now in private hands. A total of four production facilities operate in the Czech Republic and in Slovakia. Three paper machines, two fairly small coating machines and a series of other paper processing machines operate at the headquarters in Hostinné. It is located at the foot of the Riesengebirge, with the upper reaches of the River Elbe meandering through the premises.

In Hostinné, KRPA produces graphic, greaseproof and CF paper grades (coated front) in a basis weight range of 30 to 80 g/m^2. These grades are finish-processed for the final consumer in the company's own finishing department and printing shop. This form of vertical diversification ensures KRPA, above all, close contact with the final customer.

PM 6 was installed in 1984, with the main supply coming from the Soviet Union. Within the past 20 years a number of modernization measures have been taken on PM 6. In the course of these, Voith supplied a new approach flow system and a new headbox in 1996.

To continue to be competitive in the global marketplace in the future, KRPA decided in 2003 to replace the old size press with a modern film press of the SpeedSizer type. This decision to invest demonstrated KRPA's entrepreneurial vision.

The overall concept, which Voith Paper was able to carry through in the course of the negotiations in the face of exten-

2

sive competition, is based on the following scope of supply and services:
SpeedSizer, web run, Airturn, hot-air dryer, basic engineering/overall concept air system + steam and condensate system, the respective associated control modules, rebuild of the coating color kitchen (including agitator mixing tank, digester for Meypro film coating and workstation for SpeedSizer, including the integration of automation into the existing ABB DCS). Installation and start-up supervision as well as the training of the operating personnel by Voith Paper and its consortium partners rounded off the package. Spare and wear parts were additionally included in the scope of supply.

The following goals were associated with the rebuild measures:

To increase the production capacity of PM 6 by 20%, to provide for on-line application of the CF layer for the production of duplicating papers and to significantly expand the range by greaseproof papers (KH Pack) with the possibility of applying different application fluids to the top side and bottom side. It was also intended to achieve savings in the metering rates of the application fluids.

In particular the possibility of now being able to produce CF paper on-line in the paper machine and no longer, as up to now, to run over the air knives at a separate coating machine makes for a considerable improvement in the utilization of the entire paper mill. It saves re-reeling and the capacity of the air knives freed can be utilized for other coating tasks, resulting in another increase in effectivity of the entire plant.

With the results achieved up to now the demanding goals of the project can be met or even exceeded.

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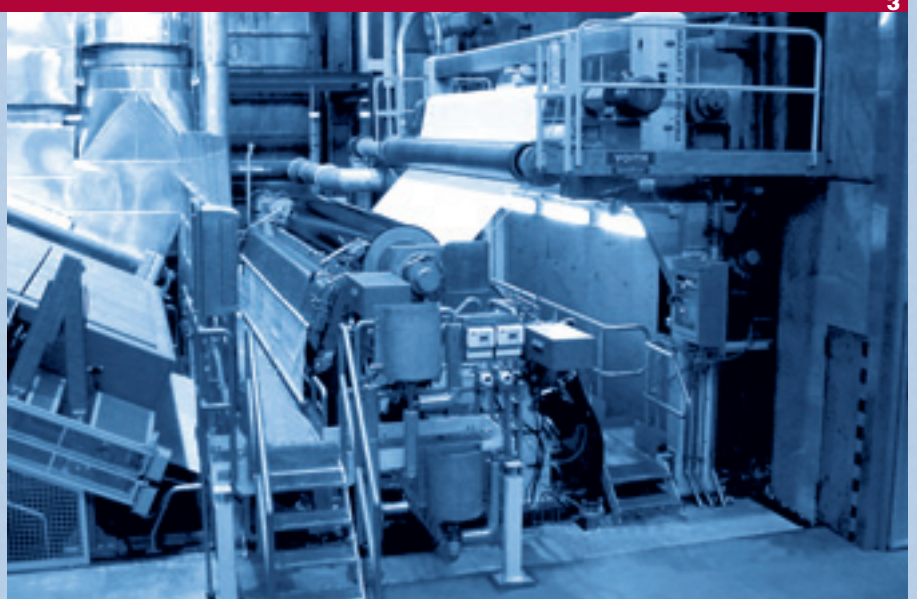

Unchallenged Market Leadership –
More than 300 Voith shoe presses worldwide

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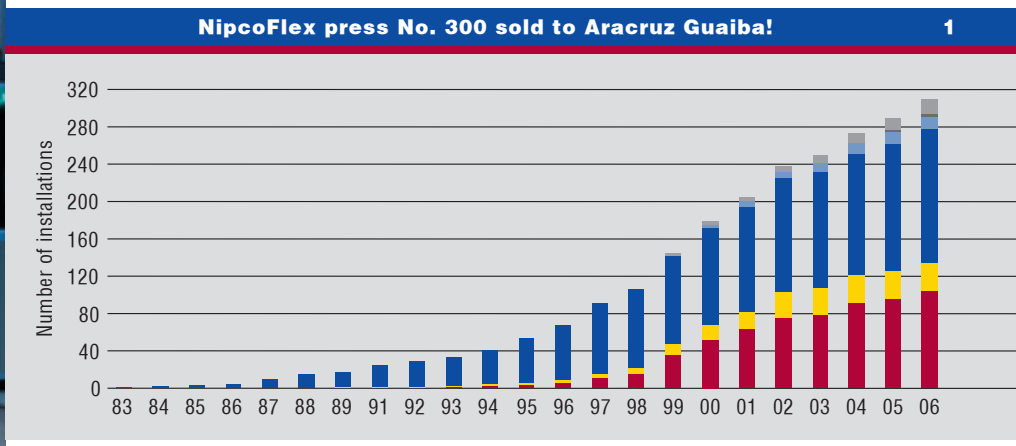
Shoe presses offer numerous advantages in paper and board production, both with regard to quality and quantity. Thanks to product innovations and reliability, Voith is the unchallenged market leader for shoe presses, with a 60 percent share of installations worldwide.

Shoe press technology applications

First introduced years ago, shoe presses are now well established in the paper industry. Nearly all modern paper and board production lines of every type are equipped with shoe press technology. A shoe press is basically a module comprising two press rolls, one with press shoe and soft sleeve, and the other as mating roll. The success of this concept depends on how well the shoe press is integrated, which is decisive for compliance with the required process and quality parameters. The basic development goal was, however, well matured high-performance shoe press modules and press roll sleeves for the highest demands and production outputs.

The first Voith FlexoNip press was commissioned in 1984 in Austria. It was followed by 46 more shoe presses of the

Fig. 1: *Shoe press sales development.*
- *Pulp*
- *Calender*
- *Tissue*
- *Packaging paper*
- *Board*
- *Graphic grades*



same type that are still giving excellent service. Another successful product was the Sulzer Escher-Wyss Intensa press for improving paper machine runability and production output. Thirty such shoe presses were installed in total. When Voith and Sulzer joined forces in 1994, the best press technologies developed by each company were combined into the NipcoFlex shoe press. More than 230 NipcoFlex presses have been sold worldwide since then.

NipcoFlex press No. 300 sold to Aracruz Guaiba! 1

As shown in Fig. 1, shoe presses were originally installed in packaging paper machines. With ongoing technical and paper technology developments, the concept was extended to new applications and performance classes. This led in 1994 to the first NipcoFlex shoe press installation for graphic paper production. Considerable success with these grades was achieved through compact press concept integration, and development of the Tandem-NipcoFlex press section, incorporating full web support and excellent drainage performance for high outputs. With the systematic development of further applications, shoe presses were also used for board und tissue production and in chemical pulp dewatering machines. In 2003 a NipcoFlex shoe press was applied for the first time outside the press section, in the form of the NipcoFlex shoe calender.

The 300th Voith NipcoFlex shoe press was sold to Aracruz Celulose in Guaiba, Brazil. As part of a chemical pulp dewatering machine rebuild, it plays a key role in boosting production output from 400,000 to 430,000 t.p.a. of eucalyptus pulp. This press will be delivered with QualiFlex roll sleeves and is the second NipcoFlex shoe press ordered by Aracruz Celulose – a sure sign of their confidence in this well-proven technology. It is due for commissioning by the end of 2005.

NipcoFlex presses with web widths ranging from 2,600 to 10,600 mm and operating speeds of 50 to 1,912 m/min are in service worldwide to the full satisfaction of their users. In order to stay one step ahead of ongoing customer needs, a special NipcoFlex test unit is already undergoing trial runs at continuous speeds of up to 3,000 m/min. NipcoFlex presses offer customers important advantages both with regard to production output and product quality. Already 60% of all shoe press users worldwide believe in the Voith NipcoFlex shoe press, the most

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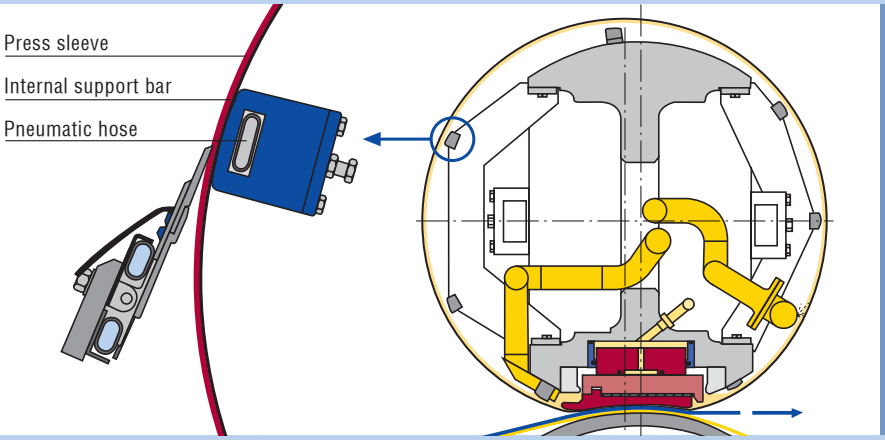

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reliable and well-tried technology on the market.

System optimization – Voith FlexDoc

As a process solution provider, Voith is concerned not only with machinery improvements, but also with process technology development for enhancing product quality. The complete removal of water collected in the press roll sleeve, whether blind-drilled or grooved, prior to nip re-entry is decisive for efficient web drainage. This ensures the high water removal rate required for a good moisture cross-profile.

Due to the roll sleeve flexibility, however, a conventional doctor system is not possible. Voith recognized this problem at an early stage, and solved it by installing a flexible support beam inside the sleeve to hold it against the exterior doctor blade (Fig. 2). This support beam is brought into the operating position pneumatically, and is designed to have a stabilizing and damping effect on sleeve operation without scraping the cooling oil film off its surface.

The efficiency and simplicity of the Voith FlexDoc system go hand in hand. In addition to the water drained centrifugally from the press roll sleeve, a lot of water is also removed by the doctor blade (Fig. 3). The advantages for the machine operator are self-evident: efficient sleeve drainage increases the nip water storage capacity and enables a higher dryness. This reduces web break frequencies and increases productivity. The success of this system is confirmed by 139 reference installations and highly satisfied production managers worldwide. Voith also retrofits this technology to shoe presses supplied by others.

Mini-NipcoFlex press – a new member of the Voith press family 4

Target: New, small NipcoFlex module (Ø 770 mm)

Suitable for almost all kinds of machines and rebuilds:

Upkeep	Replacement of press rolls
Improvement	Increase of dryness and production output
New PMs	First Nip in DuoCentri press concept

Technical data
500 kN/m at 4,500 mm paper width

Efficient rebuild solution – Mini-NipcoFlex

Shoe presses are practically a must today for all new paper machines. This technology started however as an ideal rebuild solution for increasing existing paper machine performance. Shoe presses are now used for the majority of rebuilds, but limits are often set in such cases by roll diameters and weights. To solve this

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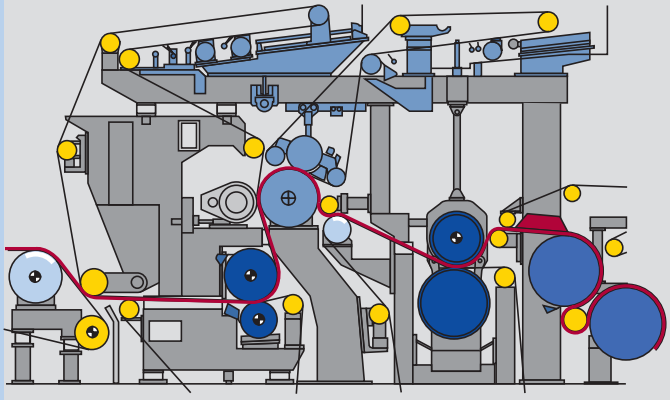

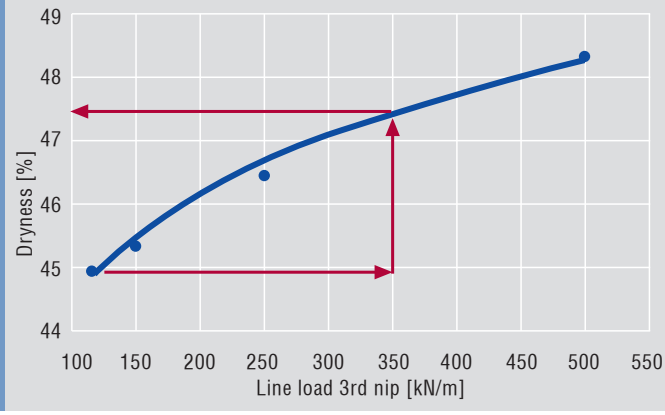

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problem, Voith has added a new member to the NipcoFlex shoe press family: the Mini-NipcoFlex press **(Fig. 4)**. Despite its very small roll diameter of only 770 mm, this new shoe press has an extremely high performance of up to 500 kN/m line load with a web width of 4,500 mm.

