Hans Müller,
Voith Paper

Dear Customer, dear Reader,

The past year 2001 has been a rewarding one for all divisions within the Voith Group of Companies that supply to the pulp and paper industry.

Bookings and sales were at an all time high with a correspondingly good financial performance.

We do not anticipate the same order intake performance for the current business year, although our strong performance in China seems to compensate to some degree for the slowing demand in most of the other geographic regions.

Consolidation continues unabated among our customers. Likewise we, Voith Paper, have continued to complement our product platform with the acquisitions of Kvaerner Recycling and Finckh, both becoming members of the Fiber Systems Division. Jagenberg Papiertechnik in Neuss, Germany, Enfield, USA and Basagoitia, Spain will enhance our position in both paper machine divisions, graphic and board and packaging, as well as in the finishing and service divisions.

In addition to the acquisitions just mentioned, we have converted long lasting license relationships with IHI, Japan and Larsen Toubro in India into joint ventures. Both ventures will solidify our footholds in these two most important markets.

With these new members, and in conjunction with Voith Fabrics, we are now in the position to offer the most comprehensive process know-how and the technology and products for every demand in the paper and board industry.

As China continues to develop into a major producer of pulp and paper, we have committed to building a state-of-the-art service center in Shanghai for roll services and roll covers, as well as for a mechanical service center in Huatai, Shangdong Province.

Last but not least, we have added roll cover capabilities in our service center in Düren, Germany.

This issue of twogether No. 13 clearly demonstrates our wide range of activities. This is depicted by the article on the Ultrastar machine of Sappi Gratkorn, Austria, representing the world's largest unit for the production of coated free sheet or the highly cost-effective newsprint machine of Inland Empire in the USA.

With our growing sensitivity towards providing elements and components for the enhancement of productivity, we are successfully deploying products such as the forming fabric Horizon™ or press felts such as the Vector™. In this issue you will read about many more products of low investment demands, but high and quick returns.

We recognize and appreciate that all these achievments could only be attained with your continued confidence and support of Voith Paper and Voith Fabrics.

Thanks for all this and enjoy reading our twogether No. 13!

Hans Müller
On behalf of the Voith Team Supplying the Pulp and Paper Industry

Startup highlights in 2000/2001

Fiber Systems

Stock preparation systems and sub-systems for graphic papers
Stora Enso, Langerbrugge, Belgium.
Keräyskuitu, Sunila, Finland.
Haindl Papier, Schongau, Germany.
Sappi Nijmegen, Nijmegen, Netherlands.
Arjo Wiggins Papiers Couchés, Bessé-sur-Braye, France.
Fabryka Papieru Malta-decor, Poznan, Poland.
Minfeng Paper Mill, Zheijiang, China.
Pan Asia Paper, Singburi, Thailand.
Steyrermühl AG, Steyrermühl, Austria.
Pan Asia Paper, Chonju, South Korea.
Papierfabrik Utzenstorf AG, Utzenstorf, Switzerland.
Stora Enso Fine Paper, Uetersen, Germany.
Papeteries Matussière et Forest, Voreppe, France.
Felix Schoeller jr., Weissenborn, Germany.
Dresden Papier AG, Heidenau, Germany.
Steinbeis Temming Papier, Glückstadt, Germany.
Holmen Paper, Hallsta, Sweden.
Grupo Pulsar, San Juan del Rio, Mexico.
Bowater, Coosa Pines, USA.
Newstech, Coquitlam, Canada.
Bowater, Gatineau, Canada.
Mississippi River Corp., Nathcez, USA.

Stock preparation systems and sub-systems for board and packaging papers
LEIPA Georg Leinfelder, Schwedt, Germany.
Genting Sanyen, Selangor, Malaysia.
Roman Bauernfeind Papierfabrik, Raubling, Germany.
Propapier, Burg, Germany.
SCA Packaging New Hythe, Aylesford, Great Britain.
Papierfabrik Niederauer Mühle, Kreuzau, Germany.
Packaging Corp. of America, Tomahawk, USA.

Stock preparation systems and sub-systems for tissue papers
WEPA Papierfabrik, Müschede, Germany.
Kimberly-Clark, Koblenz, Germany.

Paper machines

Graphic papers
Inland Empire Paper Company, Millwood, USA.
Minfeng Special Paper Co., Ltd., China.
Quena Newsprint Paper Co., Kairo, Egypt.
Papierfabrik August Koehler AG, Kehl, Germany.

Board and packaging papers
SAICA, Spain.
Rebox, USA.
Visy Paper Pty. Inc., Australia.
CMPC, Puente Alto, Chile.
Oji Paper Co., Ltd., Japan.
Newark America, Fitchburg, USA.

Tissue
Mili, Brazil.
ICT Poland, Poland.
LPC, Great Britain.

Installations and rebuilds
Klabin-Celucat, Brazil.
JSC Solikamsk Bumprom, Solikamsk, Russia.
UPM-Kymmene Corporation, Kaukas, Finland.
Neusiedler AG, Kematen, Austria.
Mitsubishi Hi-Tec Paper Flensburg, Flensburg, Germany.
Schoellershammer Industriepapier GmbH & Co KG, Germany.
Haindl Papier GmbH, Schwedt, Germany.
Haindl Papier GmbH, Schongau, Germany.
Sappi Fine Paper (PTY) LTD., Stanger, South Africa.
Temboard & Co. Ltd., Temiscaming, Canada.
Felix Schoeller Jr. GmbH & Co. KG, Weissenborn, Germany.
Sora Uetersen GmbH, Uetersen, Germany.
Sappi Alfeld Papier, Alfeld, Germany.
Balkrishna, India.
Westvaco Corporation, Evadale, USA.
Papierfabrik Hermes GmbH & Cie KG, Hermes, Germany.
Kruger Inc., Corner Brook, Canada.
Kübler u. Niethammer, Kreibstein, Germany.
Metsä-Serla, Kangas, Finland.
Nagoya Pulp Co. Ltd., Nagoya, Japan.
Atlantic Packaging Products Inc., Union, Canada.
Nippon Paper Industries Co. Ltd., Geibo, Japan.
Consolidated Papers Inc., Rapids, USA.
Sora Enso Reisholz GmbH, Reisholz, Germany.
Irving Paper Mill, Irving, Canada.
Tohoku Paper Mfg. Co., Akita, Japan.
Hokuyo Paper Co. Ltd., Nayoro, Japan.
DAIO Paper Corp., Mishima, Japan.
Alberta Newsprint Co. Ltd., Whitecourt, Alberta, USA.
Jinjiang Paper Co. Ltd., Ishinomaki, Japan.
Baceli S.A., Bacell, Brazil.
Aracruz Cellulose S.A., Aracruz, Brazil.
Cartiera Nicoli SRL, Carbonera, Italy.
Munksjö Paper Decor GmbH, Janköpping, Sweden.

Nippon Paper Industries Co. Ltd., Yufutsu, Japan.
West Linn Paper Co. Oregon, USA.
Champion Papel e Celulose Ltda, Mogi Guacu, Brazil.
Inland Empire Paper Company, Millwood, USA.
Inland Container Corp., New Johnsonville, USA.
Willamette Industries Inc., Hawesville, USA.
Khanna Paper Mills, Ltd., Khanna, India.
Torraspapel Montananesa, Montananesa, Spain.
Neusiedler AG, Austria.
Productora de Papeles S.A. Propal, Propal, Venezuela.
Bear Island Paper, Ashland, USA.
Klabin Papéis, Brazil.
Aralar, Spain.
Longview Fibre, USA.
Cartiera die Carbonera S.p.A., Italy.
Nippon Paperboard, Japan.
Frantschach Swiecie Spolka Akcyina, Poland.
LEIPA Georg Leinfelder GmbH, Germany.
Mayr-Melnhof, Kolicevo, Slowenia.
Stora Enso, Imatra Mills, Tainionkoski, Finland.
Mayr-Melnhof Karton GmbH&Co KG, Austria.
Archangelsk Pulp and Paper Mill, Russia.
Tecnokarton J.M. Weig, Mayen, Germany.
SCA de Hoop, Eerbeek, Nederlands.
Melhoramentos, Brazil.

Coating technology
Papelera del Aralar S.A., Spain.
Quena Newsprint Paper Co., Egypt.
Sappi Muskegon, USA.
UPM Kymmene, Kaukas Mill, Lappeenranta, Finland.
Neusiedler AG, Kematen, Austria.
Stora Enso Magazine Paper, Veitsiluoto Mill, Kemi, Finland.
Minfeng Special Paper Co.Ltd., Minfeng, China.
Cartiere Burgo S.p.A., Verzuolo, Italy.
Stora Enso Kabel GmbH, Hagen, Finland.
Torraspapel Sant Joan Les Fonts, Spain.
M-real Hallein AG, Austria.
Sappi Fine Paper, Stanger, South Africa.
Torraspapel Montananesa, Spain.
Stora Enso Uetersen GmbH, Uetersen, Germany.
Papierfabrik August Koehler AG, Kehl, Germany.
Mitsubishi Hi-Tec Paper, Hillegossen, Germany.
Felix Schoeller jr., Weissenborn, Germany.
Sappi Alfeld AG, Alfeld, Germany.
Steinbeis Temming Papier GmbH & Co., Glückstadt, Germany.
Sappi Fine Paper Europe, Lanaken Mill, Belgium.

Winding technology
– Sirius
Oji Paper Co., Ltd., Fuji, Japan.
August Koehler AG, Oberkirch, Kehl, Germany.

– Pope reel winders
Stora Uetersen GmbH, Uetersen, Germany.
SP Newsprint, Newberg, USA.
Minfeng Special Paper Co., Ltd., Minfeng, China.
Roman Bauernfeind Papierfabrik GmbH, Germany.
Quena Newsprint Paper Co., Kairo, Egypt.
Frantschach Swiecie Spolka Akcyina, Poland.
Shandong Rizhao Wood Pulp Co. Ltd., Rizhao, China.
Felix Schoeller Jr. GmbH & Co. KG, Weissenborn, Germany.
Papierfabrik August Koehler AG, Kehl, Germany.
Sappi Alfeld Papier, Alfeld, Germany.
Papeles Cordillera S/A Puente Alto, Chile.

Finishing

Janus-Concept
UPM Kymmene, Tervasaari, Finland.
Madison Alsip, USA.

Ecosoft-Kalander
Mitsubishi Hillegossen, Bielefeld, Germany.
Quena Newsprint Paper Co., Kairo, Egypt.
Visy Paper Tumut, Australia.
Portals Overton, Great Britain.
Maltadecor, Poland.
Linan, China.
Yang An Paper, China.
Century Paper, Pakistan.
Sun Paper, China.
Papierfabrik August Koehler AG, Kehl, Germany.

Calenders
Blue Ridge, USA.
UPM Kymmene, Kaukas, Finland.
Felix Schöller Weissenborn, Germany.
Solikamsk, Russia.
Frantschach Swiecie, Poland.

Supercalender
Ahlstrom La Gère, France.

Twister/Roll Handling
Great Northern Paper, USA.
Bacell, Brazil.
Maul Belser, Nürnberg, Germany.
Sappi Lanaken, Belgium.
Biegelaar & Jansen, Nederlands.
Roto Smeets, Nederlands.
StoraEnso Hagen Kabel, Germany.

Recent large orders

Fiber Systems

Stock preparation systems and sub-systems for graphic papers
Bear Island Paper, Ashland, USA.
Grupo Pulsar, San Juan del Rio, Mexico.
Bowater, Coosa Pines, USA.
Newstech, Coquitlam, Canada.
Bowater, Gatineau, Canada.
Madison Papers, Alsip, USA.
Abitibi-Consolidated, Thorold, Canada.
Mississippi River Corp., Nathcez, USA.
Newstech PA, Northampton, USA.
Shandong Huatai Paper Group, Dong Ying, China.
Stora Enso, Langerbrugge, Belgium.
Jinfeng Spike Paper Products, Chengdu, China.
Zhejiang Jiaxing Minfeng Special Paper, Zhejiang, China.
Mudanjiang Hengfeng Paper Group, Yangming, China.
Felix Schoeller jr., Weissenborn, Germany.
Fedrigoni Cartiere, Arco, Italy.
Myllykoski Paper, Hürth, Germany.
PAPRESA, Spain.
SCA Graphic Laakirchen AG, Laakirchen, Austria.
Steinbeis Temming Papier, Glückstadt, Germany.
Stora Enso, Uetersen, Germany.
Nanping Paper, Fujian, China.
Shixian Paper, Jilin, China.
M-real, Biberist, Switzerland.
Papierfabrik Palm, Neukochen, Germany.
Matussière et Forest, Voreppe, France.
Haindl Parenco, Renkum, Netherlands.
Nordland Papier, Dörpen, Germany.

Stock preparation systems and sub-systems for board and packaging papers
Packaging Corp. of America, Tomahawk, USA.
Inland Paperboard & Packaging, Ontario, USA.
Gaylord Container, Antioch, USA.
Norampac Inc., Mississauga, Canada.
The Newark Group, Fitchburg, USA.
Jefferson Smurfit, Carthage, USA.
Pactiv Corp., Macon, USA.
Wuxi Longchen Paper, Jiangsu, China.
Europa Carton, Hoya, Germany.
Cartitalia, Mesola, Italy.
Papierfabrik Palm, Wörth, Germany.
Technokarton, Mayen, Germany.
Papierfabrik Schoellershammer, Düren, Germany.
P.T. Indah Kiat Pulp and Paper, Serang, Indonesia.
Union Industrial Papelera, La Pobla de Claramunt, Spain.
Hsin Wu Mill, Taiwan.
Propapier, Burg, Germany.

Stock preparation systems and sub-systems for tissue papers
Copamex, San Nicolas de los Garza, Mexico.
Procter & Gamble, Green Bay, USA.

Paper machines

Graphic papers
SCA Graphic Laakirchen A.G., Laakirchen, Austria.
Myllykoski OY, Hürth, Germany.
CNTIC Trading Co. Ltd., Huatai, China.

Board and packaging papers
Shandong Rizhao Wood Pulp Co. Ltd., China.
Lee & Man Paper MFG Co. Ltd., China.
Ibema CIA Brasiliera de Papéis, Brazil.

Tissue
Guitang TM 1+2, China.
Hengan, China.
Copamex, Mexico.

Installations and rebuilds
Kappa Herzberger Papierfabrik GmbH, Herzberg, Germany.
Chuetsu Pulp Ind. C. Ltd., Sendai, Japan.
Myllykoski OY, Alsip, USA.
Nanping Paper Mill, Nanping, China.
MD Papier GmbH, Dachau, Germany.
Zanders Feinpapiere AG, Germany.
Bowater, Catawba, USA.
Papelera Espanola S.A. Renteria, Papresa, Spain.
Ripasa S.A., Celulose e Papel Limeira, SP, Ripasa, Brazil.
Steinbeis Temming Papier GmbH & Co, Glückstadt, Germany.
Copamex S.A. de C.V., Phimsa, Mexico.

Hokuetsu Paper Mills Ltd., Niigata, Japan.
VIPT, Saga, Japan.
Tamil Nadu Newsprint & Papers Ltd., Tamil Nadu, India.
Ripasa S.A., Celulose e Papel Limeira, SP, Ripasa, Brazil.
Champion International Corp., Quinnesec, USA.
Aracruz Cellulose S.A., Aracruz, Brazil.
Zibo Bohui (Paper) Enterprise Co., Shandong, Bohui, China.
Riau Andalan Pulp & Paper, Riau Andalan, Indonesia.
Shandong Rizhao Wood Pulp Co. Ltd., China.
Lee & Man Paper MFG Co. Ltd., China.
Ibema CIA Brasiliera de Papéis, Brazil.
Segezha Pulp and Paper Mill, Russia.
M-real, Äänekoski, Finland.
St. Regis Paper Co. Ltd., New Taplow, United Kingdom.
Kappa Herzberger Papierfabrik GmbH, Germany.
Mayr-Melnhof Karton GmbH&Co KG, Austria.
Schoellershammer Industriepapier GmbH & Co KG, Germany.
Papelera de la Alquería, Spain.
Madeireira, Miguel Forte, Brazil.
Mili, Brazil.

Coating technology
Shandong Chenming Paper, Shouguang, China.
Steinbeis Temming Papier GmbH & Co., Glückstadt, Germany.
Sappi Alfeld AG, Germany.
Sappi Fine Paper Europe, Lanaken Mill, Belgium.
M-real, Äänekski, Finland.
Papelera de la Alqueria, Spain.
Torraspapel, Motril, Spain.
Kübler u. Niethammer, Kriebstein, Germany.
Neu Kaliss Spezialpapiere GmbH, Germany.
Madeireira Miguel Forte, Brazil.
CIA Suzano de Papel e Celulose, Brazil.
Compania Brasileira de Papel, Ibema, Brazil.
Stora Enso North America, Interlake, USA.
Shandong Bohui Industrial Co. Ltd., China.
Cartiera di Toscolano, Italy.
Tamil Nadu Newsprint & Paper Ltd., India.

Winding technology
– Sirius
Shandong Chenming Paper, Shouguang, China.
Myllykoski OY, Alsip, USA.
SCA Graphic Laakirchen A.G., Laakirchen, Austria.
Consolidated Papers Inc., Duluth, USA.
Myllykoski OY, Hürth, Germany.
Bowater, Catawba, USA.
CNTIC Trading Co. Ltd., Huatai, China.

– Pope reel winders
Ripasa S.A., Celulose e Papel Limeira, SP, Ripasa, Brazil.
Papelera Espanola S.A. Renteria, Papresa, Spain.

Finishing

Janus Concept
Bowater Catawba, USA.
SCA Laakirchen, Austria.
Chenming Shouguang, China.

Ecosoft calender
Ibema, Brazil.
Ripasa, Brazil.
Jiteng Hebei, China.
Rheinpapier, Hürth, Germany.
Nanping, China.
Huatai, China.
Miliani, Italy.
Ningxia, China.
Nanping, China.

Calenders
Chenming Shouguang, China.
Jingxing, China.
Procor, Chile.
Bowater Catawba, USA.
Ibema, Brazil.
Lee & Man, China.
Shanying Maanshan, China.

Twister/Roll Handling
Steinbeis Temming, Germany.
Springer, Ahrensburg, Germany.
SCA Laakirchen, Austria.
Huatai, China.

Roll cutting machines
Rizhao, China.
Ripasa, Brazil.

1

The new DIP Line 4 at Steyrermühl – from the first planning meeting to production in only 13 months

The author: Leo Engelmann, Fiber Systems

In May 2000, Steyrermühl AG and Voith Paper Fiber Systems Ravensburg signed a contract for the delivery of a new stock preparation system and the rebuild and extension of the existing DIP line.

Thanks to close co-operation between Steyrermühl AG and Voith Paper, all work for the new DIP Line 4, from the first planning meeting through to production start-up, was accomplished in only 13 months.

Steyrermühl AG

Steyrermühl, in the heart of Austria, situated between Linz and Salzburg at the gateway to the "Salzkammergut" and only a few kilometres away from the picturesque Lake Traunsee, can look back on over 130 years' tradition in paper production. The people of the region have papermaking at heart, the papermaking school in Steyrermühl and the papermaking museum founded in 1993 bear witness to this.

Steyrermühl AG, member of the UPM-Kymmene Group, produces 450,000 t newsprint and magazine papers annually on two paper machines. TMP groundwood, almost exclusively own-production, and DIP are used as raw material. In the direct vicinity, the 100 % affiliated

Fig. 1: EcoCell pre- and post-flotation together with secondary cells in compact design.

Fig. 2: LC screening.

sawmill **Steyrermühl Sägewerks GmbH** produces approx. 300,000 m^3 lumber for the furniture and building industries. Apart from the advantages of central purchasing of wood, the remaining wood offcuts from the sawmill mainly serve as raw material for the TMP plant. A fully biological effluent plant and thermal recycling plant underline the standards Steyrermühl is setting in responsible paper production. Sustainability and environmental protection play a central role in the company strategy.

