Hans Müller

Dear Customer, Dear Reader,

You will realize in this issue of our twogether magazine that the Finishing Division is not as well represented as in previous issues. The reason for this is that in September of this year you will receive a special edition, dedicated to our "New Finishing Division" resulting from the merger of Jagenberg and Voith Paper.

Our order intake continues at a satisfactory level despite the prevailing unfavorable conditions in the USA, slowing project activities in South America, and the continuing slump in Southeast Asia. China continues to invest aggressively in new production lines, which is reflected in our present backlog of 5 new paper machines, including sizeable orders for stock preparation lines, for this country alone.

Since our last issue, we have successfully started up the new SC paper production line for SCA Graphic Paper in Laakirchen, Austria. Using the words of our customer "This is the best start-up we have ever experienced, and it is probably the best ever in the industry".

Soporcel, Portugal, with its No 2 machine from Voith, has developed into one of the fastest and most efficient production lines in the world for wood-free graphic papers made from eucalyptus pulp.

In summary, Voith Paper is now in the forefront of paper machine productivity (quality tons on the reel) in the newsprint, coated and uncoated wood-free paper segments as well as with online and offline calendering SC machines. The same productivity performance also applies to virtually all fields of board and packaging grades, in particular to the new production line in Saica, the fastest liner board machine in the world, which will exceed the rated output of 350,000 tons/year by the second year of operation.

I'd like to draw your attention also to the article of the recent and very successful start-up of Kehl's production line which produces thermo paper. This machine's performance, as well as that of many others, reflects on the well-established Voith partnering concept with its customers.

Our acceptance in Finland continues to grow successfully and has been elevated by the exeptional performance of the rebuild we did for the Kaukas mill of the UPM-Kymmene Group as well as the new order we received for the rebuild of the 9.5 m wide Rauma PM 2.

Voith Fabrics and Voith Paper's joint product and process development show the first successful results with our latest start-ups. To further strengthen the Voith Paper and Voith Fabrics process supplier approach (and to recognize regional customer requirements even faster and better), we are presently implementing a new organizational structure at Voith Fabrics, which will combine the two organizations of Voith Paper and Voith Fabrics more effectively.

Voith Paper Technology (Voith Paper and Voith Fabrics) is looking forward to continuing to serve you as a valued partner and customer, and we trust that this issue of our twogether magazine will prove to be as interesting as all the previous ones.

Hans Müller,
on behalf of the Voith Paper Technology team

NEWS FROM THE DIVISIONS

Voith Paper in China

65 Years of Success!

The author: Harry J. Hackl, Paper Machines Graphic

In 1936, over 65 years ago, Voith supplied the first complete paper machine to China. This was a machine for the production of folding boxboard for Shanghai Zhong Ban Paper. It was also the beginning of what has since been a continuous market presence of Voith in China, which has been increasingly intensified and expanded over the years.

Dagang PM 1 and 2: the world's largest fine paper machine for Gold East Paper.

Voith Paper's current position in the Chinese marketplace strongly confirms the decision to attach greater importance to what, at that time, was an insignificant market. However, it has since shown an enormous potential for growth.

In the years that followed, increased successes were recorded, especially in the field of rebuilds and the supply of key components (headbox, former, calender, coating machines). There were also a few orders for complete, small paper machines.

In the early 1990s, Voith began to commit itself with investments for the construction of local manufacturing facilities. In 1995, a joint venture was formed with the Liaoyang Paper Machinery Ltd. Co. for the manufacture of dryers, dryer section framing and machine components.

In 1994, a representative office was set up in Beijing to ensure better service to the market and proximity to the customer. This resulted in a greater market presence for China and project processing was greatly strengthened.

With the increasing growth of the Chinese market, the demand for imported paper machines was given a substantial boost. At the same time, demands made on machine standards, wire widths, production capacities and product qualities, etc., rose considerably.

High Tech for Minfeng Special Paper Co. Ltd.: PM 18 (above)

Loyalty to the market and the long-term commitment bore abundant fruit since 1995.

From 1995 to 1999, Voith received orders for a total of 19 paper machines for the entire range of paper and board grades, in addition to continuous orders for rebuilds and key components.

These were:
Ten machines for packaging papers or board (partially in cooperation with the joint venture partner, Liaoyang Paper Machinery Ltd. Co.)
Three Machines for graphic papers
Six Machines for graphic specialty papers.

In addition, Voith's licensee, Andritz AG, received orders for 3 complete tissue machines in this period.

Of these 19 machines, 2 are noteworthy, because of their significance as a technology indicator not only for China, but also for the entire global marketplace.

The 2 machines for **Gold East Paper/ Dagang**, for the production of woodfree coated papers, were put into operation in early 1999. These are the world's largest and most efficient fine paper machines with a wire width of 10,500 mm, a design speed of 1,700 m/min and an annual production per machine of over 500,000 metric tons. Just 2 1/2 months after start-up, PM 2 set a world record at 1,458 m/min and 1,875 t/24 h.

Headquarters (below)

Signing of contract in the impressive "Great Hall of People"

Gold East Paper, impressive dimensions on the Jangtsekiang

SpeedFlow Minfeng PM 18

Signing of contract with Shandong Huatai Paper Group Co. Ltd.

However, in 1999, a new wave of success began with orders for complete production lines. The PM 9, which previously was delivered to Haindl in Schongau, Germany was purchased by Shandong Huatai Paper Group Co. Ltd. in 1999. This machine was partially overhauled by Voith and assembled under Voith's supervision. This machine, with the following characteristic data

Product Standard newsprint
Production capacity 180,000 t/year
Wire width 6,900 mm
Design speed 1,300 m/min

was started up very successfully in summer 2001. Since then, it has been producing newsprint paper for the Chinese market with an excellent quality and an efficiency of more than 90%.

In quick succession, Voith booked orders for high-efficiency machines from the following customers:

Rizhao Wood Pulp Co. Ltd./Shandong
1 machine for the production of 150,000 tons/year of liquid packaging board
Wire width 4,100 mm
Design speed 600 m/min
Start-up March 2002

Minfeng Special Paper Co. Ltd. Jiaxing/Zhejiang
1 production line for the manufacture of top quality cigarette paper
Wire width 3,800 mm
Design speed 500 m/min
Start-up March 2001

The staff of the Beijing Representative Office with the Voith Paper Board of Management

Shandong Chenming Paper Holdings
Shouguang/Shandong
1 finishing line for WFC grades with a basis weight of 70-210 g/m^2
consisting of:
1 offline coater
Web width 4,635 mm
Design speed 1,500 m/min
2 offline 10 W-Janus MK 2 calenders
Design speed 1,100 m/min
Start-up December 2002

Lee & Man Paper Manufacturing
Co. Ltd., Donguang
1 production line for 300,000 tons/year of linerboard
Wire width 6,000 mm
Design speed 1,250 m/min
Start-up December 2002

In this period, Andritz AG received orders for 3 additional tissue machines.

Yet, this was not all ...
Within just 3 months, i. e. from December 2001 to February 2002, orders followed for 5 new, complete production lines from the following customers:

Shandong Huatai Paper Group. Co. Ltd.
Dongying/Shandong
1 production line for the manufacture of 280,000 tons/year of standard newsprint
Wire width 7,100 mm
Design speed 1,800 m/min
Start-up October 2003

Shandong Bohui Ind.
Bohui/Shandong
1 production line for the manufacture of 300,000 tons/year of coated white board
Wire width 6,230 mm
Design speed 600 m/min
Start-up End 2003

Jinfeng Spike Paper Co. Ltd.
Chengdu/Sichuan
1 production line for the manufacture of highly porous cigarette filter wrapper in inclined-wire quality
Wire width 2,120 mm
Design speed 260 m/min
Start-up End 2003

Mundanjiang Hengfeng Paper Group
Mundanjiang/Heilongjiang
1 production line for the manufacture of 10,000 tons/year of cigarette paper
Wire width 3,800 mm
Design speed 600 m/min
Start-up End 2003

Minfeng Speciality Paper Co. Ltd.
Jiaxing/Zhejiang
1 production line for the manufacture of 45,000 tons/year of inkjet paper
Wire width 4,000 mm
Design speed 700 m/min
Start-up End 2003

The important factor is that these new machines are designed according to the latest state-of-the-art and feature the most sophisticated level of technology and product quality.

In most cases, these are orders for complete production lines from the fiber to the end product. Therefore, all product divisions of Voith, i. e. Fiber Systems, Stock Preparation, Approach Flow, Paper Machine, Coating, Calendering, Finishing, Slitting and Winding, Roll Wrapping, Automation, and Voith Fabrics, have equally contributed to these successes.

As of March 2002, the total production capacity of all Voith paper machines, including those on order, in China is more than 3.0 million tons/year.

So much for the unique wave of success in this, the world's most significant and active growth market today and in the years to come.

The consumption of paper in China is expected to grow within only 8 years from the current approximate 34 million tons/year to over 60 million tons/year. A large part of this growth rate is expected to be generated in new own production systems. This is an extremely ambitious program where Voith will again make a significant contribution.

To meet the increase in paper demand, the Chinese government has set up a program for the financial support of investments for new machines. A total budget

of EUR 2 billion has been approved for an extremely attractive, low-interest loan.

This leads us to expect that Voith will continue to be able to report on further important orders from China in the future.

Governmental regulations require that Voith create the prerequisites for a steady increase in the local share of manufacture and in Chinese value creation. Voith geared itself to such a development at an early stage and is about to massively increase its commitment by considerable further investments.

- Voith's representative office has been continuously expanded over the years. Voith Paper, in Beijing, currently employs about 20 people who advise our Chinese customers and continuously support them. The joint venture with Liaoyang Paper Machinery Ltd. Co., which goes under the name of VPLY, is equipped with extensive, highly modern machinery and now manufactures complete dryer sections for paper machines in conformity with international quality standards.

- In Kunshan, a suburb of Shanghai, Voith built a greenfield mill in 1996, which produces the entire line of clothing for paper machines. Clothing, up to a paper machine width of 12 m, can be manufactured there according to the latest criteria and production methods. Today, Kunshan is one of the major production locations for Voith Fabrics, and manufactures wires and felts for worldwide use. The capacities of this factory will be further expanded within the next few years.

- In addition to the already established facility for Voith Fabrics, Voith will soon begin the construction of a service center for roll covers in Kunshan. Besides rubber and polyurethane, Voith will be able to produce ceramic coatings at this new facility. The service center in Kunshan will be able to manufacture rolls and roll covers to the highest quality standards. This Voith facility will start operations at the beginning of 2003.

- Also in 2003, another service center for general service tasks and mechanical roll service will be opened in Shandong province.

- This year, along with the aforementioned activities, Voith Paper will begin with setting up an sales, engineering and technology center in Shanghai.

With these additions to the range of services, Voith Paper will be in a position to cover even better the entire service and support of paper mills in China.

Customer proximity, fast availability and, therefore, service concepts for the whole production line are the basis of Voith's success in Asia.

The experience gained over a period of more than 65 years, the knowledge of the needs of our customers, continuity, know-how and efficiency are the reasons for Voith Paper's success in China. We are sure that, with our strategic alignment, we will continue to be able to report on Voith Paper's successes in China and Asia in the future.

Kehl PM 2, SM 2 –
a dual start-up par excellence

The author: Manfred Rieth, Paper Machines Graphic

In October 2001 the new offline coating machine SM 2 went into service at August Koehler AG, Oberkirch, Germany. This was followed two months later by the start-up of the new paper machine No. 2 in December 2001. These two on-time start-ups in rapid succession went exactly according to plan and to the customer's complete satisfaction.

1

Fig. 1: Kehl PM 2.

Fig. 2: DuoFormer.

Fig. 3: Layout of Kehl PM 2.

2

The new coating and paper machines more than double production capacity at August Koehler AG for non-impact and thermopapers. August Koehler is a leading producer of these special grades, now in ever-increasing demand due to ongoing developments in thermoprinting and copying technology for business applications.

With such outstanding know-how, August Koehler AG will clearly exploit this market opportunity to the full. Installation of the new PM 6 for decor papers was still underway when the company management decided to go ahead with another big investment – for thermo papers, the second main product of this leader in special graphic grades.

Based on our excellent working relations and well-proven technology, Voith Paper also received the orders for PM 2 and SM 2. Only 16 months after contract signing, the correctness of that decision has now been confirmed: the new PM 2 and the SM 2 coating machine are already producing first class paper considerably earlier than planned. Furthermore, machine availability and operating speed exceeded expectations right away.

One-platform concept

In addition to the innovative technical concept as a whole, two key reasons for this success were cited by the customer as well:

1. Voith Paper not only took over the project planning and engineering, but also

3

Fig. 4: Kehl PM 2 dry end.

Fig. 5: Kehl SM 2.

Fig. 6: Layout of Kehl SM 2.

4

5

manufactured and supplied all main components – from stock preparation to paper roll transport. With today's increasingly complex production and handling, this maximal integration of all interactive process technologies under the same responsibility is proving more and more successful.

2. From concept planning to machine operator training, the well-versed project teams ensured smooth ongoing partnership between customer and supplier at all times – another key ingredient for success.

Technical data and scope of supply

Stock preparation

- Voith Paper supplied all main line equipment such as pulper feed and pulping system, refining, rejects handling and approach flow section.

Paper machine PM 2

- Wire width 4,750 mm, width on reel 4,200 mm
- Design speed 1,500 m/min
- Annual production output 120,000 t.p.a.
- Products: thermopapers in grammages from 40 to 80 g/m^2

Main components of PM 2

- MasterJet G headbox with Duoformer TQv for optimal uniformity
- DuoCentri-NipcoFlex press for outstanding runnability, high dry content and maximum availability
- TopDuoRun dryer section for fast drying and optimal availability
- EcoSoft calender for precalendering and good CD thickness profile
- Speed Coater for good contour coverage or insulation coating
- Afterdryer section and reel.

Offline coating machine SM 2

- Max. design speed 1,500 m/min
- This is the first application of a curtain coater for thermopaper production,

a result of the close cooperation between Voith Paper and Voith IHI Tokyo, market leader in curtain coating technology. Kehl SM 2 is the most advanced curtain coating installation worldwide, with the widest web width and the highest operating speed.

- Additional components of the SM 2 coating machine include a re-reeler and a winder (Voith Paper Jagenberg), roll conveyor system, and Twister packaging machine.

Customer satisfaction – the ultimate benchmark

Specialty-grade paper lines are certainly no run-of-the-mill products. As proven by the outstanding customer satisfaction with Kehl PM2 and SM 2, Voith Paper is the best address for optimally customized solutions. Thanks to a strategy of intensive partnership, comprehensive know-how and overall mastery of all process technologies, maximum return on investment is practically a foregone conclusion. Against today's background of tougher global competition in the paper industry, this partnership is clearly the right way to go for sustainable market leadership.

6

Advanced Wet End Process – Proven performance on Kehl PM 2

The author:
Axel Gommel,
Fiber Systems

For ensuring optimal product quality whilst also accommodating today's increasing demands for cost economy, an optimized approach flow is essential for modern paper machines. The Advanced Wet End Process concept continues Voith Paper's high standards in paper machine technology.

This new wet end process concept *(Fig. 1)* was presented in *twogether 10* in mid 2000. The first full concept was put into operation on PM 2 at August Koehler AG, Kehl, Germany. The machine produces thermo paper. Previously, a number of individual Advanced Wet End Process components had been installed on PM 6 which produces laminating base papers.

The object of the Advanced Wet End Process is to ensure optimal conditions on entry into the ModuleJet headbox. Optimal conditions are defined as best possible hydraulic stability, completely homogeneous mixing of all components in the whitewater and full compliance with specified cleanliness requirements. Stabilization times following grade changes need to be significantly shortened and the approach flow control system characteristics improved. These objectives were reached with the Advanced Wet End Process engineering concept on PM 2 in Kehl by using new components *(Fig. 1)* and by reducing process volumes by 50% *(Fig. 2)*.

Engineering

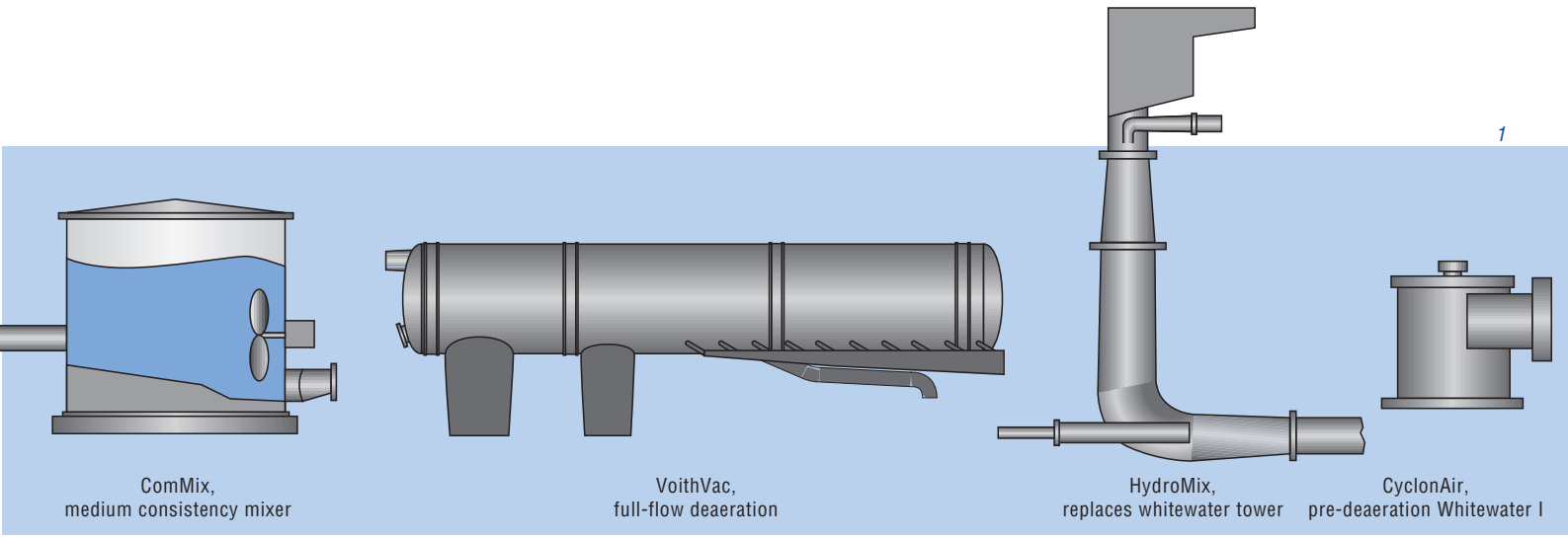
Approach flow engineering has to meet special demands. Smooth operating control loops, together with optimal pipe dimensioning and layout, are the basis for stability in the approach flow. Here, Voith can draw on many decades of experience. Apart from the VoithVac, the Advanced Wet End Process engineering concept

Fig. 1: Components of the Advanced Wet End Process.

Fig. 2: Design guideline for high speed paper machines.

Fig. 3: Fluctuations between the fan pump and MSA screens.

Fig. 4: Fluctuations between the MSA screens and headbox.



1

also incorporates the ComMix, HydroMix and CyclonAir components. These are specifically dimensioned and locally integrated to meet individual system requirements.