The Mini-NipcoFlex press is an ideal rebuild solution for small to medium size machines, e.g. as replacement for an existing roll pair in the third nip of a compact press. Freestanding press versions are also possible, however, with the shoe press roll at the bottom. The shoe press advantages of longer nip dwell time and adjustable line load profile can of course be fully exploited here as well. Furthermore, typical felt life in a shoe press is much longer than in a roll press.

Since the existing mating roll often limits the maximum possible line load, Voith has also developed a Mini-NipcoFlex module that also includes a mating roll. This enables full exploitation of the available line load capacity. A typical application is shown in **Fig. 5**, representing an ideal solution for increasing the output of a 6,000 mm web width machine by approximately 8 %.

If the machine output is limited by the dryer section, about 2 % more dryness after the press is required for a production increase of this order. In the example shown here **(Fig. 6)**, this higher dryness and production increase can be achieved by increasing the line load in the third nip to 350 kN/m with a Mini-NipcoFlex press and suitable shoe geometry – a worthwhile rebuild investment that soon pays dividends!

Fig. 2: *FlexDoc doctor on a shoe press.*

Fig. 3: *Operating principle of the Voith FlexDoc.*
- *Misting ahead of doctor*
- *High water removal – dewatering of void volume and sleeve surface*
- *No water before re-entering the press nip.*

Fig. 4: *Rounding off the product range – Mini-NipcoFlex.*

Fig. 5: *Typical application of a Mini-NipcoFlex module.*
- *For example: customer (woodfree paper grades) requires e.g. 8-10 % more output*
- *Solution: Mini-NFP module (with mating roll) Increase of dryness ~ 2 %*
- *Max. line load: with Mini-NFP much higher than with roll press.*

Fig. 6: *Attainable dryness increase with a Mini-NipcoFlex press.*
Woodfree grades, 70-80 g/m² (15 % fillers)
Current status:
Duo-Centri II press
Web width: 6,000 mm
v = 650 m/min
Line load = 70/86/117 kN/m

BoostDryer –
New higher-performance drying technology for improved paper quality

Christoph Haase

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Board & Packaging
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Maximizing production is the driving force in today's paper industry. In this connection the dryer section is often a bottleneck for rebuilds due to space restrictions, so that more efficient drying technology is indispensable. Apart from increasing production, optimizing product quality is also a challenge – both with regard to sheet strength and surface finish.

This article presents a new drying technology that meets production maximization requirements both quantitatively and qualitatively. It is ideally suitable for board and packaging paper production, and combines two processes – condensation and press drying – by incorporating a drying cylinder and a pressure hood. The positive effects of press drying have already been demonstrated by a number of studies, and are now proven by this new drying technology.

Apart from explaining the new process, this article also shows how it can be incorporated in the dryer section.

Process

Drying takes place on a specially designed cylinder, whose outer periphery is pressurized by water that also serves for cooling. The water temperature is between 60 and 90 °C.

Water pressure, ranging from 0.5 to 5 bar, is generated in a hood that encloses three quarters of the drying cylinder periphery.

The paper runs directly on the drying cylinder, which is heated by saturated steam at a pressure of 6-12 bar above atmosphere. Contacting the paper on the outside are a fine wire, a coarse mesh wire and a steel belt. The belt, fabrics and paper are held against the heated cylinder surface by water pressure. The same water cools the fabrics and the belt.

Water vapour from the paper condenses in the cooled mesh of the wires and on the surface of the steel belt. The condensate and the very small amount of water vapour remaining in the mesh are transported out of the pressure hood with the fabrics. After leaving the hood, the condensate evaporates.

The BoostDryer process attains far higher drying rates than conventional systems, thanks to the pressure hood, which greatly improves the heat transfer coefficient due to better paper contact with the cylinder surface. Another reason is that the special cylinder design enables more efficient heat flow.

As a further benefit of this drying process, the paper strength is improved by com-

Fig. 1: *BoostDryer layout.*

Fig. 2: *The BoostDryer process.*

Fig. 3: *Comparison of various drying technologies.*

Fig. 4: *Static prototype test results.*
Machine dried
BoostDryer laboratory unit

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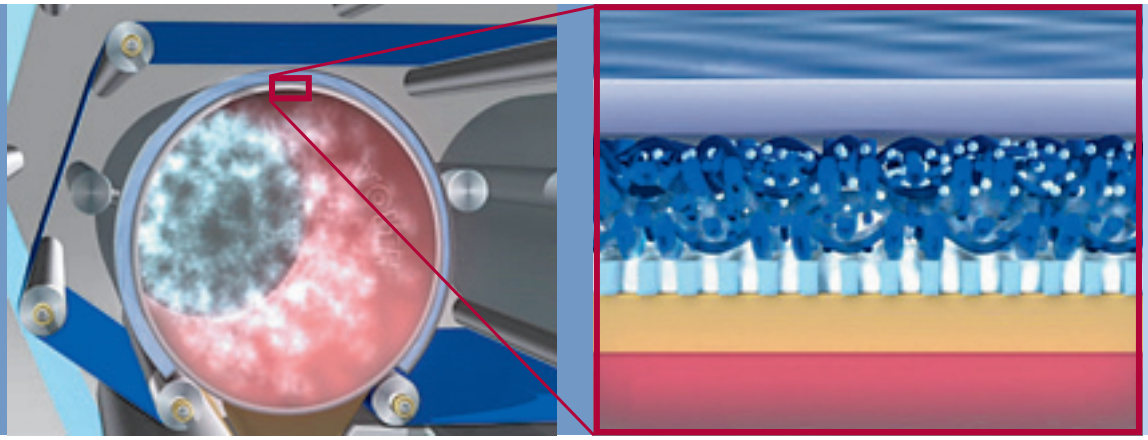

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pression due to pressurizing. By softening the hemicelluloses and lignin, fiber bonding is also improved.

The parameters of the BoostDryer process lie between those of impulse drying and conventional cylinder drying. This means that drying is more gentle than with impulse drying. **Fig. 3** compares the surface temperatures of various drying technologies.

With regard to pressure, the contact pressure between the paper and the heated surfaces is no more than 0.07 bar for conventional cylinder dryers, as against 0.5-5.0 bar at the BoostDryer.

The necessary dwell time for the required dryness, in other words the total contact time between the paper and the heated surfaces, is attained in the BoostDryer with only 6-8 dryer cylinders.

Static test results

BoostDryer process simulation trials were first carried out using a static prototype. Paper samples (corrugating medium, 120 g/m^2) were laid on a heated plate, and a fine wire, coarse-mesh wire and impermeable belt were placed on top of the sample. The entire package was pressed against the heated plate by a second plate.

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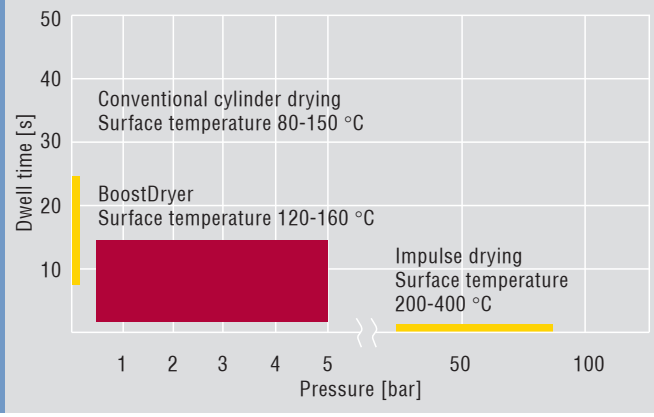

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Fig. 5: *BoostDryer prototype.*

Fig. 6: *BoostDryer prototype drying rates.*
■ *Conventional (Tappi)*
■ *Latest BoostDryer results (April 2005)*

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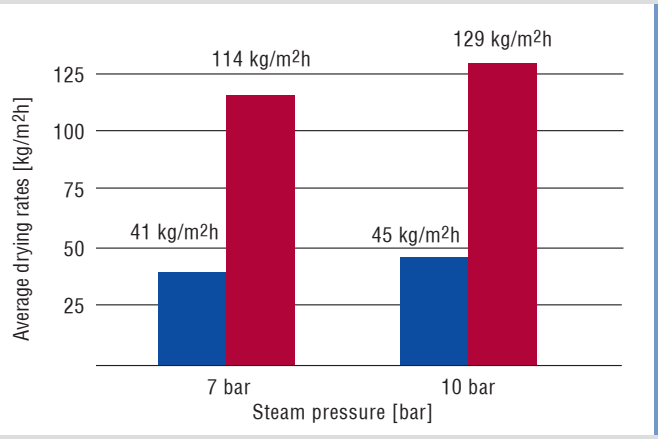


Fig. 4 compares test results on conventionally dried paper samples with those using the BoostDryer process. The breaking length increases by 20%, SCT by 23% and burst strength by as much as 49%.

In view of these promising results, Voith developed a dynamic prototype to evaluate the BoostDryer process during continuous operation.

Dynamic trials

The first prototype (Fig. 5) was installed after the press section in the Voith VPM 5 paper machine test facility. An infra-red dryer was also installed, in order to run tests at different ingoing dryness.

Significantly higher drying rates were attained than with conventional drying (Fig. 6). In order to compare drying rates, values are based on the contact surface size.

The results with testliner show an average drying rate of 114 kg/m²h at a steam pressure of 7 bar, and 129 kg/m²h at a steam pressure of 10 bar.

The test parameters were varied as follows:

Basis weight	90-260 g/m²
Steam pressure	4-10 bar
Hood pressure	0.5-3 bar

Tests were also done with various dwell times, different kind of fabrics and different freeness. The results were astonishing – drying rates of 100-150 kg/m²h at all settings. In other words, the process is not only stable, but also at a very high level. In fact, drying rates lower than 100 kg/m²h hardly seem possible!

Strength characteristics also improved, mainly because of sheet compression due to the hood pressure, and also the dwell time. The highest strength was attained with complete BoostDryer application after the press section.

The surface temperature also has an influence on sheet strength. Moreover, the sheet side in contact with the cylinder surface is smoothed. The results are similar to those with a Yankee cylinder.

Voith is currently investigating these results in more detail by carrying out extensive trials, prior to a pilot installation in a paper mill.

Future prospects for the BoostDryer

Figs. 7-9 show BoostDryer application possibilities in packaging paper machines according to the current state of technology. Thanks to the high drying rates, a

Fig. 7: *Replacement of two dryer groups by one BoostDryer unit.*

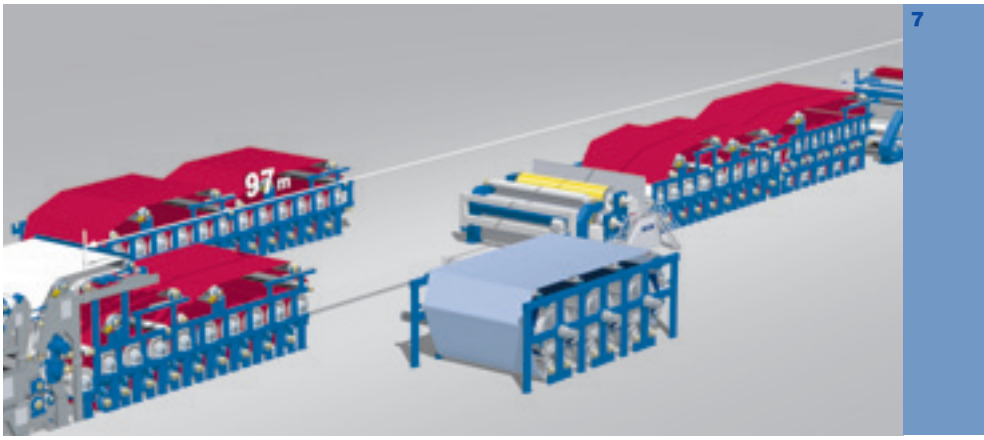
Fig. 8: *Given adequate strength and smoothness gain, possible elimination of size press and calender?*

Fig. 9: *Significant possible reduction of machine length.*

single BoostDryer unit comprising three cylinders with a diameter of 3 m can replace two conventional dryer groups. This reduces the length of the dry section from 97 m to 87 m.

Voith envisages not only using the BoostDryer for drying alone, but also developing this process for other purposes as well. With adequate strength improvement, it would, for example, be possible to use the BoostDryer instead of a size press. Furthermore, the surface smoothing effect of the BoostDryer may even eliminate the need for calendering.

Due to these benefits, a good deal of the afterdryer section may no longer be required, thereby reducing the overall length of the dryer section to 45 m.