The Project

The "DIP 2000" project, covering both a new deinking line and rebuild of an existing one, closely follows Steyrermühl AG's ecological and economic philosophy. To maintain paper production during implementation of the project, a separate line (DIP Line 4) was first installed, independently of the existing DIP plant. On start-up of this line, the existing DIP plant, which until that time had been operating without post-flotation, was then rebuilt to reflect the required technical and technological standards (DIP Line 3).

The resulting higher production capacity of approx. 60 %, and the excellent quality of the stock from the new equipment have meant the mill could increase the use of recovered paper for both paper machines.

Reduced use of process chemicals, as well as the best possible removal and recycling of the rejects, help protect the environment. In addition, the water circuits have been adjusted to the new requirements by implementing a mill-wide water management strategy.

The new DIP Line 4 has been designed for 600 t/24 h, based on a furnish of sorted mixed household collection. When the completely rebuilt DIP Line 3 starts up, the additional 130 t/24 h will increase the total mill capacity to approx. 300,000 t deinked stock per year.

The System AP 2000 (Advanced Process) implemented here ensures optimised space and energy requirements. Minimum use of chests between the individual process stages and strategic use of fan pumps provides for stock transport at maximum possible consistencies, thus minimising hydraulic throughput without reducing production throughput.

2

3

Fig. 3: The two DeltaPurge micro-flotation units supplied by Voith Paper's joint venture partner Meri; in the foreground for Loop II, in the background for Loop I.

Scope of delivery

The design of the two plants was jointly defined in detailed discussions with the Steyrermühl project team. The agreed concept was based not only on the latest knowledge and technologies from Voith Paper, but it has also included Steyrermühl's many years' of experience as an operator of deinking systems.

The Voith Paper scope of delivery mainly included the key machines in the process stages that determine finished stock quality, such as:

- Three-stage IC slotted screening with 0.25 mm C-bar® screen basket technology
- Two-stage EcoCell™ pre-flotation including flotation pumps and deaeration cyclones
- Four-stage LC slotted screening with 0.20 mm C-bar screen basket technology
- Dispersion I with EcoTherm™ heating screw
- Two-stage EcoCell post-flotation, including flotation pumps and deaeration cyclones.

Voith's joint venture partner Meri installed two DeltaPurge™ micro-flotation units, a Trenner™ fractionating filter for water purification and Sediphant™ reject handling equipment.

Services

Apart from delivery of the key components for the stock preparation, Steyrermühl also ordered the complete process and control engineering for both lines from Voith Paper. This also included the planning work for chemicals dosage, for the sludge and reject handling sections, as well as for water treatment and the integration of machines from other suppliers.

As in other mills, the Steyrermühl project has again shown that machine delivery and system engineering services from one source greatly reduce the number of interfaces, providing clear advantages in processing the project.

All details were discussed and agreed with the relevant specialists in Steyrermühl, beginning with the flow diagrams. As well as using the experience gained from its own machines and systems, Voith Paper smoothly integrated the data from the outside suppliers into its overall concept philosophy. Design calculations for pumps, pipework, valves, etc., including determining steam, water and air consumption, were the next steps.

All work for the erection and piping of the machines was carried out down to the smallest detail using a 3-D planning system. This ensured virtually error-free erection of the new plant and optimal use of available space. The rebuild of the existing DIP Line 3 was also planned based on this system. Despite restricted building dimensions, solutions were found for ensuring optimal arrangement of pipework routing.

The control and instrumentation engineering played a major role in the success of the project. As with process engineering, the amount of work carried out here was very extensive.

The Voith Paper team's responsibility in Ravensburg included drawing up bid documentation for field instruments, the process control system, installation of control and instrumentation equipment, evaluation of tenders, right through to assistance in technical decision-making. Data taken from Voith's basic and detailed engineering work served as a basis for going out for tenders.

The functional planning, which served as the basis for programming the process control system, was also an important responsibility. Logic diagrams and the depth of detail enabled the DCS supplier to carry out the work virtually free of interpretation errors. Start and stop of process groups through to one-button operation were implemented in the same way, as well as overall production control of the system, using only one setpoint value.

The high degree of automation achieved with these requirements has provided the production personnel with reliable and reproducible operation. Production changes as well as start and stop sequences run smoothly, quality variations in the product are reduced to a minimum.

A subsequent order for analysing water management of the entire paper mill, together with a mill-wide water management plan, was also completed on schedule by the Voith engineering team. Most of the resulting measures have now been implemented and the rest will be undertaken when the DIP Line 3 starts up.

Another facet of Voith's comprehensive service work was to support the customer with experienced erection specialists. Close co-operation with the logistics department in Ravensburg enabled Voith's site erection supervisor to order "just in time" deliveries onto site. As a result, most of the machines could be unloaded from the lorry and placed straight onto the prepared foundations. Time-consuming intermediate transport was thus avoided and the restricted space on site used for prefabrication of pipework.

The Voith commissioning engineers started with the first checks at the end of May 2001. Specialist teams from both companies checked all plant control circuits, from the field to the monitors in the control room. Efficient co-operation between Voith's and Steyrermühl's project teams, together with the customer's own experienced and highly skilled production

Walter Pillwein
Chairman of the Board of Steyrermühl AG.

Ernst Spitzbart
Technical Manager of Steyrermühl AG: "...a very good and successful project, fully meeting our technological requirements".

Leo Engelmann
Project Manager, Voith Paper Fiber Systems.

Herbert Domokosch
Technical Planning, Project Manager, Steyrermühl AG.

Dr. Marko Lesiak
Manager, Fiber Production, Steyrermühl AG.

Heinz Walter
Manager, Purchasing, Steyrermühl AG.

Fig. 4: Chemical preparation.

Fig. 5: Central control room.

4

5

team, secured full operation of DIP Line 4 just five weeks after commencing control and instrumentation checks. On 6th July, the complete plant ran with stock and from 7th July onwards PM 4 was fed with stock from the new DIP Line 4.

To meet the requirements of the new production tonnage, most of the chemical dosage operations had to be re-designed and built. Here, planning and processing also came from one source, allowing the various storage, dissolving and dosage facilities to be put into operation in time before production start-up. From Sunday, 8th July, 2001, the PM 4 newsprint machine has been continuously supplied with deinked stock from the new DIP Line 4. The PM 3 magazine paper machine started receiving stock from DIP Line 4 on 12th July, 2001. After rebuilding the old plant to become DIP Line 3, two recovered paper preparation plants will then be available for both paper machines.

Since start-up of DIP Line 4 the use of chemicals for recovered paper pulping and bleaching has been reduced, and problems with deposits in certain sections of both paper machines have dropped significantly. Right from the beginning, the technological results showed a clear improvement in quality of the finished DIP in terms of stock cleanliness, brightness, strength characteristics and stickies content.

The entire project, from signing the contract through to continuous production, was completed in 60 weeks, an achievement with which all concerned in the project can certainly be more than satisfied.

Fiber Systems e-business –
Spare parts shop and second-hand machines

e-business is the generic term for the generation and processing of business transactions by electronic means, – business we have been doing for a long time, but by using faxes, e-mails, etc. The difference lies simply in the method of communication used. Common to all modern e-business applications is the use of modern internet technologies, ensuring fast and reliable connections around the world. This communication medium opens up new possibilities for customer services.

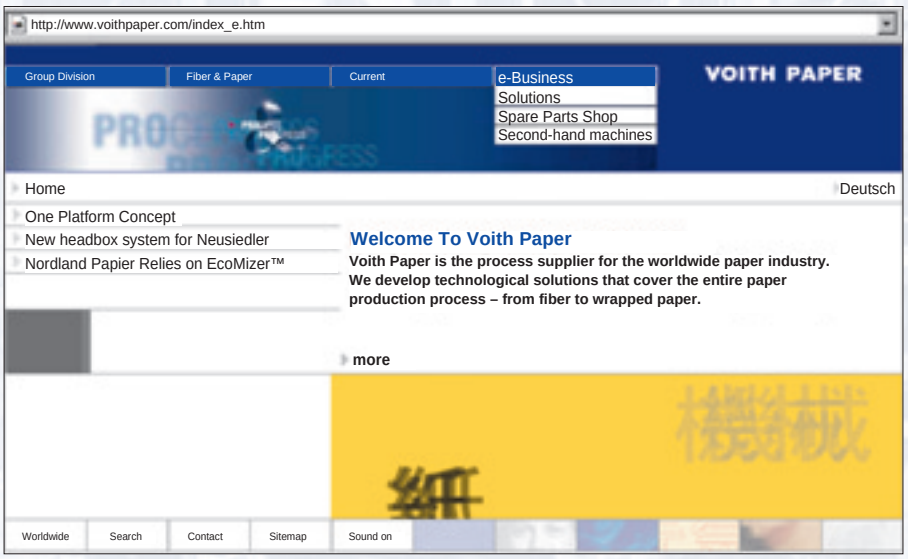
The author: Josef Hund, Fiber Systems

Spare parts availability – a fine line between immediate delivery and costs of stocking

Spare parts availability represents a significant cost factor in the paper industry. On the one hand, immediate availability on site helps reduce downtime, but on the other hand it involves ongoing financial outlay – a balancing act which demands close teamwork between paper mill and machine supplier.

Voith Paper has taken up this challenge. Bearing in mind the large number of machines involved, our Fiber Systems Division has optimised its spare parts logistics so that today more than 25,000 items are stocked for immediate delivery from Ravensburg, Germany and Appleton, USA. In addition, Regional Stockage Centers serve local customers with stocks adjusted to their specific needs.

This concept covers not just the present product range of Voith Paper Fiber Systems but also the former stock preparation products of Voith, Voith Sulzer, Sulzer Papertec, Sulzer-Escher Wyss, Bird, Bird Escher Wyss and Morden. Paper mills can thus optimise their spare parts stocks to suit their individual needs and keep redundant machines to a minimum. From now on this will be even easier, thanks to Voith Paper's internet stock inquiry system.

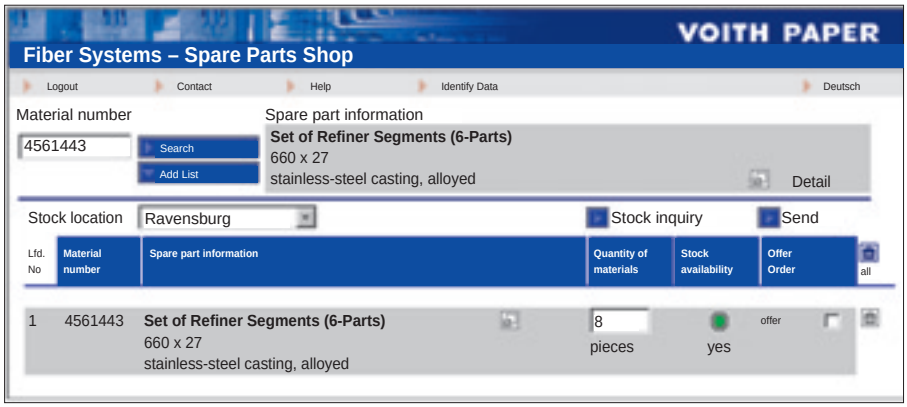


1

Fig. 1: Voith Paper homepage.

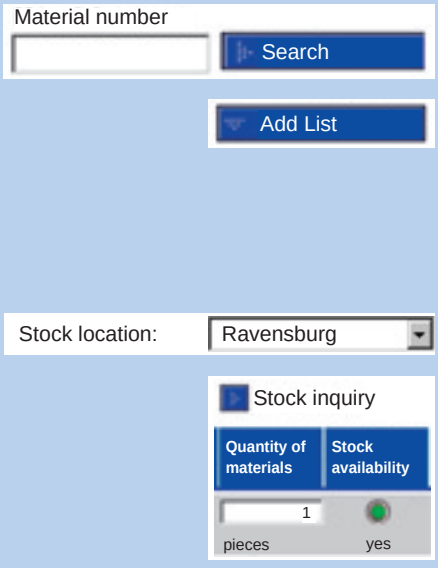
Fig. 2: Extract from the Fiber Systems Spare Parts Shop on the internet.

2



Simplified inquiry procedure:

- *Enter **material number**.*
- *Start search, the spare part description is then displayed.*
- *Add to list.*
- *Enter **quantity** required.*
  This procedure can be repeated as many times as necessary.
  When all required parts have been found and added to the list:
- *Select the required **stock location** where availability should be checked.*
- *Send **inquiry**.*
- *Whether parts and **required quantities** are available at the desired location is then indicated.*



A quotation can now be requested for the parts listed. In the Remarks Field you can also give the responsible person at Voith Paper Fiber Systems further information, such as your required delivery date.

After sending your inquiry you receive an immediate e-mail confirmation of receipt, indicating which parts you have inquired about. A quotation will then be sent to you in the normal way.

The Spare Parts Shop is located on the Voith Paper homepage **www.voithpaper.com** under “e-business”.

Via the new online Spare Parts Shop with shopping basket facility, customers can now check parts availability at Voith Paper Fiber Systems in real time round the clock.

Voith Paper Fiber Systems also offers customised stockholding concepts tailored to individual needs. We support you here with special IT tools, such as for managing consigned stocks.

When you need a second-hand machine – then best of all one generally overhauled by Voith Paper

Voith Paper machines are well-known for their long service life and high performance. However, stock preparation system modifications often free-up individual machines for re-use. Such machines can be bought back by the Fiber Systems Division and in most cases are generally overhauled and upgraded to the latest state of technology.

A newly-created marketplace for second-hand machines is now available, also at **www.voithpaper.com** under “e-business”. Here you can call up the second-hand machine database of the Fiber Systems Division.

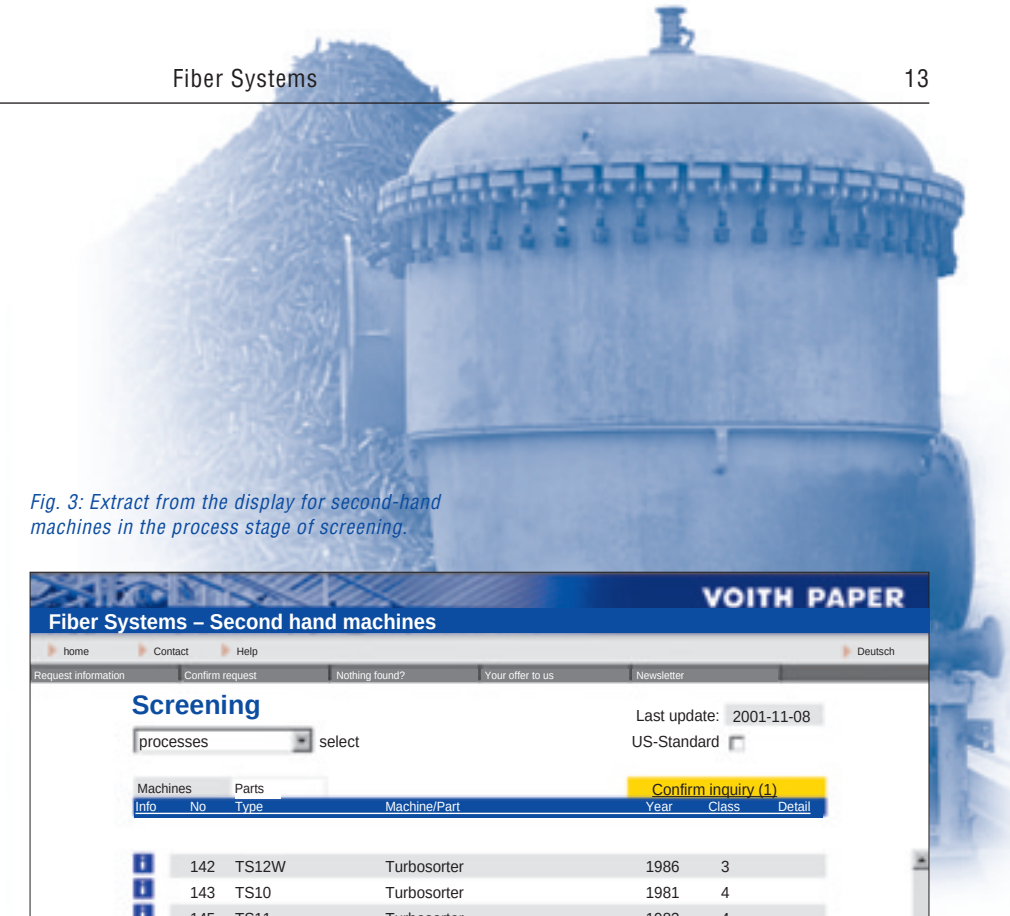
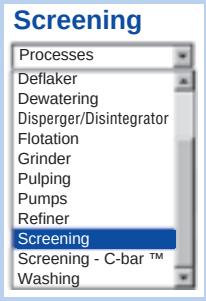


Fig. 3: Extract from the display for second-hand machines in the process stage of screening.

Procedure here in simplified form for screening:



*Process stage selection. All **screening** machines or components are displayed.*

*If you are interested in a machine or component, simply click on "**i**". The item is then placed in an inquiry basket. Any number of items can be placed in it.*

For further details, in some cases with illustrations, click on the camera icon.

Confirm inquiry (1)

*Click "**Confirm inquiry**" to transfer your chosen items to the person responsible at Voith Paper Fiber Systems who will send you the requested information by return e-mail. Before confirming, you can add any remarks or requests in the Remarks Field.*

3

Condition of machines and components

Voith Paper Fiber Systems classifies the condition of the second-hand machines and components according to the following categories:

Class 1: As new, unused
Class 2: Generally overhauled, as new
Class 3: Overhauled and fully functional
Class 4: In need of repair, but fully functional afterwards
Class 5: Old, – substantial repair work required.

In what condition you buy the second-hand machines and/or components is open to negotiation. Machines in need of repair (Class 4 or 5) can be reconditioned to Class 2 or Class 3 in the Fiber Systems Repair Center.

Additional services

If you cannot find what you need in our online shop, or you want to sell an item of our stock preparation, just e-mail the person indicated at Voith Paper Fiber Systems. Please include full details of the component and/or machine.

Future prospects

e-business is a subject much talked about. However, we will soon be using it as readily as we now use phone, fax and e-mail communications.

Visit our internet website **www.voithpaper.com** to get the benefits!

Jürgen Heindl, President of the Prowell Group *(left):*
The plant in Burg was our entry into the production of corrugating medium and testliner. By choosing a competent system partner we wanted to move into the complicated and closely interconnected technology of recovered paper preparation with absolute confidence. Our decision to place our order on Voith Paper, with their leading process technology, comprehensive know-how and references, was the right one.

1

Innovative stock preparation plant at Propapier in Burg, Germany – new dimensions in drum pulping

The author:
Hermann Probst,
Fiber Systems

Propapier GmbH is a subsidiary company of the Prowell Group, with headquarters in Offenbach, Germany. Prowell is one of the leading producers of corrugated board in Europe, with converting operations in Germany, France, and in the near future also in the Czech Republic.

Prowell's business concept is based on the strategic use of new technologies in informatics, production and management, with the objective of securing fast and successful development in the rather traditional industry of corrugated board production.
This strategy is obviously successful thanks to Prowell's optimal Supply Chain Management, i.e. the computer linkage of all business operations, starting with the system supplier, via the paper and corrugated board production, right through to Prowell's customers.

Fig. 1: Jürgen Heindl, President of the Prowell Group, with Karl Turobin-Ort (right), Manager of Sales and Marketing, Voith Paper Fiber Systems. In the background, the TwinDrum pulping drum, on the far right the drum screen.

Propapier GmbH signifies the beginning of the process chain for corrugated board production. With Propapier, Prowell have now made themselves independent of their previous suppliers by building a new high tech paper mill in Burg near Magdeburg, Germany for the production of corrugating medium and testliner.
Construction of the new paper mill began on November 22, 1999. For a greenfield project of this magnitude, the time taken from construction go-ahead to the production of stock, namely approximately 15 months, could well break records.

Propapier is scheduled to produce around 300,000 t p.a. of corrugating medium and testliner on the new machine, using 100 % recovered paper. This production covers most of the demand coming from the four Prowell converting operations in Lille (France), in Landau and Burg (Germany) and from the facility under construction in Pilsen (Czech Republic).

Testliner from 90 to 230 g/m^2 (brand name Proliner) and corrugating medium from 80 to 140 g/m^2 (brand name Promedium) are produced.