Hydraulic stability

The PM 2 approach flow is a two-pump system, the two loops being separated by full-flow deaeration in the VoithVac. The dilution water for the ModuleJet headbox is deaerated in a second VoithVac. The VoithVac is a cylindrical vacuum tank into which the fiber suspension or the whitewater is sprayed and finely distributed. The fibre suspension or whitewater is then brought to boiling point by increasing the vacuum, thus removing all free air and most of the dissolved air. VoithVac's special design and overflow arrangement avoid hydraulic instabilities. Downstream flow pulses after the fan pump are therefore very low *(Fig. 3)*. Visual inspection through the observation ports in Kehl shows a very stable flow towards the VoithVac outlet. The MSA screens in the main and dilution water flows after deaeration reduce these very low pulses even further. Dampening is achieved over practically the entire frequency spectrum *(Fig. 4)*.

Mixing

Mixing of stock components in the medium consistency range is undertaken in

	Objective	Advanced WEP
Hydraulic stability		
Periodic pulsations		
Fan pump 2	a_{eff}<2.0 mbar	**a_{eff}<1.6 mbar**
Screening 1st stage	a_{eff}<1.0 mbar	**a_{eff}<0.5 mbar**
Stochastic pulsations	<0.3%	**0.17%**
Volume reduction, loop	>50%	**50%**
Variation coefficient, stock consistency	<1.0%	**0.8%**
Free air content	<0.1%	**<0.1%**

2

3

4

5

Fig. 5: MD basis weight variations on Kehl PM 2 compared with a conventional approach flow (Boyle Profiler).
Variation: conventional +/- 1.5 g/m² (orange graph)
Advanced Wet End Process: +/- 1.0 g/m² (blue graph)

the ComMix. This unit combines the advantages of rapid hydraulic mixing and equalization in a specially designed chest, smoothing out time-based fluctuations that can often occur as a result of control system intervention or disturbances.

The homogeneous medium consistency stock is mixed with Whitewater I in the HydroMix. In the Advanced Wet End Process this replaces the conventional whitewater tower and, together with the ComMix, it helps to reduce process volumes. First, the various return flows are mixed into the whitewater in the HydroMix, and then the medium consistency stock is piped in concentrically from the ComMix. Hydraulic conditions in the HydroMix are adjusted to ensure homogeneous mixing for all production conditions.

For stable operation of the HydroMix, adequate prior deaeration is essential. In Kehl this is ensured by the combined function of the CyclonAir and whitewater trays. In the CyclonAir, whitewater coming from the forming unit is split into a large number of partial flows to enable rapid venting out of free air.

Cleanliness

The stock mixed in the HydroMix is cleaned in the EcoMizer cleaner. The EcoMizer incorporates a special backflushing device enabling only 4-stages of cleaning, which significantly reduces investment costs. The EcoMizer is also particularly economic thanks to the low fibre content in its rejects. As proven on PM 2 in Kehl, the EcoMizer not only removes contaminants, but also significantly improves hydraulic stability and ultrafine mixing. The EcoMizer has already demonstrated its capability in numerous other installations.

On PM 2 in Kehl, a 3-stage screening system with 0.3 mm slots is installed. The overflows from the MSA first stage screens are treated together in the second and third screening stages, using MultiSorters.

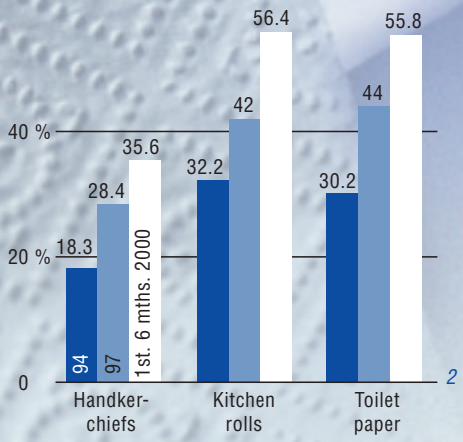
Proof of performance capability

With today's measuring technology one can now simultaneously assess a complete approach flow for hydraulic stability and constancy of paper quality. Standardized in-line paper analyses and stock consistency measurements, backed up by a comprehensive database from more than 100 plants, provide well-substantiated assessments. A comparison of the results attained in Kehl with other well-running paper machines of similar configuration, such as a modern SC machine with conventional approach flow *(Fig. 5)*, clearly shows that the Advanced Wet End Process has set new standards.

Systematic expansion of a recovered paper stock preparation line for tissue and market DIP production

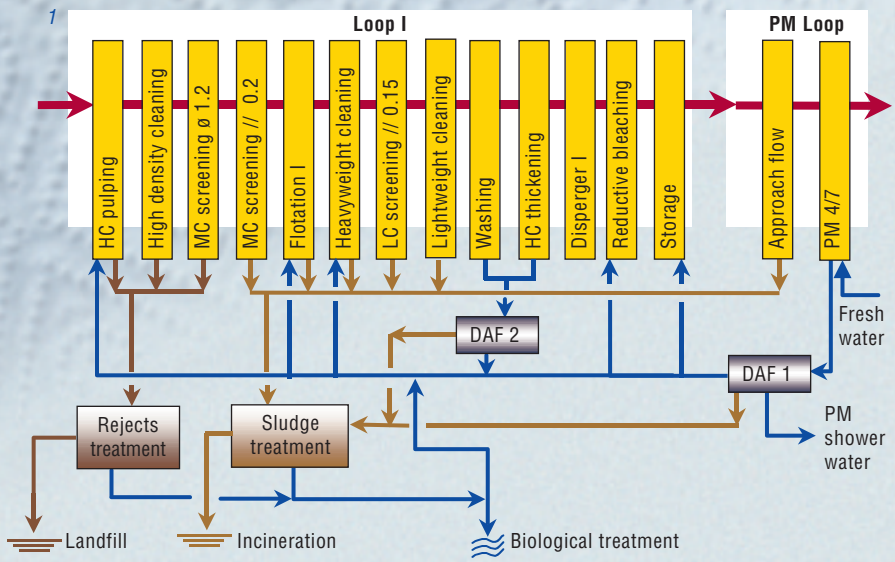
The author:
Helmut Berger,
Wepa Papierfabrik
P. Krengel GmbH
& Co. KG, Germany

WEPA Papierfabrik Paul Krengel GmbH & Co. KG, Germany was founded in 1948 by Paul Krengel Sr., originally as a wholesale trading company. Today, WEPA produces 165,000 tons/year of hygiene papers at the Müschede and Giershagen mills and at Kriepa GmbH, a WEPA subsidiary located in Kriebstein, Saxony. Products range from multi-ply toilet paper, kitchen rolls, paper handkerchiefs and cosmetic tissues, to single-ply products such as paper towels and creped toilet paper. The family-owned company is managed today by Paul Krengel's four sons.



WEPA first embarked on tissue production from recovered paper stock, a relatively new technology at that time, in 1983, when PM 6 was installed. Recovered paper usage rates of 50-60 % often meant serious runnability problems in those days, when continual shutdowns for cleaning of the machine clothing were quite normal. Over the next few years the stock preparation line was optimized, additional stock preparation machines installed, and know-how in dealing with recovered paper built up. As a result, tissue could be produced from 100% recovered paper without continually shutting down the tissue machine for cleaning purposes.

PM 7 in Giershagen was installed in 1989 together with a complete recovered paper stock preparation line and associated biological effluent treatment system *(Fig. 1: status until 1997)*. This line produced 120 t/24 h of finished stock with a raw material input of about 190 t/24 h. The stock preparation included a high consistency pulper, hole screening, flotation, heavyweight contaminant cleaning, screening, lightweight cleaning, and washing. At the end of the line the stock was disperged and bleached with a reductive bleaching agent.



The market share of own brand products of the large chain stores (i.e not including those of the paper manufacturers themselves) rose between 1994 and 1997 from 30.2 % to 44 % for toilet paper *(Fig. 2)*. At the same time the percentage of chemical pulp used for tissue grades rose, and recovered paper became less important as a raw material. In the first six months of 2000, the market share of kitchen rolls and paper handkerchiefs made from recovered paper was only 9.4 % and 3.3 % respectively. As early as 1995, WEPA took account of this trend by considering using the Giershagen stock preparation line to additionally produce market DIP. The main consideration was to optimally utilize free capacities,

Fig. 1: Giershagen stock preparation line up to 1997: 120 t/24 h.

Fig. 2: Tissue market changes: own brand development among WEPA customers (chain stores).

Fig. 3: Giershagen warranty data (expansion phase I).

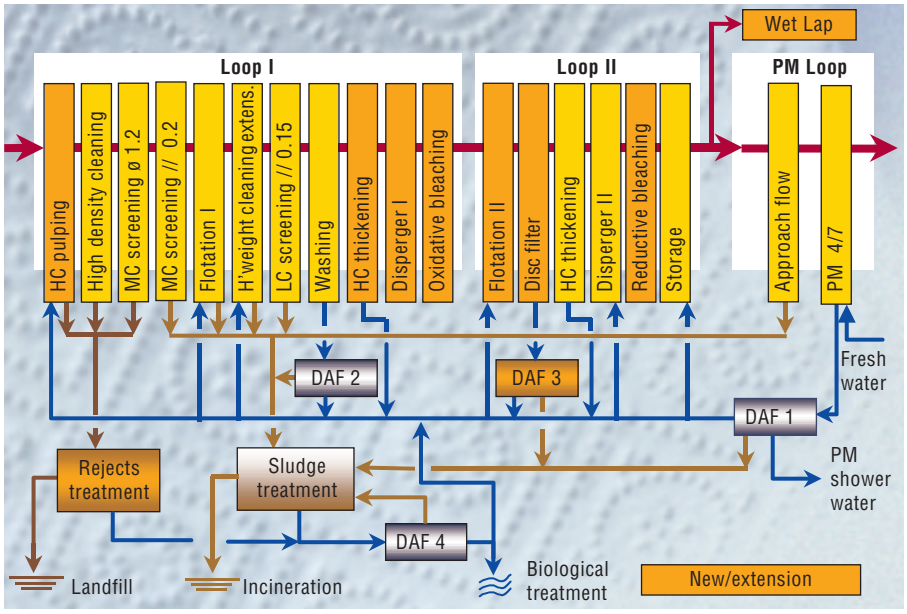
Fig. 4: Giershagen stock preparation line after the rebuild in 1998: 120 t/24 h.

Plant warranty data

- Dirt specks < 30 mm^2/m^2 (inlet flotation I: max. 1260 mm^2/m^2)
- Stickies < 200 mm^2/kg (inlet MC hole screening 11,400 mm^2/kg)
- Brightness > 80 % ISO (inlet 60 % ISO)
- Flotation I 0.8 % soap
- Flotation II 0.5 % soap
- Oxid. bleaching < 1.75% peroxide: 0.9% hydrosulfite (dithionite); 2.25% sodium silicate
- Red. bleaching < 0.9% hydrosulfite (dithionite)

3

4



use the existing line as basis for an extension and also make better use of acquired know-how in processing recovered paper.

Phase 1 expansion

The components for the Giershagen stock preparation line expansion were selected with various objectives in mind:

Apart from using fewer and less expensive grades of recovered papers, the runnability of the tissue machines PM 4 and PM 7 had to be improved, with the new plant needing to meet the following stock quality criteria:

Dirt specks < 30 mm^2/m^2
Stickies < 200 mm^2/kg
Brightness increase > 20% ISO

Large-scale tests were then carried out with various equipment suppliers to clarify the following key design aspects:

- Location of the bleaching stages, oxidative and reductive
- Disc or kneading disperger
- Flotation
- Control system concept
- Engineering
- System competence.

After numerous trials and discussions, the following line components were finally selected:

- Disc disperger
- EcoCell pre- and post-flotation
- EcoCell secondary flotation
- Wet-lap system with bale coding (number, date, brightness, dirt specks) on steel tape

The warranty data for this stock preparation line were established as shown in *Fig. 3*. It is important to mention here that WEPA had dispensed with the use of flotation chemicals since 1987.

The main aim of the first expansion phase in 1998 *(Fig. 4)* was a higher quality stock preparation. In the second phase, production capacity needed to be increased. For this reason, the new system components in the first phase were already designed for a finished stock production of 220 t/24 h oven-dry, except for the wet-lap system with a capacity of 160 t/24 h oven-dry.

WEPA and Voith Paper attached great importance to the water loop layout and technology. As a result, the stock preparation line today has three water loops with systematic use of the countercurrent principle and with appropriate cleaning capacity.

After a short rebuild time, the new phase 1 system components were commissioned in December 1998. Since then, WEPA has also been producing market DIP with widely ranging requirements for various customers. The main product criteria in the fine paper industry are dirt speck content, stickies and brightness, while for packaging papers the emphasis is on freeness and DIPN content (di-iso-propylnaphthalene). All these requirements are met by switching the line over to the corresponding operating mode.

Phase 2 expansion

The first expansion phase was so successful that the decision was made just

two years later in 2000 to increase production capacity to 220 t/24 h oven-dry finished stock. Those system components not included in the phase 1 capacity expansion now had to be expanded such as flotation I, cleaning, washing, etc. A new high-consistency pulper with bale dewiring unit was also installed, and the wet-lap system capacity was increased to 200 t/24 h. To save bleaching costs and reduce brightness variations in the final DIP stock, the new Voith iConBleach™ intelligent bleaching control system was installed *(Fig. 5)*.

Important for a successful start-up and for achieving the desired high end product quality has been a systematic quality analysis of the incoming recovered paper deliveries, regular inspection and maintenance of the plant and instrumentation, and last but not least, employee motivation. Problems arose with the biological effluent treatment plant due to an increase in water temperature and COD level. These problems were solved by installing a cooling tower and additional precipitation.

Figs 6 to 8 show the development in dirt speck content, stickies and brightness for various DIP grades after the second expansion phase in 2000.

Fork lift trucks take the DIP bales produced in the wet-lap system from the conveyor belt and load them onto lorries.

Today, WEPA produces market DIP for its highly demanding customers precisely in accordance with their specific product requirements.

Why iConBleach™?

Before	After
■ Chemicals overdosage to ensure required brightness is always met	■ Less bleaching agent (lower costs, reduced COD)
■ Specific customer demands either exceeded or not met = delivery problems = truck idle-time costs	■ Less downgrading due to brightness variations
	■ Easier for personnel (ensures faster response by personnel)

5

Fig. 5: Why iConBleach™?

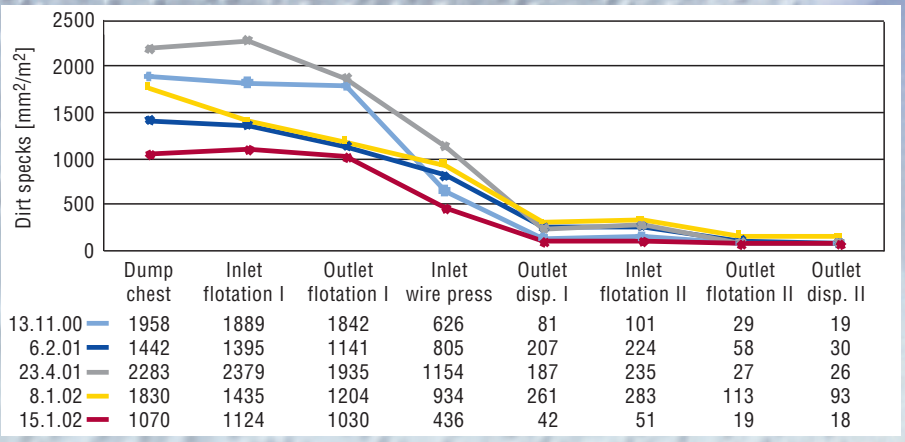
Current data of the Giershagen stock preparation line (after extension in 2000):

Fig. 6: Dirt specks.

Fig. 7: Stickies.

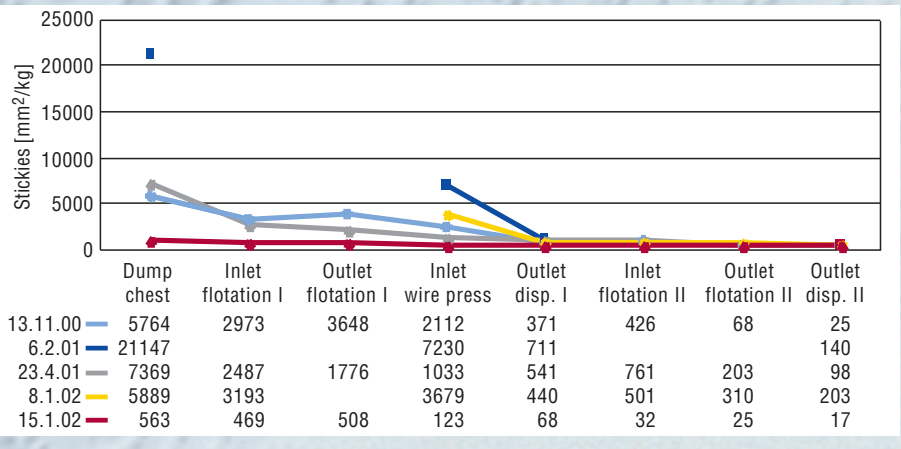
Fig. 8: Brightness in % ISO.

6



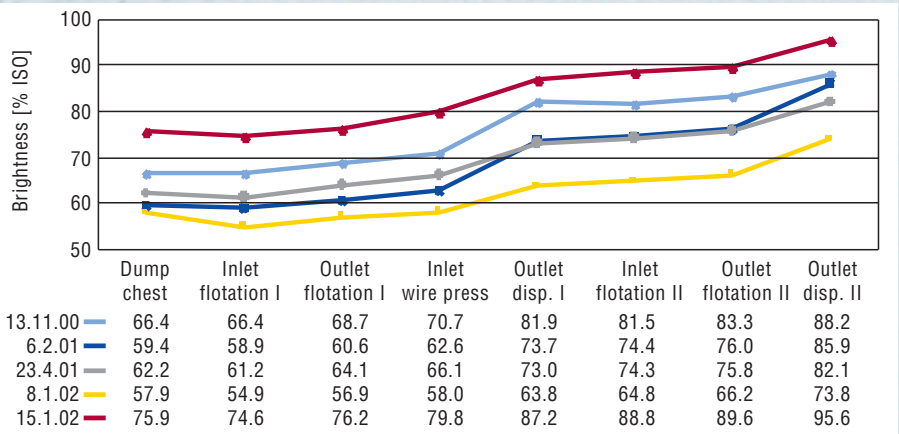
	Dump chest	Inlet flotation I	Outlet flotation I	Inlet wire press	Outlet disp. I	Inlet flotation II	Outlet flotation II	Outlet disp. II
13.11.00	1958	1889	1842	626	81	101	29	19
6.2.01	1442	1395	1141	805	207	224	58	30
23.4.01	2283	2379	1935	1154	187	235	27	26
8.1.02	1830	1435	1204	934	261	283	113	93
15.1.02	1070	1124	1030	436	42	51	19	18

7



	Dump chest	Inlet flotation I	Outlet flotation I	Inlet wire press	Outlet disp. I	Inlet flotation II	Outlet flotation II	Outlet disp. II
13.11.00	5764	2973	3648	2112	371	426	68	25
6.2.01	21147			7230	711			140
23.4.01	7369	2487	1776	1033	541	761	203	98
8.1.02	5889	3193		3679	440	501	310	203
15.1.02	563	469	508	123	68	32	25	17

8



	Dump chest	Inlet flotation I	Outlet flotation I	Inlet wire press	Outlet disp. I	Inlet flotation II	Outlet flotation II	Outlet disp. II
13.11.00	66.4	66.4	68.7	70.7	81.9	81.5	83.3	88.2
6.2.01	59.4	58.9	60.6	62.6	73.7	74.4	76.0	85.9
23.4.01	62.2	61.2	64.1	66.1	73.0	74.3	75.8	82.1
8.1.02	57.9	54.9	56.9	58.0	63.8	64.8	66.2	73.8
15.1.02	75.9	74.6	76.2	79.8	87.2	88.8	89.6	95.6

1

Inlands Kartongbruk
upgrades with a new stock preparation line

The author: Frank Meltzer, Fiber Systems

Inlands Kartongbruk in Lilla Edet, about one hour's drive north of Göteborg on the Göta canal in Sweden, looks back on a long tradition. Founded in 1884, this mill has belonged since 1995 to the Knauf Group, one of Europe's leading producers of plasterboard. In Lilla Edet, some 100 employees produce about 45,000 tonnes per year of board for plasterboard. The only raw material sources for this product are post-consumer corrugated board and printer's rejects.