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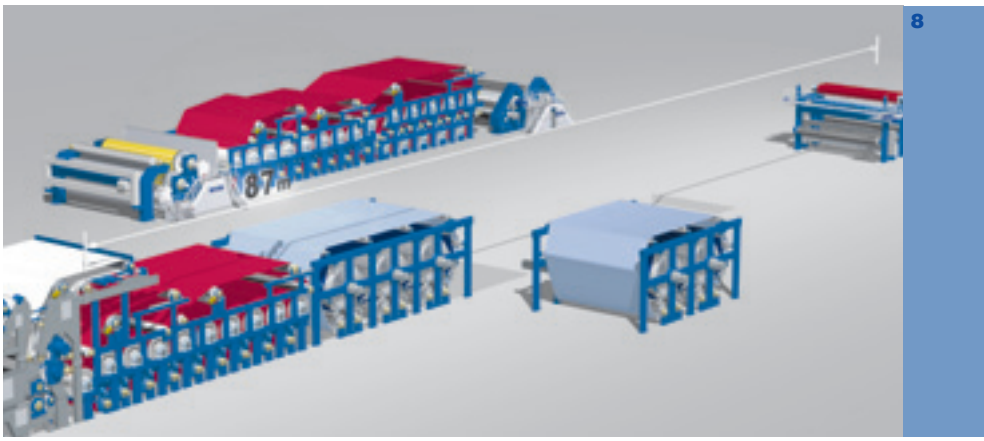

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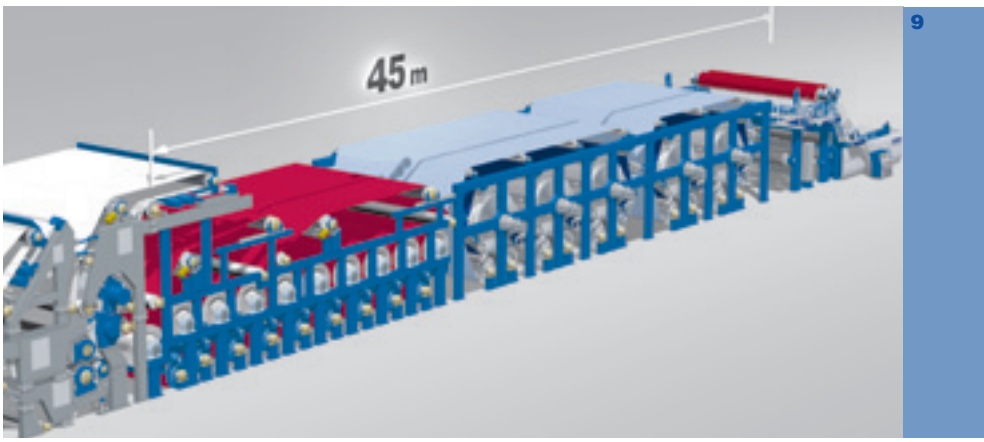

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Advantages of the BoostDryer process

The BoostDryer process enables extremely high drying rates. This reduces space requirements for new machinery, or allows substantial production increases for rebuilds with limited available space.

The paper strength is increased thanks to compression under the hood, and the sheet side contacting the cylinder surface is smoothed. The heating medium is steam, available at low cost in all paper mills.

100% Voith

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100% Voith for Tissue

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Tissue is fascinating! It is an indispensable product well known in the consumer's everyday life – at home or away. Innovative tissue producers have developed differentiated products and tuned tissue properties to increase consumer benefits: Wet strength in kitchen towels absorbing many times their weight in water, softness and strength for reliable bathroom tissue, softness also in facials, and also napkins, diapers, etc.

Intensive product development and marketing has avoided tissue becoming a pure commodity like their family members from the graphic papers and board & packing grades. It is a growing market, driven by classical factors like economic and population growth as well as by quality improvement and increasing consumer awareness of the usefulness of these high tech products. Consumer behavior is very much regionalized so that producers and machine suppliers must take care of each region individually: Markets growing in quantity or quality, conventional products transforming into quality products and quality products into premium goods, growing markets for bathroom tissue or paper towels, single or multiply, recycled or virgin fiber, in brands or private label.

Fig. 1: *Tissue World in Nizza – 100 % Voith for Tissue.*

Fig. 2: *Tissue-pilot machine at the Process Technology Center at São Paulo, Brazil.*

Voith has decided to regionally expand its activities in this lively market. The prerequisites are promising. Voith is an experienced player in tissue, is known as innovative and provides a unique worldwide structure.

Voith has been in the market since the first tissue machines have been built and is covering customer needs from stock preparation to finishing. Voith is market leader for tissue machines in South America, tissue machines developed and produced under Voith license are running successfully under record conditions in the whole world. Tissue is a substantial Voith business sector and amounted to 120 Mio. Euro turnover in the last fiscal year.

Worldwide Structures for Tissue

The Center of Competence for tissue continues to be at the Voith São Paulo facility. Here, 2,000 people are employed of which 1,000 work in the paper division with more than 50 specialists for tissue. Tissue machines are already being supplied by São Paulo and in future will also come from our system suppliers in Italy, Spain, China, Japan and India. Voith Paper at Ravensburg, Germany, will cover the European, Asian and African markets. Additionally, 27 service centers, operating world wide, are taking care of our customers' everyday needs.

2

Process Technology Center for Tissue

Voith Paper installed the Process Technology Center Tissue in São Paulo in 1994 to allow tissue producers to verify the compatibility of their processes and raw materials with newly to be acquired equipment.

The Tissue facility in the Process Technology Center consists of a tissue pilot machine, stock preparation, water treatment as well as wet and dry end laboratories. In the last year, Voith Paper invested in a fiber design plant (fractionation, fiber curling, etc.) linked to the actual stock preparation system. It is now possible to run trials comprising the entire tissue process, from the fiber to the final paper on the reel, aiming at fiber quality improvement, higher machine efficiency and better tissue paper quality.

Fig. 3: *TissueFlex configuration.*

Fig. 4: *Voith winder for Tissue.*

Fig. 5: *Voith Tissue PM.*

Innovation for Tissue...

...has always been one of Voith's main focuses. For paper production the Janus calender, NipcoFlex press, Sirius reel were major milestones of innovation. TissueFlex and Super Soft Tissue Package for handfeel and bulk increase are the latest Voith contributions to the tissue industry and were developed at the Process Technology Center for Tissue.

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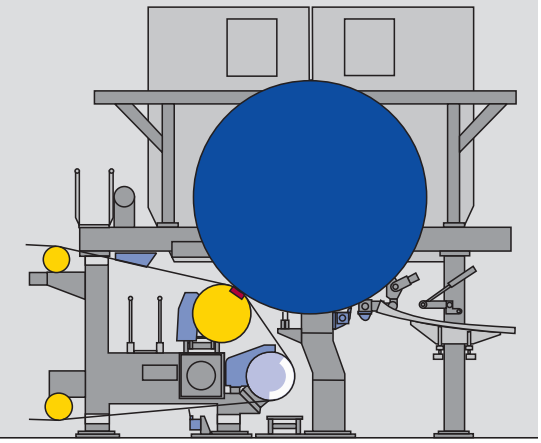

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Today, the market is still waiting for a new machine concept to produce premium tissue paper at commercial speeds with less capital investment and energy consumption than TAD machines. Voith will present a new and innovative solution in the not so far future. Another focus point is the elimination of speed limitations to operate tissue machines beyond the 2,000 m/min that are so common for decades now. Voith will be investing 30 Mio. Euro over the next 5 years into the Process Technology Center for Tissue and its tissue research. Additionally, we expect innovation to be driven by synergies from developments in the graphic paper and P&B divisions. Here, Voith is already investing 150 Mio. Euro yearly and is considered a leader in innovation.

Fabrics for Tissue

The Fabrics Division of Voith has been acting in the tissue market for over 20 years. Over 30 people are involved in the tissue section at Voith Paper Fabrics, with a team in the Americas and one in the European Region, calling only on tissue mills and their corporate headquarters. Voith Paper Fabrics has approximately 25% of the global tissue clothing market and a share of over 50% in several leading countries. The company is considered the leader in innovative fabric products, especially in Through Air Drying technologies but also in new products for conventional technologies. Voith Paper Fabrics is very close to its customers and is working closely with the Process Technology Center for Tissue to reach the ambitious R&D goals.

Stock Preparation for Tissue

Voith Fiber Systems in Appleton, Wisconsin/USA is the worldwide Center of Competence for stock preparation systems and fiber processing techniques relating to tissue. They offer an environmentally friendly process which features low investment and operating costs while producing a tissue product that completely meets the needs of the customer. The portfolio covers recovered and virgin fiber preparation, water, sludge and reject treatment as well as water management. Key products are the Kneading Disperger and high consistency refiner to in-

fluence fiber properties, EcoMizer Cleaners, MSS pressure screens with MultiFoil rotors and C-bar slot baskets, EcoDirect dispersion and EcoCell flotation technology for effective removal of ink specks and stickies, the VarioSplit washer for removal of ash and fines, and iConBleach control for reliable pulp brightness level with low chemical consumption.

Cylinder Service for Tissue

Voith Paper's Tissue Cylinder Service (TCS) Group is the recognised leader in on-site reconditioning, maintenance, and condition-assessment of Yankee Dryers. We provide support to tissue producers worldwide with safety inspections, measurement & diagnostic services as well as mechanical repair.

The Yankee Dryer is the heart of a tissue machine – its condition and performance are essential for a high-quality end product. The quality and dependability of these services is supported by Voith Paper's continual investment in the latest technology and techniques. The Voith TCS Group recently introduced the Virtual Reference Grinding technology *(see article on page 57)*, a breakthrough that changes the way Yankee grinding services are performed, with dramatic time-savings and significantly improved standards of accuracy.

Winder Technology for Tissue

Voith has been building winders for the tissue industry for over 100 years and has the perfect technology to solve the winding problems posed by tissue grades made of different furnish, multiplies, smooth or embossed. The Voith winder portfolio begins with a basic concept with 2 unwind stands, maximal 3,000 mm wide and operating at 1,500 m/min, and reaches the VariSoft II concept with up to 4 unwind stands, maximal 7,500 mm wide and designed for 2,200 m/min. Supply may also include calender, edge embossing station, shaft puller and automatic core handling.

100% Voith for Tissue

Stock preparation, paper machine, fabrics, automation, yankee cylinder service, combiners, various enhancement components, service, PTC for Tissue – this is Voith, 100% in tissue, and covering the entire tissue production process! New structures and intensified R&D activities. During the Tissue World exhibition in Nice we had a first opportunity to explain our expansion plans to our customers. So far, their feedback was enthusiastic. The tissue teams at Voith are so as well. Good luck to everybody!

The NipcoFlex shoe calender – Development and operating experience


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Based on excellent results with the shoe press, Voith Paper started developing the shoe calender in the early nineties. The foundations were laid and several patents were taken out, but the market situation soon demanded concentration on the Janus calender. Development work on the shoe calender started again in 2000, and in December 2001 the NipcoFlex calender test facility was commissioned.

Basic design and operating principle

The NipcoFlex calender comprises a heated Flexitherm roll pressing against a NipcoFlex roll with soft cover and rigid concave shoe (Fig. 1). Between the NipcoFlex sleeve and Flexitherm roll the paper is calendered on the side in contact with the latter. Important for wide-nip calendering are above all the QualiFlex Cal sleeve with its special characteristics (surface smoothness, hardness, thermal capacity and mechanical strength), and the shoe itself (nip length, MD line force profile, lubricating system between sleeve and shoe).

The principle of shoe calendering is based on the effects of moisture and temperature gradients (Fig. 2). The longer nip has a greater influence on calendering, which is further enhanced by the high temperature. This allows a significant reduction of line force and, therefore, the required pressure and enables the desired volume retention.

The NipcoFlex calender test unit

The NipcoFlex calender test unit shown in Fig. 3 is completed with a humidifier (steam or water) in front of the nip. In

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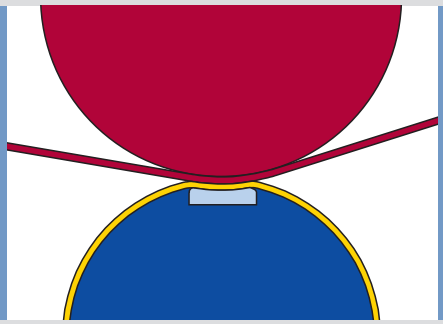

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Moisture and temperature gradient calendering

Nip pressure reduction, while preserving bulk

Contour calendering by NipcoFlex calender
– Soft sleeve adapts to macro surface structure
– Mainly micro roughness improved (PPS)
– Macro roughness (Bendtsen) improved less significantly

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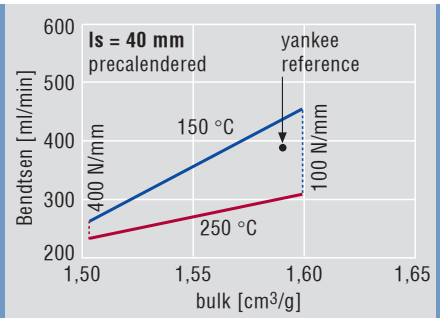

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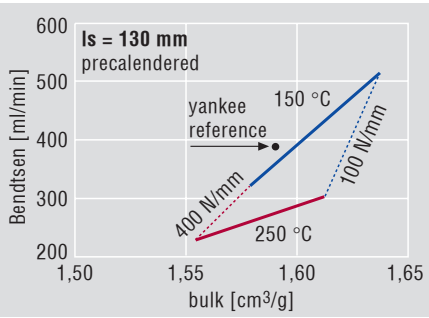

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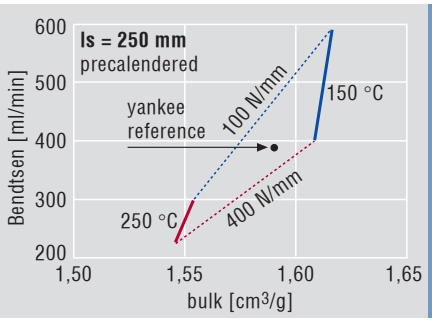

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combination with the second stack, online pre-calendering or post-calendering (reverse sheet side) with hard or soft rolls is also possible.

The NipcoFlex calender test unit can be operated at speeds of up to 1,500 m/min, line forces of up to 1,200 N/mm and maximum roll surface temperatures up to around 260 °C.

Nip lengths can be varied between 40 and 250 mm, the shorter nips mainly being used for graphic grades and the longer nips for carton.

Since December 2001 numerous tests have been carried out over a wide range of basis weights, from folding boxboard at 370 g/m^2 down to graphic paper at 40 g/m^2.