The finished stock for the paper machine is supplied by a Voith Paper stock preparation plant incorporating the latest technology.

The stock preparation system was successfully put into operation on 19th February 2001 on schedule, following the check phase begun in January 2001 and subsequent test runs with water. Production capacity is 980 t/24 h, using 100 % recovered paper of the grades B12 (sorted mixed recovered paper) and B19 (recovered packaging material from super-

2

Fig. 2: The EcoMizer heavyweight cleaner system.

markets). In a possible future extension phase, up to a maximum of 20 % post-consumer liquid packaging board may be used.

Voith Paper delivered the majority of the stock preparation process blocks, including the following new products:

TwinDrum™ drum pulping system

The recovered paper is pulped in the new Voith Paper TwinDrum pulping system *(Fig. 1)*, – the first time TwinDrum has been used for this type of raw material.

The complete pulper charging system was supplied by Voith Paper's group company B+G Fördertechnik, Euskirchen, Germany.

At Propapier this new development in drum pulping has a charge capacity of up to 1,100 t/24 h recovered paper. This represents a world record for this kind of pulping technology, and leaves all other drum pulping systems so far built by our competitors far behind. *(For more detailed information, see twogether 9).*

EcoMizer™ heavyweight cleaner system

All cleaner stages in the multi-stage cleaning system have been equipped with the new EcoMizer cleaner, both in the long fiber and short fiber lines *(Fig. 2)*.

Information on the EcoMizer has been given in *twogether 12*. Advantages compared with the previous cleaner type are:

- Reduced number of stages and cleaner units
- Higher removal efficiency
- Reduced fiber losses
- Low pulsation as well as plug-free operation.

EcoDirect™ Dispersion

With the new disperger type installed for the first time in Burg, stock is directly heated in the disperger. This means that the heating screw, normally arranged in front of the disperger for heating the stock, is now no longer required.

Requirements for an innovative stock preparation plant

Trends towards reducing the basis weight of corrugating medium and testliner, together with the increasing speed of paper machines and converting operations, call for a defined level of paper strength and stiffness characteristics. This becomes more and more difficult considering the constantly decreasing quality of the recovered paper grades used.

Two aspects of the mixed recovered paper composition – the amount of inorganic and sticky substances – place particularly high demands on stock preparation systems for high quality corrugating medium and testliner.

In the new corrugating medium and testliner mill in Burg an innovative stock preparation system philosophy has been

Fig. 3: On the left, the first stage in hole screening (MultiSorter), in the middle, the Protector System and far right the second stage in hole screening (Combisorter).

Fig. 4: From left to right: EcoMizer heavyweight cleaner system, MultiScreen slotted screening and MultiSorter hole screening.

put into operation to meet these requirements. A distinguishing feature of the concept supplied by Voith is a clearly higher efficiency in raw material yield and required specific energy consumption, compared with existing plant systems.

The pulping technology used by Voith Paper at the beginning of the process in Burg is an essential factor in achieving this efficiency level.

A distinctive characteristic of the TwinDrum drum pulping system with integral displacement body in the pulper drum itself is its very high pulping efficiency. The flake contents which can be obtained are in the range of only 3 to 4 %. Up to now, specific energy consumption for pulping, subsequent drum screening and high density cleaning is below 20 kWh per air dry ton of recovered paper.

Voith Paper has already used TwinDrum technology elsewhere for pulping post-consumer liquid packaging board. TwinDrum ensures particularly gentle pulping of recovered paper. Contaminants, such as larger pieces of foil, generally maintain their original size and can be removed in the subsequent drum screen, – with virtually no loss of fibers.

Experience from other stock preparation plants with comparable raw materials show time after time that inadequate measures for removing abrasive contaminants and other heavy rejects at the beginning of the stock preparation process lead to wear of, for instance, pumps, pressure screens and cleaners after only a relatively short period of operation.

3

4

Part of this article has been published in Prowell's inhouse magazine "Profil 1/01", author Dr.-Ing. Alf-Mathias Strunz, Fiber Technology Department, Papiertechnische Stiftung, Heidenau, Germany.

Fig. 5: Partial view of the EcoDirect dispersion system.

5

In such cases, higher costs due to an unstable process, additional maintenance measures as well as quality losses cannot be avoided. In the new Voith Paper stock preparation plant, such negative effects are avoided by the combined use of high and low density cleaners (Protector™ System, *Fig. 3*).

Fiber recovery from the rejects of the continuously operating cleaner stages is undertaken by separate sedimentation systems. Here, specifically heavier contaminants are reliably removed from the main stock flow.

As already mentioned, the new generation of EcoMizer cleaners has been installed in Burg for the removal of specifically heavier contaminants.

Another important contribution towards higher fiber yields is provided by the simple screening systems operating with a very low specific energy consumption. These have been installed directly after the TwinDrum and Protector Systems due to the low flake content and good cleanliness levels achieved here. The hole screening system *(Fig. 4)* consists of only two stages, – the MultiSorter™ with a 1.6 mm screen basket hole diameter for the first stage, and in the second stage a Combisorter™ with a 2.0 mm hole diameter in the screen plate and 2.2 mm in the screen basket. The rejects here are almost free of fibers. One can assume that using another pulping technology would require considerably more system equipment to achieve a comparable stock cleanliness.

The next process stage consists of one-stage fractionation with MultiFractors™ using 0.2 mm screen basket slots.

Cleanliness of the short fiber fraction is so high that only a four-stage EcoMizer heavyweight cleaner system is needed ahead of stock thickening and storage.

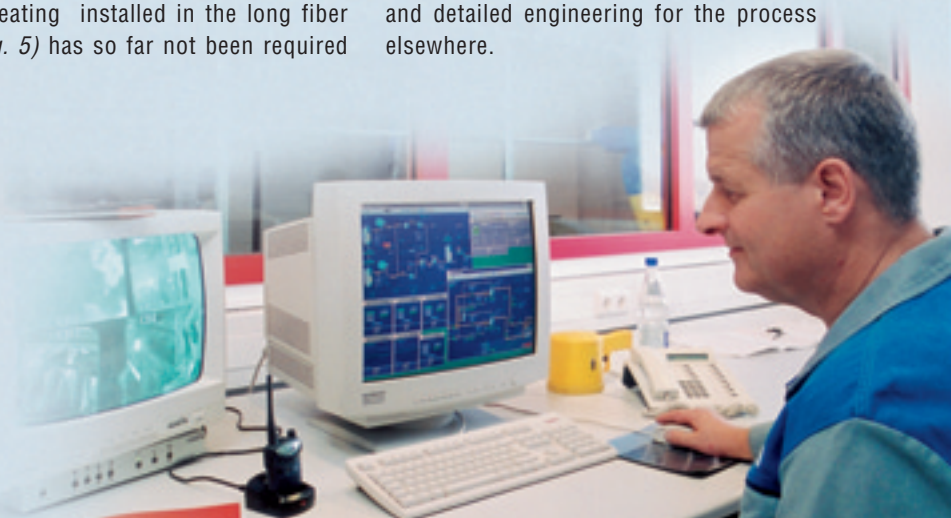
After long fiber fractionation, the heavy rejects are moved in a three-stage EcoMizer cleaner plant. After this, a three-stage MultiScreen™ slotted screening system (0.2 mm slots) operates in the low consistency range for removing stickies and other contaminants.

Since the stock preparation system fully meets the requirements for feeding a high grade finished stock quality to the paper machine, the disperger system with direct heating installed in the long fiber line *(Fig. 5)* has so far not been required for ensuring the necessary quality. However, the system is available for increasing optical homogeneity, dispersing stickies and for reactivating the mechanical strength of the stock, without substantially decreasing CSF, should a deterioration in the quality of the recovered paper used make dispersion essential.

Propapier has selected first class hard- and software components from Voith Paper Fiber Systems, and this has been confirmed by the very good operating experience achieved over the past few months.

Based on excellent cooperation on the Burg project, Voith Paper are pleased to report having since received a further order from Propapier. The new order includes supply of a fiber recovery system, including basis and detailed engineering for both the process and control and instrumentation, as well as basis and detailed engineering (also covering process and control and instrumentation) for extending the existing paper machine cooling system.

For the original overall project in Burg Propapier had placed the complete basis and detailed engineering for the process elsewhere.



International Customer Conference

Voith Paper – Graphic Papers
September 4 to 6, 2002

Science Dialog ▶ PROCESS & PROGRESS

What will the future bring? Where will the market grow, and how will competition develop? Which demands will be made by print and media technology development trends? And what are the most promising solutions to meet these demands?

These questions affect us all, and we would like to discuss them with you for two days of science-based dialogue.

We, therefore, invite you to join us from September 4 to 6 this year at our International Voith Paper – Graphic Papers Customer Symposium in the beautiful city of Salzburg, Austria.

Apart from an outstanding program of interesting papers by our specialists and reputed guest speakers, you will also be able to participate in some unforgettable events and sight-seeing in the Mozart metropolis. This global conference will close with a guided tour of the world's most modern production plant for SCA-plus papers in Laakirchen.

"Process & Progress" – integrated but custom-tailored processing, based on an efficiency-oriented one-platform concept for "Quality tons on the reel" – that is how we are shaping our future supplier and producer in the world of paper.

Some of the topics to be covered at this symposium:

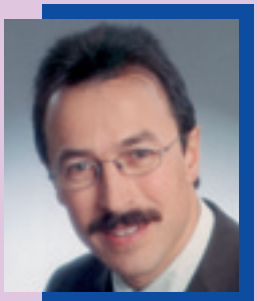
Quality tons on the reel:
The One Platform Concept
- for SC paper and better printability…
- for LWC paper and higher runnability…
- for newsprint and greater cost-effectiveness…
- for fine grade papers and faster operating speeds…
- for special grades and flexible machine concepts…

If you would like to attend this symposium, please fax your name and address to the *twogether* editorial office at ++49 7361 94 98 94. We shall then send you further details.

www.processandprogress.com

Left: Our conference venue: the Mozart metropolis of Salzburg. Top: The congress centre. Below: Trip by historical steam train to Laakirchen.

ULTR@STAR –
the world's biggest production line for wood-free coated papers



The author: Johannes Rimpf, Paper Machines Graphic

"Those who think they are perfect will never reach perfection". In other words, records are there to be broken – which is why sappi Gratkorn GmbH had their ***Triple Star* line rebuilt by Voith Paper. Then on February 3, 2002 they broke their own production record of May 1 on PL 4. In 24 hours, the coating machine turned out 2,735 ton of Magno Matt paper at 150 and 170 g/m². Then, on September 25, 2001, the paper machine broke the world production record at 1,732 ton of the same grades.**

Conception

In mid-2000, sappi Gratkorn decided to increase the capacity of their number 4 production line – so far known as ***Triple Star*** – after establishing that this would be possible with a relatively low investment. The main results of the feasibility study were as follows:

- Capacity increase by 100,000 t.p.a. to 570,000 t.p.a.

1

- Paper machine speed increase to 1,420 m/min
- Coating machine speed increase to 1,650 m/min
- Project completion within eight months
- No reduction in high environmental standards despite productivity increase
- Investment cost not to exceed € 34.8 million.

Fig. 1: PM 11 at sappi Gratkorn GmbH.

Fig. 2: The paper machine output is 1,732 t/24 h.

2

Preparations

After thorough groundwork by the sappi team – market analysis, technical and technological concepts, detailed scheduling and cost/benefit analysis – the project was approved by sappi in Brussels and in Johannesburg. It took several preparatory meetings and marathon negotiations lasting 21 hours before this rebuild contract was finally closed. Toward 5 am on October 12, 2000, the order was awarded by handshake to Voith Paper Heidenheim. These were the longest ongoing negotiations ever held by Klaus-Dieter Merzeder (Manager Technology and Engineering sappi Gratkorn) in his nearly 30 years of worldwide project experience.

Realization

Voith Paper implemented the sappi concept goals as follows:

- Improved screening: new screens in the ModuleJet™ line and rebuild of three existing screens
- Shortening the web draw after the third and fourth press
- Deckle adjustment on the double suction press roll
- Steam pressure increase to 6 bar in the predryer section
- Larger air squeezer roll on the coating machine
- Modification of the coating machine reel
- Coating machine unwind system cycle time shortened
- Basic engineering for the extension of all IR systems
- Complete installation and commissioning of all of the above.

sappi also took the following measures:

- Installation of a steambox in the press section
- Higher IR drying capacity after the

online coaters and in the coating machine.

In conjunction with the productivity increase, the printability of the end product was optimized. The DuoFormer™ CFD was converted into a DuoFormer™ TQm in order to attain the quality of first-class hybrid formers.

Rebuild

Only sixteen days of shut down time were available for the rebuild from March 12 to 28, 2001. With detailed network planning and pro-active time management, all possible preparations were made before the shutdown. Nevertheless, additional maintenance and modification work still had to be fitted into the available shutdown time. Thanks to meticulous planning, the entire rebuild was carried out with optimal efficiency. Due to outstanding teamwork among all parties involved (with up to 520 people on-site in peak phases), the rebuild was completed one half day earlier than planned. “Paper on reel!” was celebrated on March 27 at 22.20.

Picturebook startup

Saleable paper was produced, right from the first reel, with 97.6% production time efficiency over the first full operating day. Printability was further improved after only a few days. The world production record has already been broken twice, thus confirming the outstanding rebuild performance.

Tribute is due to Manfred Tiefengruber, production manager line 4 and his entire team. Manfred Tiefengruber maintains the production and maintenance team at a very high training level. Together with Hermann Waltl, Karl Weber and Hans Zettl, Manfred Tiefengruber won the “sappi technical innovation award 2000” in Europe for the Eco-change W development work carried out together with Voith Paper Heidenheim.

The editorial staff of Voith’s *twogether* magazine extends hearty congratulations on this great honor!

Work safety

Accident prevention and significant work safety improvement were already set as overall project planning goals, and were reached as follows:

- A new access control system applying to every single person on site
- Comprehensive safety training for all project personnel

Fig. 3: The coating machine produces 2,735 t/24 h of Magno Matt grades at 150 and 170 g/m².

Fig. 4: K. Merzeder (left), Dr. D. Radner and M. Tiefengruber in front of the rebuilt PM.

4

- Personal safety equipment to be worn at all times
- Work discipline and safety awareness.

The results of these high work safety standards are shown by a DIFR factor (differential incident frequency rate) computed from the number of incidents resulting in at least one missing day x 200,000 hours, divided by the number of hours actually worked in the period concerned. During 168,000 working hours from October 2000 to March 2001, three slight accidents occurred. This corresponds to a DIFR factor of 3.57, compared to 3.07 at Gratkorn for the year 2000 as a whole. For a project such as ULTR@STAR, a much higher DIFR factor would have been expected.

Quality

Dimensioning capacity was fully attained. The paper machine is still 7% below and the coating machine 3% below design speed. Raster mottling has now stabilized at the targeted printability quality level. Retention lies between 45 and 55%. With a 2 sigma basis weight cross-profile of <0.25 % rel. CD, <0.5 % rel. MD and <0.9 % rel. random variation, the parameters meet expectations.

Project goals

All project goals were achieved: rebuild measures, deadline compliance, work safety and investment costs. In the opinion of our customer sappi Gratkorn GmbH, the main reasons for the success of this ULTR@STAR project were as follows:

- Highly motivated and committed people
- Outstanding teamwork
- Highly competent partner companies
- Joint target-setting.

Voith Paper was clearly the right choice for sappi.

Klabin Piracicaba –
EcoTech: a new concept proves its worth

The author:
Jair Padovani,
Voith Paper São Paulo

With South America's steeply rising paper consumption, particularly in Brazil, the amount of recovered paper available for recycling purposes has greatly increased. Since the paper industry there cannot afford the heavy investments required, Voith Paper has developed a machine concept specially tailored to this market situation.

The new EcoTech papermaking concept (optimally combining economy with technology) was developed by Voith Paper São Paulo for small paper mills. Using well-proven Voith Paper technologies, it minimizes investment costs for high-output production of first class paper from secondary fibres, thus ensuring optimal cost-effectiveness. The resultant production costs are extremely competitive, with very low investment costs per tonne of paper.

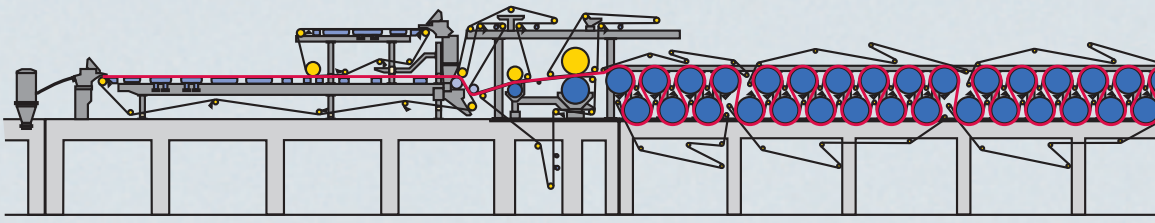


Fig. 1: The new PM 2.

Fig. 2: PM 2 layout.

1

Klabin Fabricadora de Papel e Celulose S.A., *founded more than a century ago, has always been one of the most innovative pioneers in the South American pulp and paper industry. Apart from pulp and paper production, Klabin also manufactures corrugated board, paper bags, envelopes, sanitary articles, liquid packagings and deep-frozen food cartons. This company pays particular attention to reforestation projects.*

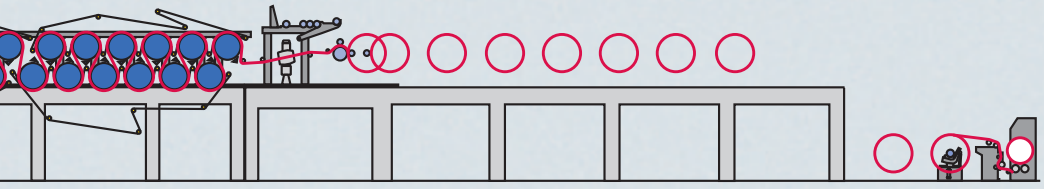
Klabin has twenty production sites with offices and mills. In some market segments Klabin has set up joint ventures with reputed international companies, for example in the sanitary paper sector with Kimberly-Clark in the USA, and in the newsprint segment with Norske Skog of Norway.

In teamwork with Klabin Brazil, the first Voith EcoTech concept has been realized at Piracicaba. Klabin is South America's biggest paper producer, but so far it only had a machine with a daily output of 65 tonnes in this mill.

This joint effort by Klabin Piracicaba and Voith Paper – to establish the cost-effective production of high quality paper at lowest possible investment and operating costs – was crowned with success in January 1999, when the first EcoTech line (PM 2) was commissioned.

250 t per day of liner and corrugating medium is produced here at 600 m/min within a basis weight range of 100-210 g/m^2, for a cut sheet width of 2,500 mm. The very first roll of paper was fully up to production standards, thus meeting the high expectations of this EcoTech line. The use of recycled paper as furnish has also been justified completely.

With an optimal start-up curve, guaranteed output was attained only three months after commissioning. By January



2

Hélio Biagio
Mill Manager,
Klabin KPO

"We are very satisfied with the performance of our PM 2. Thanks to Voith Paper's consolidated technology and Brazilian team, product quality and output fully comply with our expectations."

3

Fig. 3: Klabin Fabricadora de Papel e Celulose S.A.

2001, after two years of operation, the production guarantee was exceeded by more than 20 % with an output of 305 t per day at 140 g/m^2.

Thanks to excellent operating experience with this first Voith EcoTech line, the concept has now been adopted as a standard. In the future, less and less design effort will be required, manufacturing will be simplified still further, and erection procedures improved. It goes without saying that the EcoTech concept has, therefore, raised great interest in the market.

The Klabin success story and the expected 4% p.a. increase in corrugated board consumption have led to further orders for such machines (including a good many new ones) from customers who, although willing to invest in new technology, were previously put off by the high costs and relatively low value-added. Judging by the large number of inquiries received, this market segment has enormous growth potential.

The EcoTech concept: Economy through technology

The former section of Voith's EcoTech paper machines for Klabin includes a primary and secondary fourdrinier, each of which has a hydraulic headbox with pulsation damper.