In 2000 the green light was given for replacing the existing stock preparation line, originally supplied by Voith in 1974, with a new line for a capacity of 240 t/24 h. There were various reasons for this decision. On the one hand, the existing installation was showing signs of ageing. The preparation of the recovered paper grades used put a considerable load on all process components due to the contaminants found in the raw material. On the other hand, the recovered paper quality was steadily deteriorating. For these reasons, the 25 year old original concept had reached its limits. New and more efficient process stages were necessary to meet end product demands, as well as requirements in other areas, such as rejects handling. These were important criteria for the new stock preparation line concept. However, the project team was also faced with other challenges. The new line had to be installed parallel with the existing plant with a minimum of production shutdown time. This meant all the new components had to be installed in the existing building.

Special attention was paid at the design stage to the pulping process – a key section in every system for recycled fibre preparation. Here, the raw material has to be slushed down into a pumpable suspension, the majority of contaminants removed, and the flake content appropriately set for the following process stages. In other words, the pulping process can influence the entire system concept. The original production line incorporated a continuous low consistency pulper, but in view of the ongoing deterioration in raw

2

3

material fibre quality, amongst other factors, the project team preferred high consistency pulping. This has more advantages due to the gentler fibre treatment. Based on Voith's ability to install the new pulper in the very restricted space available, coupled with extensive experience in high consistency pulping, as well as a convincing tour of reference plants, Voith Paper was selected as the partner for this project.

The new pulping system comprises a high consistency pulper *(Fig. 1)*, a discharge Fiberizer *(Fig. 2)* and a drum screen re-used from the existing line. Special importance was also attached to the rejects system, supplied by Meri Entsorgungstechnik, a joint venture between Meri Anlagentechnik and Voith Paper. The rejects are specially processed to enable incineration of the lightweight contaminants fraction. Rejects from the Fiberizer and drum screen are separated by a metal detector into a metal-free lightweight fraction, and a smaller heavyweight fraction containing metal. After dewatering, the lightweight fraction can, in future, be reduced by shredding to the required particle size ready for incineration.

The downstream system concept is designed with a view to maintaining stock consistency as high as possible so that the paper machine can be supplied with cleaned fibre stock, without an additional dewatering stage.

The new stock preparation was largely influenced by the high consistency pulping process. Thanks to this, conventional screens with screen baskets are used in the coarse screening section since the low residual flake content requires no machines with additional deflaking potential. For coarse screening, Voith Finckh Cyclo Screens were selected *(Fig. 3)*. The 3-stage system has a Voith Finckh Hico Screen as tail screen. The screen basket hole diameter is 1.6 mm in the first two stages and 1.4 mm in the third stage. The Cyclo Screen combines both heavies separation and screening in a single machine. A 3-stage slotted fine screening system directly follows coarse screening *(Fig. 4)*. This operates in the medium consistency range with a slot width of 0.25 mm, using Voith Finckh Hico Screens. Here again, reference installations for very similar applications were decisive for selecting the hole and slot screening systems.

4

5

Fig. 1: High consistency pulper.

Fig. 2: Discharge Fiberizer.

Fig. 3: Cyclo Screens (hole screening).

Fig. 4: Hico Screens (slot screening).

Fig. 5: Kalevi Mononen, Project Manager, Inlands Kartongbruk, Lilla Edet/Sweden (right), talking with Lars Eriksson, Voith Paper AB, Djursholm, Sweden.

Kaukas PM 2 –
continuation of Voith Paper's success story in the north of Europe

The author: Ulrich Schad, Paper Machines Graphic

UPM Kymmene Corporation, Helsinki, is currently the third largest paper producer in the world. It operates production facilities in 15 countries, including Germany, Great Britain, France, the USA, Canada and China. In January 2001, Voith Paper concluded the rebuild of Production Line 1, consisting of the paper machine and coating machine, at the Lappeenranta Mill, approx. 150 kilometres to the east of Helsinki. The modernisation of the line, designed for LWC and MWC papers, was so successful that UPM Kymmene shortly afterwards placed an order for the rebuild of PM 2 – continuing Voith Paper's success story in the north of Europe.

Kaukas PM 2 produces LWC base papers in a basis weight range of 27 to 45 g/m^2. The capacity of the machine is around 750 tonnes per day.

Prior to the rebuild, the bottom dryers in the single-tier first and second dryer groups were designed as ropeless vacuum rolls. The two-tier third and fourth dryer groups were designed with a rope system. At the beginning of the third dryer group the tail was blown into the rope nip and often not gripped properly, which again and again considerably extended the threading time.

Kaukas PM 2, UPM Kymmene and Voith Project Team.

Due to the impressive results that the rebuild of PM 1 produces, the mill management decided only a few weeks later to award an order to Voith Paper also for the modernisation of the dryer section in PM 2. The order was received in September 2001.

Implementation and start-up followed in March 2002. The installation itself took only six and a half days. The complete dryer section is now re-equipped for ropeless tail threading and the goal of the modernisation has been reached:

- Shortening of threading times
- Prevention of loss of production due to rope breaks
- Higher safety by eliminating the rope system.

Since the rebuild, the threading time throughout the dryer sections has been, on average, less than 40 seconds – renewed confirmation of the advantages of the ropeless threading systems that Voith has favoured in installations since 1993.

Since then, it has proven successful for all graphic paper grades and even brown papers in the speed range of 350 to 1,650 m/min and in basis weight ranges from 36 to 225 g/m^2.

The advantages of the Dry Star rebuild at a glance:

- Safe and reliable pick-up of the tail by threading doctor.
- The doctors are in contact only during the threading operation, which ensures a long service life of the doctor blade.
- Two to three tail threading blow pipes on the doctor backs lead the paper web securely into the dryer nip.

Procor –
Top quality at highest productivity

The author:
Oswaldo San Martin,
Voith Paper São Paulo

In May 2000, Voith Paper was selected by Papeles Cordillera S.A., a CMPC Group company, to supply a complete production line for Testliner and Double-layer Corrugated Medium production, with basis weights between 90 and 300 g/m², using only recycled paper and pulp. The machine started up without problems six weeks earlier than agreed in the contract.

The Procor Project, implemented in Puente Alto, Chile – that involved a US$ 97 million investment, one of the major CMPC projects and the most complete project sold by the Voith Paper to date in South America – was completed on October 31st, six weeks ahead of the contract date, which can be considered a world record (less than 16 months from contract signature to paper on the reel).

Almost all units of Voith Paper, including Voith Fabrics, took part in the supply of

1

2

Fig. 1: Papeles Cordillera S.A., Puente Alto, Chile.

Fig. 2: Chile's president, Ricardo Lagos Escobar, at the inauguration ceremony.

Fig. 3: Arturo Mackenna, CEO CMPC Group; Kurt Brandauer, Executive Vice president Voith Paper São Paulo; Eliodoro Matte, Chairman of Board CMPC Group; Osvaldo San Martin, Voith Paper São Paulo; Enzo Giordana Brunel, Voith Paper Chile (from left to right).

3

equipment and services, from Project Management to wires and felts.

The official inauguration of the new mill on January 9th, 2002, was attended by the President of Chile, Mr. Ricardo Lagos Escobar, several government officers as well as the CMPC Board of Management and executives.

The project will increase both the Chilean production and job opportunities, as well as enhancing the delivery service to clients and increase indirect jobs in sectors such as recovered paper handling. In addition, the new mill production will replace two-thirds of Chile's imports corrugating medium, that is, 195,000 tons per year.

In Chile, the consumption of papers to be corrugated – a product that will be manufactured in the new unit – has increased in the last few years at an average rate of 6.6% per year. In 2001 consumption by the boxboard industry was 320,000 tons of paper, with a value of US$ 133 million.

In parallel, the recovery rate of these papers has been increasing significantly in the country and shall exceed 70% of the current demand, placing the Chilean recovery index among the most impressive recycling indexes worldwide.

The recycled raw material, that will feed the new CMPC line, represents a significant contribution to the Chilean environment. In order to meet the recycled paper demand of the Chilean market, investments were undertaken in OCC and waste Paper collection plants in Chile. It is estimated that activities related to paper recovery employ directly and indirectly more than 15,000 Chileans, considered as one of the most labor-intensive industries in the country.

Presently, Papeles Cordillera sells 160,000 ton/year of corrugating medium, writing & printing and wrapping papers. However, the company plans on a future production of 220,000 ton/year, which will allow CMPC to assume the local leadership for these segments.

Pedro Huerta Barros
General Manager
CMPC – Papeles Cordillera S.A.

This project has started a new phase in our concepts of installing new paper mills. It was the first contract that we signed for the purchase of an integrated project.

Voith Paper Brazil was selected as project supplier, responsible for the engineering, manufacture, purchasing, installation, training, start-up, after start-up optimization and, above all, project management expertise.

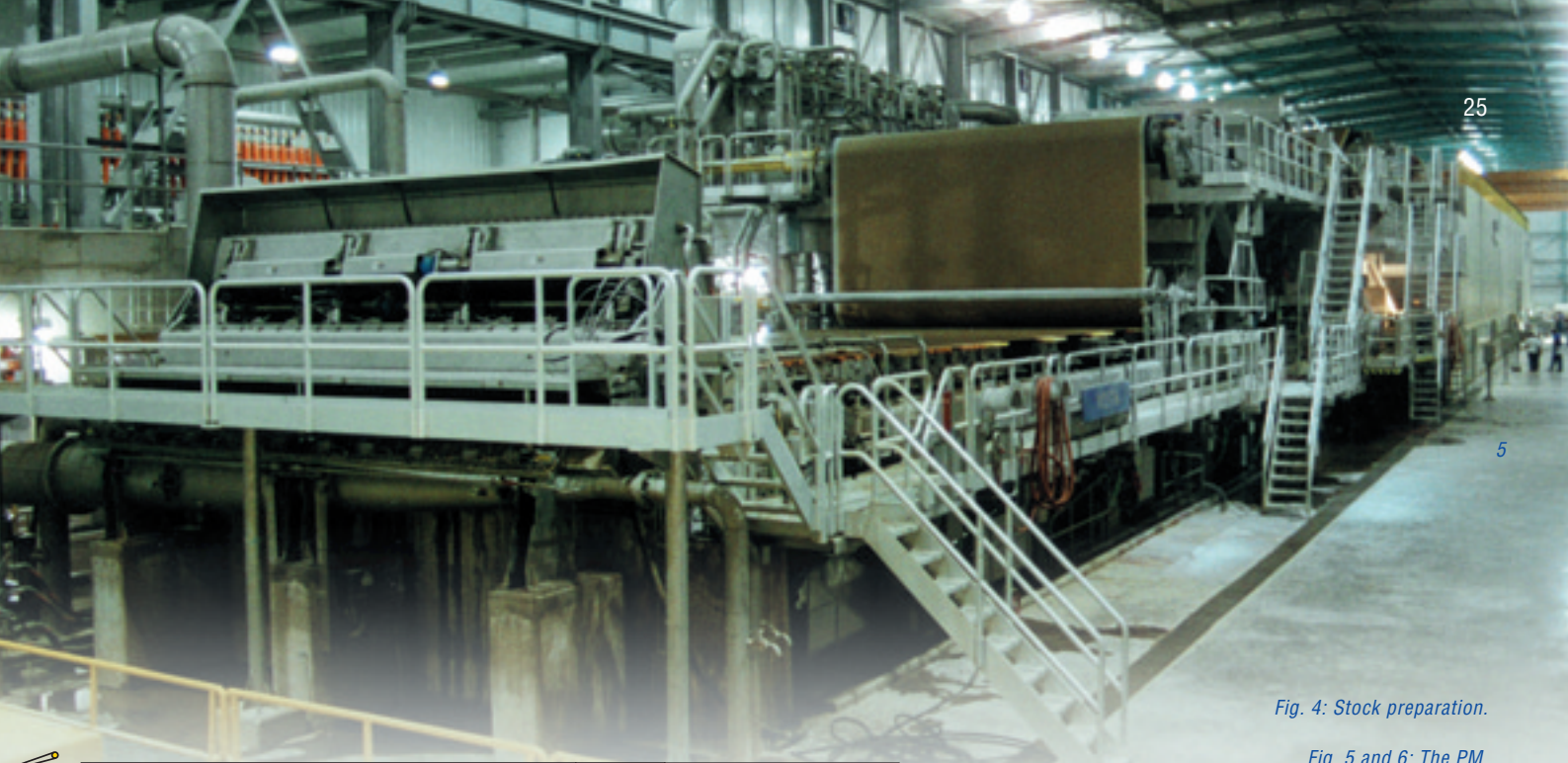
This decision proved to be right. Synergy and interaction between the CMPC and Voith Paper work teams, since the pre-sales phase, were decisive for the choice of Voith Paper Brazil and have surely contributed to the achievement of the project goals established by the CMPC Group.

The line's start-up was six weeks ahead of schedule, the learning process is being accelerated, the process stability improves day by day, the final product quality is above any expectation and the production goals have been fully achieved; in some cases, they were exceeded by far.

The CMPC Group is convinced that the solution presented by Voith Paper as an integrated project supplier is an excellent alternative as far as Investment Management is concerned, and believes that, after the Procor Project experience, Voith Paper Brazil is perfectly qualified and is a strong player in this market segment.

In terms of technology, the new mill is able to clean and fractionate fibers, by separating long from short fibers, in order to treat them differently, without any damage, thus obtaining a higher strength level at lower basis weight. Due to the project modernization level, all contaminants from treatment plants are removed in a solid and compact way. In addition, the noise level and water consumption are reduced, and the plant is ISO 14000 certified.

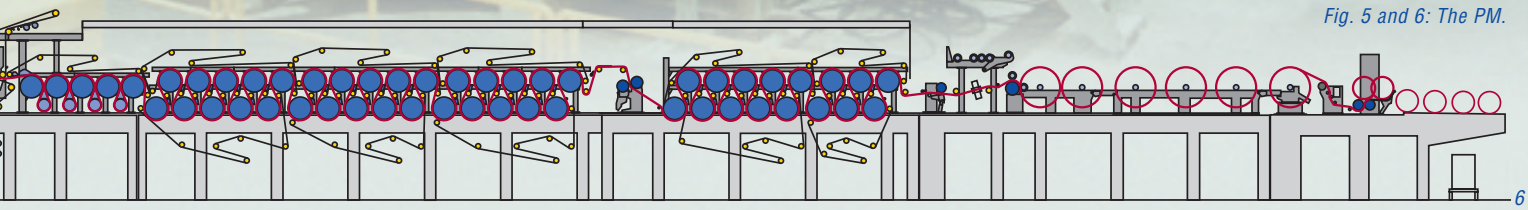
4



5

Fig. 4: Stock preparation.

Fig. 5 and 6: The PM.



6

The new line represents part of the modernization process of the Puente Alto mill, the cradle of the Chilean paper industry, where, back in 1920, a paper mill was installed, capable to produce, on two machines, 2,200 ton/year of cardboard and wrapping papers.

The new machine concept

Stock Preparation

All equipment required for the OCC and Pulp/lines, cleaning, coarse and fine screening, refining, as well as the approach flow equipment, were supplied by Voith Paper and its associated companies, such as Meri Systems and B&G.

Forming Section

29 m long bottom wire with dewatering elements and suction roll. 10 m long top wire designed for a future DuoFormer D. The installation of a second top wire, 10 m long, is planned. Both wires have MasterJet-type headboxes, and the back ply has ModuleJet technology, that ensures a perfect basis weight cross profile.

Press Section

Tandem NipcoFlex press, the first of its kind installed in Latin America. The two separate presses are designed for maximum 1,200 kN/m linear pressure. Two pick-up rolls, one of which positioned between the fourdrinier and the press section, and the other roll located between first and second presses.

Dryer Section

First group as TopDuoRun (single tier arrangement) with drilled rolls and Duo-Stabilizers in bottom row. Remainder of predryer section and the after dryer section in conventional double tier.

The hood and ventilation equipment were supplied by Brunschweiler Spain and Brazil. Building ventilation was supplied by local companies.

Size Press

For starch application on one or both web sides. Designed to be converted to a full SpeedSizer.

Hard-nip Calender

Two-roll calender, with the heated roll in bottom position and the EcoNip roll on top, providing an excellent surface quality of the paper.

Reel

With reel spool storage and automatic transport for reel spool change.

Slitter & Winder and End Section

Capable to handle the whole machine production, it can produce 8 sets of up to 8 paper rolls. The end section consists of conveyors, wrapping machine and paper roll elevator.

Electrical System/DCS and instrumentation

All equipment and services required for the line were ordered by Voith from ABB Oy, Finland, which was responsible for supplying the equipment from several worldwide locations (Chile, Brazil, Germany, Sweden and Finland).

Fig. 7: Final section.

QCS (Quality Control System)
This system, considered as the core of the production process control, was supplied by Voith Automation.

Wires and Felts
All wires, pressfelts and felts, were supplied by Voith Fabrics.

Project Management
The whole project management was carried out by the Brazilian project management team. The scope was complete from engineering, purchasing, cost control, erection to start-up and performance tests.

Start-up

Commissioning and start-up were smooth and exactly within the normal standards for this kind of installation, due to the perfect planning and team work of CMPC Group and Voith Paper personnel. Synergy between specialists was ideal, since everyone focused on the same common objectives from the very beginning.

At the present time the machine produces all papers for which it was designed, with complete success: testliner with and without size press; corrugating medium, kraftliner, gypsum and white top papers, all of them with the excellent quality and productivity expected by the client.

Expectation about the production learning curve and specific consumption variables has been widely exceeded when compared to the values defined in the contract. This success is the result of the excellent work done by the start-up and machine optimization personnel.

"Special emphasis was given to the follow up and fine-tuning of control loops, so as to achieve a quick and stable process with a high degree of reliability. The result has been more tons of paper produced at the reel, with excellent quality, efficiency and above-average availability and, above all, increased reliability in the overall papermaking process" comments Pedro Huerta Barros, CMPC Papeles Cordillera General Manager.

The CMPC Group is the second major paper producer in Latin America and has 16 paper mills spread over several countries on the continent, producing pulp, as well as writing and printing, newsprint, tissue, wrapping and cardboard papers.

7

1

World speed record for graphic paper production from 100% eucalyptus pulp

After a rebuild by Voith Paper, PM 1 at the Luiz Antônio mill of Votorantim Celulose e Papel, Brazil set a new speed record of 1,221 m/min in graphic paper production (basis weight 75 g/m²) from 100% eucalyptus pulp. No other paper machine worldwide processing 100% eucalyptus pulp has ever attained this production speed.