The NipcoFlex calender for board and packaging paper

In many board machines volume retention is achieved by calendering with a Yankee cylinder, which however has the drawback of restricted operating conditions with regard to production speed and output. In the end, the principle of gentle bulk-retaining calendering leads to the wide-nip or shoe calender.

NipcoFlex calender in comparison to the Yankee cylinder

Nip length is a very important parameter in shoe calendering, because it determines how long the pressure, temperature and humidification take effect. **Figs. 4, 5 and 6** show calendering results on uncoated white lined chipboard – WLC (basis weight about 370 g/m^2) with nip lengths of 40, 130 and 250 mm. The continuous lines in these diagrams show the relation between macro-roughness (Bendtsen) and specific bulk at temperatures of 150 °C (blue) and 250 °C (red) with linear load variation from 100 to 400 N/mm. The dotted lines show this relation at constant linear load and varying temperature. Overall, these curves define the operating range at these calender settings.

Using the shortest 40 mm shoe **(Fig. 4)**, temperature variations have no effect on calendering results. Compared with the reference point, a higher bulk than with a Yankee cylinder is only attained at low linear loads. This nip is clearly too short for the relatively heavy board, and results are similar to those with a soft calender.

At 130 mm nip length **(Fig. 5)**, however, the bulk changes significantly also with temperature. Furthermore, shoe calendering results exceed those at the reference point over a wide range. If the calender nip length is further increased to 250 mm **(Fig. 6)**, these results are hardly improved because, due to the long dwell time, temperature has a greater effect than linear load.

As a further comparison between the NipcoFlex calender and Yankee cylinder with white lined chipboard, **Fig. 7** shows the relation between micro-roughness of

Fig. 1: *The NipcoFlex calendering principle.*

Fig. 2: *Surface quality improvement with NipcoFlex calender.*

Fig. 3: *NipcoFlex calender test unit.*

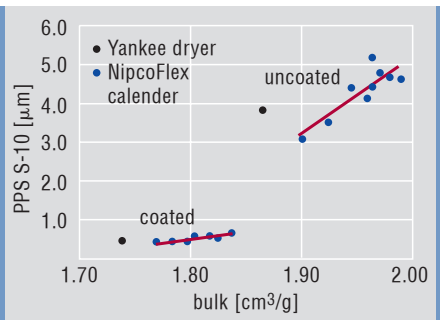
Abb. 4: *NipcoFlex calender, nip length 40 mm, precalendered with hard nip, white lined chipboard.*

Fig. 5: *Nip length 130 mm.*

Fig. 6: *Nip length 250 mm.*

Fig. 7: *Folding boxboard: Yankee cylinder versus NipcoFlex calender.*

Fig. 8: *Operating window for liquid board: comparison between soft calender and NipcoFlex calender.*



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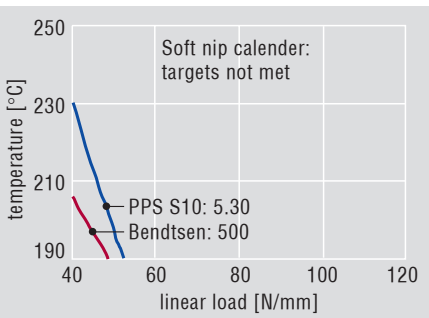

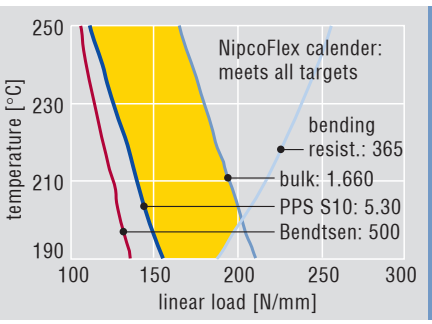

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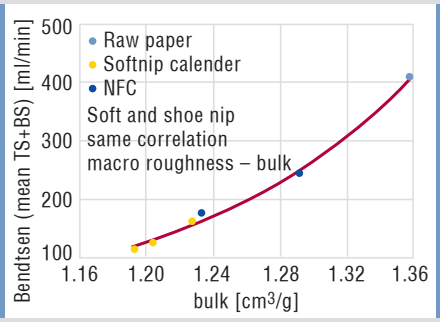

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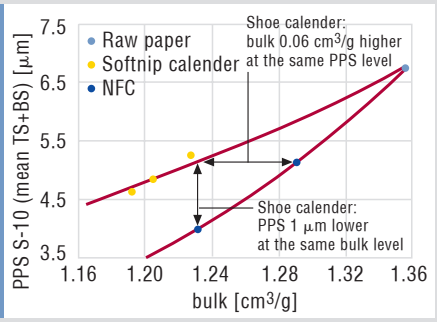

Fig. 9: *NipcoFlex calendering of copy paper (80 g/m²): macro-roughness.*

Fig. 10: *NipcoFlex calendering of copy paper (80 g/m²): micro-roughness.*

Fig. 11: *StoraEnso Baienfurt BM 3 project.*

Fig. 12: *NipcoFlex calender.*

Fig. 13: *StoraEnso Baienfurt BM 3.*

the board surface (PPS S-10) and bulk before and after coating. The NipcoFlex calender attains the same PPS level as the Yankee cylinder, but with up to 4 % more bulk and at 40 % higher speed. This effectively eliminates the bottleneck caused by the Yankee cylinder.

NipcoFlex calendering in comparison to the soft calender

Fig. 8 shows this comparison based on test data with liquid packaging board. Using a process optimization software, the respective operating window was determined each time. In the present case no operating window remains with soft-calendering: surface quality requirements are fulfilled, but the bulk is inadequate. With the NipcoFlex calender, however, all requirements are exceeded within the yellow range.

The NipcoFlex calender for graphic grades

NipcoFlex calender in comparison to the soft calender

Soft calenders are used for grades such as copy paper or matt coated wood-free papers. Here NipcoFlex calendering offers the advantage of a possibly higher bulk, with savings in fibers and lower operating costs accordingly.

Figs. 9 and 10 compare results for 2-sided calendered copy paper (80 g/m²).

Fig. 9 shows Bendtsen macro-roughness plotted over specific bulk. Here there is practically no difference between the two calendering methods. But referred to PPS S-10 micro-roughness (Fig. 10), there is a very clear difference: bulk with the NipcoFlex calender is 5 % or 0.06 cm³/g higher at the same PPS value, while smoothness improves by about 1 µm or 20 % at the same bulk.

NipcoFlex calendering in comparison to the Janus calender

The Janus calender is currently used for graphic grades with high demands on surface quality, such as SC or LWC papers. Based on this technology, demands for still better surface quality and higher production speeds can only be met by further increasing the number of nips. However, this is unreasonable both technologically and with regard to investment and operating costs. Here again, the NipcoFlex calender might be the answer.

In order to equal the calendering performance of multiple-nip Janus technology with a single NipcoFlex calender nip per sheet side, short nips with high line forces and/or high roll surface temperatures (well over 200 °C) are required. This reaches the maximum sleeve loading limits, and while tests so far have shown the potential of NipcoFlex calendering technology, they have also revealed its current limitations. Voith Paper, therefore, has a lot of development and optimization work to do in the near future.

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Project

Rebuild of White Lined Chipboard Machine
width: 4.8 m, speed: 750 m/min

Scope

NipcoFlex shoe press
NipcoFlex shoe calender (at 250 °C), Sirius reel

Target

1. step: increase production ~ 35.000 t/a (20%)
2. step: replace Yankee cylinder (approx. 25%)

February 2004:
production restart after rebuild BM 3

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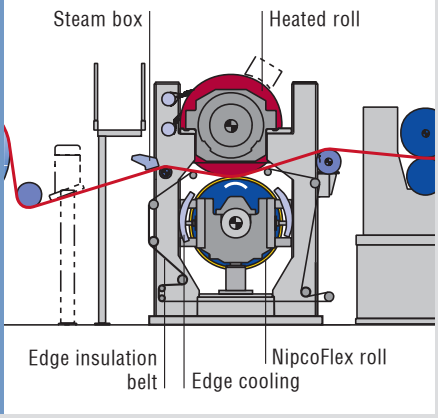

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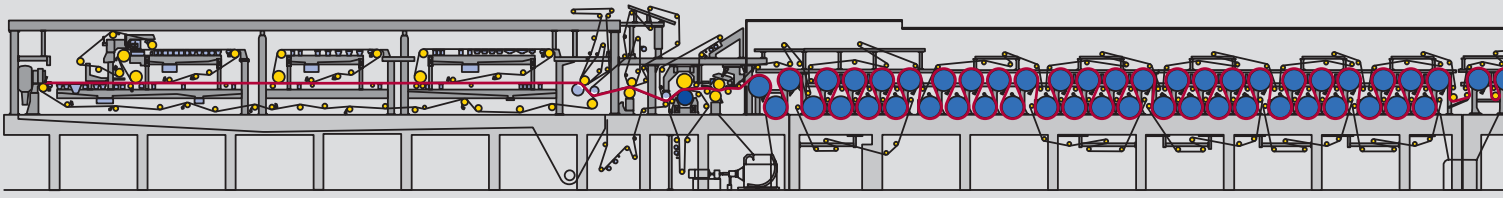

Fig. 14: *Design data of the Baienfurt BM 3 NipcoFlex calender.*

Fig. 15: *NipcoFlex calender in Baienfurt BM 3.*

Design speed	850 m/min
Heated roll surface temperature	250 °C in operation
Line force	max. 500 N/mm
Nip length	190 mm (130, 250 mm possible)
Shoe tilt (load change at in- and outgoing side)	+/- 20 %

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NipcoFlex calender in practice – operating experience at StoraEnso Baienfurt, BM 3

NipcoFlex calender technology

Fig. 11 summarizes the decisive goals of this rebuild, particularly with regard to the planned 25 % production increase in future by completely replacing the Yankee cylinder with a shoe calender.

In this rebuilt board machine (Fig. 13) the NipcoFlex calender is not located in the relatively damp board production process zone, where the Yankee cylinder is currently situated, but directly in front of the coating machine where the web has a much higher dryness.

Fig. 12 shows the detailed layout of the NipcoFlex calender. The top roll is inductively heated to a surface temperature reaching 250 °C during operation. The NipcoFlex bottom roll enables shoe changes for nip length variation. Since calendering is online, both rolls have to be driven.

To prevent roll sleeve melting due to the high temperature of the top roll at the edge zones outside the board web, direct contact is avoided by changing the operating mode compared with shoe presses.

The NipcoFlex calender shoe is, therefore, retracted from the bottom roll periphery, and the roll edges are cooled by compressed air and cold water nozzles.

Board surface quality is improved by a steam blow box located in front of the nip above the web. The steam condensation increases surface smoothness.

The rolls and NipcoFlex roll sleeve are changed in the same way as with shoe presses.

Fig. 14 summarizes the main design and operating parameters of this machine. Three different nip lengths are available for optimizing board quality. A 190 mm nip was used at start-up, because that gave the best results in the previous pilot tests.

Fig. 15 shows the NipcoFlex calender in operation on board machine BM 3 in Baienfurt.

Operating experience

Commissioning followed an optimization plan based on experience with the pilot machine. Fig. 16 summarizes the first operating results immediately after start-up, showing the quality and printability data for 215 g/m^2 folding boxboard.

All the positive pilot test results were confirmed without exception during commercial operation.

With the rebuild, two important changes were decisive for the board structure in the z-direction and for the surface quality:

- Drainage through a double-felted shoe press with downstream offset press

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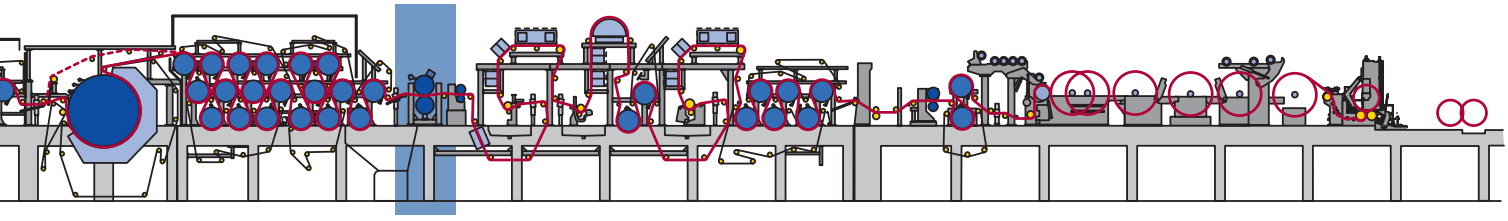

NipcoFlex calender

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Required technological standard	Before rebuild w. Yankee/grade 1	After rebuild w. NFC/grade 1
BW total [g/m^2]	220	215
Speed [m/min]	440	470
Bulk [cm^3/g]	1,48 +/- 3 %	= (+)
Mean bending Stiffness [mNm]	9,6 - 10,7	=
PPS roughness [µm]	1,3 - 1,6	= (+)
Printability	mottle free, good gloss and brightness	= (+)

instead of conventional individual presses (but still one press less in total)

- NipcoFlex calendering through a long high-temperature nip, without using the Yankee cylinder.

It, therefore, had to be determined whether the board structure was changed enough to affect subsequent processes (coating, printing), or whether the difference in surface quality and z-direction structure was only marginal.

This question can be answered in part by comparing the SEM (scanning electron microscope) photographs taken in three production phases **(Fig. 17)** – with individual presses and Yankee cylinder prior to rebuild, with shoe press and Yankee cylinder after rebuild, and finally with shoe press and NipcoFlex calender after rebuild.

As shown in these pictures, there are only minimal differences in the z-direction web structure. Moreover the excellent printing results prove that the effect of these differences is negligible.