The press section incorporates two double-felted high performance straight through presses with nip loads of 110 and 350 kN/m, respectively. Not only does the high final dry content attained save energy in the dryer section, but the paper density and strength are also increased. For the type of product manufactured by Klabin, this can be used to attain low basis weights and resultant furnish savings.

The dryer section cylinders are designed for an operating pressure of 10 bar.

The reel is equipped with automatic reel spool loading.

The winder attains operating speeds up to 2,000 m/min.

This *modular system* also enables modernization by stages.

Further savings are attained by optimal use of the recycled paper furnish from the *stock preparation line* to produce testliner and white top grades.

1

Inland Empire's recovery project – Millwood PM 5

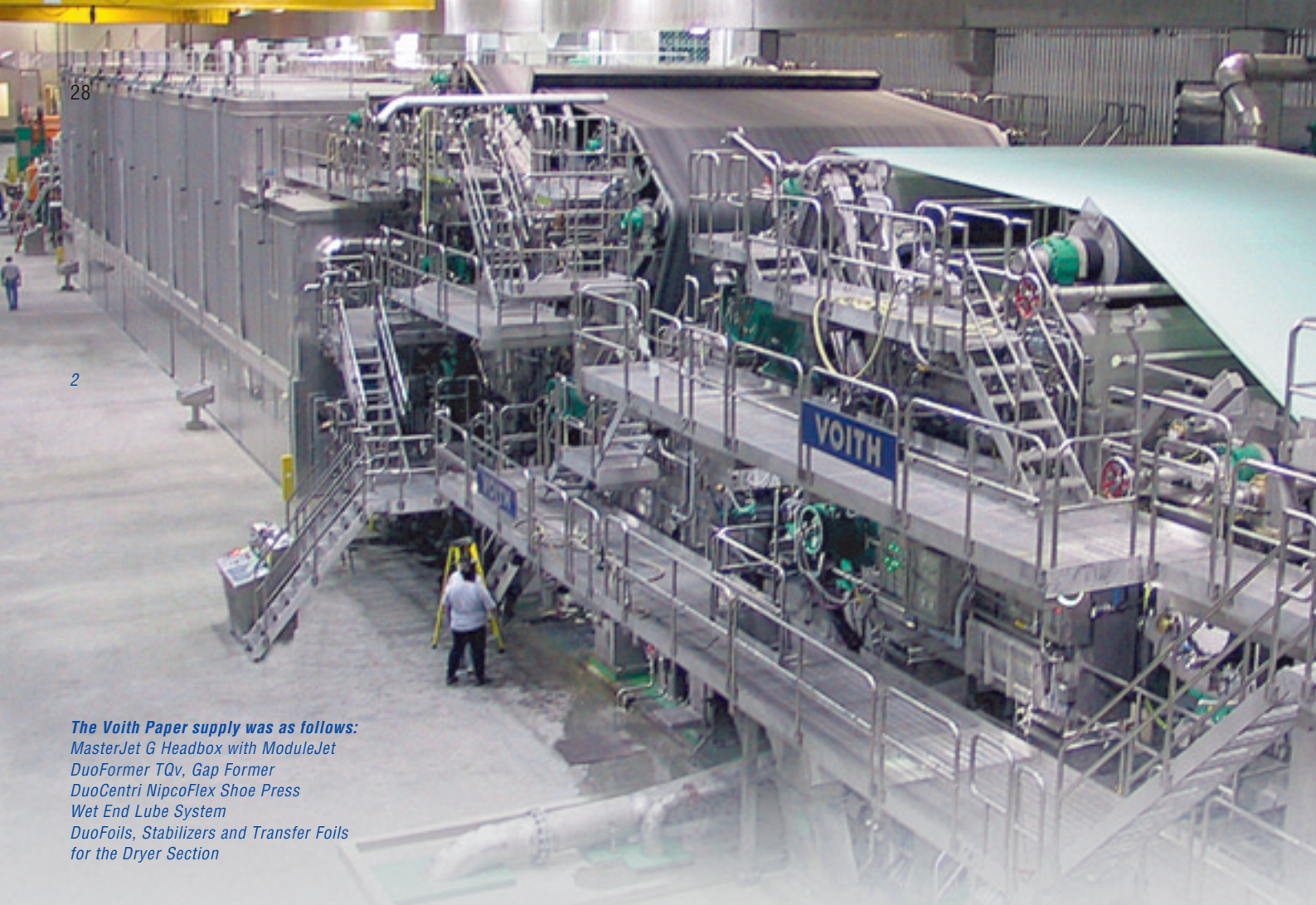
The author: Gareth Jones, Voith Paper Appleton

Inland Empire Paper Company is unusual. Founded early in the last century, it has produced newsprint in Millwood (Spokane), Washington state continuously since 1911. The company is owned by the Cowles family, who also own and publish the local newspaper, the Spokesman Review. They are, therefore, one of their own customers.

For many years the mill has run just one machine, PM 2, using a mixture of virgin pulp and recovered paper as furnish. The machine was rebuilt at various times. The last rebuild included a soft calender, making Inland Empire a pioneer of this technology for newsprint in North America. They were also one of the first mills to try the Hydranip in the drying section.

In 1997, Inland Empire decided that a new, state-of-the-art newsprint machine was necessary for them to be able to produce the sheet quality required by an ever more demanding market. They also decided to increase production from 250 to 500 tons per day. The competition for their new machine was fierce, but despite admitting to being impressed by Voith Paper's wet end technology, in a close decision they awarded the machine and winder to Beloit in December 1997. This was not to be a fast-track project, with startup planned for January 2001.

In early 2000, Beloit went bankrupt. Inland Empire had by then received some stock preparation equipment and the complete dry end of the paper machine, including the winder. Nothing of the wet end had yet been received, although the wet end foundations and other civil work were almost complete, designed and prepared for the Beloit wet end. Discussions were quickly held, and Voith Paper was challenged with the fast delivery of a new wet end that would fit, as close as possible, the already existing civil work. Technical and commercial details were agreed upon in March, and Voith Paper received an order in April.



2

The Voith Paper supply was as follows:
MasterJet G Headbox with ModuleJet
DuoFormer TQv, Gap Former
DuoCentri NipcoFlex Shoe Press
Wet End Lube System
DuoFoils, Stabilizers and Transfer Foils for the Dryer Section

Voith Paper's design and manufacturing people in Appleton and Heidenheim worked very quickly to produce the machinery. Careful choice and engineering of equipment options ensured that the civil alterations necessary on site were minimal. Drive points and tie-down points were nearly all maintained, enabling economy of cost and time.

The lean Inland Empire project team, admirably led by Bob Sallee, worked with the Voith Paper team led by Project Manager Richard Toth. Together they accelerated the project progress so well, that even with Voith Paper's normal, detailed pre-erection in Appleton, WI, major deliveries started in November and were complete by February 2001. Plant Engineer Ed Orr and his team, assisted by Voith Paper's erection supervision group, installed the equipment quickly and precisely, enabling commissioning to begin in early March.

Stock was fed to the wet end on April 9th and Inland Empire's startup team, Voith Paper's startup engineers and, of course, the wet end equipment worked so well that a sheet went into the press pulper the same day. The first paper reached the reel on April 14th and the project team was able to celebrate a remarkable achievement. Paper was on the reel 12 months after order, and only three months later than the original plan, despite the bankruptcy of the original main supplier!

Kevin Rasler, Production Manager, said *"After three years of planning and preparing, and then working through the challenges created by the default of the original supplier, to have this machine come up and run this well was a tremendous reward for all our employees. Initial paper quality was superior to the old machine even before we began optimizing, and customer response has been overwhelmingly positive. The delay in completing the project ended up being relatively minor and the silver lining... we consider the Voith equipment to be the first major upgrade to our new machine."*

This project is an example of what can be achieved when each team member concentrates on their own tasks and leaves the other members to concentrate on theirs, without undue interference or bureaucracy. The Inland Empire team contributed greatly to this. Meetings were kept to a minimum and were focused and effective, with decisions made quickly. The fact that the overall team was small helped enormously.

Paper quality has been impressive since startup. Profiles in all three directions are excellent. The pressrooms are already unanimous in their approval of the sheet, which runs very well on their presses. Optimization will, nevertheless, continue

Fig. 1: Inland Empire in Millwood (Spokane) in the state Washington/USA.

Fig. 2: Rebuild PM 5.

Fig. 3: The team at the first reel after the successful rebuild.

Fig. 4: Bob Sallee, Director (left) and Ed Orr, Plant Engineering and Maintenance Manager.

Main Data:
Design Grade Standard Newsprint
Furnish 40-50% TMP, 10-25% RMP, 25-40% Deinked ONP

Products:
Standard Newsprint
Improved Newsprint
Directory (SC Grades in Future)

Basis Weight Range 22.1-38 lb/3,000 sq. ft. (46-62 g/m²)
Maximum Operating Speed 5,000 fpm (1,524 m/min)
Wire Width 250.8 in. (6,370 mm)
Sheet Width on Reel 227 in. (5,766 mm)

3

as Inland Empire drives towards its objective of the best newsprint sheet in North America.

Runnability has also been excellent on the paper machine. Startup speed was 3,500 fpm, and good runnability was obtained the first week. Runnability has remained good as the speed is gradually increased, and the operating people happily expect a better than average machine efficiency even when the eventual production speed of 5,000 fpm is reached. Paper machine superintendent **Kevin Davis** commented, *"We ended up with the machine components we wanted originally. The machine is a clean running machine and has shown great potential to operate very efficiently. I am very excited about what we can achieve with paper machine 5".*

Bob Sallee, for many years Director of Special Projects at Inland Empire, and **Ed Orr**, longtime Plant Engineering and Maintenance Manager, had reached the end of their careers when the PM 5 project started. Both agreed to stay to complete the project. There can be no better testimonial to the quality of their professional capacities than the extraordinary success of this project. Both retired soon after startup, but what a way to go! For the Voith Paper team, it was a pleasure and a privilege to work with them, and we wish each of them a happy, fulfilling and lengthy retirement.

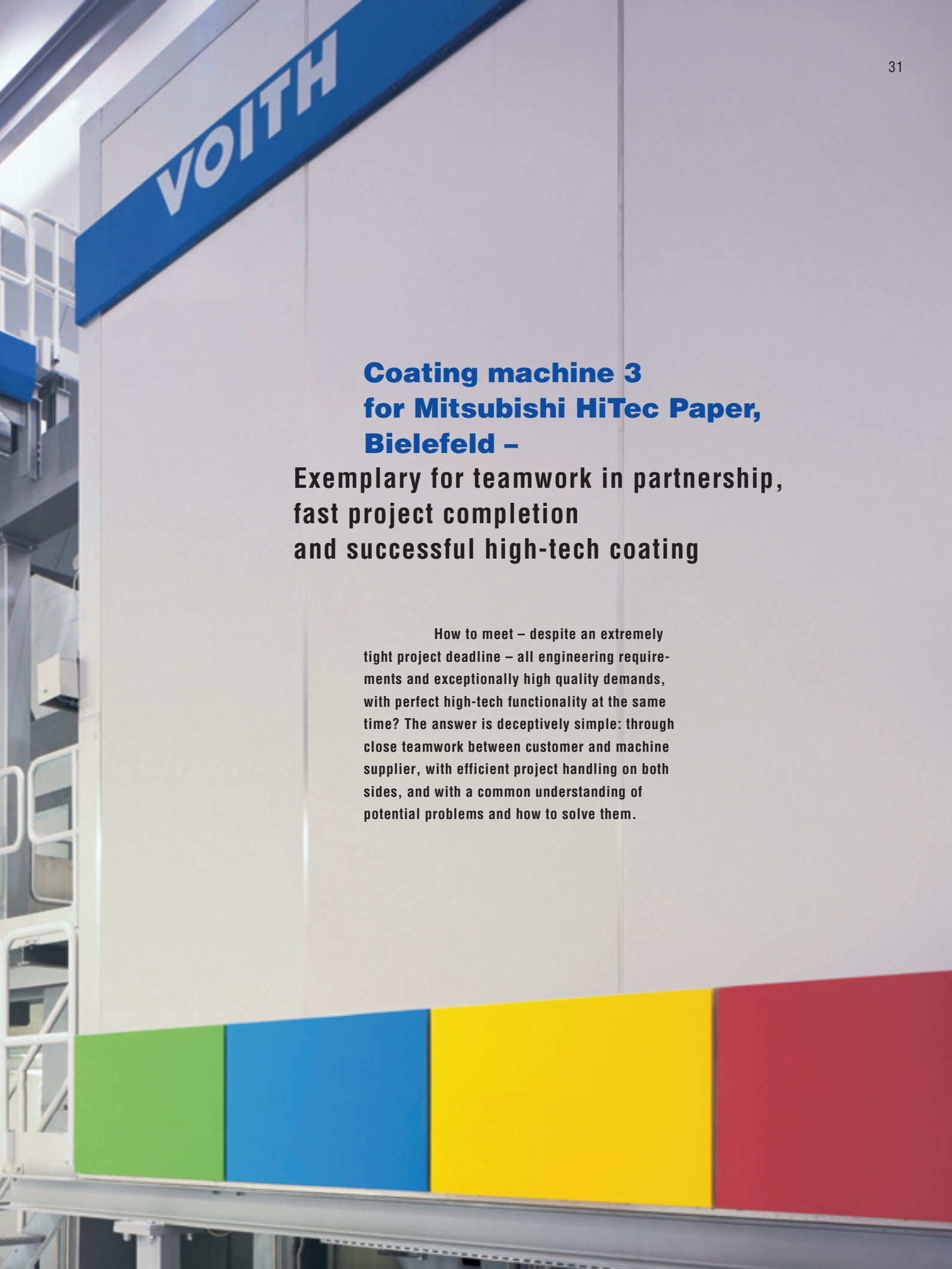
4

Wayne Andresen, President and General Manager of Inland Empire, who oversaw the whole process, deserves the last word. *"For a company of Inland Empire Paper Company's size, a project of this magnitude was a huge undertaking, especially when you consider that it was done primarily with in-house personnel. I am very proud of our people and the job they did. However, we could not have been successful without the tremendous effort by our outside contractors, especially Voith Paper who helped us through a very critical stage of this project's life. With the state-of-the-art paper machine that we now have, along with our outstanding customer service, Inland Empire Paper Company is well prepared to meet the future".*

As the proud owners of the most technologically advanced newsprint machine in North America, Inland Empire Paper Company is indeed *"well prepared to meet the future".*

The author: Klaus Schmidt, Paper Machines Graphic

1

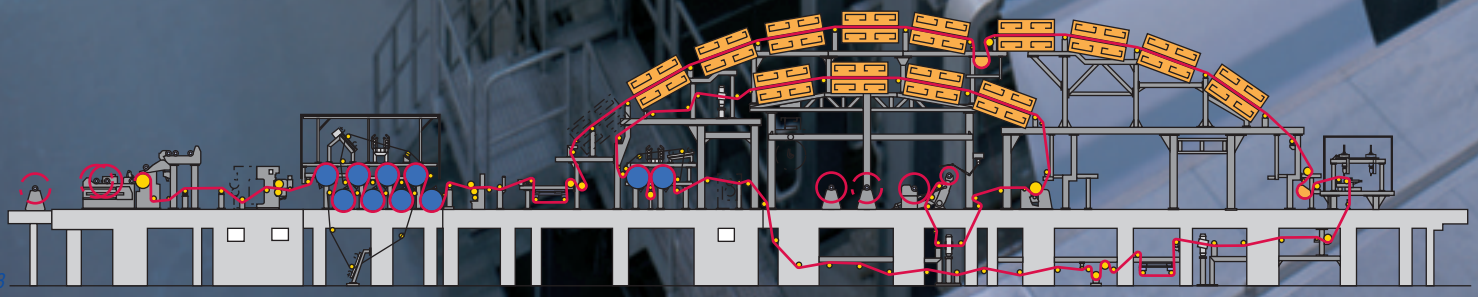


Coating machine 3 for Mitsubishi HiTec Paper, Bielefeld –

Exemplary for teamwork in partnership, fast project completion and successful high-tech coating

How to meet – despite an extremely tight project deadline – all engineering requirements and exceptionally high quality demands, with perfect high-tech functionality at the same time? The answer is deceptively simple: through close teamwork between customer and machine supplier, with efficient project handling on both sides, and with a common understanding of potential problems and how to solve them.

2



3

4

Figs. 1 and 2: Coating machine 3 Mitsubishi HiTec Paper, Bielefeld.

Fig. 3: Schematic layout of coating machine 3.

Fig. 4: Dynamic Coater.

Fig. 5: End section with EcoSoft calender and Sirius reel.

This applied precisely to the project handling – and above all the results, start-up and product quality – of the new coating machine 3 for our customer Mitsubishi HiTec Paper, Bielefeld-Hillegossen. From the beginning, both teams completely agreed that the goals were demanding, but not unattainable, if special approaches were adopted. These included starting with the engineering work very shortly after project commencement. At the same time, the technical concept of the entire machine was finalized. Its main features are as follows:

- The offline coating machine is designed for the final expansion phase, i.e. production of all technical communication papers with multiple and reverse surface coating. This requires a broad basis weight and coating density spectrum, a working width of 2,900 mm and a design speed of 1,500 m/min.
- For the start-up with thermo paper, presizing is done by Dynamic Coater with blade, and the surface layer by DF coater (curtain coater).

5

According to this concept, the air drying stretch after the modified curtain coater takes into account of the maximum admissible web temperatures for thermosensitive coatings. A polygonal arrangement was chosen, with additional airturn to ensure a stable web run.

A softnip calender precedes the Sirius reel with Senso Roll for high-sensitivity

6

Fig. 6: Sirius reeler with SensoRoll.

Fig. 7: The project team.

nip adjustment and optimal wind-up. To enable precise quality optimization and continuous control, corresponding systems are installed for the humidity and coating density control.

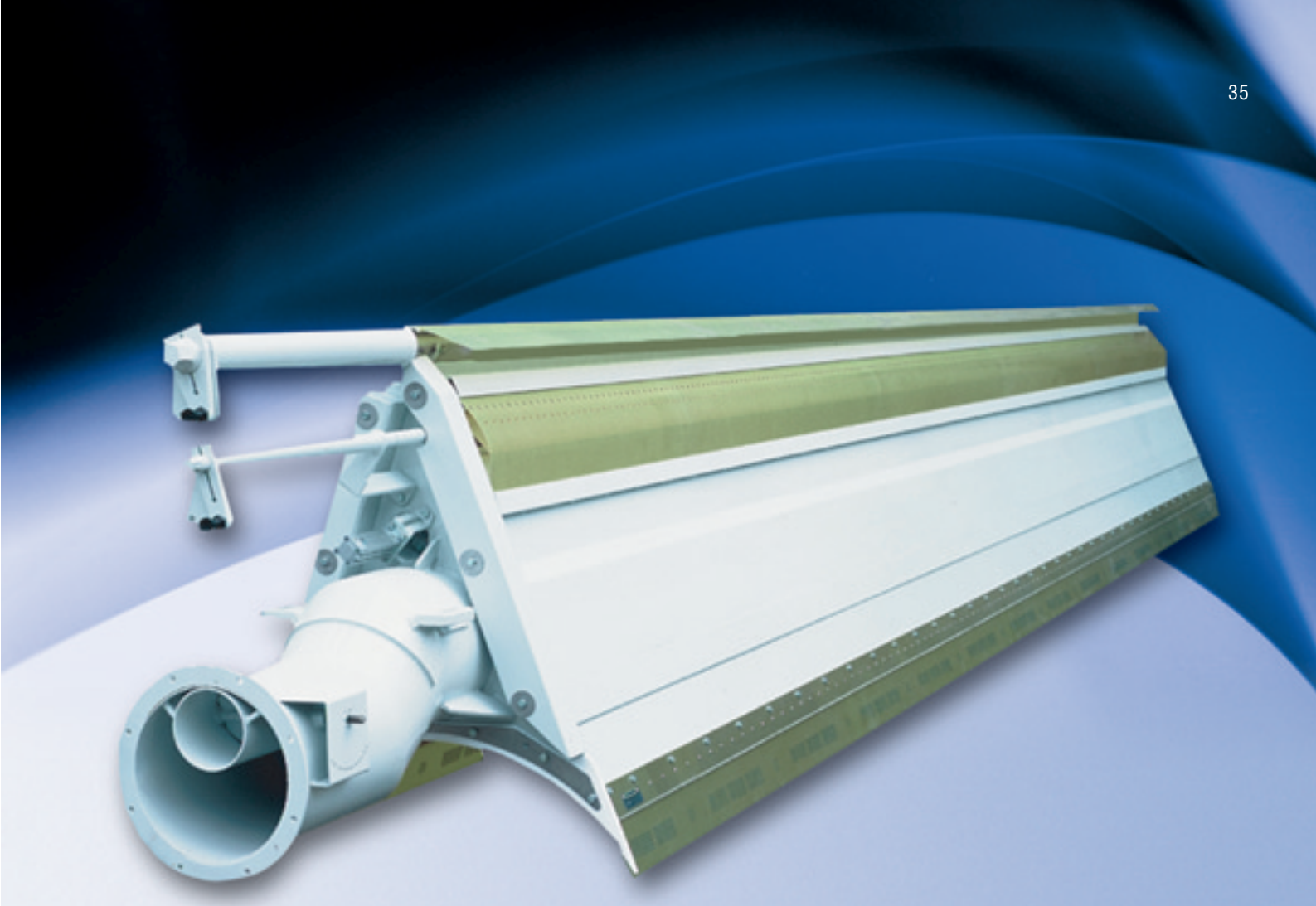
The scope of supply also included peripheral systems, such as central lubrication and machine air supplies, as well as machine building ventilation systems and extensive services. The latter covered the entire machine engineering, process control systems, complete installation and commissioning, and comprehensive training of the customer's operating team.