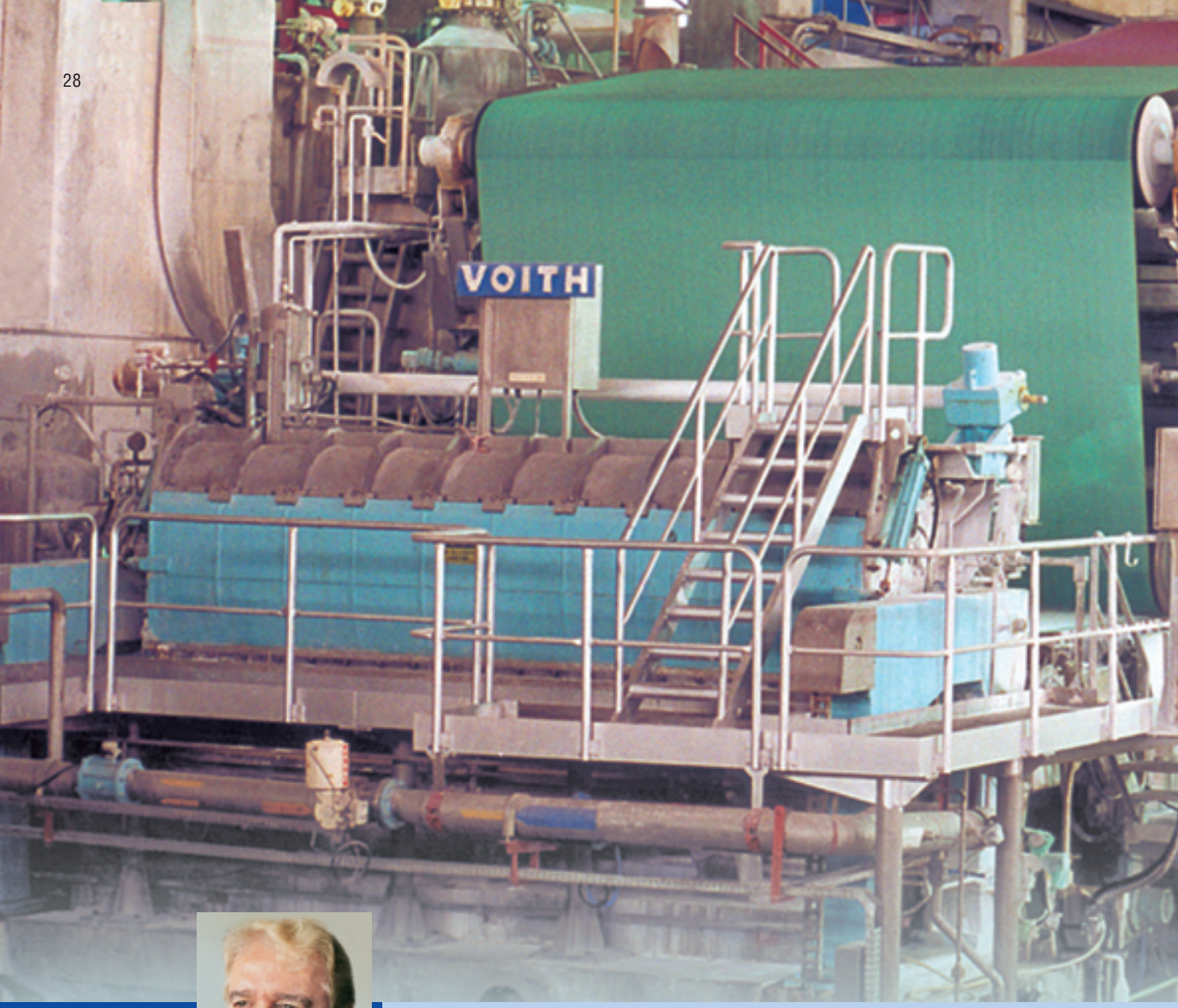
Votorantim Celulose e Papel – VCP – is one of the largest pulp and paper producers in Brazil, reputed for its environmental protection efforts and projects in endemic reforestation in Brazil. VCP owns about 160,000 hectares of forest, thus ensuring its own independent supply of raw materials procurement and high

The author:
Nestor de Castro Neto,
Voith Paper São Paulo

2

Fig. 1: The Luiz Antônio mill, Brazil, of Votorantim Celulose e Papel – VCP.

Fig. 2: The NipcoFlex press.



Paulo Basseti, Divisional Manager VCP Luiz Antônio

Votorantim Cellulose e Papel has established and implemented eight corporate principles in order to meet its ambitious goals for sustainable development.
One of these principles concerns relations with machinery suppliers and service providers, whereby teamwork must always ensure optimal satisfaction on both sides. In keeping with this policy, Voith Paper has become our most important partner.

I have been working very closely with Voith Paper for many years and can vouch for the quality and efficiency of Voith Paper installations and technologies as a traditional strength of this supplier. Another reason for Voith's outstanding reputation with our company is the dependability not only of their machinery, but also of their technical personnel.

Business relations today reflect the quality of partnerships. They have to be continuously upheld and strengthened by dependable teamwork on a mutual trust basis. In this way, outstanding results can be attained again and again – such as the speed record broken by PM 1 in our Luiz Antônio mill. Graphic papers with 75 g/m² basis weight are now produced here from 100% eucalyptus pulp at 1,221 m/min – far exceeding our goals.

We not only appreciate Voith Paper as a machinery and process supplier, but also as a dependable service provider with the same high quality standards. Both aspects are indispensable factors in attaining our goals, for without such optimal teamwork, we would never have reached our leading position in the pulp and paper industry.

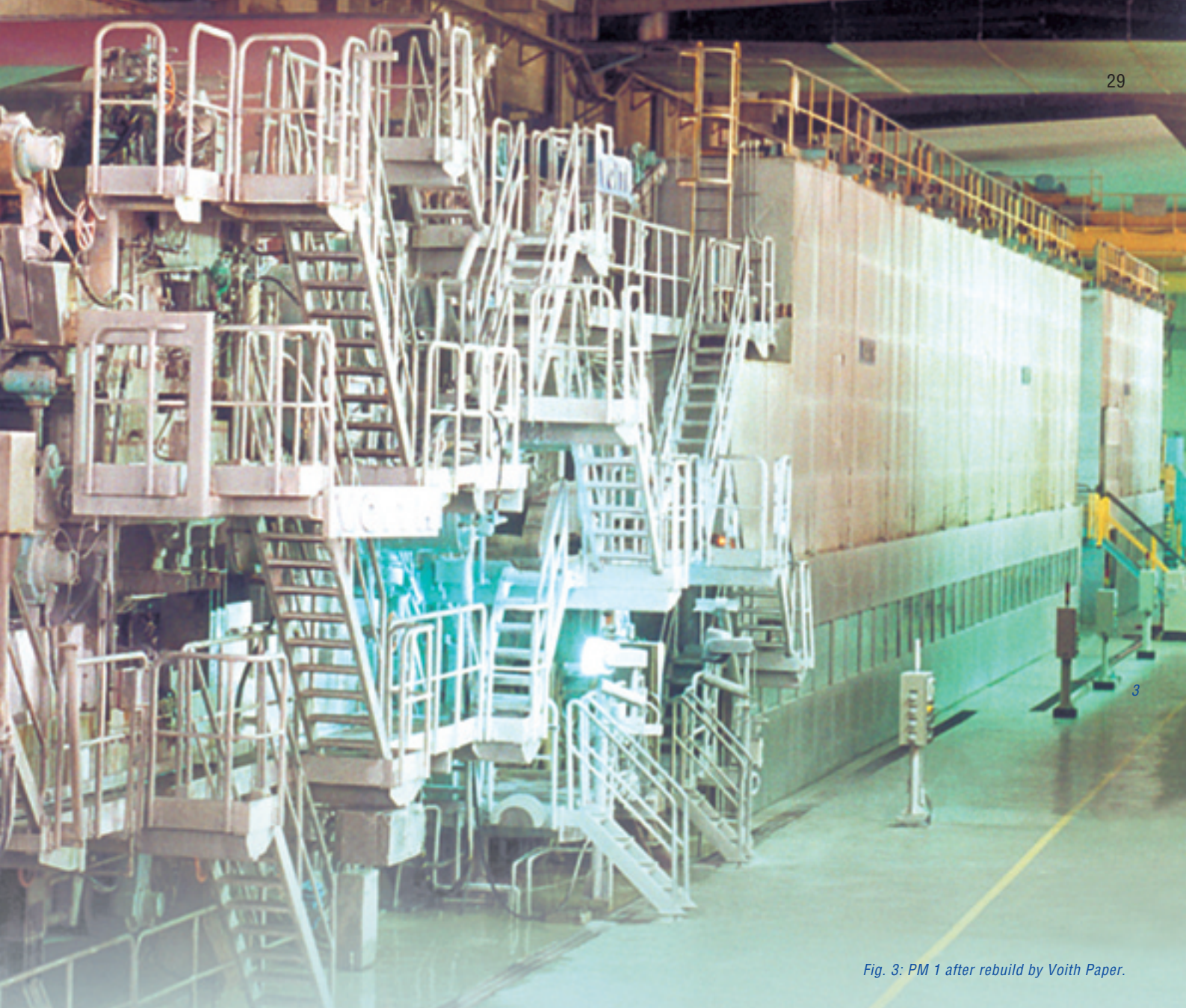


Fig. 3: PM 1 after rebuild by Voith Paper.

product quality accordingly. Fauna and flora study projects in the company's own forests together with universities and research institutes, help to ensure environment-friendly paper and pulp production. Every year 800,000 ton of pulp and 655,000 ton of paper are produced by the company's four mills in Jacareí, Luiz Antônio, Piracicaba and Mogi das Cruzes.

Votorantim is also known for its pioneering integration of the latest technologies in new installations and rebuilds. This ongoing investment in modern paper production pays dividends not only in terms of value added, but also in better product quality.

The record-breaking machine is located at Luiz Antônio mill in the inland city of São Paulo. This integrated mill, one of VCP's largest, produces 350,000 t.p.a. of pulp and 310,000 t.p.a. of wood-free graphic paper.

PM 1, rebuilt by Voith Paper, with a wire width of 5,100 mm, produces 200,000 t.p.a. of graphic papers with basis weights ranging from 45 to 120 g/m^2. This rebuild incorporates the latest Voith Paper technology innovations.

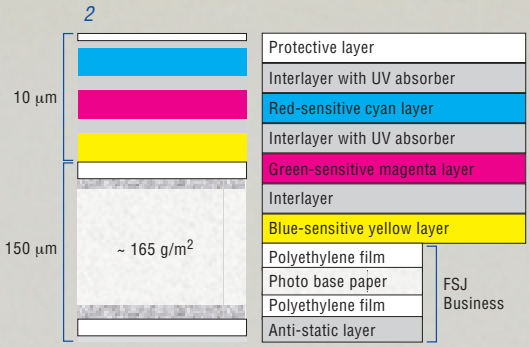
For the first time ever worldwide, a shoe press is installed in a graphic paper production from 100% eucalyptus pulp. Thanks to this NipcoFlex press, moisture content ahead of the dry section is reduced without diminishing specific volume. The ModuleJet™ headbox with cross-profile control ensures basis weight optimization with the shortest possible correction times. A DuoFormer™ D helps to improve sheet formation, while sizing is optimized by a Speedsizer. This rebuild project was handled from beginning to end by Voith Paper São Paulo, and Voith Paper also took full responsibility for the machine installation work. Paper production output increased by 35,000 t.p.a. immediately after commissioning, and the world speed record was broken in January 2001.

Weissenborn PM 4 –
Striving for perfect surface quality

The author:
Reinhard Leigraf,
Voith Paper
Ravensburg

"Rebuild our PM 4 to produce the same high quality at twice the speed". That was our order in September 2000 from Felix Schoeller jr. GmbH & Co.KG, producer of photographic and other specialty grade papers. At that time, about 130 grades were produced on PM 4 in 5 different groups, at speeds no higher than 320 m/min. All in all, quite a challenge!

1



2

Paper grades

The Felix Schoeller Group is a leading producer of high-grade specialty papers. Photographic paper is the traditional product of this company, founded more than a century ago, and accounts for the greater part of its business. These papers are produced in the following grades:

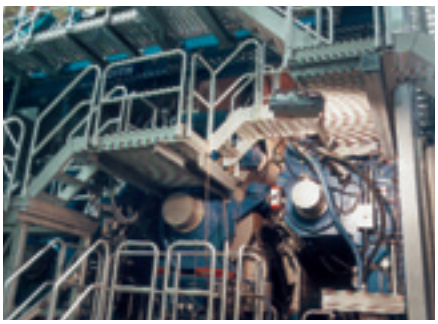
Fig. 1: Weissenborn PM 4.

Fig. 2: Schematic set-up for photographic paper.

Fig. 3: Press section.

Fig. 4: Air float dryer after the size press.

3



4

- Base paper for colour and monochrome photography
- Baryta paper for monochrome photography
- Base paper for technical photography.

Surface quality is a decisive quality criterion for photographic base paper. It is checked under extremely oblique light in the longitudinal and cross-machine directions – several times:

- First by the production team,
- Then by the local quality assurance and production managers,
- After PE-coating, once more by the product managers.

Only experts can tell the difference here between acceptable and reject products.

After a PM rebuild, which always affects quality in one way or another, the product quality of each grade has to be re-accepted by the final customer. To this purpose tests are carried out on product samples before any further orders are placed. It goes without saying that the paper ordered has to be produced in exactly the same way as the test rolls.

That is why paper quality had to remain absolutely unchanged after this rebuild.

Another special feature of this project was the extremely high cleanliness requirements on the photographic base paper, as reflected both in plant layout and site logistics. Corresponding measures had to be taken here to ensure the uninterrupted operation of neighbouring lines during the rebuild.

Other grades produced on PM 4 are:

- Base coating papers (e.g. for reflective foils on traffic signs),
- Inkjet printing papers, including digital imaging (DI) paper.

History of Weissenborn PM 4

Paper machine 4 in Weissenborn, Germany about 10 km from Freiberg and 40 km west of Dresden, was built by Bruderhaus prior to German reunification. In 1988 PM 4 was fitted with an Escher Wyss step diffuser headbox, at which time it produced about 25,000 t.p.a. of photographic and specialty grade papers. After the German reunification, the mill was taken over by the Felix Schoeller Group and output was increased to around 55,000 t.p.a. in 1999.

5

6

Scope of contract

The stock preparation line and approach flow section had to be adapted to the higher production capacity. Due to the doubling of operating speed, relatively few components of the old paper machine could be re-used. All the others were newly ordered by the customer, the dryer section and steam/condensate system being supplied by the local company PAMA. The Voith Paper scope of supply thus comprised the following components:

- Complete pulp bale transport and dewiring system
- ST8C-M pulper
- New refining line comprising HC cleaner and 2 Twinflo refiners
- First stage screening extension with MSA 10/10 screen in the approach flow
- MasterJet F/B headbox with ModuleJet
- Complete fourdrinier section
- Complete press section with offset press
- Calender
- Size press with Nipco rolls
- Air float dryer
- Horizontal reel.

This paper machine was designed for a maximum operating speed of 800 m/min, a web width up to 3,600 mm, and basis weights between 78 and 280 g/m^2. The design speed is 1,000 m/min. Furnish varies from 100 % long-fibre to 100 % short-fibre, with 0 - 20 % fillers.

Theoretically, maximum output with the most productive grade would be 490 t/day, but the annual output goal is 120,000 t.p.a. on average for all grades.

Investments at Weissenborn during 2000/2001 totalled more than 200 million DM. 90 million DM of it were for the PM 4 rebuild.

Since the new PM 4 had to fit in the existing building, the last possible centimetre was exploited for optimal equipment positioning to ensure efficient functioning and web run. For example, the calender was moved forward 30 cm to reduce the web run angle, while the air float dryer was installed obliquely and its top edge cut off. In short: everything possible was done to ensure a good web run.

Furthermore, this “rebuild” had to be completed in an extremely short time, whereby “rebuild” is hardly the right word for the enormous component replacements carried out in the 33-day shut down period allowed.

Risk management

Paper machines of this size represent a rather large investment volume, so that any delays or errors represent an unacceptable cost risk both for the customer and the machine supplier.

Apart from the aforementioned product risks, the following aspects are at stake:

- Secure supplies for the paper customer
- Quality assurance
- Prevention of serious damage to the equipment.

In many respects, this rebuild was based on the well-tried technology of a performance enhancement rebuild carried out by Voith Paper in 1997 on PM 1 at Osnabrück, Germany. However, prior inspection revealed a good many differences between the two paper machines.

For example, Weissenborn PM 4 covers a much wider product range than Osnabrück PM 1. Furthermore, the Voith Paper product range has been substantially developed in the meantime and designs have changed accordingly. Consequently, a joint risk management system was established for this rebuild.

All in all, well over 100 possible risks were evaluated, and three primary risks per section were identified. Risk reduction measures were then developed accordingly, and fallback solutions worked out. This work was carried out in various groups before a secure basis was established for going ahead.

It goes without saying that since nobody is perfect, some things were overlooked. But in view of the smooth startup – and everything that did not happen – our risk management efforts were certainly worthwhile.

Commissioning and optimization

On October 3, German reunification day, we had the first paper on reel and were able to start optimization, first of all from the technical point of view. As with every commissioning, imperfections had to be

7

Fig. 5: Size press control panel.

Fig. 6: Morning conference of all parties during the commissioning phase.

Fig. 7: End section of PM 4.

corrected and parameter settings changed, positionings optimized and operating modes checked. Thanks to excellent cooperation between the Weissenborn production team, the project CCE (Competence Center Engineering) and the erection and commissioning team, machine operation was soon optimized to the point where we could concentrate on optimizing paper surface quality.

Test production took place according to a sophisticated plan specially developed by Schoeller. This enabled compliance with the extremely tight qualification program and rapidly gave a good overview of product quality results, thus making overall optimization much easier. In a market demanding a wide product range and customized grade production, where there is no room for "seconds", this is an inestimable advantage.

Summary

This rebuild was completed very successfully, and is now being followed up with fine-tuning. Availability is exactly what would be expected of a modern paper machine. During production of one of the most lightweight grades, Weissenborn PM 4 operated for four full days without a single break until being shut down for a product change. Web threading is also much easier, a big advantage with so many grade changes.

The following success factors can be regarded as decisive for this rebuild:

- Meticulous preparations by a project team including FSJ, VP and other companies with experience of FSJ projects in the past. Credit is due here to project managers Thomas Gehring of FSJ and Herbert Brandiser of Voith Paper.
- Competent and motivated project management people on both sides.
- Comprehensive risk analysis, evaluation and minimization.
- The production team's long-standing process experience in Weissenborn and Osnabrück.
- Long-standing experience with paper machines for specialty grades, in particular photographic papers.

Thanks to the outstandingly efficient cooperation of all project participants, this modern photographic paper machine has not only been built with well-tried technology in a very short time span, but shows outstanding results both with regard to product quality and performance.

Tumut VP 9 –
the largest project ever undertaken by Visy Paper

The authors:
Marcelo K. Santos,
Marcos Roberto Blumer,
Voith São Paulo

In summer 2001, Visy Paper's largest project was successfully completed in Tumut, Australia. The new mill will be one of the most efficient and environmentally friendly paper mills worldwide. An annual 240,000 tons of unbleached pulp and packaging paper from a virgin fiber furnish will be produced at the Tumut mill.

Visy Paper – Australia's leading producer of board and packaging papers

Visy Paper is the leading producer of board and packaging papers in Australia and one of the major producers in the USA. Visy built its first mill, producing packaging papers from recycled furnish, in 1979 and now owns eight of the world's most advanced recycled paper mills, six in Australia and two in America. Together, they produce more than 1.2 million tons/year of high-grade board and packaging paper.

1

Fig. 1: Board machine VP 9.

Fig. 2: Transporter on woodyard.

The Project

Visy Tumut is located in the Gilmore valley near the township of Tumut, halfway between Australia's two largest cities, Sydney and Melbourne. The contract for the new VP 9 was signed on March 25, 1999.