Summary and future prospects

The tests carried out by Voith Paper over the last three years show great potential for the NipcoFlex calender.

The world's first wide-nip calender for folding boxboard production started commercial operation on February 1, 2004 in board machine BM 3 at Stora Enso Baienfurt/Germany. **Fig. 18** summarizes the operating experience and advantages so far with this NipcoFlex calender.

In the second quarter 2006 Voith Paper will start up a NipcoFlex calender at Weyerhaeuser Longview (USA) for liquid packaging board production. In the same year further machines already ordered will be installed, also for graphic grades.

Fig. 16: *Post-commissioning operating experience.*

Fig. 17: *SEM analysis of Yankee roll and NipcoFlex calendering results.*

Fig. 18: *Production benefits and future potential.*

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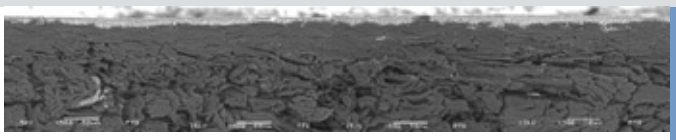
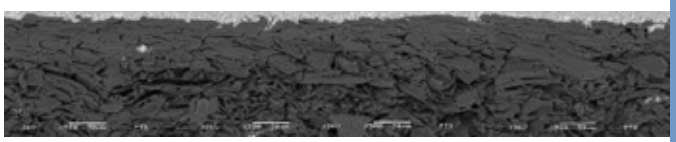
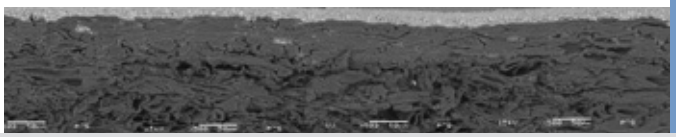
Before rebuild with old press and Yankee



After rebuild with new NipcoFlex press and Yankee



After rebuild with NipcoFlex press and new NipcoFlex calender



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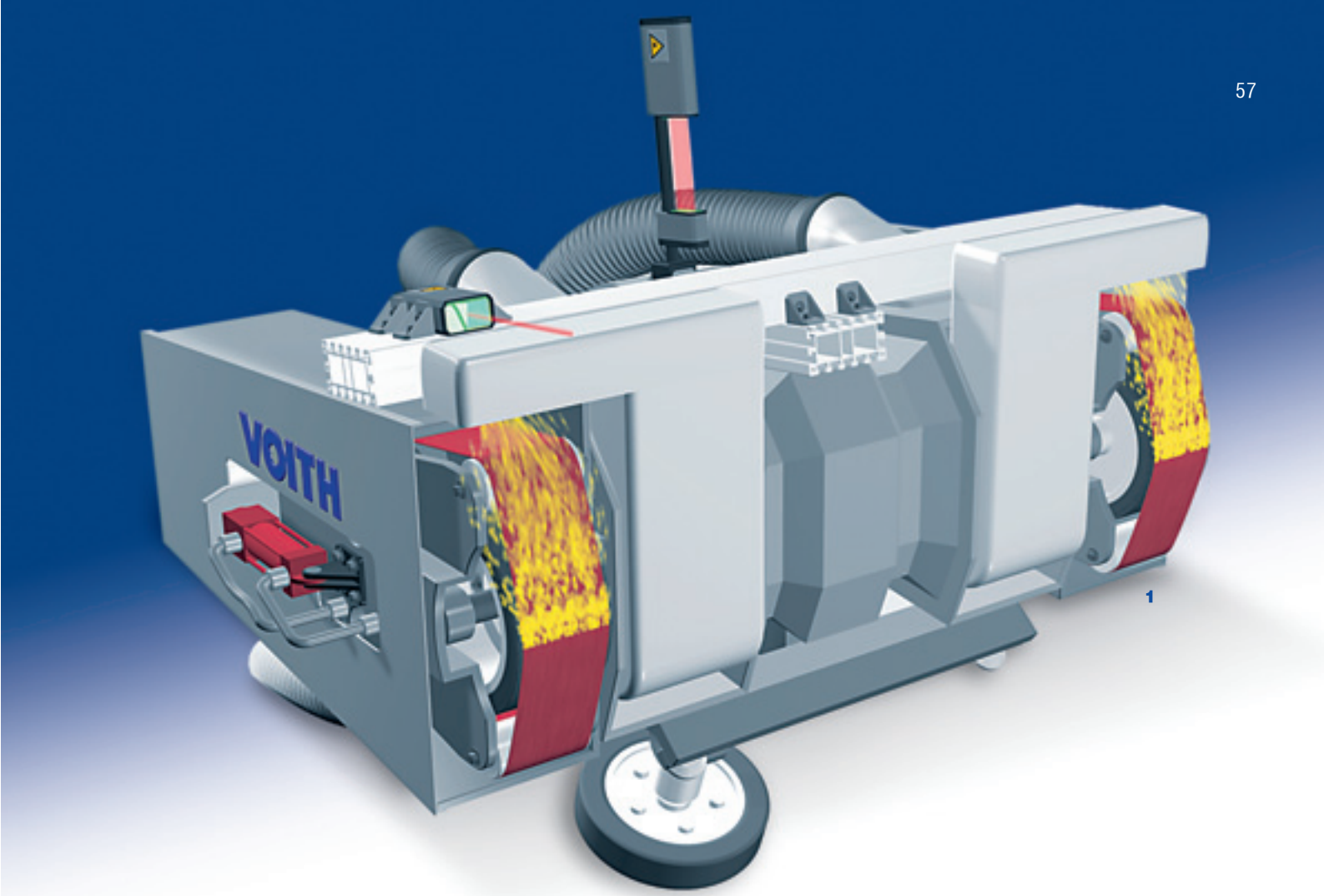
Quality targets with shoe calendering after first production runs fulfilled and printability as brilliant as before rebuild

Efficiency and runability as good as expected

Speed increase without lack in quality possible

Rebuild target to increase production by further 25% and replacement of Yankee seems reasonable

NipcoFlex calendering fulfills product development and rebuild objective



Virtual Reference Grinding –
An innovative method to re-condition the Yankee Dryer in a Tissue Machine

Sjaak Melkert

Service
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The Yankee dryer in a tissue machine is an unique, multi-functional component. It is backing the press rolls, it is a sheet carrier, a large drying cylinder and a creping surface all in one. The Yankee is the central, most critical and most expensive part in any conventional tissue machine.

The condition of the Yankee dryer, and in particular the Yankee surface, is critical to the operational performance of the tissue machine.

Re-grinding the Yankee dryer, to re-condition the surface and re-establish the dryer crown, has become a routine maintenance operation carried out by specialists, usually at intervals between 12 and 36 months, depending on the operating conditions. Any necessary maintenance of the Yankee results in machine downtime, as it can only be performed 'on-site' and 'in-machine'. Similarly, regrinding of the Yankee normally requires a major shut-down of the tissue machine.

In co-operation with the German Fraunhofer Institute, the Voith Paper Cylinder Service group has developed an innovative technology named "Virtual Reference Grinding", abbreviated to "VRG", to re-grind the Yankee dryer. VRG is a very small, but powerful dual head grinder, which is mounted directly onto the existing creping or skinning doctor holder. To install this grinder, almost no paper machine components need to be disassembled **(Figs. 1 and 2)**.

Fig. 1: *VRG system.*

Fig. 2: *Installed grinder.*

Fig. 3: *Helix surface measurement.*

Fig. 4: *Measurement system.*

Fig. 5: *2-D carpet-view of cylinder surface.*

Fig. 6: *3-D surface representation.*

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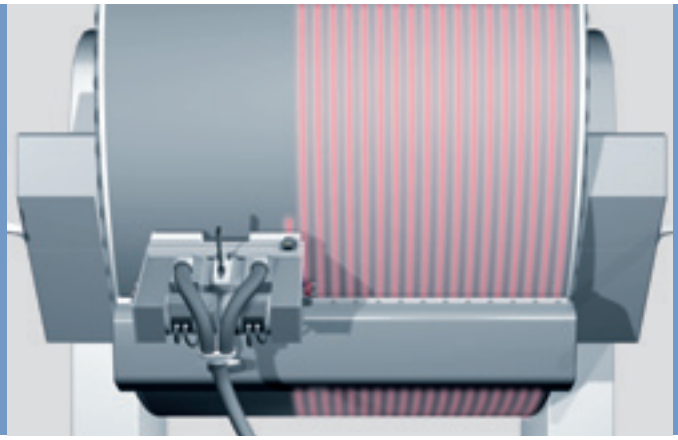

VRG technology uses, as a reference, a spring steel wire spanned equidistant to the main axis of the dryer, and incorporates on-board laser systems to continuously measure both the distance to the Yankee surface and to the reference wire. Indexing sensors and electronic level sensors continuously record the position of the measurement unit, which is freely moving on the doctor holder, in relation to the dryer **(Fig. 4)**.

The Yankee surface is measured in a helix, collecting up to 1,000,000 data points from each sensor, simultaneously **(Fig. 3)**.

The surface description, in helix format, is mathematically processed into a grid matrix system, taking into account and correcting all movements of the measurement/grinding unit. The grid density can be as small as 10 x 10 mm, very accurately displaying the topography of the entire dryer surface. Typical measurement accuracy is within a band width of 20-30 µm.

The system can display the Yankee surface in 2-dimensional carpet-view, or in real-time 3-D visualisations, which allow for in depth investigations into dryer wear patterns and their correlation to production related problems. A standalone visualisation software package provides further valuable information for ongoing optimisation of the Yankee within the overall production process **(Figs. 5 and 6)**.

Any conventional grinding technology uses a geometrical reference plane. This can either be the grinding bed itself, or any straight plane (reference point) incorporated into the grinder. The shape of this so called reference is copied or transferred onto the roll or cylinder to be ground, often (as required) in the shape of a 'crown-profile', or camber. In order to maintain accuracy on these geometrically functioning grinders, the grinding

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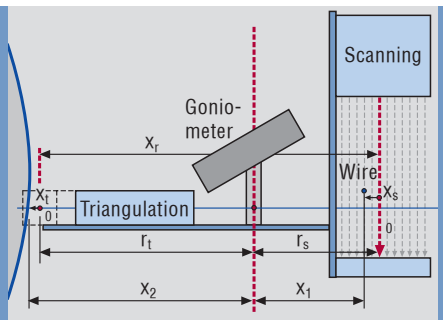

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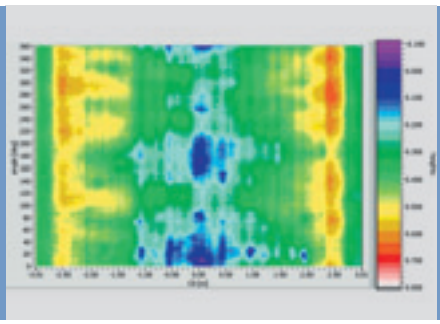

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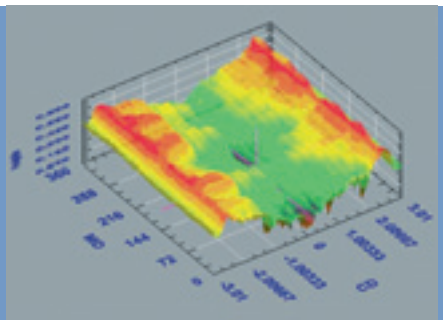

Fig. 7: *Grinding head.*

Fig. 8: *Force controlling the grinding process.*

Fig. 9: *2-D carpet-view of a finished cylinder.*

Fig. 10: *Centerline run-out (TIR) achieved.*

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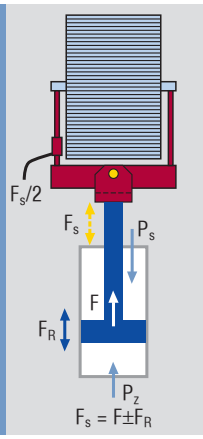

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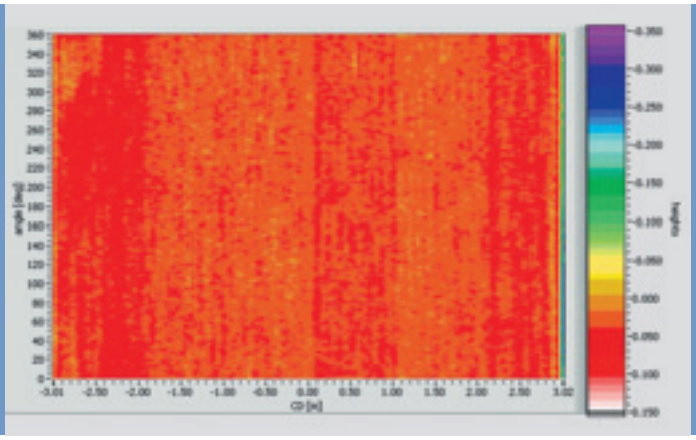

bed needs to be very accurately machined and must be sturdy and heavy, to maintain form stability.

VRG grinding technology is unique and fundamentally different. Grinding is not accomplished through a geometrical coupling between the grinder and the roll or dryer, but through a force-coupling. Material will be removed only where necessary **(Fig. 8)**.

Following collection of the surface topography data, the grinding cycle uses the surface description in the form of an electronic grinding protocol to control the forces applied to the grinding wheels, and thus the abrasive powers. This is accomplished using very fast acting hydraulics, whilst the actual applied grinding forces are further measured continuously. Grinding forces up to 1000 N are applied within a reaction time of less than 20 milliseconds. During the grinding process the control computer simulates, in the background, material removal and the expected form and shape of the dryer, in real-time, to prevent over-cutting of the surface.