No problems or delays occurred either in the planning and design phase or during erection. The extremely tight commissioning deadline was met, but only thanks to exceptional efforts on the civil engineering side. Our customer's equally outstanding project organization ensured the perfect coordination of all activities as well.

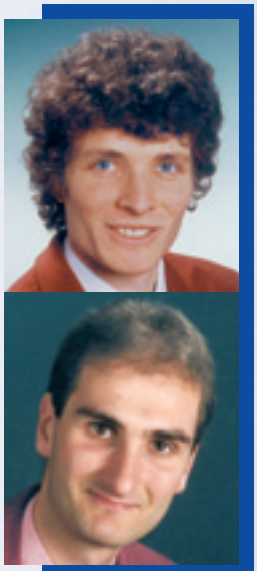
On October 15, 2001, the first thermo paper of saleable quality was produced immediately after start-up of the machine. Just 2 weeks later, a production speed of 1,300 m/min was reached, while achieving 90 % runnability in production.

Dieter Baumgarten, Profit center manager "large rolls"

Dieter Baumgarten, profit center manager "large rolls" at Mitsubishi HiTec Paper, expressed his appreciation of this successful teamwork as follows: *"I tender my sincere thanks to Voith Paper for their outstanding performance. The new coating machine started up right on time, and produced saleable paper on the first day of operation, October 15, 2001. The planned operating speed of 1,250 m/min was easily attained, already reaching a maximum speed of 1,300 m/min. Product quality is at a very high level, significantly improving over that of our competitors. No problems at all have been experienced with the DynamicCoater and the modified Curtain Coater units. Voith Paper sent an excellent team to Bielefeld, and we were very happy with them."*



ProRelease – gentle web run



The authors:
Roland Mayer,
Uwe Joos,
Paper Machines Graphic

Since its introduction, the single-tier dryer section – equipped with DuoStabilizers and ropeless tale threading technology – has proven extremely successful. The complete single-tier TopDuoRun is now the preferred dryer section configuration, especially for high-speed paper machines and lightweight paper grades. Furthermore, in combination with double-tier dryer groups – the CombiDuoRun – for heavy grades and at somewhat lower speeds, it permits high runnability through stable web run and reliable, fast tail transfer.

The newly developed and already successfully installed ProRelease Stabilizer now offers further optimization potential in the particularly sensitive area of the first dryer groups by reducing the required tension of the still wet and weak paper web during detachment from the dryer.

Web release at the dryer

The detachment, or release, of a paper web from a plain dryer surface is affected by a number of forces. *Fig. 1* shows schematically the main forces that occur at that release point. Because there is a lack of ventilation to the opening nip, which has to act against the running of the cylinder and the web, a negative nip force is created, which holds the paper on the dryer surface. In addition there are centrifugal forces, which have no loading effect while the web is in contact with the dryer, but act after detachment due to the sharp deflection of the web.

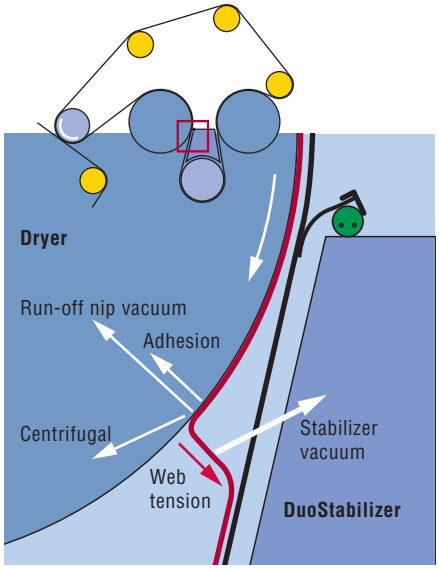
Adhesion forces also apply, which are dependent on temperature. These forces must be overcome by increasing tension in the paper web, preventing the web

Fig. 1: Forces during web detachment from a plain dryer.

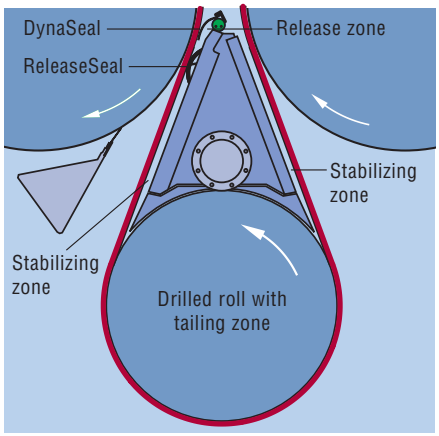
Fig. 2: Schematic arrangement of the ProRelease Stabilizer.

Fig. 3: Tension reduction and speed increase by the installation of a ProRelease Stabilizer on Eltmann PM 3.
Newsprint, 45 g/m², 100 % DIP
◆ *Before rebuild*
◆ *After rebuild*

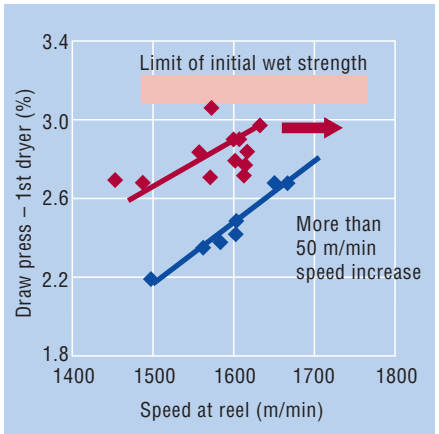
1



2



3



from following the dryer away from the separation point. Insufficient tension will result in web wrinkles or sheet breaks. This tension is built up by differential speeds, or draws, between the drive groups. The maximum possible web tension is limited by the initial wet strength of the paper.

With increased production speeds, the forces on the web increase. At the same time, the web must continue to be picked up reliably and trouble-free regardless of small fluctuations during production or after felt changes in the press section. The operating window available between the minimum necessary web tension for good web running and the initial wet strength, therefore, diminishes and, in many cases, limits the production speed. Vacua introduced by web stabilizers can relieve the effect of the forces on the paper web, allowing for reduced tension.

Mode of operation of the new stabilizer

To improve the situation, the web should be fixed on the fabric as close to the release point as possible and the forces holding the web to the dryer should be countered by increased stabilizer vacuum. To avoid negative effects due to increased air leakage or intense fabric deflection, the increased vacuum must be limited to the pick-up area.

The new ProRelease Stabilizer *(Fig. 2)* optimally meets these demands, while still drawing on the proven advantages of the DuoStabilizer. The release zone offers a high vacuum targeted in the pick-up area with a reliable and non-contacting seal against the stabilizing zone. The stabilizing zone continues to work at a low vacuum level, which is sufficient to hold the web fixed on the fabric even at a high production speed. The drilled roll continues to be subjected to suction by the stabilizer. The vacuum in the release zone and that in the stabilizer can be adjusted and optimized independently from each other.

Successful in operation

Following extensive trials on our pilot paper machine, the first ProRelease Stabilizer was put into operation at the end of August 2001, on Palm Papier Eltmann PM 3 (newsprint, 100% DIP). Despite starting with four new press felts, a speed increase of over 50 m/min was reached immediately *(Fig. 3)*. At the same time, the web run in the first dryer groups became less sensitive to fluctuations in the moisture profile or to minor disturbances in the edge areas, which led to smoother running and fewer sheet breaks.

Also, the installation of four ProRelease Stabilizers in October 2001 in the first two dryer groups of PM 2 at Soporcel, Portugal (copy paper, 80% eucalyptus) was very successful. The reduction in draw of 0.4% achieved after the press, combined with the more gentle web pick-up and the improved web run in the press due to the installation of a transfer belt, increased the speed over 100 m/min, bringing the machine up to world record level.

Fig. 3 shows how the increase of the ProRelease vacuum on PM 3 in Eltmann

positively affects the required tension after the press. At a negative pressure of 800-1000 Pa (standard ProRelease operating range), the tension can be reduced by 0.5% *(Fig. 4)*. The maximum negative pressure reached was even higher, at 1300 Pa. On the pilot paper machine, the effect was successfully tested for numerous stocks and paper grades *(Fig. 5)*. To the extent that the initial wet strength allowed, trials were run up to 2,000 m/min. This impressively demonstrated the stabilizer's abilities, particularly that of the seal, even for maximum production speeds.

The greatest effect occurs on paper machines with a tandem NipcoFlex™ shoe press or other presses without a center roll. Here the paper web does not need to be pulled off a smooth press roll. The improvement of the web run at the first dryers can, therefore, be fully utilized. To achieve the maximum potential, three to six ProRelease Stabilizers are necessary, making a 0.4% to 0.7% reduction in draw possible.

On machines with a center roll and possibly a fourth press, the ProRelease Stabilizers can also provide some runnability enhancement. However, in this case the improvement potential is somewhat less, as the tension required to detach the web from the press roll is not directly influenced, but only the percentage of tension that is required for a good web run in the first dryer groups is reduced.

Proven functionality and reliability

The heart of the stabilizer is the cross-machine sealing. Both the well-known DynaSeal at the top of the stabilizer and the new ReleaseSeal, work with an air gap and without contact during operation and, therefore, do not cause any wear on the dryer fabric. Nevertheless, they seal very effectively and permit, through the adjustability of the pre-tensioning and the distance, optimal sealing even at maximum speeds and high negative pressures. Both seals are flexible and can give way when paper wads or broke come with the fabric.

These innovative seals provide a much more energy efficient alternative to machine wide air knives, since the consumption of supply air is minimized. Through the flexibility of the seals, the distance between the wire and the fixed elements of the stabilizer can be large enough that fabrics can be pulled on without any problem and there is no risk of fabric damage in the event of a dryer wrap or paper jam. Both the supporting and the sealing blades can be changed without removing the box, even if they are located behind framing supports.

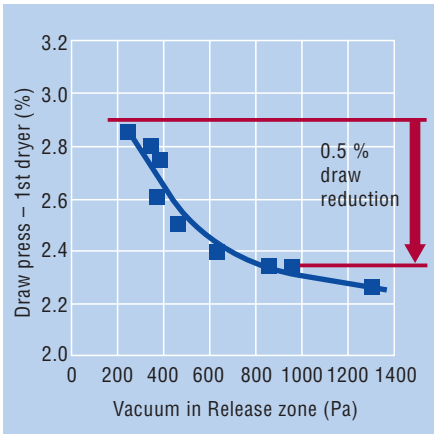
Lateral sealing on the front and drive sides is done with bolted-on air knives extending over the entire height of the stabilizer. Therefore, the release zone – operating at high negative pressure – is also sealed laterally against air leakage.

Fig. 4: Draw reduction on Eltmann PM 3 in relation to vacuum increase. Tandem NipcoFlex Press Newsprint, 45 g/m², 100 % DIP, 1,560 m/min

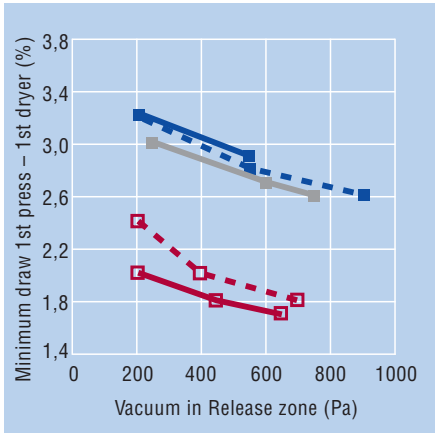
Fig. 5: Draw reduction for various stocks on the pilot paper machine at 1,550 m/min.
- *SC (100 % DIP, 28 % AiP)*
- *Newsprint (100 % DIP, 18 % AiP)*
- *Copy Paper (80 % eucalyptus, 12 % AiP)*
- *Newsprint (100 % TMP, 11 % AiP)*
- *Newsprint (100 % TMP, 4 % AiP)*

Fig. 6: Schematic cross-section with patented transfer zone.

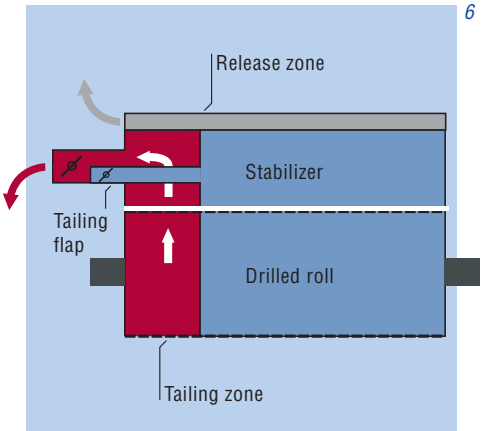
4

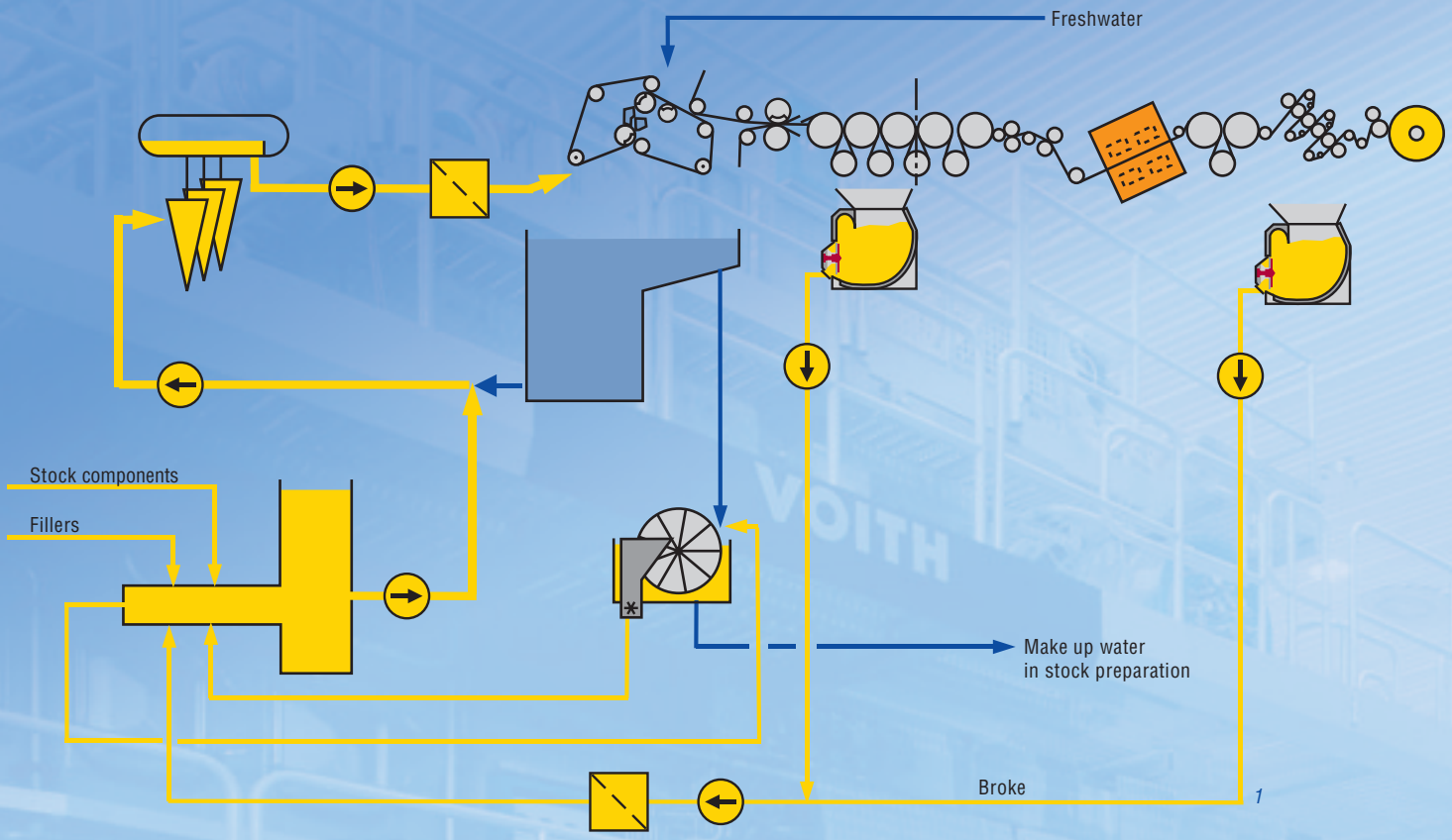


5



6





Automation in the Wet End Process™

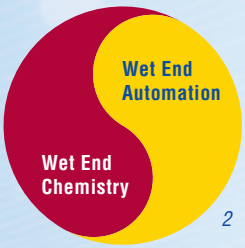
The author:
Dr. Michael Schwarz,
Paper Machines
Graphic

The Wet End Process (WEP) is comprised of all machines and equipment around the wet end of the paper machine. The three main partial systems are: approach flow, broke treatment and fibre recovery. A simplified view clearly shows that not only the interplay between these three sections has to be taken into account, but also, in particular, their complex interfaces with the paper machine itself.

Immediately ahead of the headbox, all fluctuations – whether periodic or stochastic – must be avoided in order not to affect the finished paper product.

Chemical additives are used both for process stabilization and for paper quality optimization. The efficiency of these additives is due to their strong and direct effects on the fibres and fillers.

On the other hand, the active mechanisms of these additives charged mostly at the surface are in turn influenced by the properties of the fibrous stock. This interplay is extremely sensitive to fluctuations, which can only be mastered by efficient monitoring and optimal process control immediately before the headbox *(see Fig. 2)*.



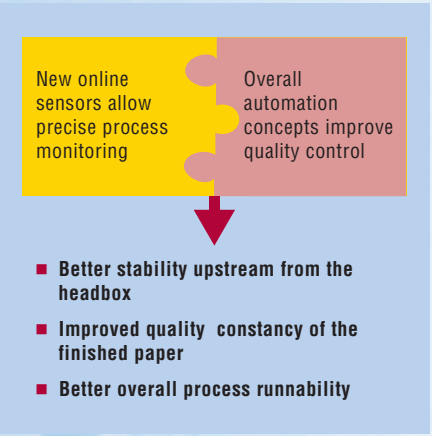
2

Fig. 1: Wet end process: approach flow, broke treatment, fibre recovery.