Visy invested 400 million US$ in the integrated packaging paper mill, which is comprised of both a pulp preparation line and a paper machine, as well as a pine plantation (pinus radiata) for pulp production. The mill was built to meet the highest environmental and technical standards and was designed to be the most efficient and ecologically friendly paper mill worldwide, aiming at minimum use of water and chemicals. Even the energy supplying power to the mill is generated from environmentally friendly sources, such as water power and biomass, byproducts of pulp production.

The new Tumut site is 1,100 hectares in size, with the mill utilizing only 40 hectares. The site includes a storm water reservoir, a sludge settling basin, an effluent treatment system, a woodyard, a pulp production line and the paper mill itself.

The Tumut mill will produce 240,000 tons/year of high-quality unbleached kraft pulp and packaging paper for the export and domestic markets. The new VP 9 is the Visy group's first machine using kraft pulp as furnish, while 100 % recycled fibers are used in all other mills.

To satisfy the long-term demands made on packaging papers from recycled furnish in Australia, it is necessary to add virgin fibers to the Australian recycling system. Otherwise, the quality of the recycled fiber and papers produced will continually decrease. The new Tumut mill, therefore, has to fulfill an important

Technical data
Wire width 5,880 mm
Design speed 1,000 m/min
Production 40,000 tons/year of kraft liner
Basis weight 80-300 g/m²
Furnish 80% kraft pulp, 20% recycled fibers

2

3

Fig. 3: Visy Tumut in Gilmore valley near the township of Tumut.

task in the national recycling system by maintaining recycled paper supplies on a long-term basis.

Fiber System

The approach flow system has been designed to supply 850 tons/day in two lines for the top and bottom plies. The stock preparation system for rejected rolls and trimmings has been laid out for a capacity of 400 tons/day (accepted stock). A TwinFlow TF4 E double-disk refiner is used for refining.

Fig. 4: Start-up team.

4

Paper Machine

The VP 9 machine has been designed for a maximum speed of 1,000 m/min and a basis weight range of 80-300 g/m^2, producing 820 tons/day in two plies on a trimmed working width of 5,300 mm.

The new paper machine is equipped with top-quality components: two MasterJet™ headboxes, one of which is fitted with a ModuleJet™ dilution water control, ensuring optimum formation. The wire section comprises two fourdrinier wires to allow the installation of a hybrid former (DuoFormer™ D/K) on the top wire at a later date. A double-felted tandem NipcoFlex™ press ensures maximum dryness and high runnability. To optimize the surface finish, VP 9 has been equipped with an Ecosoft™ calender. One winder was also included in the Voith Paper scope of supply.

Start-Up

After completion of the installation work, the first trials with water and stock were run in late April 2001. The first parent roll of paper from 100% recycled furnish was produced on May 8, 2001 at 4:05 am, less than 26 months after the contract was signed. The machine started up with a speed of 420 m/min at 125 g/m^2 and an average production of 350 tons/day. The stock preparation system achieved a peak output of 420 tons/day, thus exceeding the original design output of 400 tons/day without major optimization measures.

Shortly after start-up, the machine produced saleable testliner. The new machine has been operating smoothly since the first day of continuous operation.

In mid-July 2001, the kraft pulp line was put into operation, thus starting the production of kraft liner from a furnish of 80% virgin fibers and 20% recycled fibers and optimizing the technological quality parameters of the kraft liner.

Voith Paper thanks all persons who contributed to the success of this project and wishes VISY Paper Group all the best with the new Tumut paper mill. Voith Paper looks forward to a strong, continuing relationship with Visy Paper.

Schongau PM 7 and Schwedt PM 11
Optimization successfully completed

The author:
Stefanie Busch,
Paper Machines
Graphic

In spring 2001, PM 7 in Schongau and PM 11 in Schwedt were modernized and optimized to meet future demands.

Schongau PM 7

Commissioned in 1989, this Voith Paper machine still retained its original concept until the first large modification at the end of March 2001. It produces standard newsprint, and was originally designed for a maximum operating speed of 1,400 m/min.

In order to increase speed from 1,560 to 1,625 m/min, with improved cross-profile and fibre orientation, wire cleaning, former cleanliness and web run, new components were integrated as follows:

The existing headbox was upgraded with a ModuleJet unit. On the main drainage elements of the former, individual ceramic bars were replaced with a plate cover, and a Jet Cleaner was installed in the bottom wire. DuoFoils were installed in the first and second dryer groups. The fifth dryer group was converted according to the Dry Star concept into a single tier section, by drilling the bottom dryers and installing DuoStabilizers.

The approach flow section was extended and optimized to suit the rebuild measures.

All new components were installed on time according to contract during the seven-day shut down period in March. Since the rebuild, operating speed has been steadily increased up to a maximum of 1,687 m/min for 45 g/m^2. Since May 2001 the average operating speed has always been above 1600 m/min. In May 2002 a production record was broken at 1633 m/min average operating speed and an overall efficiency exceeding 93 %.

Thanks to these optimization measures, production capacity has increased by about 13,000 t/a. With its high average speed and high overall efficiency, PM 7 in Schongau is now among the "top 5" most efficient newsprint machines, and is likely to remain so for a long time to come.

Schwedt PM 11

The customer's rebuild goals for Schwedt PM 11, a Voith newsprint machine delivered in 1994, were similarly formulated:

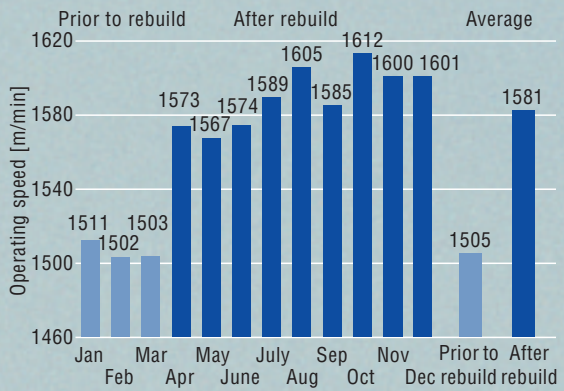
Operating speed had to be increased from 1,530 to 1,650 m/min, at the same time improving overall efficiency and increasing production output by 20,000 t/a. The approach flow section had to be modified in order to avoid pulsation. Great attention was paid to attaining the desired quality improvement by a better cross-profile and fibre orientation. Drainage capacity had to be increased and, at the same time, the water handling stabilized and formation irregularities prevented. Furthermore, wire wear had to be reduced and the web run stabilized.

For all that, Voith Paper modified the wire section by retrofitting a ModuleJet unit, exchanging the jet and skimmer channels, replacing the formation boxes and flat suction box, installing a new plate cover in the top wire suction box and adding a HiVac suction unit, repositioning the wire separation on to the suction couch roll, installing a double doctor on the suction couch roll, and modifying the drive concept.

Voith Paper also optimized the dryer section, by retrofitting web stabilizers (DuoFoils) in the first and second dryer

groups. The steam and condensate system was modified, and the fixed doctor blade holders were converted to flexible ones. At the end of 2001 a scanner with moisture sensor was installed.

Twelve hours earlier than the contractual deadline, PM 11 was successfully restarted at the end of March 2001, also after a seven-day shutdown. Only two months later, the average operating speed had increased by more than 70 m/min, and the 1,600 m/min limit exceeded with a maximum speed, so far, of 1,650 m/min.



Operating speed increase of Schwedt PM 11 in 2001

All rebuild goals were attained both qualitatively and quantitatively. Basis weight fluctuations both in the machine and cross-machine directions were reduced by about 10 percent – at the mentioned significantly higher speeds. By extending the evaporation length in the first two dryer groups and increasing the steam pressure, drying capacity was substantially increased.

As emphasized by mill manager Sebastian Loewenberg: *"Our experience over the last few months has shown the great success of this rebuild. The efficiency of PM 11 has improved impressively."*

The order value for Voith Paper for the two rebuilds was about DM 25 million. Both mills expect that, thanks to the greater output, production losses due to the necessary shutdowns will already be recovered this year.

Decisive for the success of this project were the excellent cooperation with the customer, efficient project planning and preparation, assured delivery of all components prior to the shutdowns, and the Voith Paper quality assurance during the manufacturing phase. And this was why all rebuild goals were met in terms of quality, efficiency and increased production.

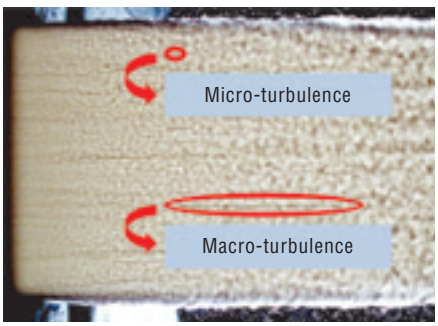
MasterJet II – optimum jet quality, the prerequisite for best sheet structure

The authors:
Klaus Lehleiter,
Wolfgang Ruf,
Hans Loser
Paper Machines
Graphic

The headbox is one of the main tools in the papermaking process for reaching a homogeneous sheet structure. Optimum flow control within the headbox is the fundamental prerequisite for meeting the high paper quality requirements set by different end uses and converting processes. Both, the hydraulic concept and the geometric dimensions are key factors for the influence of a headbox on paper structure uniformity.

Because of the very flat jet angle at the impingement point at a Fourdrinier or a Gapformer, difference in the free jet topography results in totally different impingement conditions and, thus, in non-uniform starting conditions of initial sheet formation. Furthermore, the physical characteristics of the sheet are determined at the impingement point by the speed difference between the free jet and the wire. The uniformity of the impingement conditions determines the homogeneity of fibre distribution and fibre orientation.

1



Description of the free jet

All flow structures and turbulence properties coming out of the headbox nozzle contribute more or less to the sheet formation process, because they result in topographic structures at the free jet surfaces.

The structure of the topography allows a rough subdivision into macro- and microstructures *(Fig. 1)*. The small structures generated by micro-turbulence are of uniform size and distribution, dependent on the distance from the nozzle. During operation, they are not visible to the naked eye. Macro-turbulence generates very long, finger-wide disturbances in the topography. These structures, which are non-stationary in time and place, are dependent on the headbox design and are very well visible, especially on a Fourdrinier.

Effects in the sheet structure

In numerous packaging paper grades, macro-structures of the free jet result especially in the formation of more or less irregular stripes on the wire side of the sheet. Those irregular stripes are gloss differences visible at certain angles of light incidence and are often called Tiger Stripes *(Fig. 2)*.

Tiger Stripes are caused by local fibre orientation non-uniformity in the sheet

Fig. 1: Free jet characters.

Fig. 2: Tiger Stripes on kraftliner.

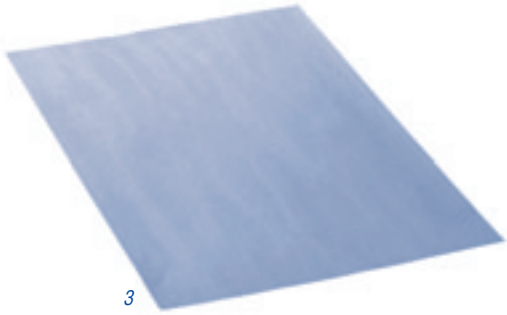
Fig. 3: Water streaks on copy paper (80 g/m²).

Fig. 4: Sheet flatness of a graphical paper grade.

Fig. 5: Formation streaks.

Fig. 6: Goals for free jet quality optimisation.

2

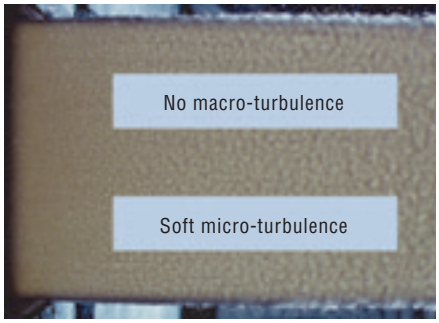


3

4

5

6



surface due to cross flows at the impingement point, induced by the macro-structures in the free jet.

Papermakers, producing paper of very low filler content and using long fibre pulp and/or CTMP on a Fourdrinier, are very familiar with this phenomenon.

In graphic paper grades, those macro-structures of the free jet also result in gloss effects on the paper surface, called water streaks or snailing *(Fig. 3)*.

Non-uniform fibre orientation, combined with a drying process using open draws, creates and freezes differential stresses in the paper sheet. By changing temperature and/or moisture conditions, these frozen stresses are partly released and the history of sheet formation becomes apparent again in the form of flatness defects *(Fig. 4)*. Often these effects are also visible in the sheet hanging from a full parent roll after reel spool changes.

At a higher formation level, macro-structures in the free jet become visible as formation stripes. These effects can be visualised by adding colour into one turbulence tube of the turbulence generator in the headbox *(Fig. 5)*. The colour distribution in the paper sheet reflects the characteristics of both the macro-formation and the sheet flatness.

In summary, it can be stated that macro-turbulence in the free jet has a significant influence on gloss, flatness and formation of the paper sheet in areas 5-15 mm wide and approx. 300 mm long. Depending on the former concept and on the intensity, the micro-turbulence in the free jet influences the breaking length ratio of the micro-formation of the sheet.

Optimization of free jet quality

Forming an ideal free jet is one prerequisite for optimum sheet formation. A free jet without macro-turbulence and defined micro-turbulence *(Fig. 6)* is the goal.

Fig. 7: Flow configurations inside the headbox nozzle without lamellas.

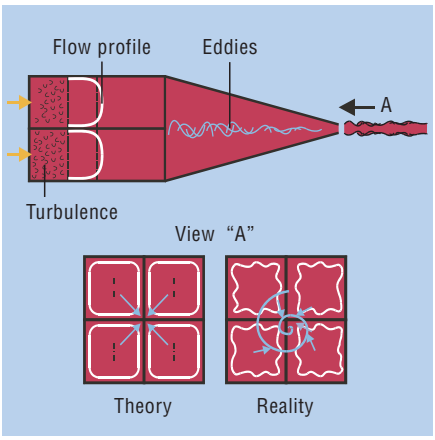
Fig. 8: Flow configurations inside the headbox nozzle with lamellas.

Fig. 9: Lamellas inside headbox nozzle.

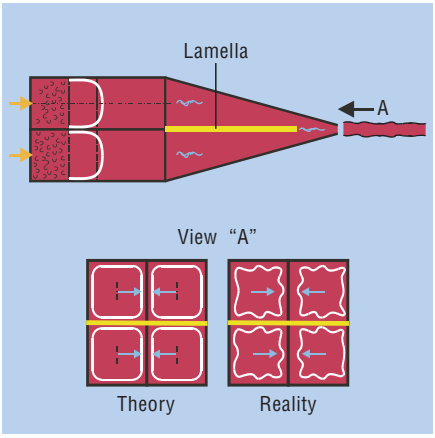
Fig. 10: Effect of lamellas on formation.

Fig. 11: Effect of lamellas on sheet flatness.

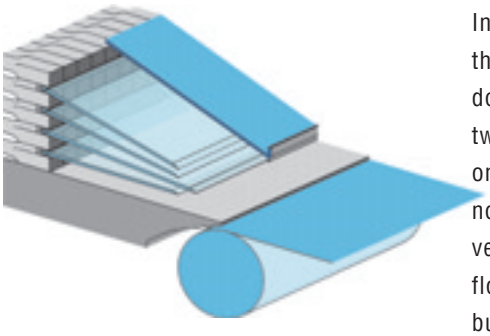
7



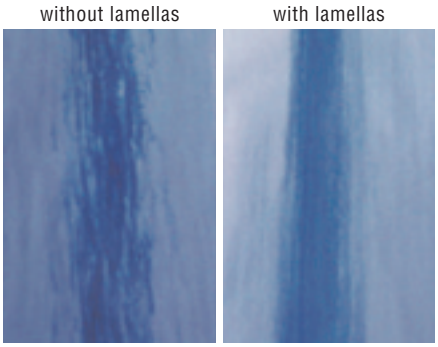
8



9



10



11

Micro-turbulence in the free jet is mainly created at the end of the nozzle by fluid friction, due to the high acceleration of the flow in this area.

Macro-turbulence in the free jet is primarily dependent on the flow configurations just at the outlet of the turbulence tube bank.

Interactions between individual tube outlet flows in the nozzle are unsteady, three-dimensional processes, forming eddies in the flow *(Fig. 7)*.

Installing lamellas between the rows of the tubes will reduce the degree of freedom of the flow *(Fig. 8)*. Interactions between the individual tube outlet flows will only happen in cross direction inside the nozzle. Interactions in z-direction are prevented. The result is a turbulent but steady flow inside the headbox nozzle with turbulence of mainly small scale wave length.

To achieve a free jet almost free of macro-turbulence, the flow control and turbulence generation inside the tube bank were optimized. The best result was obtained with lamellas inside the headbox nozzle *(Fig. 9)*.

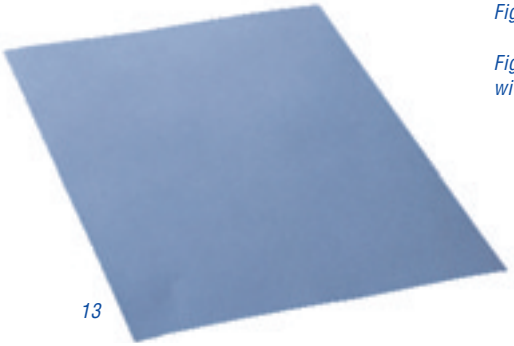
The results of the free jet analysis show a very good correlation with the physical characteristics of finished paper sheets. Specifically, sheet defects caused by macro-turbulence can clearly be reduced.

Micro-turbulence control in the free jet by varying lamella geometry also correlates with the results of paper analysis. Due to the faster dewatering process, the influence of optimal micro-turbulence in the free jet is more evident on Gapformer than on Fourdrinier machines.

Improvements in sheet structure

The effect of different headbox hydraulics on paper quality is shown in *Fig. 10*. The influence of micro- and macro-turbulence on the paper samples is shown by colour

12



13

Fig. 12: Effect of lamellas on Tiger Stripes.

Fig. 13: Neusiedler PM 5, copy paper (80 g/m²) without water streaks.

addition into one tube of the turbulence generator.

Excessive macro-turbulence (without lamellas) results in a soft, but streaky formation structure.

The graphic paper sample produced under optimal free jet conditions (with lamellas) is shown on the right of *Fig. 10*. The colour distribution in the sheet is relatively homogeneous. A soft and non-streaky formation combined with very good sheet flatness is achieved.

Two further examples show the effect of using lamellas inside the headbox nozzle.

Fig. 11 demonstrates the effect of lamella length on a paper sample from a production machine. With a proper lamella design, the characteristics of the sheet flatness can be significantly improved and Tiger Stripes can be eliminated completely *(Fig 12)*.

First installations

Based on the experiences of our installations at Donnacona PM 4, Tumut VP 9, Procor, Oji Fuji N 2 and West Linn PM 3, the final version of the new turbulence tube bank in combination with lamellas was installed at Neusiedler PM 5.

Neusiedler PM 5 is producing woodfree copy paper in a basis weight range from 62 to 172 g/m² at production speeds up to 1,000 m/min.

After start up in October 2001, the results were fully convincing.

We had achieved, what seems to be unrealistic: the complete elimination of the water streaks or snailings on the wire side of the paper sheet *(Fig. 13)*.

In the past, PM speed was limited because of low paper quality caused by water streaks. Today, Neusiedler PM 5 produces top quality paper at capacity limit.

Summary

The effect of the headbox on sheet uniformity is based on its hydraulic concept, as well as the geometric dimensions.

In addition to the flow rate and stock-consistency distribution in cross direction, the generation of turbulence in the free jet without macro-structures and defined micro-structures, is an important parameter for the quality of a headbox.