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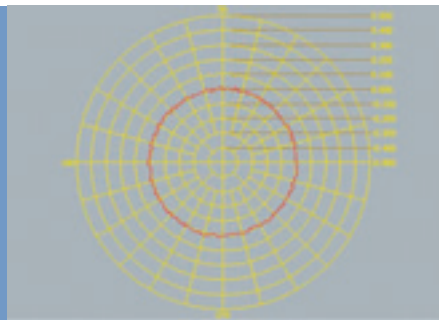

Only the required grinding forces in relation to the out-of-profile condition of the dryer are applied and controlled. The grinding equipment can, therefore, be extremely light-weight, and its actual movement accuracy is not important.

With VRG technology, Yankees can be reconditioned in a fraction of time when compared to conventional grinding technology. Usually, no ancillary machine components need to be removed for the grinder installation. Down time and other mill cost savings are, therefore, considerable.

VRG is now proven as an extremely powerful machine tool capable of taking the guesswork out of the reconditioning of Yankee and MG cylinders, and can be summarised as follows:

- Compact, lightweight equipment that can be easily shipped/air freighted.
- No need to disassemble paper machine components to facilitate installation of VRG grinding unit.
- Reduced installation, set-up and equipment removal times.
- Cylinder re-grinding can be performed much faster and more accurately that any previously available grinding technology.
- Due to VRG system accuracy, only the absolute minimum of material is removed to achieve Yankee profile, thereby ensuring optimum asset preservation **(Figs. 9 and 10)**.
- 3-D data acquisition via system computer creates a comprehensive picture of entire Yankee surface providing a valuable database for on-going tracking of Yankee condition and performance.

Voith Customer Conference in Indonesia

Improving Productivity, Quality and Efficiency!

Robert Kietaibl

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Indonesia, as one of the largest paper production countries in Asia with an installed annual production capacity of about 10 million tons of pulp, board and paper, was chosen for customer conference in Jakarta and Surabaya in March 2005.

Voith Paper Jakarta, Voith Paper Service Indonesia, Voith Paper Fabrics, Voith Paper Tail Threading Group and Krieger presented products, services and solutions for improving productivity, quality and efficiency. Customers from Indonesia and Malaysia were invited to attend these seminar days to listen to and discuss with experts of the various Voith Paper Divisions from Asia and Europe.

The events started on the evening of March 2nd with a reception dinner at the Gran Melia Hotel in Jakarta, which was the opportunity for guests and Voith specialists to begin their discussions. 150 dedicated papermakers from different countries exchanged their experience and shared their input during this casual evening.

On March 3rd, the series of papers was opened by Mr. Siegfried Wauer, Managing Director of Voith Paper Indonesia and Mr. Robert Kietaibl, Senior Vice President Voith Paper Service Asia, giving the audience an update of the current organization and product portfolio of Voith Paper, Voith Paper Service and Voith Paper Fabrics in Indonesia.

The technical experts from Voith in Asia and the invited speakers from overseas created high interest with their presentations and many questions were discussed in the forum at the end of each presentation. It was hardly enough time to respond to all questions to specific topics during the conference sessions. Groups, therefore gathered during coffee and

Fig. 1: *Discussions amongst several guests.*

Fig. 2: *Evening event with Karaoke Show.*

Fig. 3: *Speakers (from left to right): Bertinus Tirtadihardja, Head of Paper Machine Division, Jakarta; Michael Cartmel, Vice President – Asia/Pacific Sales, Fabrics; Hans Peter Schoepping, Sales Manager, Krieger; Robert Kietaibl, Senior Vice President Asia, Service; Beth Rooney, Business Development Manager, Tail Threading; Siegfried Wauer, Managing Director for PT. Voith Paper, Jakarta; Thomas Holzer, Regional Sales Manager SEA, Service; Michel Beltzung, Vice President Product Management Roll Covers, Service; Thomas Jap, Head of Fiber Systems Division, Jakarta.*

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Mr Wong Kam Choi
Production Manager,
Malaysian Newsprint Industries

"I was pleased to be invited to the Voith Paper Customer Day. Several of the presentations were of specific interest to me. One of the drying cylinders on the MNI machine needs grinding and the ability to do this work at site would be a great benefit to us because of the saving in down time. Other topics like roll covers, fabric cleaning and tail threading are all subjects of high interest in our mill."

Mr Alpin Wu
Deputy Director of Engineering Division, Pindo DeliPulp and Paper Mills

"It has proved to be very beneficial for us to have the Voith Paper Service Center located here in Indonesia near to our two Pindo Deli mills. This allows a rapid response to our requirements. The conference was very informative with the update on the wide scope of Voith Paper's services and products. I was interested in the details of several topics, including roll covers, on-site cylinder spraying and Modern Drying Concept."

Mr Ramli Sirait
Deputy General Manager,
IKPP Perawang, Paper Mill 2

"The conference gave me a better understanding of a number of technical subjects and was a good update on Voith's products and services. In particular I was interested to have information about the DuoCleaner as well as the new developments of Voith Paper Fabrics. Roll cover life time was discussed and is an important subject at our operation at Perawang."

lunch breaks to continue and work on custom made solutions for the different requests. The displayed roll cover samples gave customers insight into the products manufactured in the Voith Service Centers in Indonesia and China. 50 contact requests on the seminar organization team for a visit by a Voith expert to discuss specific customer questions, will be followed up in the near future. The high interest created by the Voith team during this seminar was also reflected in the fact that over 80 % of the guests handed in the seminar feed back form, giving us their comments and input for future events.

After a hard working day, all guests and Voith staff could finally enjoy an evening with a traditional Indonesian dinner and first class entertainment. Some of the customers still could not stop work and continued to discuss paper making topics where others enjoyed their time with karaoke singing on the stage.

A successful event ended late in the evening after intense communication between paper making experts from all over the world. Satisfied customers left Gran Melia Hotel on March 4th to plant tour to our newly establish Stock Preparation Service Center of Voith Paper Indonesia in Jakarta, to get an overview of our rotor restauration competence and to our Voith Service Center in Karawang for an update on the latest state-of-the-art roll cover production.

The Voith seminar organization team meanwhile was working already behind the scenes to move all the equipment to Surabaya for the next stop, were the same seminar was held just a few days later, on March 8th, at the Marriott Hotel in Surabaya.

The event in this region was again very successful with 72 customers and Voith experts, many follow up requests from the visitors and very positive comments in the returned seminar feed back forms from our guests.

A big thank you to the South East Asian paper makers for participating on this Voith Conference. We are looking forward meeting all of you again in Indonesia.

Stage-Gate® at Voith Paper Fabrics – Greater customer benefit through faster product development

Arved Westerkamp
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As a world leader in paper machine fabrics, Voith Paper Fabrics works in a global product development environment. These activities are centrally managed by the R&D/Technology Center in Pfullingen, Germany, where our basic research and process development is also located.

During restructuring of the Voith Paper Fabrics R&D/Technology organization, a very effective customer-oriented development process was introduced. This enables flexible compliance with customer requirements and the systematic development of Voith Paper products in teamwork.

The result is a solid know-how basis, that, together with basic research activities, makes a valuable contribution to the development of future-oriented manufacturing technologies.

Thanks to clearly defined responsibilities in the development fields of forming, pressing, drying, materials and process technology, product development transparency and focusing have greatly improved. By integrating sales and marketing activities at an early stage in development projects and joining forces with all the Voith Paper divisions, we can now concentrate much more intensively on customer needs.

By highlighting specific customer problems, cooperation with our applications specialists for all the various paper grades enables us to develop innovative solutions more rapidly.

Due to the complexity of manufacturing technology, our forming wires, press felts, dryer fabrics and transfer/smoothing belts are developed in close teamwork with the respective Voith production plants for each sales region worldwide, centrally coordinated in Pfullingen.

Introduction of the Stage-Gate® project management system

After extensive studies, the Stage-Gate® project management system was globally introduced in the Voith Paper Fabrics R&D/Technology organization for the following reasons:

- It enables the central management of development projects, involving several locations worldwide
- Systematic resource management
- Portfolio management can be more efficiently structured for meeting customer needs and developing new technologies
- Product development is integrated in the overall business process
- Joint projects within Voith Paper can controlled and managed more efficiently.

In the next phase, the overall system was established and employee training and system introduction was started.

The Stage-Gate® process

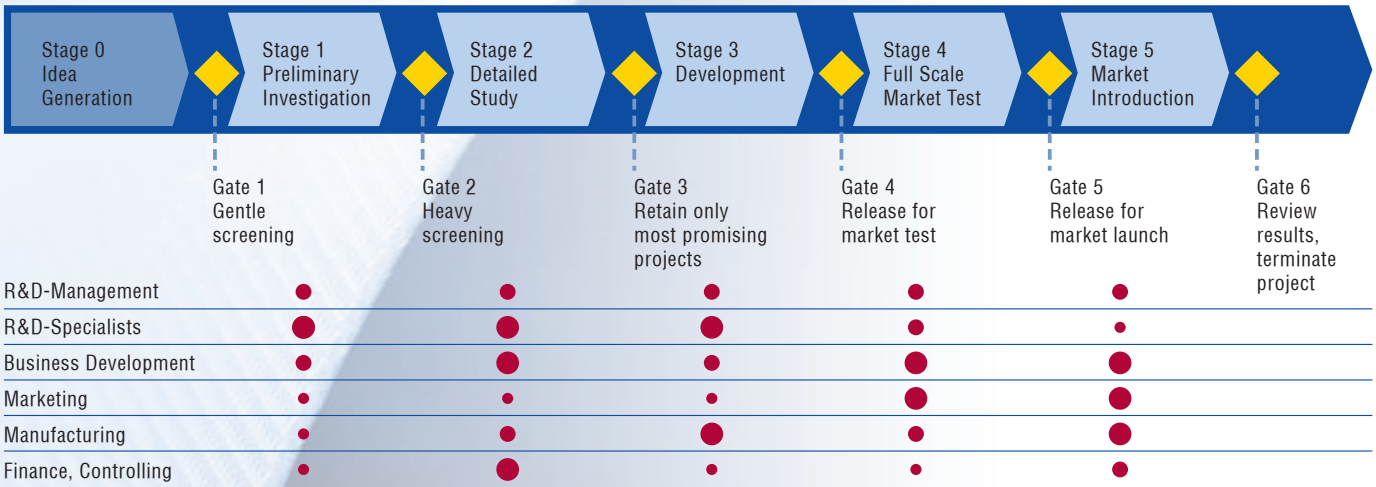
The Stage-Gate® process is a phased product development model, each stage of which is handled as a 'mini-project' embedded in the overall project structure. This not only enables optimal resource allocation among parallel projects, but also the efficient monitoring of intermediate goals and definition of break-off criteria.

In contrast to the conventional milestone plan, there is much more emphasis thereby on setting gates as hard, clearly defined limits. Only if the respective gatekeeper gives the go-ahead, can the project be continued. In case of a 'kill' decision, the project is immediately terminated. If it is decided to redirect the project, the next gate cannot be passed until this has been done.

Structure of the Stage-Gate® process

As indicated by its name, the Stage-Gate® process is made up of stages (project phases) and gates.

Schematic flow chart of the Stage-Gate® process, with typical integration of various responsibilities during the course of a development project.



Stages

The first stage is **idea generation**, a kind of brainstorming phase where ideas are collected and structured.

Then comes the **preliminary investigation** stage, where rough estimates are made of technical feasibility, the project costs and timeframe involved, and the potential market volume.

This is followed by the **detailed study** stage, involving a thorough investigation of all factors including the market situation, technical and technological solutions, financial analysis, etc.

The subsequent **development** stage covers product and process development as well as prototyping and the definition of production goals.

After that comes the **full-scale market test** stage, which is critical for project success. With close customer involvement, the respective product or technology thereby undergoes product pre-launch trials to test for market acceptance and manufacturing dependability. Based on test results and customer feedback, the decision is then taken whether to go into full production or not.

Finally, the **market introduction** stage involves a systematic and widely based product launch, followed by revalidation after assessing the experience gained thereby.

Gates

These five or six project phases are separated by gates, where decisions are made by the respective gatekeepers according to defined criteria. Only three decisions are possible:

Go: continue the development project.
Kill: terminate the project immediately while safeguarding all findings and know-how gained so far.
Redirect: do not continue the project until after realignment.

Interdisciplinary project structure

One of the main advantages of this staged development process is that the right specialists are engaged at the right time under the supervision of each respective project manager. The philosophy of a sole project manager, often applied to small development projects, is replaced here by task distribution among the respective experts according to responsibility for each project phase.

In line with the latest findings, development projects are no longer reserved for the "backroom boys", but handled as actual business processes.

Customer benefits

Including customer requirements at an early stage in the selection process is an important step toward interdisciplinary, customer-oriented product development. Well structured decision-making during the course of the defined project sequence enables reproducible, resource-optimized development.

Factually based decisions also help the project team members to concentrate on goal attainment rather than emotional considerations.

By embedding Voith Paper Fabrics in Voith Paper, the volume of joint projects and activities has risen steeply. The common controlling system for development projects strengthens our systematic approach, and enables us to cooperate more closely and efficiently thanks to an analogous project structure on all sides.

iCon – intelligent Control for stock preparation lines

Dr. Boris Reinholdt
Voith Paper Automation
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The technological trend in stock preparation lines today is increasingly toward continuous production, with fewer vats accordingly. In this connection Voith has developed the EcoProcess system concept (Fig. 1), which enables enormous savings in investment and operating costs.