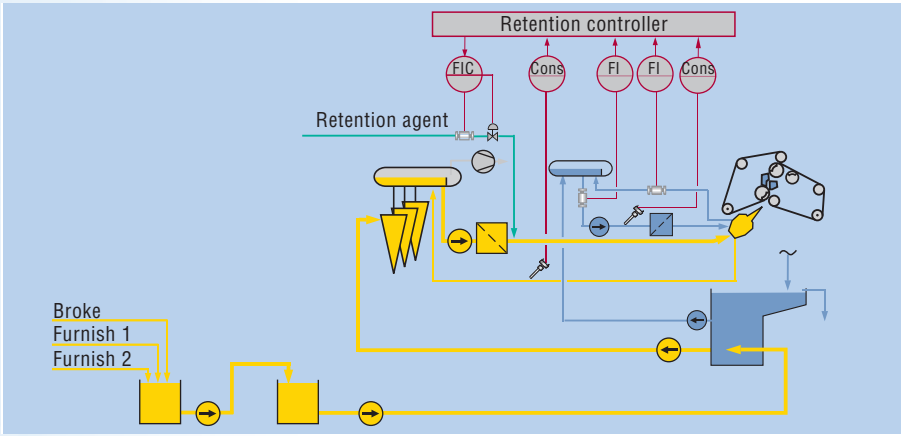
Fig. 2: Automation and chemical additives in the wet end process – perfect match.

Fig.3: Online sensors and overall automation concepts.

Fig. 4: Retention control.



3



4

Automation in the Wet End Process

Every efficient control concept depends upon reliable online sensors. However, the suspension parameters are far more difficult to measure than the finished paper characteristics. Even determining stock consistency places high demands on measuring technology, not to mention measuring chemical properties such as charge level or air content.

New findings in online measuring technology, and recent advances in existing techniques, have brought a decisive breakthrough in this direction. Significant improvements have been achieved both in absolute precision and in repetition accuracy, and particularly in the speed of measurement.

This opens up new possibilities for implementing control strategies. Impressive process control concepts are nothing new in theory, but so far they have been unsuccessful in practice due to a lack of reliable online sensors (repetitive, see last paragraph).

By further developing and optimising control concepts in conjunction with sensor systems, not only can paper quality constancy be improved, but significant costs can be saved by enhancing plant availability and reducing additive requirements *(Fig. 3)*.

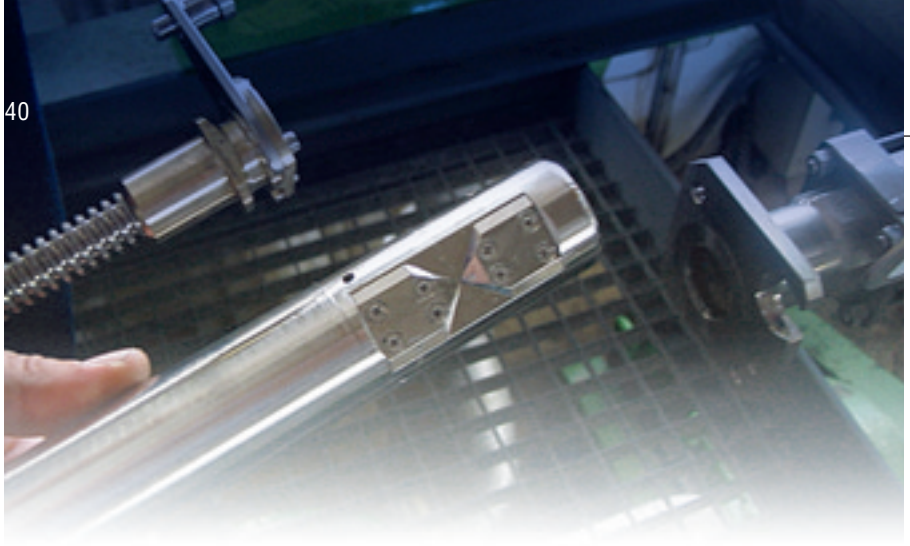
The goal is to develop clearly defined control strategies for implementation separately or in combination with others.

Retention control

The central module of all controls in the Wet End Process is the control of retention via the various stock consistencies. Retention control is a rather confusing term, in so far as it is primarily not the retention itself, but the whitewater consistency that is kept constant.

Since retention is defined as the quotient of the difference between headbox and whitewater stock consistencies, the retention figure would assume the same value for an indefinitely large number of ratios between headbox consistency and whitewater consistency. Thus, a retention control would be impossible.

Measured for this reason is the whitewater stock consistency, which is maintained constant by adjusting the quantity of retention agent accordingly. The second measurement taken in the headbox intake enables retention to be computed precisely *(Fig. 4)*. This concept gives papermakers a tool for controlling retention as a function of formation, stock grade, lip flow, etc. while independently allowing the elimination of undesirable stock consistency fluctuations.



5

Fig. 5: Newly developed stock consistency sensor TCT 2.

Fig. 6: Retention control with SC paper.

Fig. 7: Basis weight stabilisation by retention control.

Fig. 8: Charge control in fresh stock.

Together with our alliance partner, BTG, Säffle (Sweden), we developed the first new sensor enabling genuine inline measurement of total stock consistency and filler content separately. This finally eliminates the drawbacks of "continuous offline" operation with its intensive maintenance requirements *(Fig. 5)*.

With these high-precision suspension sensors, full real-time balancing around the headbox and the former section is now possible. Retention control is thus fully integrated into the paper machine quality control system.

Comparison of the stability of various parameters before and after commissioning a retention control system gives very impressive results *(Fig. 6)*. This also shows why "retention control" is always based on the constancy of whitewater stock consistency rather than on the retention itself.

However, the main purpose is not merely constant stock consistency in the formation section, but more constant paper quality. *Figure 7* illustrates this in terms of basis weight.

Charge monitoring

Even with optimal stock preparation, furnish-related fluctuations cannot be entirely avoided. In order to ensure consistently good retention, charge fluctuations in the stock must be avoided or eliminated. A fluctuating charge level before the headbox would reduce the effectiveness of the charged retention agent, and the inorganic particle systems, leading to variable retention.

Online charge measurement now enables fluctuations to be detected at the earliest possible point right after the mixing chest. By regulating the input of charged additives (fixing agent), such fluctuations can be corrected accordingly. Therefore, stock charge measurements are taken directly after the machine chest, without sample dilution *(Fig. 8)*.

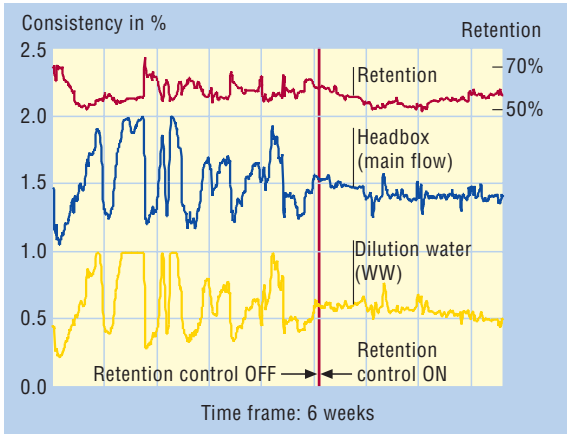
If, in contrast to this, charge is measured in the whitewater or in the headbox recirculation, there are two serious drawbacks. First the high whitewater flow has a dampening effect on the readings, and secondly only the sum effects of fixing agent and retention agent can be detected.

Extensive tests with parallel installed instruments provided by our alliance partner Mütek, Herrsching (Germany) have proved above impressively *(Fig. 9)*.

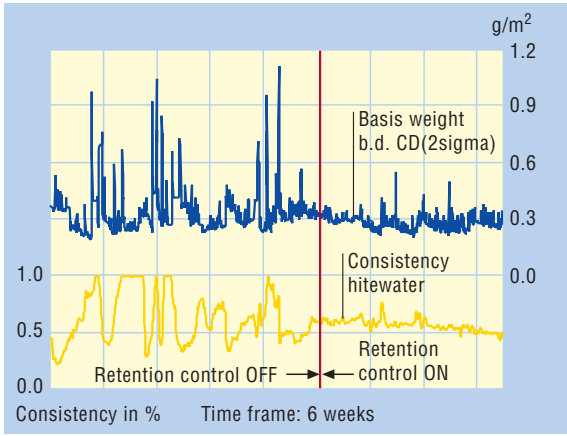
Online gas content measurement

Deaeration by applied vacuum reliably eliminates free and dissolved gas from

6



7



8

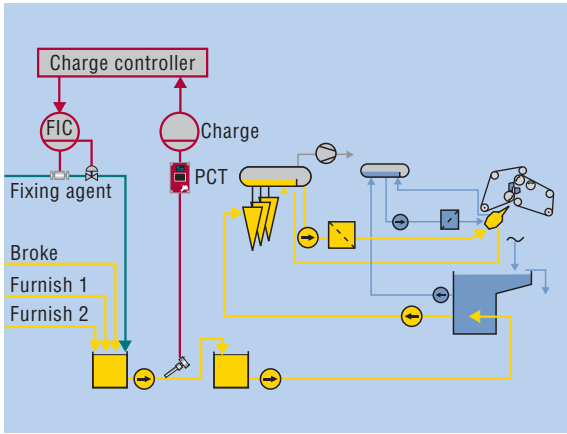


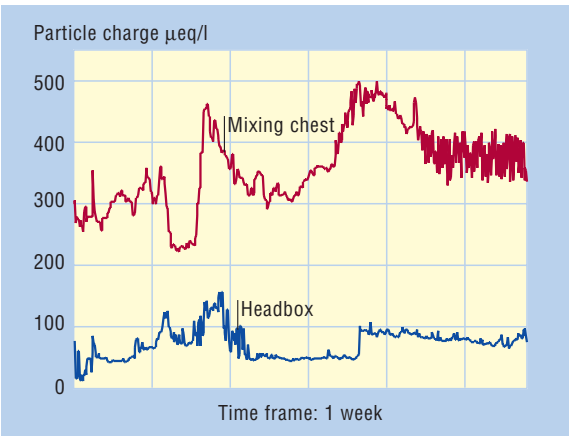
Fig. 9: Comparison of charge control in the headbox and after the mixing chest.

Fig. 10: Gas content control in whitewater.

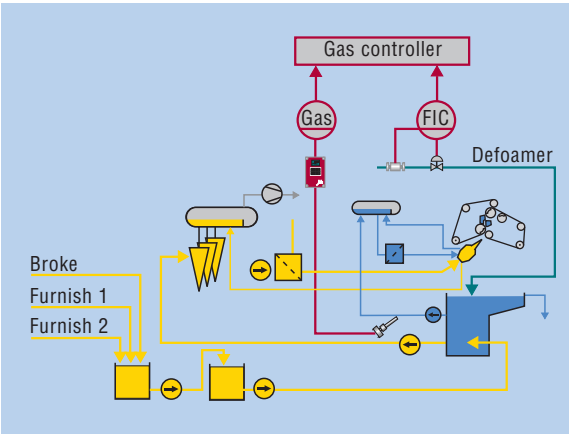
Fig. 11: How gas content in whitewater affects pump speeds.

Fig. 12: Potential benefits of Advanced Controls in the Wet End Process.

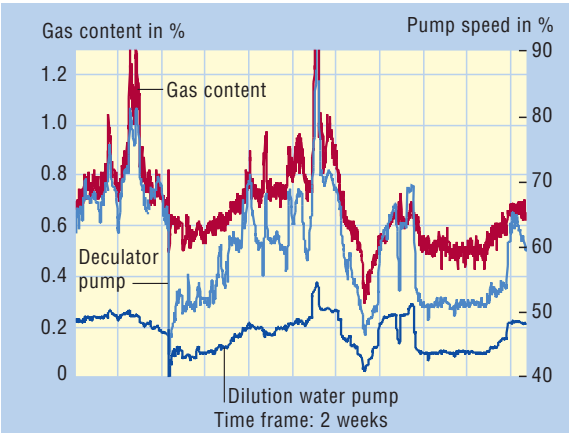
9



10



11



the suspension before entering the headbox. The residual gas content measured after the deaeration is less than 0.1 %.

In the closed, pressurised piping system ahead of the headbox, small pressure thrusts can then no longer intensify and build up into pulsations, and the feared gas pressure spring effect cannot occur. Sheet formation in the former area or on the fourdrinier is not disturbed by free air. Nevertheless, chemical additives are still required here in the whitewater for deaeration purposes to avoid pumping problems due to air in the whitewater, and also to prevent foam formation in the ducts *(Fig. 10)*.

These deaeration/defoaming additives are comprised of surface-active substances (such as fatty alcohol) which may react with other chemical additives. Furthermore, their cost is significant.

For each installation, there is maximum tolerance limit for gas content in the whitewater. If this limit is exceeded, pumping efficiency falls off sharply and in extreme cases the paper machine has to be slowed down. However, since the gas content can fluctuate considerably, enough defoaming agents have to be added to eliminate problems with excessive gas content even in the most unfavourable cases. Deaeration additives should, therefore, be minimized at all times to the smallest amount necessary.

12

	Quality improvement	Cost savings
Thick Stock	+ + +	
Retention	+ + +	+
Gas content		+ + +
Particle charge	+ +	+
Filler content	+ +	

This demands continuous monitoring of the gas content in the system.

As shown in *Fig. 11*, the pump operating speeds vary as a direct function of gas content. Clearly, regulating the defoaming agent input so that the maximum tolerable gas content is not exceeded can result in substantial cost savings.

Potential benefits of advanced control in the wet end process

The online measurements discussed above and the control concepts based on them can be applied either individually or in combination. They not only improve the paper quality in various ways, but also reduce production costs. These results are summarised in *Fig. 12*.

1

Oji Fuji N-2 – the five-star board machine

The author:
Jörg Fischer,
Paper Machines
Board and Packaging

Fuji City, south of Tokyo, is located at the foot of the famous white top volcano, Mount Fuji, and is reachable within one hour by Shinkansen super express train. The area has been Japan's center of papermaking from the very beginning due to its abundance of forests and clear water. Today, approximately 100 paper mills (most of them small and obsolete) in a city of 200,000 residents, still provide evidence of long tradition. Just realizing this may have been one of the essential spurs to tackle the project for building a new board machine N-2 at the Fuji mill. It was indeed an ambitious, but promising project launched by Oji Paper Corporation at the end of 1999.

Four small and obsolete board machines, owned by the company, were to be replaced by one new, larger machine. What a challenge when considering Japanese tradition and market habits! In Japan, the customer is still the principal focus, but now many small clients will have to be convinced to accept a standardized product instead of a grade that had always been tailor-made for them. Producing and distributing minimum order lots of only two tons would be a logistic challenge with such a huge machine. There would also be the problem of releasing many long-time employees where previous tasks would now be eliminated through newer technology. This in a country where employment with one company for one's entire working career is a standard way of life. On top of all this, there is the disadvantage of being in the center of a big city, operating under perhaps the strictest environmental regulations worldwide!

The only solution possible was a highly automated and flexible production line making use of the latest experiences in technology and engineering from the beginning of the stock preparation system and ending in the shipping department. The decision on the supplier of the board

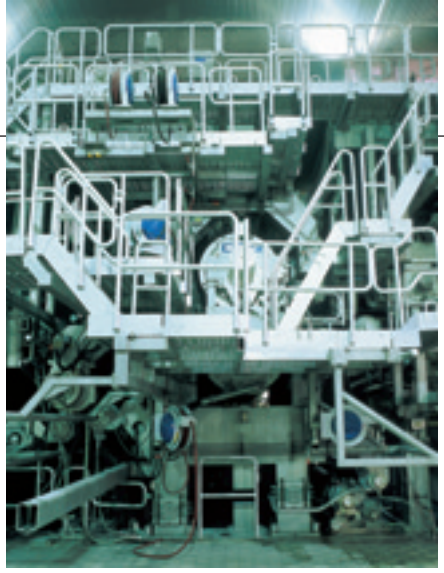


Fig. 1: Oji Paper at Fuji City at the foot of Mount Fuji.

2 *Fig. 2: Press section with NipcoFlex™ press.*

machine was made in favor of Voith Paper. Excellent references and the confidence in Voith Paper's know-how and workmanship were the main criteria for the selection. The N-2 machine at the Fuji mill is now the largest board machine in Japan, and with a designed production speed of 800 m/min, it will also be the fastest multi-fourdrinier machine for white lined chipboard worldwide. The board grades produced on this machine include top-side double-coated white lined chipboard and two-side double-coated special board with a basis weight range between 160 and 450 g/m^2. 100% recycled fibers are used as furnish. The machine has been specially designed to meet the quality targets of the product: good stiffness with the highest possible bulk; but even more important is an excellent surface in terms of smoothness, gloss and printability. Surface properties have the highest priority in Japan because boxes are mainly printed by gravure printing, but are also offset printed.

The investment cost by Oji Paper for the N-2 project was 27 billion Yen (250 million EUR), substantially strengthening the company's leading market position for folding boxboard in Japan. This grade is one of Oji Paper's strong points in the Japanese market besides their newsprint and coated paper grades.

The Mill

In 1908, the first board machine was started up at the Fuji mill. In the mid-sixties, the deinking process was introduced into the mill to substitute groundwood. The deinking process has been steadily developed and improved over the years, recently with special emphasis on high-brightness pulp. Today, the recycled pulp capacity is more than 1,000 tons/day consequently making the mill one of the largest worldwide. Virgin pulp is no longer needed, since the mill operates a recycling line for used liquid packaging boxes. The recycled pulp is used not only for board production, but also as furnish for the N-1 machine. The LWC machine with on-line coating started up in 1990 and is running with 90% recycled pulp at a speed of 1,200 m/min.

For energy supply, the mill owns a 10 MW hydropower station and three steam boilers with a total capacity of 100 MW. Before the new board machine N-2 was installed, the Fuji mill had been running two smaller board machines. Owing to its existing resources in assets, as well as the experienced and educated personnel, the Fuji mill was the preferred place to successfully carry out such a project.

Engineering, Construction and Installation

Oji Paper is one of the two major paper producers in Japan and number seven in the world ranking. Typical for most big companies, it is well staffed with experts in technology and engineering. No wonder that Oji was able to make great use of its resources for the new project. Mill-owned engineering companies did the engineering for the stock preparation system and finishing department, the civil engineering and the detail engineering for piping and electricity. The engineering services for ancillary equipment around the board machine and the board machine building were also performed by Oji Engineering, however this work was based on Voith Paper's basic engineering and recommendations. Limited space in the center of an operating mill was a challenge for the planning engineers and construction companies.

In European countries, the use of prefabricated concrete elements is often considered as the most efficient and fastest way to construct a paper machine building. The Japanese have demonstrated the contrary. Five months after starting the civil engineering work, the first foundation rails were installed. From the basement to the operating level, the whole building was made from on-site cast concrete in a solid construction. From this point upward, steel construction was used. The Fuji area in Japan is known to be a high-risk earthquake region. For this reason, the board machine and the foundations had to be designed for an earthquake factor of 1.3 g, making the building and the machine heavier than usual.

Voith Paper supervised the installation and start-up of the machine, while the job itself was done by Oji Paper's installation company together with the mill's staff. The performance of installation, the management of transportation and the reliability in keeping to the time schedule were excellent. The majority of pre-piping was done outside the mill. The entire installation of the board machine was finished four months after the foundation rails had been put in place. After six weeks of operational tests, the first board was wound on the reel, 18.5 months after contract signing. On October 1, 2001, the board machine started its commercial production.

Wet End

The wire section comprises five fourdrinier wires. The backliner is formed on the bottom fourdrinier with a length of 105 meters. The underliner back is formed on the first top wire, the second top wire with a DuoFormer™ D produces the middle layer, and the underliner top and the topliner are formed on the third and fourth wires. All five headboxes from the latest family of MasterJet™ F/B headboxes have shown an excellent performance. The middle layer headbox is equipped with ModuleJet™ dilution valves and controlled by a Profilmatic™ M CD profile control system. The expected CD basis weight profile was achieved within a short time.