With a very well-tuned system of turbulence generator and nozzle geometry in combination with lamellas, a distinct improvement in the free jet quality is achieved. This potential is confirmed by a significant improvement in paper sheet quality, especially in the elimination of water streaks on the wire side of the sheets.

1

Janus™ Day 2001 in Krefeld

Successful Customer Symposium on the subject of "Rolls and Roll Surfaces"

The Voith Paper Finishing Division invited users of Janus™ calenders to a symposium, held on October 18, 2001. It was planned to exchange experience on the subject of "Rolls and Roll Surfaces".

The author:
Hans-Peter Marleaux
Finishing

A number of customers accepted the invitation by Voith Paper, Krefeld, Germany to exchange ideas and experience from the day-to-day production with "their" Janus™ calender in discussions. For this Janus™ Day the main theme was "Rolls and Roll Surfaces", as great interest in this subject had become manifest prior to the event.

The attendees arrived the day before the symposium, as Voith Paper had invited them to a casual "get-together" dinner in a typical Lower Rhine country inn. In a friendly and relaxed atmosphere the people got to know each other or deepened existing contacts.

On Thursday, 18 October 2001, the symposium took place in the spacious rooms of the new Voith Paper Training Center. Introductory topics were: "Soft Roll Covers for Janus™ Calenders", "The Influence of Roll Surfaces on Calendering" as well as "Coating of Thermo Rolls". Experts presented short papers on these individual areas. They concentrated purposely on practical experience, test

Fig. 1: Thomas Koller, member of the Board of Management of Voith Paper GmbH in Krefeld, welcomes the attendees on the first Janus™ Day.

Fig. 2: The introductory papers were followed by a lively discussion among all the participants.

Fig. 3: In the Finishing Technology Center a lively discussion was held in small groups.

Fig. 4: An old mill served as rustic surroundings for the final event of the Janus™ Day.

2

3

results, production aspects, but also on problematic points of the various technologies.

As expected, a lively discussion arose during the papers, which was based on the practical experience gained by the users and led to queries and also to detailed discussions. This open and frank atmosphere pervaded the entire event and initiated additional subjects, which the users were "itching" to talk about. An interesting aspect was, among other things, the question: Under what production conditions are doctors required? Or are perhaps other devices for cleaning the rolls conceivable? But also subjects like "barring" or the influence of chemistry on the covers were passionately and sometimes controversially discussed.

Around midday all of the attendees went to the adjacent Finishing Technology Center, where they were invited to a buffet lunch close to the Janus™ MK 2 pilot calender. The way back then took them through the Krefeld production shops, where they were able to see, among other things, the Janus™ MK 2 for SCA Laakirchen with the so far largest inclined frames manufactured by Voith Paper, which were beginning to undergo works assembly. At the base of the already erected equipment, which took up almost the entire width of the largest assembly area, the customers were given interesting new details about the current Janus™ technology. The guests were also impressed by the unwinding and rewinding stations (SCA Laakirchen will have an Offline-Janus™) as well as by the dimensions of the rolls, which lay lined up ready for installation in the adjacent machine shops.

To conclude the event, Voith Paper invited the attendees of the symposium to a romantic windmill classified as a historical monument. The evening, during which the guests were not only well treated with good food and drinks, but were also offered "magical" entertainment, will surely remain a most pleasant memory to everyone who was present.

Second Janus™ Day already planned

This first Janus™ Day made it clear that customers have great interest in an open exchange of experience within the settings of such an event. It was therefore agreed to consider the next Janus™ Day for the autumn of 2002. The attendees were asked to express their requests and suggestions on the subjects for the second Janus™ Day.

From the suggestions of the first Janus™ Day, Voith Paper prepared a program, the subjects of which were worked through step by step. It is intended that the Janus™ Day shall be successful not only for the participating customers, but in the medium term shall also benefit the entire paper industry through the translation of suggestions into technological solutions.

One result of the event is, for example, the further development of a cleaning unit for the rolls in the calender, the so-called "brush". This generated significant interest among the paper producers. This technology has already been incorporated in the next system engineering plans.

4

1

Voith strengthens South American position with major São Paulo plant expansion

The author:
Cesar Schneider,
Voith Paper Service
São Paulo

Voith Paper Service continues to lead the industry in providing tangible, state of the art products and services for the South American market. The pace of progress is quite evident as Voith Paper Service Division doubled the size of its São Paulo, Brazil facility, to a total of 6,250 m², making it one of the largest and best equipped roll cover technology operations in all of Latin America. The expansion involves a new roll cover section, capable of offering premium roll cover technology previously unavailable in South American locations. Ceremonies marking the official opening were held February 22, 2002, with Voith officials, employees, and customers in attendance.

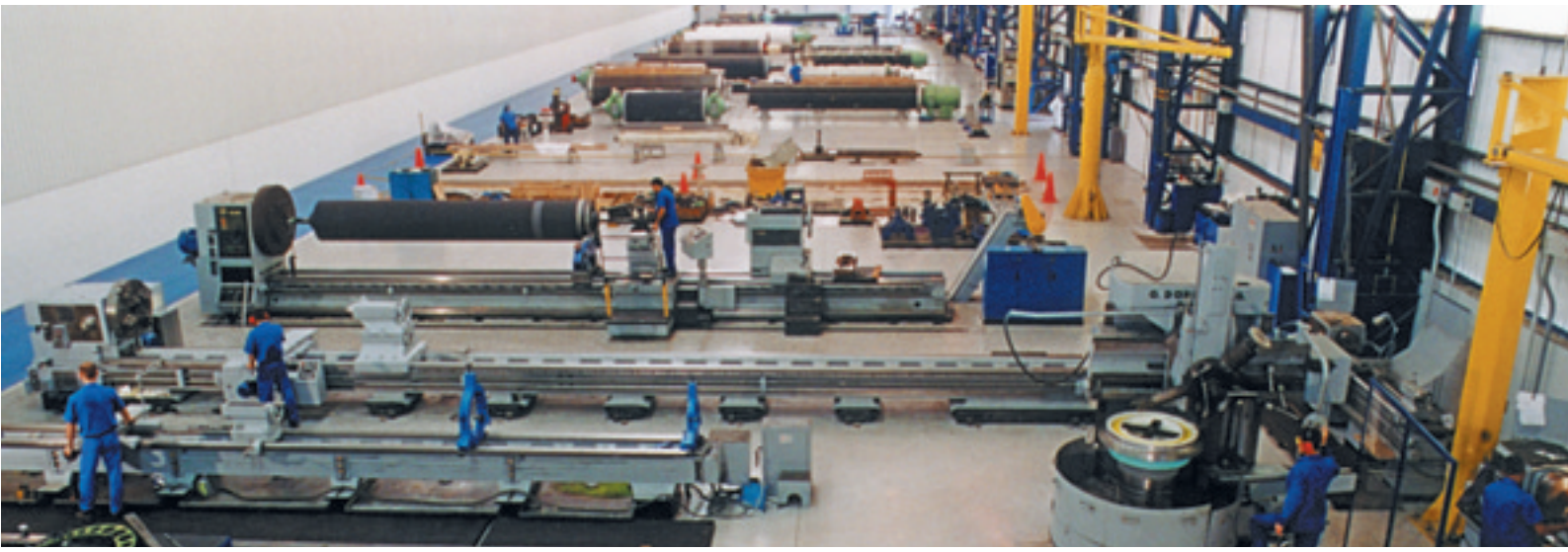
According to Voith officials, the São Paulo project will have a significant impact on the South American market, substantially improving access to much needed services and technology, while markedly multiplying growth and profit opportunities for paper producers.

"The demand for advanced roll cover technology in the South American market continues to show a strong increase," says Ray Hall, Executive Vice President of Voith Paper Service. *"South American paper producers are driven by higher paper quality requirements and the need to enhance paper machine operating efficiencies. This expansion gives our customers greater access to Voith's most advanced roll cover designs."*

The new Voith offerings represent a genuine service breakthrough in the South American market and will greatly strengthen Voith's competitive position. The expanded capabilities in the São Paulo operations dramatically shorten delivery cycles for premium technology roll covers. Customers who needed premium covers used to have to wait while rolls were shipped to North America or Europe. For the first time ever, these customers now have access to these

Figs. 1 and 2: The new Service Center São Paulo.

Fig. 3: Service team São Paulo.



2

advanced services and product offerings on their home soil.

The São Paulo operations now offer rebuilds, maintenance and repair for all pulp and paper equipment on a larger scale than ever before. The facility is fully equipped with crane systems, lathes, grinders, and all the necessary technology to service virtually any roll used in the industry. Many services can be performed on the customer's site, as well. Everything in the Voith process is designed to provide customers with faster-than-ever turnaround of premium roll covers and top-of-the-line services.

Voith's presence in Brazil actually dates back to the 1960s, when it first entered the market. Voith's strategic service initiative in Brazil began more than a decade ago – in 1990. It was then that company leadership recognized the need for – and the enormous potential of – enhanced service-after-sale capabilities. The first official South American Voith Service Center started operations in São Paulo.

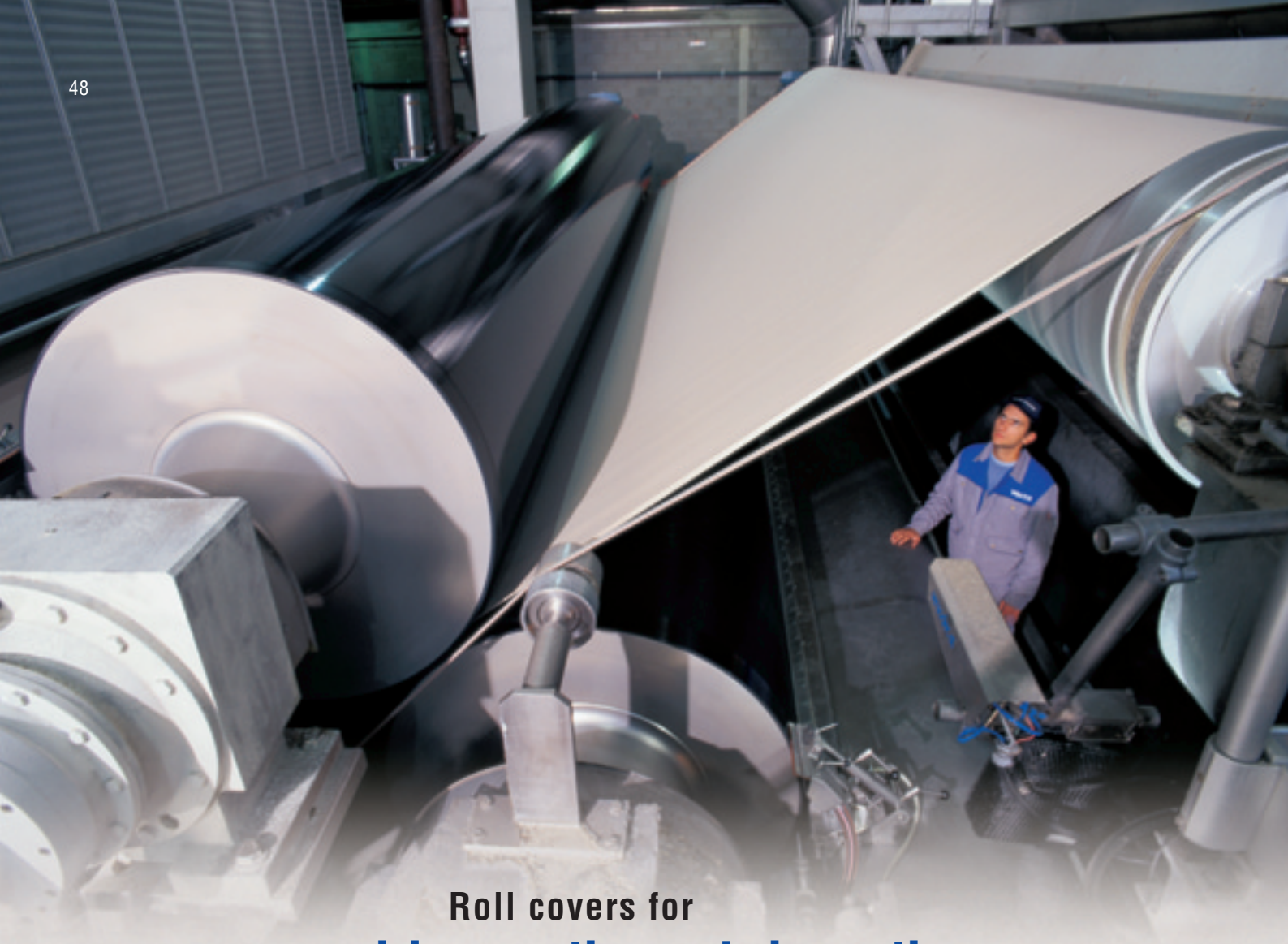
Another Service Center opened up in 1992 in Ponta Grossa, Brazil, with a focus on serving customers in the country's southern region. In 1997, the company moved forward with an additional new Service Center, actually built inside a customer's facility: the Bahía Sul Pulp and Paper Mill, in Mucuri. This operation brought advanced service capabilities to the northeastern region of Brazil.

By the year 2000, Voith had expanded even further, adding yet another Service Center – this time in Buenos Aires, Argentina. The Argentine center offers quality services to customers in Chile and Uruguay, as well.

3

The year 2000 also saw the initiation of the Service Division's on-site service contracts for customers. These agreements provide for higher levels of service, offered in the customers' facilities on an ongoing basis. The results are impressive reductions in downtime and operational costs as well as increased up-time and quality.

The new roll center in São Paulo, then, is another of many steps forward in meeting the growing needs of the South American Pulp and Paper industry, but Voith's progress isn't contained by any geographic borders. Today you'll find Voith on four continents, operating 25 service centers – with more already in construction right now. Voith is speeding up the pace of progress – leading, expanding, growing, evolving, and always intensifying its focus on global leadership in the production of high-tech products and implementation of advanced services for the paper industry.



Roll covers for sizing, coating and pigmenting

The author:
Dr. Thomas Stübegger, Service

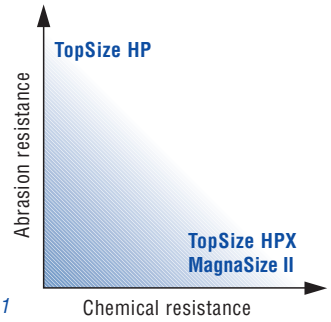
Besides the properties of the paper and the formulation of the starch and coating color (solids content, rheology, gas content, etc.), the design of the application unit, in conjunction with the roll covers used, plays a decisive role in determining the properties and quality of the coating.

Sizing

The traditional puddle size press with its hard/soft combination of the two rolls is generally replaced by a film press in new machines *(Figs. 2 and 3)*.

The disadvantages of the fluid pond at high machine speeds can be elegantly avoided in this way. In addition, the film premetered on the rolls permits widely variable application rates (e.g. by profiled metering rods, *Fig. 7)*.

Despite this trend toward film presses, a large number of puddle size presses are in use at present. This justifies a continued development of the covers for this application.

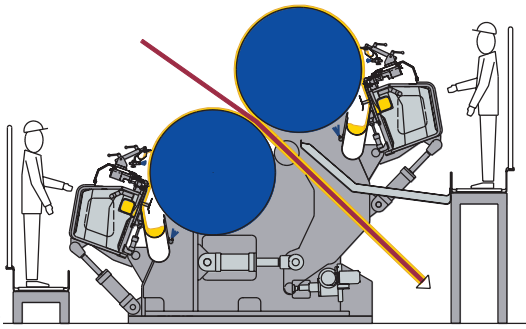


1

Fig. 1: Range of products.

2

Fig. 2: Film press MagnaSize/TopSize HP.



3

Fig. 3: Film press.

Fig. 4: Comparison Film Coating/Blade Coating.

4

		Film coating	Blade coating
Quality	Smoothness	-	+
	Gloss	0	+
	Fiber coverage	+	-
	Opacity	+	0
	Orange peel	-	+
Runnability	High speed	0	+
	High coat weights	0	+
	Nip misting	-	+
	Sheet breaks	+	-
Costs	Investment	+	0
	Operation	0	0
	Machine efficiency	+	-

Unlike film presses, on conventional size presses the roll covers are heavily stressed by temperature. Sump temperatures up to approximately 90 °C are possible. The covers must be appropriately resistant to starch solutions at service temperature. The materials are allowed to swell only very little in the application fluids.

Our rubber covers for this application are mainly **MagnaSize II** (approximately 15-30 P&J) and **MagnaRock II** (hard – 0 P&J).

TopSize HP ("high performance") is used as a highly abrasion-resistant quality. An overview of the two properties, chemical resistance and abrasion resistance, is given in *Fig. 1*.

It should be noted that before using the TopSize HP, unusual chemicals – those deviating from the standard – must be tested for safety reasons. In particular, operation or long cleaning in the strong alkaline range should be avoided!

For the hard rolls ceramic coatings can also be used – **CeraSize**. These coatings are characterized by a virtually perfect constancy of shape of the surface over yearstime. Due to the high form stability of the hard roll, a longer service life of the soft mating rolls is usually also achieved.

Furthermore, costs for the installation and removal of the hard roll as well as regular grinding can be avoided in machines in which it is possible to exchange the soft roll alone.

Coating and pigmenting

In this sector, too, film presses are gaining ever more importance. Due to rising machine speeds and cost pressure in investments in new paper machines, "compact" solutions must be used.

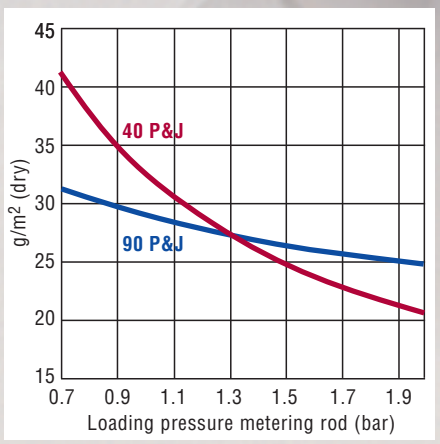
For example, an offline-coating unit station can be replaced with a film press (*Figs. 8-10* show the space requirement of two single side coaters in an on- or off-line arrangement and a single two-side

Fig. 5: Ratio of R_a value to layer thickness of the film (yellow).

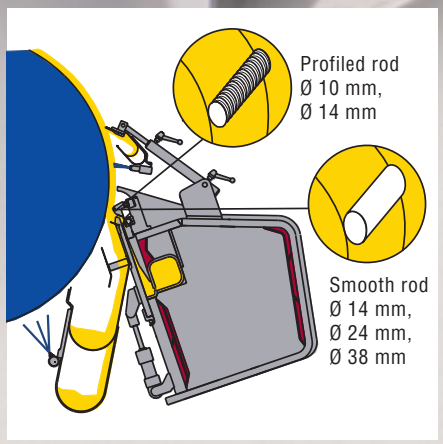
Fig. 6: Adjustability – and sensitivity to variations of the coat at different metering rod loading pressures. Coat weight on the cover.

Fig. 7: Metering via rotating rods – example for grooved rods.