For maximum benefit, the EcoProcess depends on systematic plant automation with higher-ranking control strategies. All these higher-ranking systems work on the same principle: they supply a production automation system with setpoint inputs for various control parameters, to keep plant operation as near as possible to the technical and technological optimum. EcoProcess can also be retrofitted to increase the productivity of existing deinking lines.

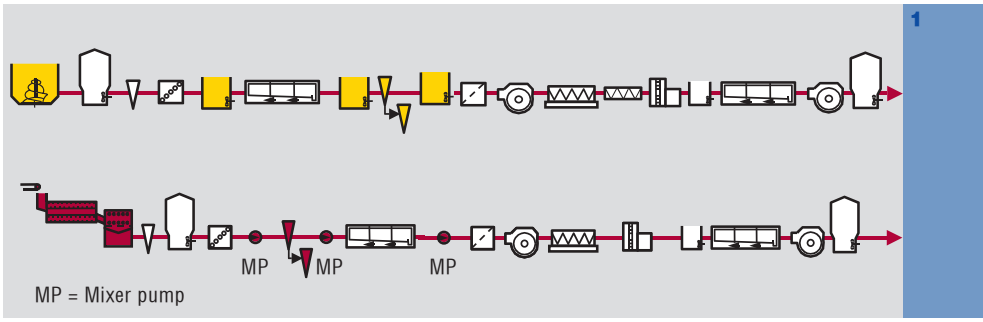
To cover such higher-ranking control needs in stock preparation lines, Voith Paper Automation developed the iCon product family. iCon stands for intelligent Control, and incorporates all the control and regulation tools beyond basic automation of a stock preparation line.

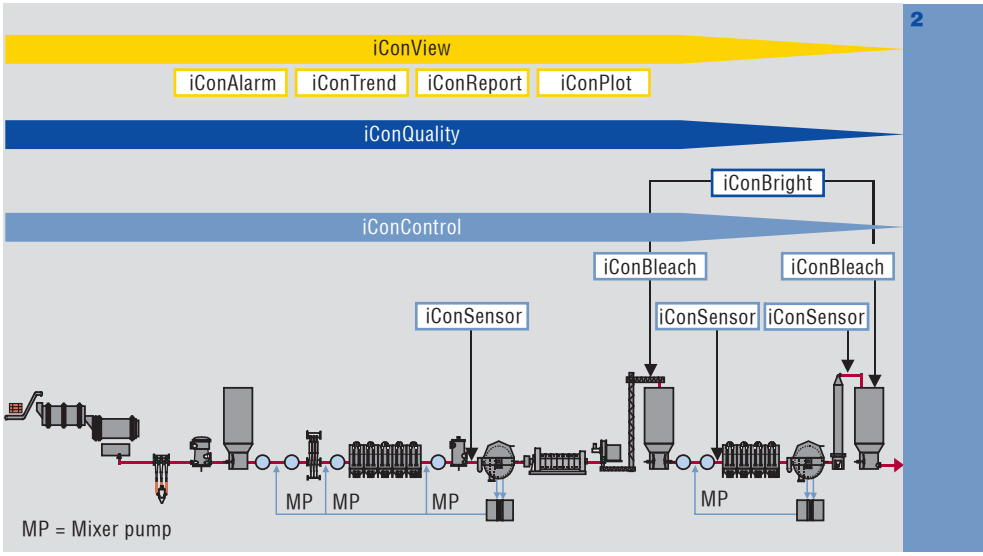
The modular iCon product family offers hardware and software solutions with associated services for simplifying stock preparation line operation, improving

Fig. 1: *From conventional process to EcoProcess.*

Fig. 2: *Structure of the iCon product family.*

reliability and minimizing costs (e.g. for bleach chemicals). Investment costs for these intelligent systems are very quickly amortized: according to Helmut Berger, production manager at WEPA Giershagen, deinking line upgrading saved 30% oxidative and about 40% reductive bleaching costs, with an investment payback time of less than two years.





System structure

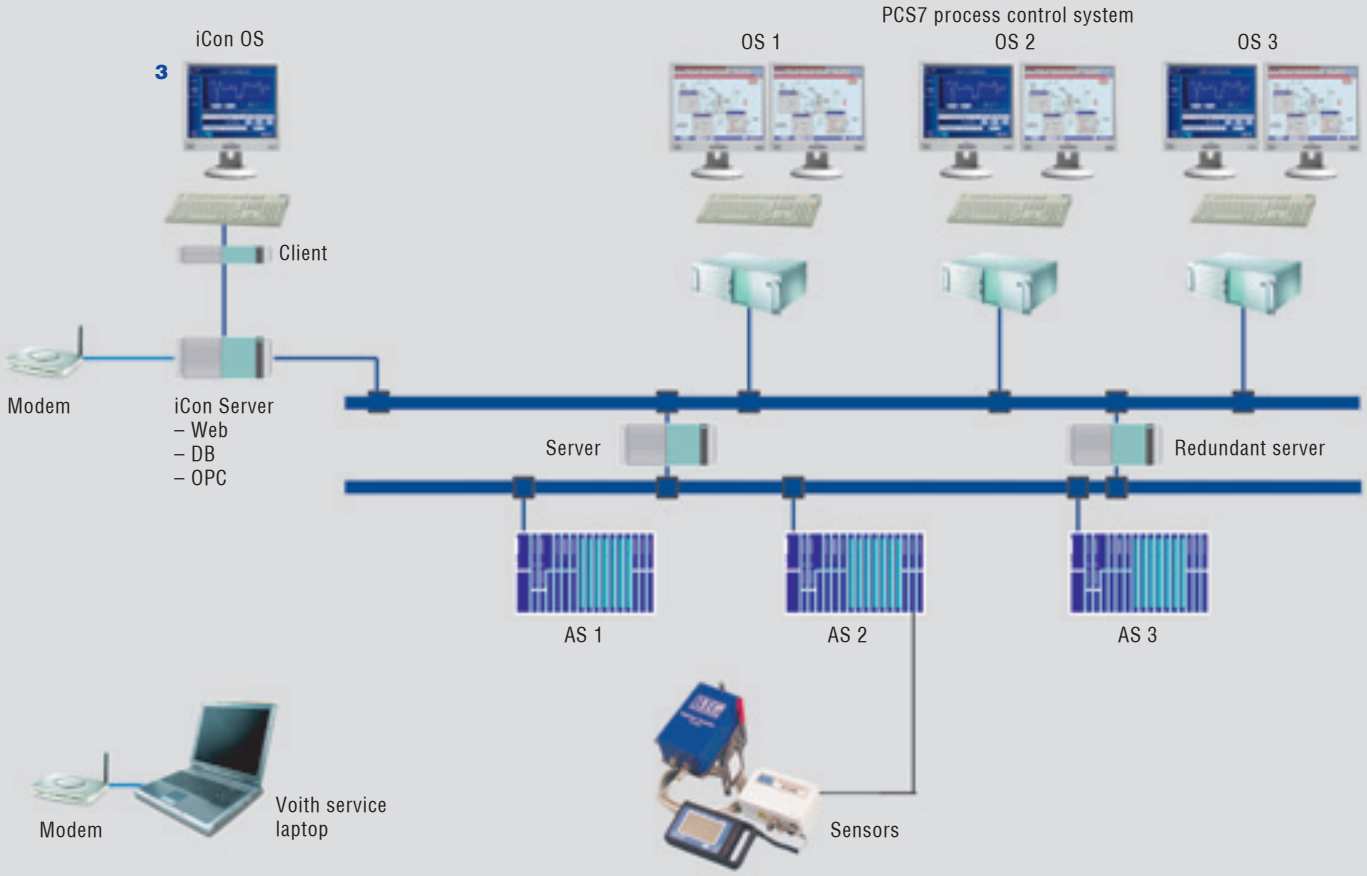
iCon is mainly divided into three interlinked areas:

- **iConControl** is the platform under which all controls and the information system run. It communicates directly with the process control system.
- **iConQuality** incorporates all the control systems for improving stock quality and at the same time optimizing process operating costs.
- **iConView** covers all the communication and information systems required for stock preparation line control **(Fig. 2)**.

iConControl

The MS Windows based iConControl platform comprises a high-end industrial PC with standard OPC interface to the process control system. Via this interface large quantities of data are read in from the process control system, and the requisite setpoints are fed back to the deinking process. This OPC and web technology ensures seamless integration in practically all process control systems, irrespective of manufacturer.

The user operates the system from a browser window on the process control interface, and is unaware that another system is operating in the background. All necessary inputs and outputs are continuously provided by the database, thus enabling for example visualization on the form of freely configurable graphics. Via an ethernet link, the PC can access the process control system OPC server to read and write process data and variables.



iConView

The Voith iConView system is installed on the iConControl platform to ensure basic functionality of the individual quality control modules. The large quantities of data are stored in compressed form in a database developed by Voith Paper Automation. This system forms the basis for various modules providing interactive data interchange with the iConView system.

With ongoing automation of the papermaking process, the volume of process data is increasing rapidly. On the one hand this enables increasingly precise analysis, but on the other hand such a flood of information can hardly be evaluated manually. This is where the iConView system plays a decisive role in drawing the right conclusions and taking the right action.

iConView thus supplies plant operators, engineers and management not only with online process information, but also with historical data. The only limit to the time span of such data is the system storage capacity, which can however be expanded to take account of increasing data volumes during the course of time. This enables for example data and parameter comparisons over several months or even years. The iConView module is therefore an ideal decision-making tool both for engineers and management (Fig. 4).

Process data can be displayed in various forms depending on requirements – such as individual values, bar or column charts, trends, or X-Y diagrams – not only on individual client PCs via web browser, but also per intranet throughout the paper mill's process control system. By allocating the respective access rights, system operation can be limited to specific user groups.

An iConView reporting system is also available optionally. By compressing the vast array of data, this enables documentation both chronologically (by shift, day, week, month and year) and according to product grade. The form of reporting is agreed in advance with the customer.

iConBright and iConBleach

Brightness, one of the most important paper quality criteria, can be improved by stock bleaching. The online brightness measuring sensors installed by most paper mills in recent years supply the necessary data for Voith Paper Automation's intelligent bleach control system. By reducing the bleached stock brightness

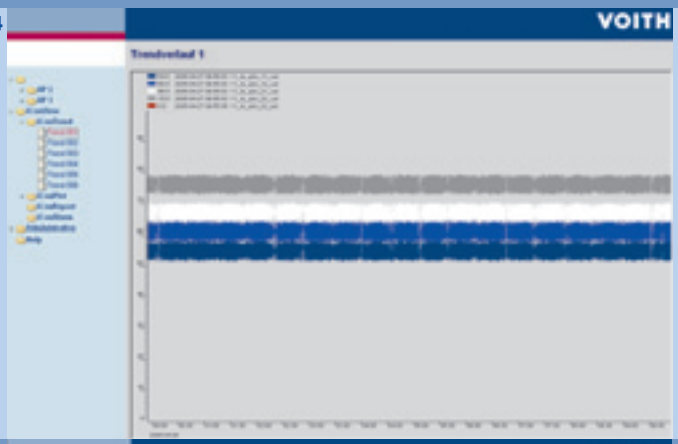
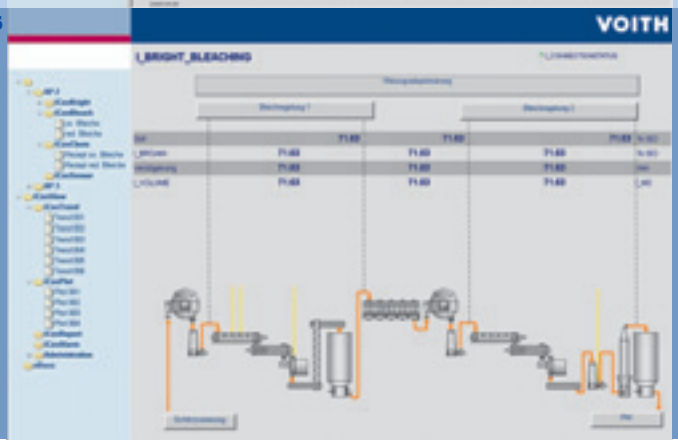


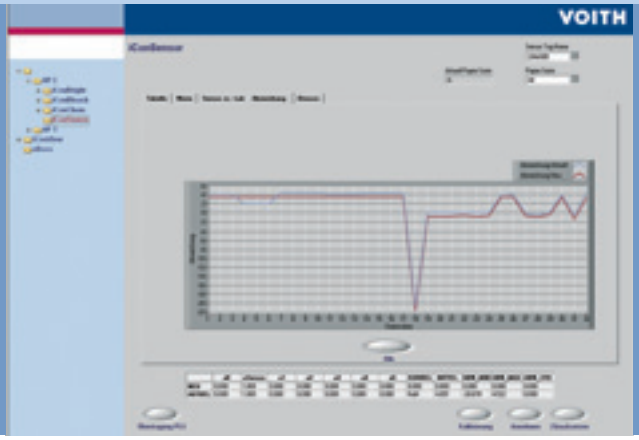
Fig. 3: *iCon product integration in the process control system environment.*

Fig. 4: *iConTrend display.*

Fig. 5: *iConBright – mimic diagram for brightness control.*

Fig. 6: *iConSensor – sensor calibration.*





fluctuation, this significantly improves the finished stock quality and also brings considerable cost savings.

Each iConBleach system comprises several modules according to customer requirements. The main system module, iConBleach, regulates the brightness gain per bleaching stage and determines the dosing of bleach chemicals and additives. An internal model-based controller (IMC) takes into account the long deadtimes and nonlinearities of the bleaching process as well as the upstream and downstream process values.