The press section has been designed for two nips and four felts. The first press is a double-felted suction press with suction roll web pick-up off the fourdrinier. The second press is a double-felted NipcoFlex™ shoe press with the shoe in top position and a solid backing roll. Similar to the first press, the web is taken off the first felt, maintaining a completely closed web run through the whole wet end. The shoe press can be loaded with 800 kN/m, but usually a lower load is used. Before the web enters the dryer section, an offset press without felts smoothes both surfaces of the board. Upstream of the NipcoFlex™ press, a ModuleSteam steam box is installed above the bottom felt of the first press.

Cylinder Drying and Machine Ventilation

The cylinder drying and machine ventilation equipment was not included in the Voith scope of supply. Oji Paper purchased it directly from domestic suppliers.

Calenders, Coaters

Ahead of the coater section, the web is calendered in a Voith Paper hardnip calender. A ThermaJet hot air blower with Profilmatic™ TJ control unit controls the CD thickness profile, both from Voith Paper Automation. Four LDTA coating stations of the SmartCoater type with applicator rolls, two for each side, are available for coating application. Metering of the precoats is done by smooth rods, and the top coats are applied in bent blade mode. A combination of gas-fired infrared dryers by Krieger, and hot air dryers by Langbein & Engelbracht, provide for smooth and efficient evaporation. One row of the gas IR dryers is suited for CD moisture control.

Web Run and Wind-up

Before winding up at the reel, the proper smoothness and gloss can be achieved

3

Fig. 3: Oji Fuji N-2 board machine.

Fig. 4: Sirius reel with 4 m parent roll.

by two soft nips. Two Voith Fibron vacuum belts assist in tail threading in the two positions where the rope run is interrupted. They show an excellent performance with all basis weights.

The board is finally wound on a Sirius™ reel, permitting roll diameters of 4,000 mm. RollMaster control ensures a uniform build-up of the roll during the whole wind-up process. The roll change is supported by an IBS turn-up system, cutting the web with a tape. The Sirius™ reel allows easy roll changes with minimum board loss.

Oji Paper purchased the automation systems for the machine directly. However, it should be mentioned that the DCS control system and the machine drive were supplied by Toshiba, and the QCS control system by Yokogawa.

4

Design criteria of the board machine

Design speed	*800 m/min*
Drive speed	*800 m/min*
Speed range	*200-800 m/min*
Wire width	*4,700 mm*
Paper width on the reel	*4,250 mm*
Maximum roll diameter	*4,000 mm*
Gross production on the reel	*800 t/24 h*
Daily average sold production	*650 t/day*
Basis weight range	*160-450 g/m²*
Length from headbox to reel	*230 meters*
White-lined chipboard	*top side double-coated*
and special board	*both sides double-coated*
Furnish	*100% recycled fibers DIP and magazines*

Hideki Yamamoto, Executive Officer of Oji Paper and Mill Manager of Fuji Mill

The main machine parts for the Fuji Board Machine N-2 were directly imported from Voith Paper, Austria, owing to the excellent technological concept and with a view towards saving cost.

This state-of-the-art and most advanced machine has enhanced our productivity and board quality.

Our aim is to gain a leading position in terms of board quality. With this new machine, we are in no way behind other large machines in Southeast Asia.

Only recycled fibers are used at the Fuji mill, and I believe it is one of the largest mills of this type worldwide.

The Fuji mill, with its prime geographic location and this big investment made, has set itself the goal to become the world's best recycled mill.

5

Fig. 5: Oji Fuji N-2 coater.

Fig. 6: A look into the control center.

Finishing

The Voith Paper scope of supply ended at the reel. Nevertheless, it is of interest to mention some highlights of the sophisticated finishing department. The latter has been designed for supplying even small order lots to many customers within short-time intervals, without having to make too many grade changes.

After the reel, the parent rolls are slit into smaller rolls in the winder. The rolls are then conveyed to a vertical roll storage unit with a capacity of 13,000 tons. An automatic crane with vacuum lift handles the rolls. From here, most of the rolls are conveyed to the sheeting department and cut on four Simplex sheeters. Others are sold as complete rolls. Rolls, which are not totally sheeted, are returned to an intermediate storage area. The pallets from the sheeters can either be conveyed to a sorting area or directly to the automatic reaming or wrapping station where paper is used as packaging material.

6

Summary

On November 2, 2001, the new production line was inaugurated with an impressive and festive opening ceremony, marking the final point of the project. The Executive Officer and Mill Manager, Mr Hideki Yamamoto, welcomed 400 invited guests and was proud to demonstrate a flawless production line right up to the last detail. The speeches were brief and the main participants were the members of the project team and the operating personnel. The President and CEO of Oji Paper Corporation, Mr Shoichiro Suzuki, emphasized in his address the importance of the new machine. He pointed out that the high quality and flexibility would make it easier to serve a difficult market, resulting in benefits for all customers.

With the Oji Fuji N-2 project, Voith Paper has once again shown its strength in group-wide sourcing and its competence in project handling in the Asian market. Due to new communication technologies, even a distance of 11,000 kilometers was no real barrier, as almost all documents and drawings were forwarded electronically. Nevertheless, local support was very important. The local office, Voith Tokyo, today Voith-IHI, as well as the trading company, Mitsui Bussan Plant & Project Corporation, rendered important services, such as local transportation, translation and communication with the customer, which were absolutely necessary for establishing and maintaining the logistics and a good working environment. It was easy and a pleasure to work together with the experienced and professional Oji project team members.

Within one month of continuous operation, the machine was running with nominal capacity and the essential quality properties were reached. We would like to congratulate and to express our appreciation to our Japanese friends on their great success, and acknowledge those in the Voith Paper organization who contributed to the success of this project.

Forming Fabrics
for graphic papers

The forming fabric is a precision made, highly engineered, component of every former. To determine the most appropriate fabric for an application requires an understanding of the customer's key papermaking needs and the paper end use issues. Thus, a partnership between fabric supplier and user is essential.

The author:
Stewart Hay,
Voith Fabrics

Fabric Structures

The perfect fabric that allows best practice manufacture for all grades on each position of every machine has not yet been invented. A range of fabric types is made so that added value can be provided for all product and process variations.

In this article the fabric types used for Graphic paper production are identified and compared. Each type offers a unique combination of properties. Applied appropriately all types will deliver measurable benefits on the former.

History

Fabric properties are largely determined by the weave structure together with yarn parameters such as the number of MD/CD yarns per unit area, their diameters, and polymer type. The early single-layer fabrics had one system of machine-direction (MD) yarns which interlaced with one system of cross-machine direction (CD) yarns. Consequently, any changes in yarn diameter or weave pattern to improve the fabric's on-machine performance affected both surfaces of the fabric. "Multi-layer" designs were required to overcome the limitations of single-layer fabrics and to deliver major benefits in the forming section.

Multi-layer Fabric

Multi-layer fabrics have either one MD yarn system interlacing with multiple layers of CD yarn systems or, several fabrics, each with its own MD and CD systems, bound together in some way. Every multi-layer fabric allows independent enhancement, to some extent, of both fabric paperside and wearside surfaces.

Fabric Surfaces

Indicators of a suitable paperside include acceptable formation, retention, roughness and wiremark. Fabric paperside "support points" (yarn floats) significantly influence these parameters. Support point distribution, orientation, planarity, effective length, support area, and number, are all important.

The paperside should form the initial fibre mat on the fabric surface, as opposed to allowing fibre penetration below the surface. In this way, sheet sealing of the fabric drainage channels is avoided and the fabric influences drainage.

Fig. 1: Double-layer.

Fig. 2: Triple-weft.

Fig. 3: Triple-layer.

On the fabric wearside, relatively long CD floats and thick CD yarns are used to obtain the desired service life. However, the overall suitability of the fabric application, and not just the wearable yarn volume, will determine fabric life.

Double-layer Fabric

The most basic multi-layer type has one MD yarn system and two CD yarn systems. *Fig. 1* illustrates a plan view of a typical "eight shaft" fabric paperside (i.e. eight MD yarns per weave repeat) together with cross-sections through both CD & MD yarns respectively.

Double-layer designs carry minimal water and are associated with high solids at pick up. Optimisation of both fabric surfaces, as with all fabrics using a single MD system, is restricted.

(Double-layer) Extra Weft Added Fabric

The so-called "two-and-a-half-layer" fabrics have a paperside to wearside CD (weft) yarn ratio of 2:1. The extra "half-layer" of paperside CD yarns give increased fibre support when compared to equivalent double-layer fabrics.

Larger wearside CD yarns are typically used to compensate for the reduced number of these yarns. The larger CD yarns create thicker fabrics with higher levels of void volume than the double-layer structures illustrated in *Fig. 1*.

Triple-weft Fabric

In triple-weft fabrics a single system of MD yarns interlaces with three CD yarn systems.

Fig. 2 illustrates a plan view of a typical "eight shaft" triple-weft fabric paperside and cross-sections through both CD & MD yarns, respectively.

The three CD yarn layers provide the highest CD bending resistance of any fabric category. High CD stiffness has improved sheet profiles associated with fabric distortion on unsupported outer positions.

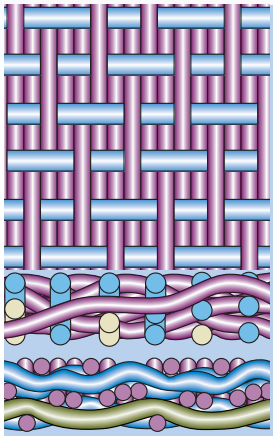
The "extra-wefted" paperside surface provides good papermaking properties and the dense triple-weft structure also benefits retention by dampening pressure pulses from the dewatering elements.

Triple-layer Fabric

Triple-layer fabrics actually comprise two separate fabrics, each with its own MD and CD yarn systems. The fabrics are bound together by additional MD or CD binder yarns.

Fig. 3 illustrates a plan view of the paperside fabric and cross-sections through both CD & MD yarns, respectively. Plain weave paperside and five-shaft wearside fabrics are shown with additional CD binder yarn. Both fabrics can be optimised independently.

1

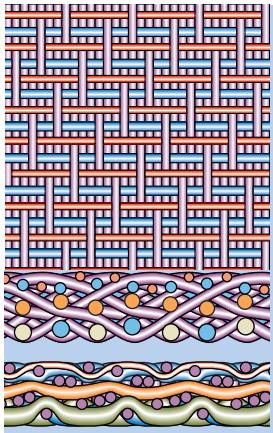


Double-layer –
Paperside Surface
<– CD –>

Section through
CD yarns
<– MD –>

Section through
MD yarns
<– CD –>

2

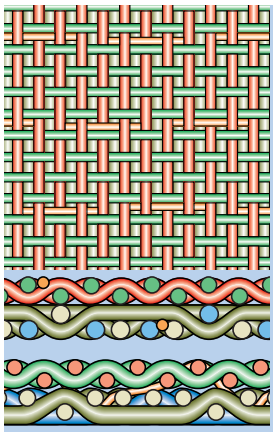


Triple-weft –
Paperside Surface
<– CD –>

Section through
CD yarns
<– MD –>

Section through
MD yarns
<– CD –>

3



Triple-layer –
Paperside Surface
<– CD –>

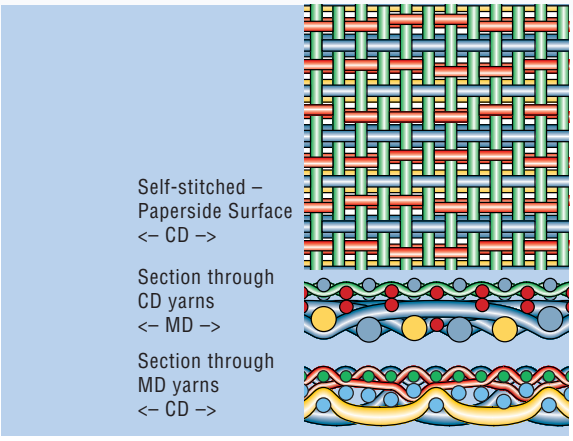
Section through
CD yarns
<– MD –>

Section through
MD yarns
<– CD –>

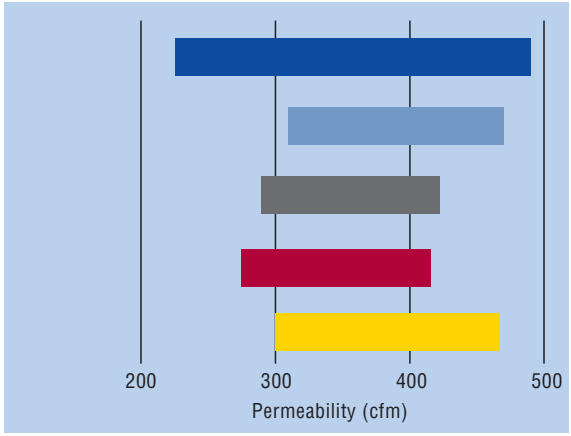
Fig. 4: Self-stitched (Triple-layer).

Fig. 5: Permeability.
- *Double-layer*
- *(Double-layer) Extra-wefted*
- *Triple-weft*
- *Triple-layer*
- *(Triple-layer) Self-stitched*

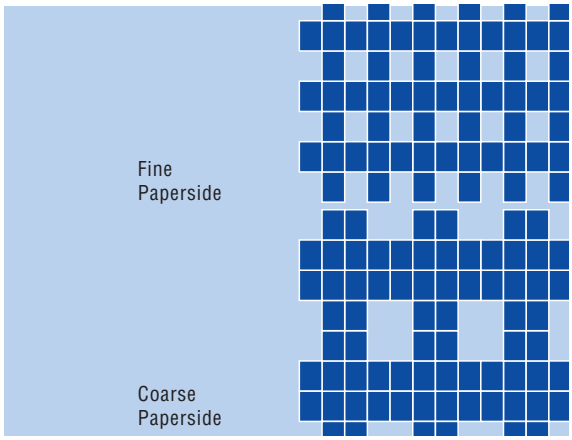
Fig. 6: Paperside Openness.



4



5



6

The paperside has a very regular distribution of support points and high fibre support level. However, the single binding points in the paperside can cause wiremark.

Historically, relative movement of the fabric layers caused "internal" binder wear and fabric layer separation. This delamination was largely resolved by using new binder materials.

(Triple-layer) Self-stitched Fabric

Self-stitched fabrics also have two separate fabrics, each with its own MD and CD yarns. However, certain paperside CD yarns also bind the fabrics together.

Fig. 4 illustrates a plan view of the paperside fabric and cross-sections through both CD & MD yarns respectively. Again plain weave and five-shaft wearside fabrics are shown. Paperside to wearside CD yarn ratios are effectively two to one. Pairs of paperside yarns contribute to the high number of fibre support points but also act as binders.

Both fabrics can be optimised independently. Self-stitched fabrics are usually thicker than equivalent triple-layer fabrics and have higher void volume. The binder cross over regions sit lower on the paperside and can generate wiremark.

Fabric Properties

Some of the properties typically used to compare fabric designs are discussed below.

Permeability

Fig. 5 shows the permeability range for multi-layer fabrics. Most fabric is made between 300 to 425 cfm.

Permeability is the volume of air (cubic feet per minute) that passes through the fabric at a given pressure difference (127 Pa). It indicates fabric openness and is often considered to indicate fabric dewatering potential.

However, the wearside and paperside of multi-layer fabrics give identical permeability values but forming on the different fabric surfaces would not achieve the same drainage.

Representations of fine and coarse fabrics are shown in *Figs. 6.1 and 6.2* respectively. These "fabrics" have identical openness and permeability. However, fabric 6.2 has fewer and larger holes, thicker yarns and less support points. It gives a more rapid initial dewatering, resulting in reduced retention. The large holes fill with fibre to the detriment of sheet properties and total drainage.

The fabric paperside influences where the initial sheet is formed and how it drains

and thereafter, the initial sheet controls drainage. Permeability alone is not enough to indicate fabric drainage capability – fabric and fibre interaction must be considered.

Fibre Support Index (FSI)

FSI was defined by Beran (Tappi, 62 (4), 1979). It estimates the fibre support provided by a fabric's paperside. *Fig. 7* shows the range of (unitless) FSI values for multi-layer designs. The self-stitched designs with their plain weave paperside, and two effective paperside CD yarns for every one wearside yarn, provide the highest FSI values.

FSI assumes that the fabric paperside is a two-dimensional grid *(Fig. 8.1)*. *Fig. 8.2* shows an actual impression of a plain weave paperside as used in triple-layer and self-stitched fabrics. The surface is very much three-dimensional. Consequently, FSI greatly over-estimates the support from current self-stitched fabrics. Double-layer, extra-wefted and triple-weft fabrics typically have longer support points such that FSI more accurately reflects reality.

There is an optimum FSI for each application – it is often not the highest available value.

Thickness

Fig. 9 shows fabric thickness for multi-layer designs. Knowledge of initial thickness allows calculation of the fabric's theoretical worn out thickness. Thickness is also a rough guide to water carry and sheet solids at pick-up. Thinner double-layer designs are associated with high sheet solids.

Thicker fabrics may give increased fabric stability. Triple-weft designs have the highest CD bending resistance and can minimise sheet profiles associated with fabric instability.

Void Volume

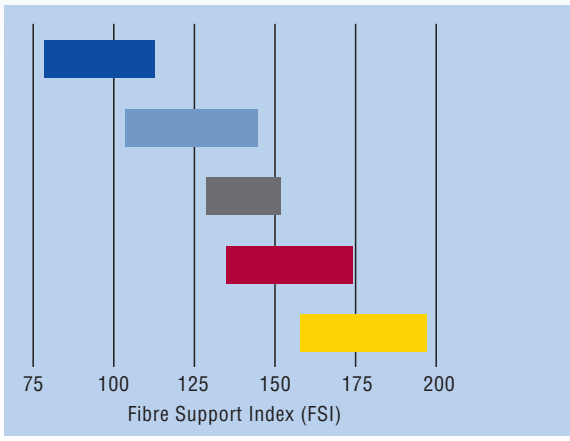
All multi-layer fabrics contain a significant amount of empty space, or voids, between yarns through which water is removed. Void volume values for multi-layer designs are shown in *Fig. 10*. The relative ranking of the fabrics closely corresponds to that observed in *Fig. 9* (fabric thickness).

It is also useful to know the distribution and orientation of the void volume throughout the fabric's thickness as this will influence the fabric's water handling ability.

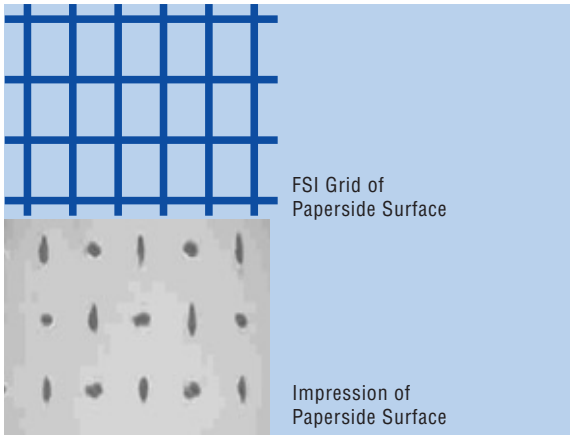
Abrasion Resistance Index

Theoretical abrasion resistance values are shown in *Fig. 11*. The triple-layer and double-layer designs, which have a greater proportion of their CD yarns on the wearside, give the best abrasion resistance values. In reality fabric life potential will be influenced by the overall

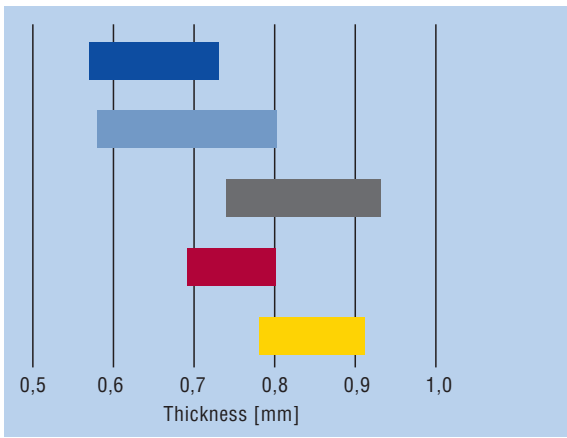
7

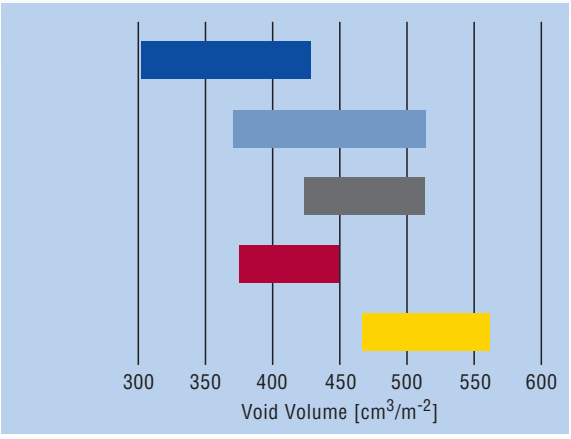


8



9





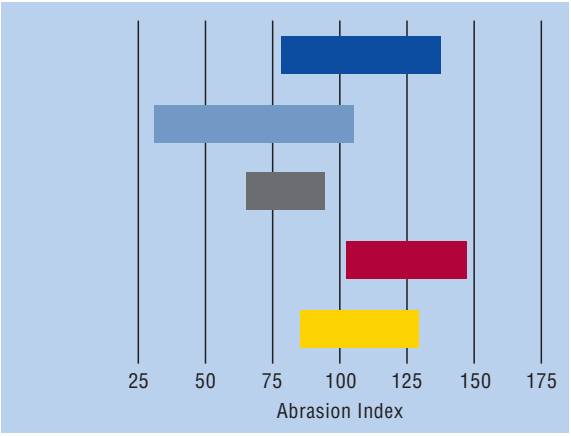


Fig. 7: Fibre Support Index (FSI).