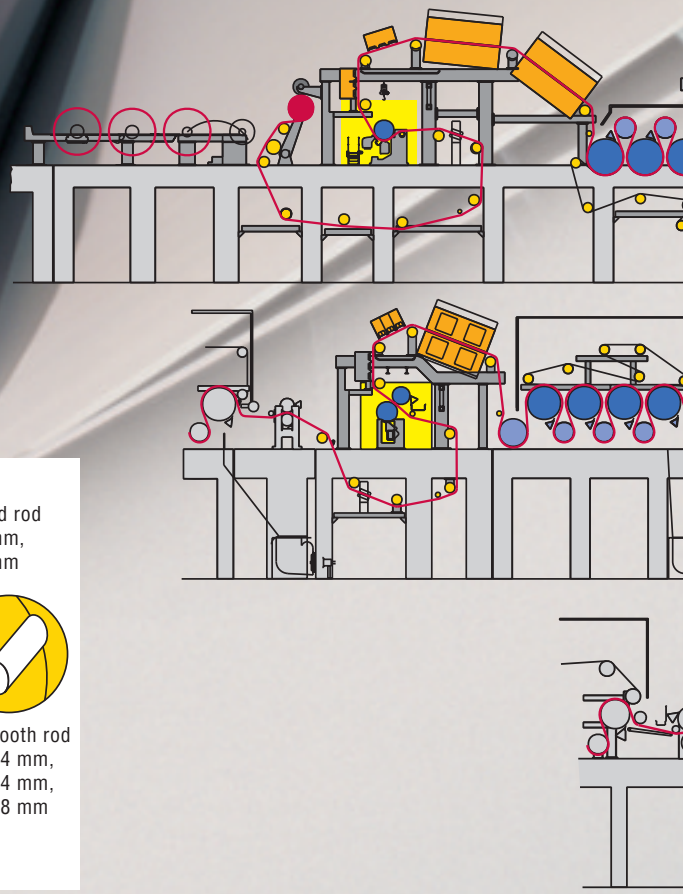
5



6



7



coater). The implementation of such a concept is shown in *Fig. 11*.

With coated papers, film presses are generally used as units preceding blade coaters. A good coverage of the paper fibers is achieved by the uniform application of a film. Gloss and smoothness of course fall behind here (if an "uneven" surface is covered with a constantly thick film, the unevenness is retained).

The advantages and disadvantages of the two concepts, blade and film application, can be found in *Fig. 4*. Particularly in machine efficiency and number of sheet breaks, film presses prove to be significantly better than the blade coating method.

Problems occur, however, during high-speed coating in film presses in terms of coat quality. Nip misting *(Fig. 12)* and orange peel effect reduce coat quality.

The cause lies in the fact that in the press nip the film press does not transfer the entire quantity of coating color from the cover to the paper and a residual quantity of coating color remains on the cover at the outgoing nip. Therefore a fluid layer has to be split when the web is pulled off the roll (film splitting). A part remains on the paper web and the rest remains as "return flow" on the roll. During this film splitting, droplets may form, which are thrown into the air by centrifugal force – resulting in misting.

The formation of orange peel on the paper is also caused by film splitting. An additional factor here, however, is the property profile of the coating color. If the color has not yet been fully immobilized, the orange peel can be reduced further after film splitting by "running". The viscoelastic behavior of the coating color must be taken into account in this.

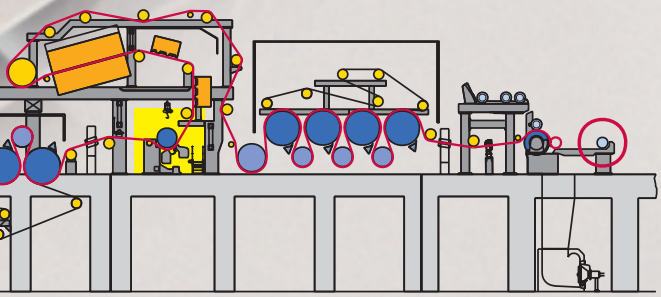
The covers also show a major influence on the result of film coating. The roughness of the cover is decisively responsible for nip misting. Very rough rolls carry much more color. Color transfer does not increase to the same extent and misting increases.

Ra values < 1.2 µm should be aimed at. Excessively smooth rolls are, however, likewise not good for coating quality, as the paper web cannot easily be pulled off a very smooth surface.

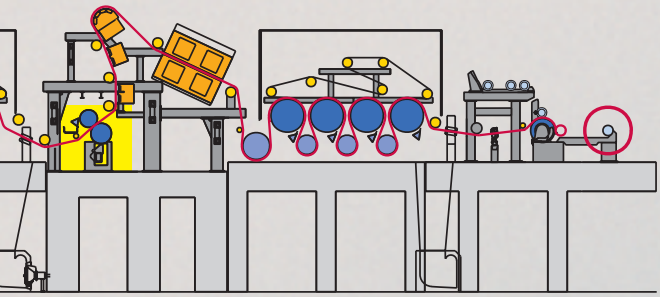
There are several differing recommendations for the cover hardness. Basically, the roll cover must be all the softer the more color is to be applied (with approx. 90 P&J, 16 g/m² per side is achievable at medium machine speeds).

Softer roll covers have (depending on the point of view) also advantages and disadvantages in terms of coat weight controllability *(Fig. 6)*.

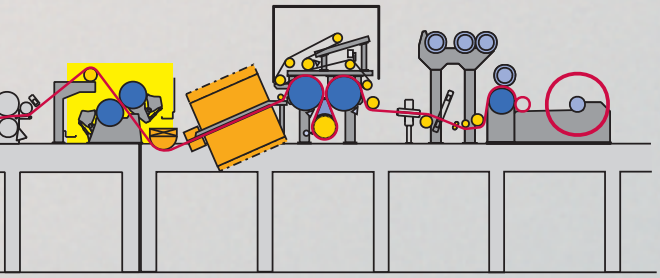
With soft covers, the coat weight cannot be controlled well in a wide range by the metering-rod loading pressure. Modifications in the color formulation are necessary for major changes. But on the other hand soft covers are not so sensitive to fluctuations in the metering-rod loading pressure, so that a more constant CD profile thicknesses of the coat can be achieved.



8



9



10

Fig. 8: Machine concept Offline Coater.

Fig. 9: Machine concept Online – 2x one-sided (Blade, Film).

Fig. 10: Machine concept Online – both sides simultaneously (Film).

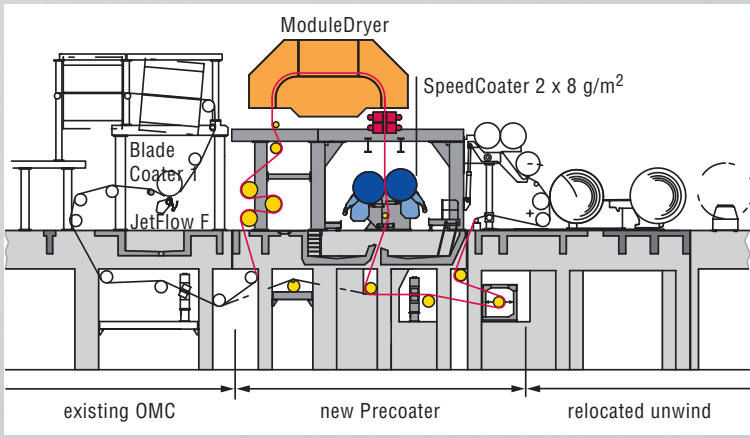
Fig. 11: UPM Kaukas (MagnaCoat/TopCoat HP and 2x TopCoat HP).

Fig. 12: Intense misting at the outgoing nip.

Fig. 13: Repair point ground open – hidden crack.

Fig. 14: "Barring".

Fig. 15: Typical cracks after massive paper wrapping.



11

Damage to roll covers in puddle and film presses

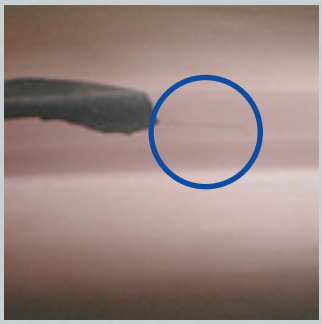
Damage may occur during operation if, for example, a roll is wrapped by paper after a sheet break and the nip does not open quickly enough. *Fig. 15* shows a typical crack that occurred during such an incident. Repairs of cracks up to some centimeters in size are possible. However, such repairs do not offer 100 % security. Inside of the paper web width there is a risk of marking in the coated surface if the hardness of the repair area does not coincide exactly with the hardness of the roll cover. A further danger can be seen in *Fig. 13*. In this case a crack on the surface was repaired, without it being noticed that the crack continued below it. However, the crack did not cause a failure of this roll. The repair area was examined during cutting off of the cover because of a large-area of irreparable damage.

New developments

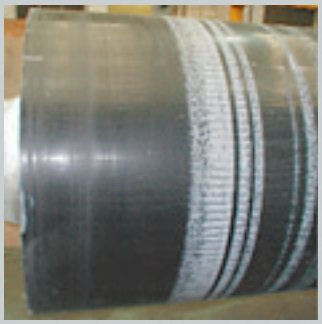
One goal of the development work was to improve the crack resistance of the materials to avoid damage as far as possible. High-speed machines are more critical in terms of vibrations. Due to vibrations, in the course of time permanent deformations are produced in the cover, which then further intensify the vibrations *(Fig. 14)*. The damping of the cover and heat development in the cover are decisive influential variables that contribute to the operational reliability of such machines. A reduction in the tendency to vibrations can be achieved in many cases, by a suitable selection of materials.

Due to the special fillers in the material, **TopSize HPX** and **TopCoat HPX** have excellent crack resistance. With the selection of polymer, good damping has been achieved in fast machines subject to vibrations. This development in the field of roll covers was possible, above all, through the intensive cooperation with the engineering department for film presses.

12



13



14

15

Successful Customer Symposium organized by Voith Paper Service

Some 120 representatives of the North German, Belgian and Dutch paper industry met with Voith Paper staff in Cologne from Feb. 28 to March 1, 2002 at a Customer Symposium organized by Voith Paper Service.

Hans Müller, President and CEO of Voith Paper, welcomed the guests and opened the two-day event. The program began with several papers presented focusing on "Voith Paper Service" starting with Josef Stübegger introducing the future visions of the Voith Paper Service Division. Manfred Kicherer presented the product portfolio of Voith Paper Service and Ernst Maurer the One Stop Strategy of the Service Center in Düren. The various components of the paper machine were the topic of Walter Blum's presentation and Peter Putschögl informed the participants about the production process of rubber covers for rolls.

Comments by the guests:

Dipl. Ing. Helmut Kluth

FS Karton GmbH, Plant Neuss

"... the upgrading of the Voith Paper location at Düren is a good sign for the paper industry in this region. It signals the readiness of Voith Paper to be even more intensely present in this area."

Dipl. Ing. Dietmar Böhm

SCA Aschaffenburg

"I have already attended a number of other events, but the organization of this one is really excellent. I know the Voith Paper Service Center in Düren from earlier times, but today it has a completely new face, the former dark shack is now a modern, bright building."

Mr. Franz Kustos

Norske Skog Walsum

"Voith Paper Service is on the way from good plain cooking to nouvelle cuisine. With this symposium, Voith Paper Service has succeeded in showing the future of service and maintenance: customer-oriented, target-oriented and visionary."

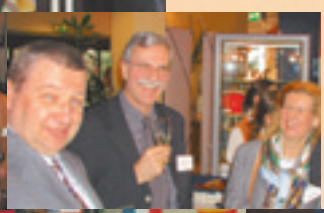
Following the informative series of papers, theory was backed with practice. The guests were given the opportunity of obtaining information on site at the Service Center in Düren.

After the opening speeches by the Mayor of Düren, Larue, and the Service Center manager, Ernst Maurer, the attendees of the Customer Symposium were taken on a tour through the Service Center, where they were able to see, among other things, the new production line for the covering of rolls with rubber.

Several displays at the in-house exhibition gave the guests a further insight into the range of services offered by Voith Paper. The one-stop strategy (latest in roll technology in conjunction with full service) and the up-to-date quality standards were further issues on which customers were pleased to receive information.

The series of papers on the following day focused on the further development of roll covers presented by Dr. Norbert Gamsjäger. Dr. Thomas Stübegger gave a detailed description of the latest developments for rubber roll covers. Hans Ruff and his co-speaker Norbert Butzke gave an overview about ways of optimizing the paper machine with focus on ProRelease. The opportunities on the sector Field Service, in detail cylinder service and Diagnostics, were presented to the interested audience by Uwe Becker and Bernd Stibi. The guest paper by Jürgen Birk from Rheinpapier on the "Hürth Service Concept" project rounded off the event.

The symposium was considered to be a complete success by all participants and provided a good opportunity to exchange ideas and experience.



Sappi Gratkorn and IP Carter Holt Harvey – Voith Paper Tail Threading Group helps these two customers achieve superior paper machine threading performance using Fibron TEAMS total process approach

The authors:
Elisabeth Rooney,
Robert Hotter,
Voith Paper
Tail Threading Group

In 1997, the Voith Paper Tail Threading Group introduced a new service called Fibron TEAMS (Threading Evaluation And Managed Solutions) to help mills optimize the total machine threading process and system performance effectively and economically, with a single process partner – Voith Paper. Fibron TEAMS is used by mills around the world to develop fully integrated, total machine tail threading solutions with guaranteed and sustainable performance and safety.

"Subsequent to our Fibron TEAMS audit, we worked with the Voith Paper Tail Threading Group to upgrade our Total Machine threading process and have exceeded our performance and return on investment (ROI) expectations. Following our success, many group mills are now using Fibron TEAMS to make threading process optimization decisions" said a satisfied customer.

Below are case studies of Fibron TEAMS for both Graphic and Packaging Grades.

Case Study: Graphic Grades

SAPPI, PM 9 Gratkorn, Austria
44-82 g/m^2 fine paper
1,050 mpm (future 1,100 mpm)

Threading Evaluation

Threading required risky operator intervention, resulting in inconsistent and operator dependent threading processes throughout the machine. The average was 3 breaks per day and the average total threading time was 23 minutes from press to reel. Their goals were to reduce full machine threading time by 50 % consistently and to improve operator safety.

The on-machine evaluation identified four areas where the current combination of manual operating procedures and trans-

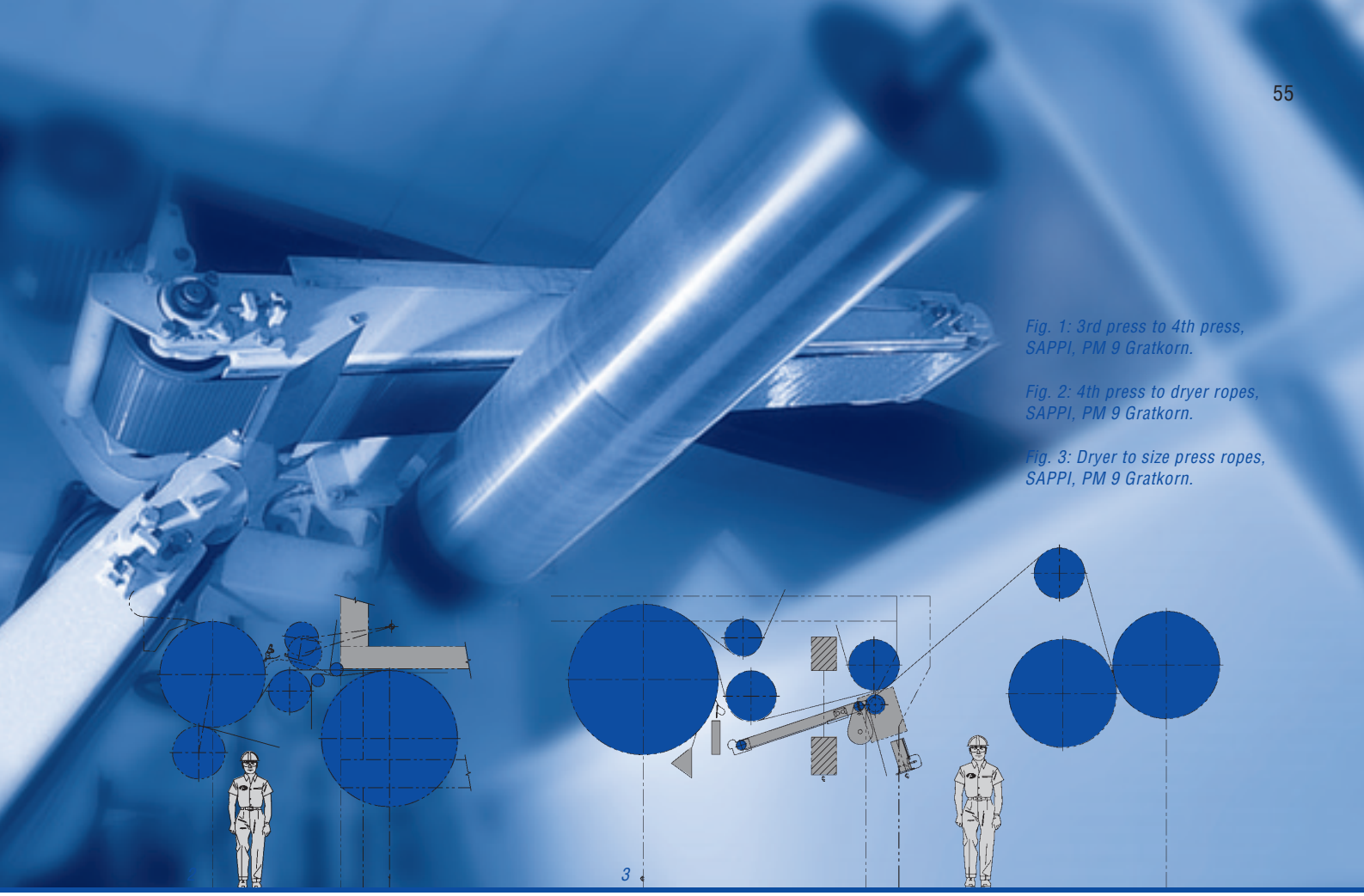


Fig. 1: 3rd press to 4th press, SAPPI, PM 9 Gratkorn.

Fig. 2: 4th press to dryer ropes, SAPPI, PM 9 Gratkorn.

Fig. 3: Dryer to size press ropes, SAPPI, PM 9 Gratkorn.

fer configurations were the root causes of their threading efficiency and safety problems. In addition, a number of rope system configuration issues were clearly identified for remedial work.

Recommended Solutions

3rd to 4th press:

Installation of an automated Fibron Universal P&T (Peel and Transfer) Shoe and a FibroFoil. The P&T Shoe is used to automatically "peel" the tail from the 3rd press, and the Fibrofoil acts as a non-contacting means to stabilize the tail on the fourth press felt and guide it to the 4th press.

4th press to dryers:

Installation of an inverted Fibron Universal P&T Shoe to automate this transfer. In the dryer section, we recommended installation of some new sheaves to optimize the rope to rope transfers and to eliminate interferences.

Size press through after dryer

Installation of a fully automated transfer from the last pre-dryer to a Fibron VTT Venturi conveyor feeding an optimized rope run. The proposed solution would automatically cut and transfer the tail as well as adjust to the varying machine speeds and grades without operator intervention. Additionally, the Voith Tail Threading Group recommended optimizing the rope run by installing some new sheaves to the initial rope transfer and to eliminate interferences.

Last dryer to reel

Installation of a fully automated transfer from the last dryer to a Fibron VTT Venturi conveyor feeding an optimized rope run. The proposed solution would automatically cut and transfer the tail as well as adjust to the varying machine speeds and grades without operator intervention. Additionally, the Voith Tail Threading Group recommended reconfiguring the rope run by installing some new sheaves to optimize the initial rope transfer and to eliminate interferences.