Two or more iConBleach modules are linked with a higher-ranking iConBright module, thanks to which only one setpoint for brightness at the end of the stock preparation line has to be entered. This module coordinates the individual iConBleach modules to optimize bleaching chemical costs, the technological weighting of each bleaching stage, deadtimes, and other factors **(Fig. 5)**.

iConSensor

The iConSensor module is a so-called soft sensor for various quality criteria sensors in the stock preparation line. By linking various internal and external sensor signals, the display precision is improved. In future this will enable the inclusion of additional quality criteria signals in the Voith iCon control system. Furthermore, various sensor calibration curves for different grades can be stored and selected according to need.

Another advantage is that the central calibration not only saves time, but also enables automated interrogation of a laboratory data system. The deviations between online and laboratory measurements can thus be determined and displayed, as a basis for recalibrating the online sensors whenever required **(Fig. 6)**.

The iConBright and iConSensor modules can be activated by a grade selection program so that the respective grade only has to be set and activated at one point in the program. The respective setpoints and parameters are then adjusted automatically in the iCon modules.

Summary

Voith Paper Automation's new iCon product family offers a comprehensive package of tools and modules not only giving users a better overview and control of the stock preparation process, but also paying off quickly thanks to short ROI times.

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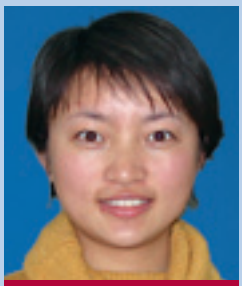
Voith Paper Fabrics Customer symposium in China – On-the-spot reliability, knowledge and trust



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In March this year Voith Paper Fabrics invited leading papermakers in China and the Far East to an Asian customer symposium entitled "Voith Paper Fabrics Kunshan – bringing reliability, knowledge and trust closer to you".

Linked with the inauguration of the Kunshan plant extension, this event took place from March 16 to 18, 2005 in Kunshan, China.

Kunshan is about one hour to the west of Shanghai in Jiangsu province, at the heart of a rapidly growing papermaking region. The Kunshan plant, where former wires and press felts are made, has been supplying Asian paper mills for more than seven years with high quality products.

Almost 150 customers from more than sixty paper mills met in Kunshan to hear

2

Fig. 1: *Bob Burke opening the inauguration ceremony.*

Fig. 2: *The attentive audience at the customer symposium.*

Fig. 3: *Simultaneous translation services were in great demand.*

Fig. 4: *Dr Hermut Kormann greeting the guests.*

Fig. 5: *The Voith management delegation on its way to the new production facility.*


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about Voith's latest innovations in papermaking technology. Voith has always attached great importance to dependable partnership with Asian customers. This was emphasized once again by the presence of a high-level Voith management delegation including Dr Hermut Kormann, President and CEO Corporate Board of Management of Voith AG, Hans Müller, formerly President and CEO Voith Paper, and Bertram Staudenmaier, new member of the Voith Paper Executive Board with responsibility for the Fabrics and Rolls divisions.

The symposium was officially opened on Wednesday March 16 in the evening by Bob Burke, Senior Vice President of Voith Paper Fabrics Asia/Pacific division. He cordially welcomed the participants to Kunshan and thanked them for attending. During the ensuing banquet they were entertained with jazz and a magician in a light-hearted atmosphere ideal for making new contacts and meeting old friends.

On Thursday the first day of the seminar started with a welcome address by Hans Müller, who outlined the Voith organisation in Asia and gave an interesting overview of Voith's development in China. Afterwards the various Voith Paper technologies and their application possibilities were explained by specialists and illustrated by references. This was followed by a panel discussion, and it became quite clear that innovative high-end technology is rapidly gaining ground in the Asian papermaking industries, whose further expansion still depends on an ongoing partnership with Voith. This partnership is solidly based on reliability, knowledge and trust, and is being steadily consolidated by on-the-spot customer contact.

On Friday March 18, guests and participants attended the official inauguration of the new Kunshan plant extension. Voith is now in the position to manufacture locally the entire range of dependable press felting from the Voith Paper Fabrics portfolio, thanks not least to a new production shop with high-tech facilities.

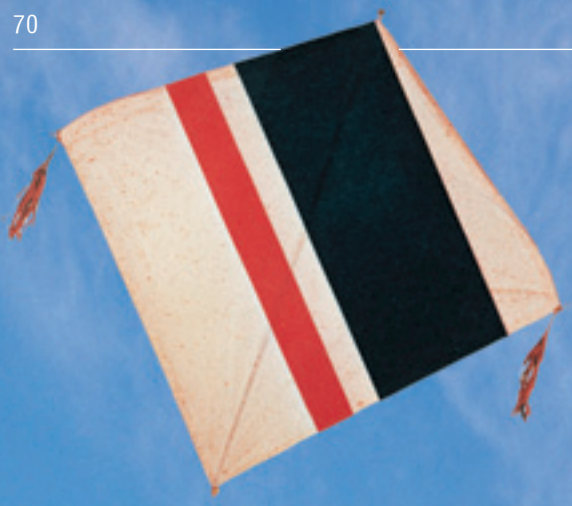
Before attending the inauguration ceremony at this new Voith Paper Fabrics plant, the guests of honour visited the neighbouring Voith Paper Rolls plant opened in summer 2003.

Bob Burke greeted the guests at the inauguration before their tour of the new VP Fabrics plant. The official opening ceremony started at 9:58, a lucky number in China.

After the official opening, the ceremony continued in traditional Chinese style with a lion dance as good omen or "feng shui". When the red ribbon had been ceremoniously cut, welcoming addresses were held by Dr Hermut Kormann, Bob Burke and official representatives of the Chinese government.

Dr Hermut Kormann got to the point in his speech: *"This Kunshan plant is our new baby, whom we welcome with parental pride into the Voith family. In such a big strong family, the new member stands excellent chances of a long, prosperous and happy life!"*

This successful two-day symposium will certainly improve relations between Asian papermakers and Voith Paper even further. Kunshan is the first Voith Group location where former wires and press felts are produced under the same roof as roll sleeves, not to mention the roll servicing also offered here. This outstandingly successful teamwork continues to set an example worldwide for the synergies between Voith Paper divisions.



Paper kites –
Magic, mythology and sport

Everyone knows those brightly coloured shapes in the sky that dance in the wind to the delighted gaze of children. Whether on beaches or hillsides, in Asia, North and South America or Europe, playing about with the air currents is a well-known and popular pursuit. From the earliest days, mankind has yearned to fly. The first and very ancient flying machine that enabled man to reach up into the air above, though still attached to the earth by a cord, was the kite.

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Fig. 1: *Kite flying in China in the 19th century.*

Fig. 2: *Medieval 'wind sock' – similar to the kite and made of pergamin paper and material.*

Fig. 3: *A colourful street-scene in Tokyo during the Japanese New Year Festival two centuries ago.*

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But it is still very difficult to trace the origins of the kite, if at all. The first mention we have of kites as flying objects is from China, at least two and a half thousand years ago. The latest finds, from Indonesia, suggest that the first kites could have existed even earlier. The first kites from China that we know of were made from little bamboo sticks and silk, which was expensive even in those days. But to spread any further, the kite had to wait for the invention of paper. Paper was cheaper to come by and easy to work and ideal for decoration with symbols applied in paint and other media.

Originally, there was a close link between kites and religion and mythology. People saw kites as some kind of messenger of the gods. They hoped that these flying objects would carry their wishes and requests, for good weather or fertility perhaps, to the gods. Even today, kites figure in countless folk celebrations, which can trace their origins back to mythological and religious traditions.

It is probable that the use of kites spread out from China into the Pacific region. Some experts think that, over 1,200 years ago, Buddhist monks brought kite flying to Japan via Indonesia whereas according to other theories, kite flying reached Japan and Korea along with the sale of paper. More recently, the view has developed that kites originated independently of each other in a variety of countries.

These messengers of the gods all developed and adapted differently in their various homes – Burma, Korea, Indonesia, Melanesia and Polynesia – and acquired their own key roles in religious ceremonies.

Sometimes, more worldly uses for kites have been found. According to Japanese tradition, Kaniko Kinsuke, a mythological bandit, flew about on a man-sized kite while stealing the gold leaf from the dolphins decorating the towers of a palace. But he did not have long to enjoy the fruits of his daredevil banditry. Along with all his family, Kaniko Kinsuke was executed in short order.

Then, well over a thousand years ago, kites started to be used for pleasure. This was when China introduced the 'Day of the Kite', a festival held on the 9th day of the 9th month. And in some Asian countries there is still a popular form of duelling game whereby fragments of glass

Fig. 4: *Giant kite battles. The history of these enormous kites, which are flown at the Hammamatsu Festival, goes back centuries. The battles have become so popular since the 19th century that lots of kite teams converge on Hammamatsu. The traditional kite Edo Dako is fashioned from bamboo and robust Mino paper.*

Fig. 5: *Yakko – a servant kite from Japan. It is called Yakko (servant) because it was forbidden to depict the Samurai – only the lower classes could be shown.*

Fig. 6: *Traditional kites at the Wau Festival – Wau Bulan, Wau Jala Budi or Wau Kuching, for the Malays, what really counts is the choice of the right paper and the form of the frame, not the actual flying skill.*

are attached to the cord and are used to try and bring down an opponent's kite. There are festivals held in many part of India for fighting kites fashioned from silk paper. In Japan and Korea, when families celebrate the birth of a boy, kite battles can be part of this special 'Boy's Festival'. Thailand, too, has a special relationship with kite flying. There, kites used to be an element of magic and folklore. In the past, kites made with paper stretched on a frame were flown at monsoon time as an exhortation to the winds to bring good weather, and the present-day festivals that have grown from this are an obvious continuation of this kite-flying tradition.

In the 13th century, in the Marco Polo era, merchants brought kites from Asia into Europe. In the 16th century, kites of a grander variety were brought to Europe by English, Dutch and Portuguese merchants trading in the Far East. Brightly coloured and decorated 'wind socks' made of paper, and so a primitive form of kite, were very popular in the Roman era and in the Middle Ages for use as pennants at festivals.

For centuries, Europeans mainly thought of kite flying as a game for children. And yet, when adults discover the child within them, childish games can become a pleasure for every age. The kite continues to develop, even today. There are literally hundreds of different types. Although kite enthusiasts are tending more and more to prefer modern, more robust materials, the traditional paper kite remains a firm favourite. It doesn't take much effort to make a kite from ordinary wrapping paper or newspaper and a flour-based paste. More demanding kite makers choose tear-resistant pergamin paper.

Given the wide range of uses a kite can have, it is not very surprising that it has also been used for military purposes. For many centuries, soldiers have repeatedly made use of kites. More than 2,000 years ago, General Huan Theng discovered that kites could also have their military uses. According to tradition, the General ordered his men to construct a large number of kites and fit them with devices made of bamboo that buzzed loudly in the wind. The General used these kites to terrify the opposing army in the night. The enemy thought they were being attacked by evil spirits and fled in a terrible panic. This was not the only military use for the kite. During the First World War, kites were used for air surveillance. In the Second World War, a kite, nick-named the 'Gibson Girl', was a regular part of sea rescue equipment for flight crews who were forced to ditch in the sea.

Since the time of Leonardo da Vinci (1452-1519), the kite has been used time and again for scientific purposes. Leonardo was the towering figure of the Middle Ages who thought through the problems of air travel scientifically. A very well-known kite experiment was conducted by the American Benjamin Franklin, who used a kite in 1752 to prove that light-

Fig. 7: *Chula & Pakpao – Battle of the Sexes in Thailand. The battle kites made from paper and bamboo embody the male and female principles. At festivals, two smaller female Pakpao's (85 x 70 cm) fly against one male Chula (250 x 190 cm). The aim of the battle is to ensnare the opposing kite by means of hooks fixed to the cord.*

Fig. 8: *The Chinese centipede. The centipede is actually a chain of lots of interlinked kites plus a three-dimensional head. The long line of kites makes for an impressive sight as it snakes about across the sky.*

Fig. 9 : *Korean fighting kite – this is in the typical rectangular form with a central hole. The framework covered with paper is made from split bamboo canes.*

ning was an electrical phenomenon (Fig. below). During a heavy storm, he flew a rhomboidal kite to which a metal rod was attached which acted together with the wet cord of the kite as a lightning conductor. Since the end of the 19th century, kites have been used to carry meteorological instruments. Finally, one of the more significant aspects of kite flying has been its influence on the development of the earliest flying machines.

Early in the history of flying machines, different covering materials were being tried out, whereas paper, a tried and tested material, is still in use by kite enthusiasts. A whole range of different grades and types of paper are used to cover kite frames – from simple wrapping paper and other tear-resistant types to the finest silk papers. Quite a number of kite makers swear by their own particular way of pretreating the paper before it is stretched over the frame. A common method is carefully to crumple the paper up beforehand, then rub it and finally smooth it out again. As with banknotes, which pass through many hands, this treatment is thought to increase the elasticity of paper. According to an old English method, it is advisable to lay the paper between two damp cloths before fixing it on the frame.

There is quite a distance between a simple piece of paper stuck on wooden sticks, which children the world over love to see fluttering in the sky, and the accomplished designs of kite-making artists. And for enthusiasts of the many types – two-dimensional, box-shaped, steerable, V-shaped or arched kites and or even interlinked kites – there are countless clubs and associations, especially in America and Europe. In Asia, however, kite flying still retains a social aspect. In Japan, for example, whole villages may build kites communally – and these can be enormous. Probably the largest, measuring 14.5 by 11 metres, are flown at the Hoshuba Festival. Such monsters take fifty people to get them into the sky.

Werner Jany

Photos: Deutsches Museum München, a.o.

twogether

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