Guaranteed Results

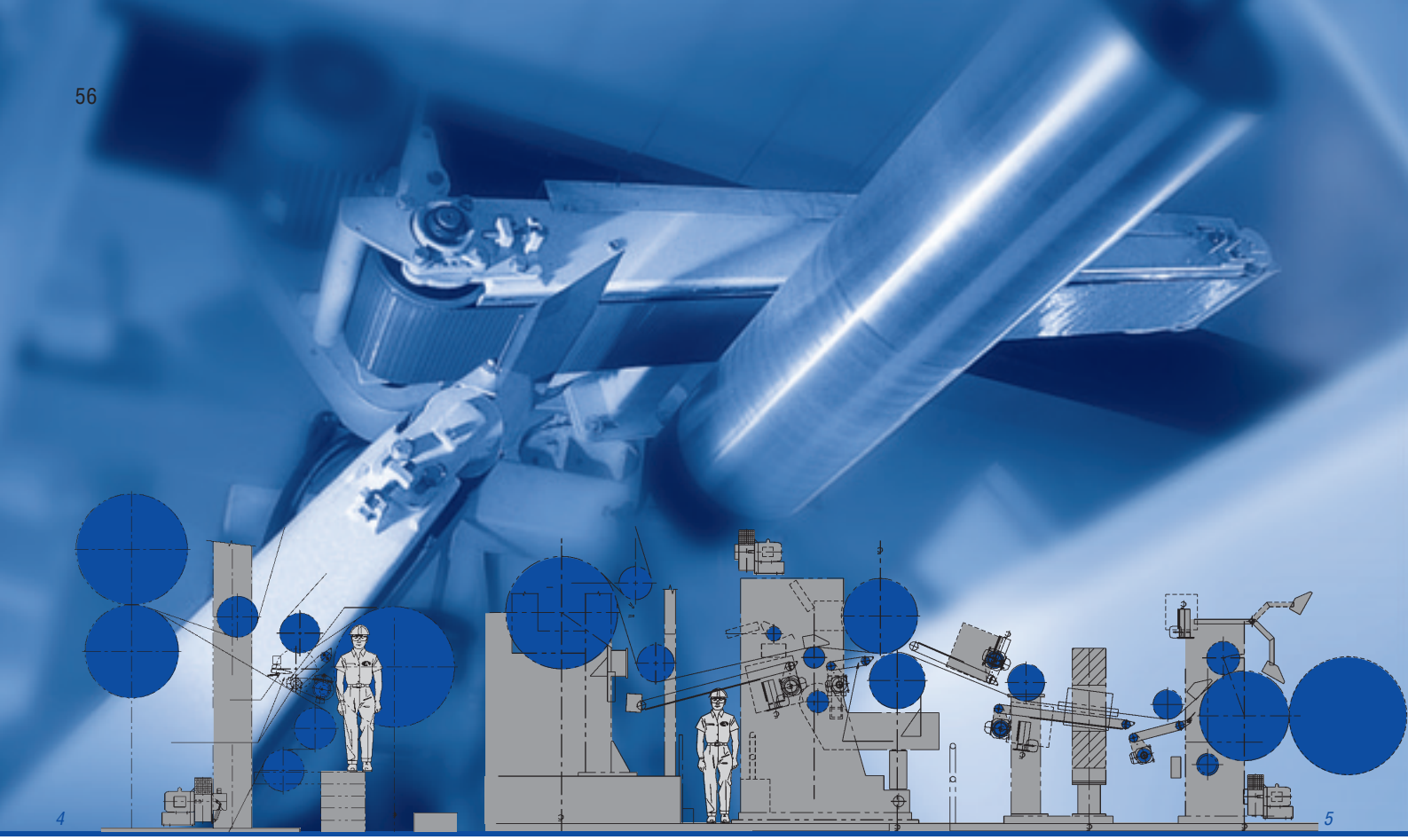
Based on the TEAMS Evaluation, Voith Paper Tail Threading Group was able to guarantee a 50% reduction in full machine threading time for PM 9.

Managed Solutions

Based on the Fibron TEAMS evaluation and guarantee, Gratkorn decided to fully implement Voith Paper's recommendations.

Results

Total tail threading time from the presses to the reel is now under 8 minutes. Total tail threading time, from the presses to the reel, widening the sheet with the size press closed and on line and the calender closed and on line, is 12 minutes or less. The mill's goal of minimizing total threading time by 50% has been achieved. In



4 5

addition, the system is now automated. No manual intervention by operators is required.

Case Study: Packaging Grades

Carter Holt Harvey, PM 6, Kinleith, New Zealand
175-300 g/m^2 corrugated Medium and Linerboard
300-710 mpm (Future 800 mpm)

Following a major rebuild of PM 6, Carter Holt Harvey experienced severe threading difficulties and contacted the Voith Paper Tail Threading Group for assistance and placed an order for a Fibron TEAMS assessment. The mill's goal was to reliably thread at full speed with increased operator safety.

Threading Evaluation

At the time, PM 6 had an average of 2-3 breaks per day and threading times varied widely, due to the threading being unreliable. As a result, significant lost time was recorded. Problems included dryer can wraps, rope breakage due to tail wads and the need for operator involvement for successful threading.

The evaluation identified the press to dryer ropes transfer and threading through the seven dryer sections as the areas of greatest impact, with the dryer to reel section of secondary importance.

Press to dryer ropes transfer

- The installed suction tray system at the last press was unreliable, requiring operator intervention.
- Changes in grade and speed affected threading performance.
- Unsafe, as operators had to be in the machine to assist in the threading operation.

Dryer sections 1-7

- The mill was consistently losing ropes in all dryer sections, especially the 5th section.
- Draws between sections were causing problems.
- The tail was falling out of the ropes at all sections, but especially in the 5th section.
- Successful threading required operator's assistance to help move the tail through the dryer sections.
- Machine could not be threaded successfully above 600 mpm.

Dryer to Reel

- Transfer tray feeding the rope system had never been successful.
- Rope life was poor and ropes interfered with the scanner operation.
- Ropes would slip on reel drum causing tail slackness during threading.
- Required operator intervention for operation and adjustment.

Recommended Solutions

Press to Dryer Ropes:

Installation of an L&T (lift and transfer) shoe and a VTT conveyor to automatically lift the tail from the press felt and accu-

Fig. 4: Last press to dryer ropes, Carter Holt Harvey, PM 6 Kinleith.

Fig. 5: Dryer to calender to reel, Carter Holt Harvey, PM 6 Kinleith.

rately direct it into the rope nip. The proposed solution would automatically cut and transfer the tail as well as adjust to the varying machine speeds and grades without operator intervention.

Dryer sections 1-7:

The Voith Paper Threading Specialists recommended that the entire rope system be redesigned and optimized using existing parts, with the following changes made:

- Eliminate the vertical up transfer from the 1st section to the 2nd section.
- All automated (rope to rope) transfers to be corrected and adjusted so the tail would transfer from section to section without operator assistance.
- Eliminate all rubbing and interferences.
- All sheaves to be checked, (required replacements were noted).
- Provide rope system maintenance training for all mill crews.

Dryer to Calender to Reel:

Installation of a fully automated transfer from the last dryer can to a Fibron VTT conveyor system right through to the reel. The proposed solution would automatically cut and transfer the tail as well as adjust to the varying machine speeds and grades without operator intervention.

Guaranteed Results

Based on the Fibron TEAMS evaluation, the Voith Paper Tail Threading Group was able to guarantee that the full machine threading process for PM 6 would exceed the customer's requirements and provide an 85 % reduction in threading time.

Managed Solutions

Based on the Fibron TEAMS evaluation and guarantee, Carter Holt Harvey decided to fully implement Voith Paper's primary recommendations with the dryer to reel as a second step.

Results

Following installation of the L&T and VTT conveyor at the last press, and the redesign and optimization of the rope system, total threading time from the presses to the last dryer can has been reduced from over one hour to six minutes with virtually no operator intervention required. The redesigned and optimized rope system reliably transfers the tail to the last dryer before the size press with no operator intervention. At the size press, there is a long, open draw section, and the tail successfully makes the rope to rope transfer approximately 30 % of time on the first attempt, taking the tail all the way to the last dryer can without operator intervention. The mill is currently looking at an additional VTT system to further improve size press threading.

Six months after the press section installation and rope system optimization, the end section tray and rope system was replaced with a complete VTT conveyor system (dryer to calender to reel).

The VTT system from last dryer to calender to reel is very reliable and threading times are no longer measured in minutes but seconds. The entire machine threading process is now automated and averages less than 10 minutes.

CHH's Paper Mill Operations Team is very satisfied with the TEAMS solution and the ongoing results and equipment operation. CHH is happy to be used as a reference for other mills.

Threading analysis		
Average machine threads/day	Before 2	**Fibron solution**
Average time/thread (minutes)	60	**8**
Production in tons/h	37	
Selling price per ton (US$)	350	
Annual losses		
Hours of production time	650	86.67
Tons of production	24,050	3,206.67
Potential revenue lost US$	8,417,500	1,122,333.33
ROI		**7,295,166.67**

ROI analysis

The ROI analysis was based on the results achieved and assumed averages for price and production over 325 days per year.

In Conclusion

Contact your local Voith Paper office if you would like to have a Fibron TEAMS threading specialist evaluate your potential to optimize your threading process both profitably and safely.

Paper Diagnostics

Using the Eureka System to identify periodic sheet mark

The author:
Sharon Hoole,
Voith Fabrics

The Eureka image analysis system was introduced to the Blackburn site of Voith Fabrics in October 1992. The system had originally been developed at the University of Manchester Institute of Science and Technology (UMIST) in the UK by Dr Stephen I'Anson, who was responsible for its transfer to Blackburn.

With the early success of the Eureka system, an identical set-up was introduced to the Högsjö site in Sweden during 1994. A second system was purchased for the Blackburn site in December 1994. Towards the end of 1995, investment was made in a laser scanning profiler, which became known as the Eureka 3D system, since we could now look at paper and board surfaces in three dimensions. This new system also meant we could investigate how periodic markings in the paper affect the measured roughness of paper and board.

Further developments of both systems have led to a wide range of techniques which are available to our customers, as well as for in-house R&D. To date, around 1500 separate investigations have been completed for paper mills and research establishments world-wide.

1

Description of the Eureka System

The Eureka system *(Fig. 1)* comprises a black and white CCD video camera connected by a digital frame grabber card to a computer. A separate monitor allows the user to see the image before it is captured. Sample illumination is provided by either placing the sample on a light box and shining light through it (transmitted light) or by shining light across the surface of the sample using a slide projector (glancing incident or low angle reflected light). Three complementary image analysis software programs on the computer allow further image manipulation and processing, largely using a Fast Fourier Transform (FFT) algorithm.

A later modification of the Eureka system was the introduction of an ordinary desktop scanner for image capture. This was found to be a quick repeatable method for imaging such things as carbon impressions made from press fabrics, dryer fabrics and drilled press roll rubbings and enabled much larger images – up to 200 mm x 200 mm to be captured. With the addition of a transparency unit in place of the scanner lid, it was also possible for transmitted light images of paper to be taken using the scanner.

The Eureka Method

In technical terms, the Eureka method is used to analyse samples for periodic content by performing a two dimensional Fast Fourier Transform (FFT) on an image of the sample. The FFT produces a two dimensional frequency spectrum of the

Fig. 1: The Eureka image analysis system.

Fig. 2: Transmitted light image of the paper sample at 70 mm x 70 mm.

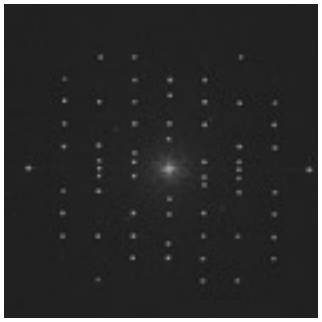
Fig. 3: FFT spectrum of the image shown in Fig. 2.

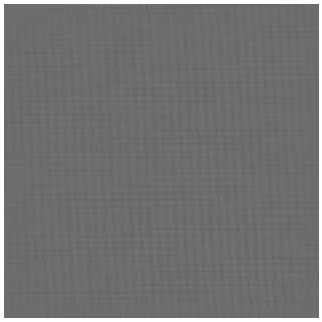
Fig. 4: Areas of the FFT spectrum shown in Fig. 3 which represent periodic data produced by the same source.

Fig. 5: The result of performing an inverse FFT on the spectrum shown in Fig. 3 using only the data associated with the areas highlighted in Fig. 4.


2


3


4


5

image, in which periodic elements are represented by sharp peaks and other variations by continuous shading. This is followed by interactive filtering of the FFT spectrum and an inverse FFT. This method firstly detects any periodic content in an image over a wide range of frequencies, then allows the periodic and non-periodic contributions of the image to be separated.

Simply stated, we use a computer to separate marks due to paper machine clothing and drilled or grooved rolls, from random unevenness of the sheet produced by formation or shrinkage during drying. Normally, if a mark can be detected by eye, it will be possible to use this method to clarify the source of the mark. It is necessary, however, to use a variety of methods of illumination as well as special inks which show up changes in roughness and absorption from place to place on the paper or board surface.

The best way to explain how the Eureka system is used in practise is by way of illustrated examples.

Case Study 1 – Identification of Machine Clothing Mark in Copier Paper

A Scandinavian paper maker observed that the 100 % chemical pulp, high quality paper which he was making appeared to be marked by his paper machine clothing. Although it was clear that the paper was marked, he was not certain which item of machine clothing was at fault, since the unavoidable cloudiness of the paper due to formation effects made it impossible to make any detailed measurements of the mark. However, he believed that it was a press fabric mark.

Fig. 2 is a 70 mm x 70 mm image of the paper viewed on a light box. This image was digitised and processed using a two dimensional FFT algorithm to produce the FFT spectrum shown in *Fig. 3*. Each point in *Fig. 3* corresponds to a two dimensional sine wave in *Fig. 2*. Formation and other "random" effects appear as continuous changes in background shade, but periodic contributions appear as sharp peaks, shown as white dots in this picture. The existence of sharp peaks in *Fig. 3* confirms that there is a periodic mark in the paper and their positions in *Fig. 3* can be used to calculate the dimensions of the weave pattern. It is also possible to separate the periodic and "random" elements of the image by setting to zero all points in the FFT spectrum except the sharp peaks. An inverse FFT can then be performed on the selected areas. *Fig. 4* shows the areas of *Fig. 3* selected on this occasion and *Fig. 5* is the result of performing an inverse FFT. The textile pattern has now been isolated and can be studied and measured without difficulty. The scale of *Fig. 5* is identical to that of *Fig. 2* and they, in fact, correspond point by point with each other. The textile can be identified as having a four shaft broken twill weave pattern.

In this case, a sample of the forming fabric in use at the time was available. From an image of this fabric (not shown) the FFT spectrum shown in *Fig. 6* was produced. As the FFT can be used like a "fingerprint" to identify the source of a mark,

Fig. 6: FFT spectrum obtained from an image of a sample of forming fabric in use on the machine at the time the paper was manufactured.

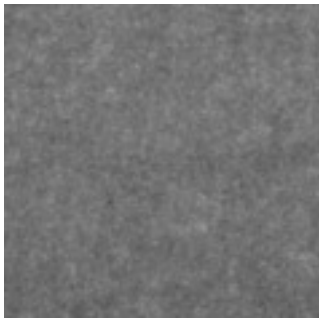
Fig. 7: Scanned image of the bottom side of a full width newsprint sample. Image size is 70 mm x 70 mm and the MD is exactly vertical.

Fig. 8: FFT spectrum obtained from Fig. 7 with the peaks used to measure shrinkage highlighted.

Fig. 9: Absolute CD shrinkage profile for 42 g/m² newsprint sample, having a total width reduction from wire to reel of approximately 2.5 %.

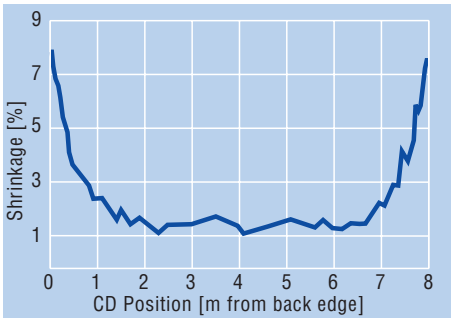
6

7



8

9



the peaks selected in *Fig. 4* are clearly also found in *Fig. 6* confirming that this forming fabric is the source of the mark in the paper, and not a press fabric as was thought by the papermaker.

Case Study 2 – Differential CD Shrinkage Profile Measurements

It is well known that the physical properties of paper or board are different at the edge than in the middle of the sheet. In particular, roughness is higher and dimensional stability is reduced at the edges. Both of these properties are related to the degree of cross machine direction (CD) sheet shrinkage, a property which can be very different at the edges due to lower restraint during drying and the wet straining effect of open draws. The relative (and actual) degree of shrinkage between the edges and the middle can now be quantified using the Eureka method allowing these differences to be more effectively dealt with. The method involves the measurement of a CD dimension of the forming fabric mark and comparing its magnitude across the full width of the machine. In this example an accurately cut full width strip from a high speed newsprint machine was supplied. *Fig. 7* is a typical image of the paper which was obtained using a desktop scanner fitted with a transparency adapter. This image was transformed to produce the FFT spectrum shown in *Fig. 8*. The highlighted peaks represent nearly machine direction (MD) features of the forming fabric mark in *Fig. 7*.

After small adjustments for distortion of the forming fabric on machine, measurement of the separation in the CD of these nearly MD features of this fabric can be made. These are compared at many positions across the machine and the relative dimensional change of the sheet after the forming section can be calculated.

These values are converted to give the degree of shrinkage for each point across the sheet relative to the average. From a knowledge of the width reduction down the machine, the relative shrinkage profile can be converted to an absolute, or actual CD shrinkage profile of the sheet as shown here in *Fig. 9*.

Results like these can be obtained from full width strips of any paper or board with a forming fabric mark detectable by the Eureka system, which includes almost all grades of paper and board, although it is easier to measure the profiles for lower weight publication type grades such as LWC, SC paper and newsprint.

Summary

The Eureka system can help papermakers identify and understand the nature of periodic marks from forming, press and dryer section components in their products. With the inclusion of differential CD shrinkage profiles, this unique tool offers even more understanding of the very complex art of papermaking. A future paper will examine the relationship between sheet roughness and machine clothing surfaces, using the Eureka 3D equipment.

Voith Paper supports AIDS children in South Africa

1

2

3

"More than 4.2 million South Africans are HIV-positive. Over 1700 South Africans get infected every day with HIV. South Africa currently has the world's highest rate of HIV infection. At least one out of every five pregnant women in South Africa tests HIV-positive. In other words, 30% of South African babies are born HIV-positive".

The author: Astrid Giltjes, Fiber Systems

This original quote from the Cotlands Baby Sanctuary brochure moved Voith Paper to financially support this charitable organization formed to help AIDS children in South Africa. Tony Joseph and Brian Innes of Inher S.A., the South African Voith Paper representation, presented a cheque to Allison Gallow, Coordinator, Corporate Affairs *(Fig. 1)*.

Brian Innes, his wife, and Tony Joseph personally visited the Cotlands Baby Sanctuary *(Figs. 2 and 3)*. to see for themselves how the Voith Paper donation was to be used, and were extremely impressed.

Cotlands statement: "The mission of our HIV baby support programme is to help the local communities through systematic information and assistance with the projects they have started for AIDS children and their families. Our philosophy is to help people who have to live with HIV and AIDS to become more independent and competent, so that fewer AIDS children are neglected or abandoned."

Allison Gallow expressed her thanks on behalf of Cotlands as follows: "In the name of all the babies and small children under our care, I sincerely thank Inher S.A. and Voith Paper for this generous support. Yours for a better future, ... for the sake of our children. Cotlands Baby Sanctuary."

Voith Paper is convinced that this donation is in the right hands and has already done a lot of good. And we are very sure that our customers wholeheartedly support this donation.