Fig. 8: Paperside Sheet Support.

Fig. 9: Thickness.

Fig. 10: Void Volume.

Fig. 11: Wearside Abrasion Index.

- *Double-layer*
- *(Double-layer) Extra-wefted*
- *Triple-weft*
- *Triple-layer*
- *(Triple-layer) Self-stitched*

10 suitability of the fabric for the application.

Summary

Several fabric properties known to be related to fabric on-machine performance were investigated for various multi-layer fabric categories. No one category gave the highest or lowest value for all properties, i.e. there was no all round “winner”.

11 All types of multi-layer fabrics enjoy commercial success in the Graphic paper sector. Voith Fabrics supplies a wide range of designs in each category. Indications from the market are that demand for the full range of multi-layer designs will continue throughout the foreseeable future. Voith Fabrics will continue development work for all types of fabrics. However, the key to a fabric’s success is in choosing the correct application.

To identify the most suitable fabric for any machine requires a knowledge of the fabric, the machine variables, and the customer’s key objectives. Voith Fabrics uses techniques such as the “Assist Program” to quantify the current situation on the machine. The acquired data is used in discussions with the customer to determine the most suitable fabric for the application.

In determining the potential performance of a new fabric design Voith Fabrics does not rely exclusively on measured lab properties or simulations which tell only part of the story. As part of the development process, Voith’s unique pilot machine facilities are used to evaluate fabric performance and to better understand the interaction between fabric, furnish, and machine.

Voith Fabrics and Voith Paper work closely together so that both expert fabric and papermaking knowledge is used to determine the very best solution to the customer’s requirements.

Part two of this article will focus on case studies regarding the applications of multi-layer fabrics.

Seam Press Fabrics from Voith Fabrics – building on two decades of continuing technological evolution

Seam press fabrics have evolved dramatically since their European beginnings two decades ago. Their use has spread rapidly out of the board and packaging sectors, where the technology was initially applied, into a broad customer base ranging from graphics to tissue.

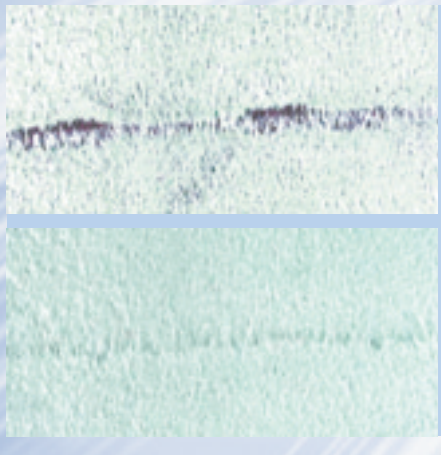
The authors: Dan Aldrich, Mike Mason. Voith Fabrics

Many mills, primarily in North America, have realized that, in addition to easy, quick and safe installation, improved press performance could also be achieved. Seam fabric base constructions are made from 100% monofilament yarns and are stiffer and more "open" than their endless counterparts. They can provide higher void volume, enhanced water flow and more resistance to compaction in the nip. They also result in easier cleaning, better water handling, higher dryness out of the press, reduced shadow mark and increased speed.

In North America, seam press fabrics are dominant in board and packaging grades. Even for graphic applications, the number of machines using seam press fabrics is approaching 50%. In Europe, many board and packaging machines now regularly use seam fabrics, although acceptance has been slower on graphic grades. Nevertheless, the trend is beginning to accelerate in Europe as the newest seam technologies from Voith Fabrics can eliminate seam marking, even on the most critical grades.

Voith Fabrics' advances in seaming techniques, batt flap design, needling procedures and base construction have extended the benefits of seam press fabrics to the most prestigious graphics paper machines in North America. Notably, Voith Fabrics supplied the world's first successful installation on a high speed LWC machine shoe press.

1



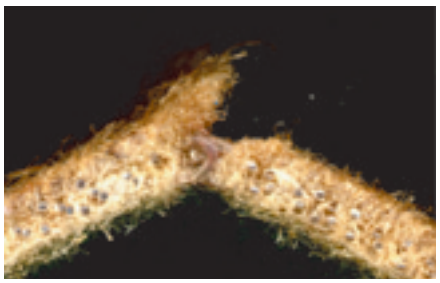
Old technology Seam
Uncoated Fine Paper
2nd Press, 850 m/min,
31 days

New technology Seam
Same machine
2nd Press, 850 m/min,
32 days

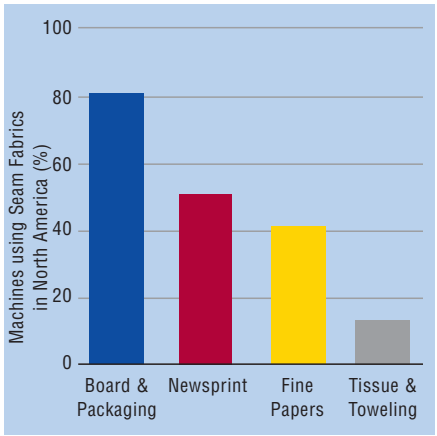
Fig. 1: New seam technology compared with traditional technology shows greater flap coverage of the seam even after running a longer lifetime.

Fig. 2: New technology seam fabric after running 44 days on a 1050 kN/m (6000 pli) shoe press.

Fig. 3: Seam press fabric use in North America has increased dramatically in recent years, saturating the packaging and board grades fabric market and now being used in nearly half of the graphics paper machines.



2



3

Evolution of Seam Fabric Technology

With early seam fabrics, cutting of the needled batt to expose the base fabric loops resulted in a tendency for the batt flap to peel back and wear away from the seam area as it passed over Uhle boxes and other abrasive machine elements. This sometimes led to seam marking problems and early fabric failure. The way in which the seam flap was cut has since been changed and improved needling techniques, chemical treatments and use of low melt materials have enhanced the fiber bonding in the seam area, resulting in a much stronger, wear resistant flap as shown in *Fig. 1*.

By the late 1990s, the base fabric used in seam press fabrics evolved into a much more durable structure. Better materials were used to make seam loops stronger, stiffer and shorter, all but eliminating seam marking and loop failure.

As more and more machines started to use seam fabrics, successes were achieved on tougher and more demanding positions, including shoe presses. *Fig. 2* is a photograph of a new technology seam fabric after 44 days on a 1,050 kN/m shoe press. Few positions are considered unsuitable for seams with this advanced technology.

Driving forces

The driving forces for seam fabrics in Europe today are focused primarily on reduced downtime and above all, on the safety issue. Modern paper machines have low manning levels, which means the mills do not have a lot of people available to change clothing. Thus, seam fabric installation is well suited to today's paper machine manning practices and to the overriding need for safety.

Market Applications – by Grade

Press fabric usage in general has declined in recent years due to consolidation of papermaking capacity in conjunction with the fact that modern fabrics have a longer operating life than even those of five years ago. Yet the proportion of seam fabrics is continuing to increase. In North America, about 40% of Voith Fabrics' press fabric output is in seam designs, and it has an estimated 28% share of the world seam fabric market. Voith Fabrics' average annual growth rate for seam fabrics has been more than 10% since the mid-1990s.

As shown in *Fig. 3*, some 80% of board and packaging grades in North America (concentrated in the U.S.) are using seam fabrics today. Approximately half of North American newsprint machines and roughly 40% of its fine paper machines are running them. Inroads are being made into tissue and toweling, after significant results have shown improved runnability and water-handling. Some 10%-15% of North American tissue machine press clothing is seamed.

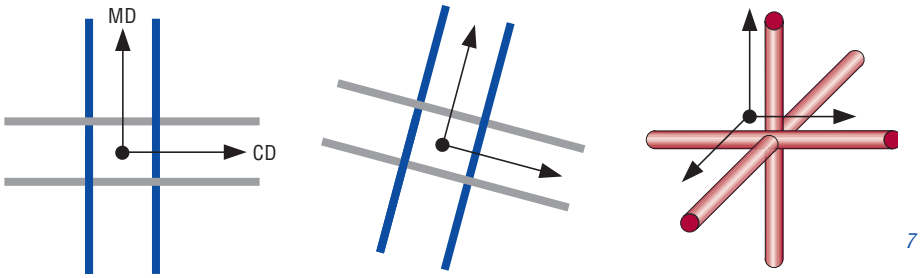
Fig. 4 shows Voith Fabric shipments of seam fabrics for graphics grades (including newsprint) in the U.S. from October 2000 through June of 2001. During that period, the trend toward increased seam fabric use in graphics grades continued, particularly in uncoated fine papers with some 1,051 units (180 ton) being shipped to uncoated fine paper machines,

Fig. 4: Voith Fabrics' shipments from October 2000 through June 2001 reflect the continued increase in seam press fabric usage on graphic paper machines in the U.S.

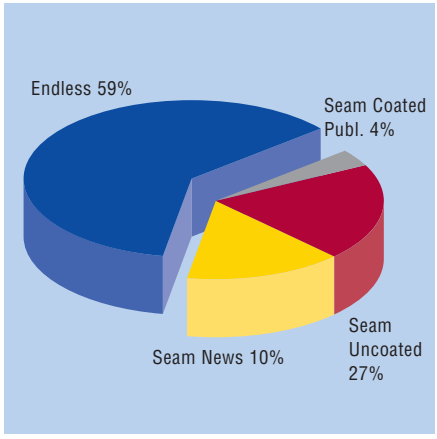
Fig. 5: Percentage of Graphics machines in Europe using seam press fabrics in one or more positions.

Fig. 6: Vector Cross Section.

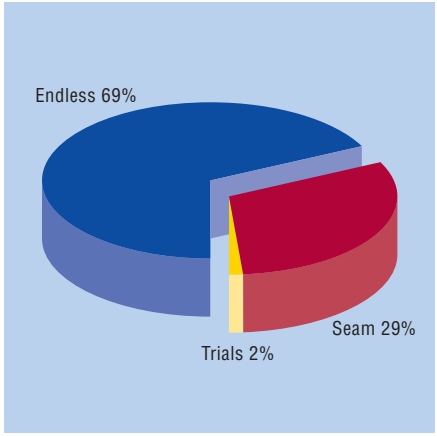
Fig. 7: Vector Tri-Axial technology.



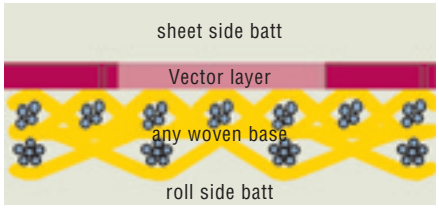
4



5



6



385 units (107 ton) to newsprint machines, and 154 units (25 ton) to coated publication paper machines.

As *Fig. 5* shows, the switch to seam fabrics in the graphics paper sector has been slower in Europe, with only some 29% of machines (including newsprint) currently running them in at least one press position.

Excluding newsprint, only 5%-10% of other graphics grade producers in Europe use them at the moment, and again, most of these applications are on the medium to smaller, non-cantilevered machines.

European growth on the larger machines is currently concentrated in the newsprint sector, chiefly because this is a less mark-sensitive grade, but also because newsprint tends to be a slightly tougher sheet than, for instance SC or LWC grades.

Performance, Production Gains

The single monofilament yarns used in seam press fabrics provide the best compaction resistance of any of today's woven designs. Besides this significant benefit, a seam press fabric also provides exceptional masking characteristics. Nip impressions made with standard endless fabrics over a blind drilled roll cover clearly show the marking from the holes. Using a seam fabric, the roll cover marks barely show, if at all. The seam fabric's stiffer base provides a more uniform pressure profile to the sheet.

A modern seam fabric, with its high void volume, handles water much better than traditional endless constructions. A seam fabric's compaction resistance, higher void volume and lower flow resistance all add up to increased water removal, longer lifetimes and improved sheet quality, as well as ease of cleaning. The result is significant production gains through higher sheet dryness out of the press.

Safety Benefits

Recent UK legislation places heavy emphasis on the risks related to press (and forming) clothing operation and installation. Even where a mill has a fully cantilevered machine, changing press and forming fabrics can be a strenuous, time-consuming and dangerous process.

The UK HSE measures are now being considered for implementation as an EEC standard. They are likely to be released within two years (EN 1034). Seam fabrics will answer some of the safety issues raised by these standards.

Vector

The new Vector design, unique to Voith Fabrics, is available in endless and seam versions and has the potential to become the market leader due to its excellent surface characteristics, pressure uniformity and water handling capability.

As seen in *Fig. 6 and 7*, Vector is a combination of a standard base fabric (or fabrics) and a non-woven "tri-axial" layer onto which batt is needled. Vector designs are ideal for seam fabrics because the tri-axial layer covers the seam area so well, giving the most effective prevention of seam mark of any fabric currently available.

The Vector product line was launched in North America in the summer of 2001, and is rapidly being accepted by brown and graphic grade machines at the highest speeds. Within the period of six months, 46 machines are already running Vector seam fabrics with another 127 trials in hand. To date, the product has had a 100% success rate and will be launched in Europe in early 2002.

Parenco saves time and improves safety

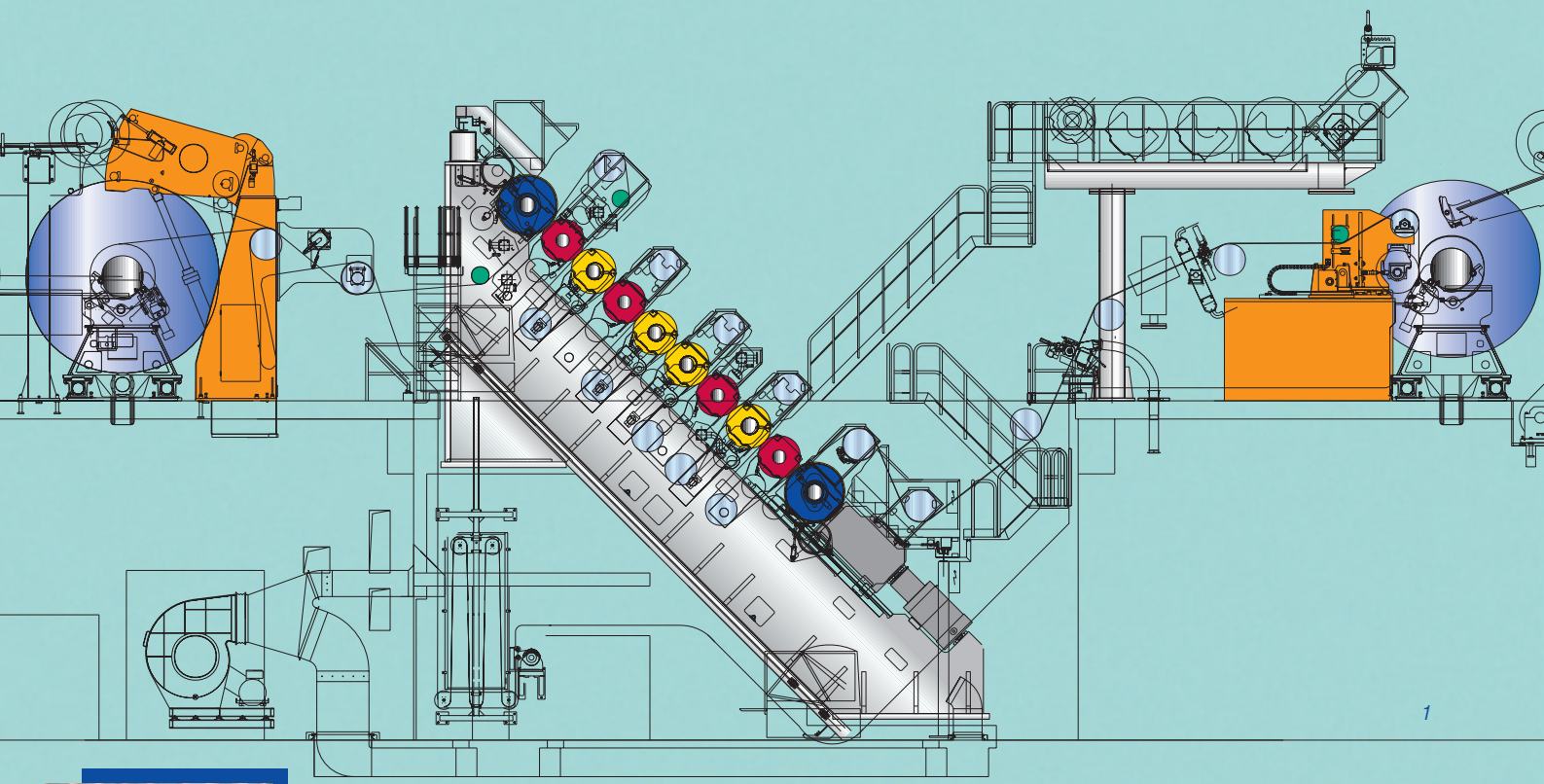
The Parenco mill near Arnhem, Netherlands, has been using seam press fabrics on its No. 2 newsprint machine for approximately three years. Seam fabrics were used first in the pickup position, followed shortly afterwards in the bottom position of the first press. The mill operates two machines producing newsprint and SC paper grades. PM 2 is 9.1 m wide operating at 1300 m/min and has a production capacity of 260,000 metric tpy.

According to René Keizer, assistant mill manager, the mill switched to seam fabrics on the non-cantilevered PM 2 to improve safety and shorten installation time, which had taken about five hours with an endless design in the pickup position. This has now been cut to less than two hours with seam fabrics.

"The endless pickup fabric was very large, stiff, and difficult to handle. We usually had to impregnate it with a softening agent to get it through the openings in the non-cantilevered frame," he notes.

Seam fabrics in the bottom position of the first press have significantly simplified the installation process and created a much safer environment for employees. Mr. Keizer explains, *"With seam fabrics, workers don't have to go inside the machine anymore. We don't have to open up rolls, nips, etc. Particularly with the endless bottom fabric, we had to shift some guide rolls, which we don't have to do now."* The mill is also getting longer operating life. *"We will never go back to endless pickup and bottom fabrics"* he insists.

"The Big One!" – shop assembly of a Janus™ MK 2 calender for SCA Laakirchen in Krefeld



1

The author:
Martin Deitel
Finishing

In autumn 2000, SCA Laakirchen/Austria ordered a production line from Voith Paper for 240,000 t.p.a. of SC-A paper, including an offline Janus™ MK 2 – the world's largest calender of this type.

Due to the unprecedented size and component weights of this Janus™ MK 2 calender, the shop assembly phase described here was an extremely challenging task for the Krefeld erection team.

Complete shop assembly is the best way of ensuring trouble-free site erection and commissioning afterwards. This article explains the reasons why, and also takes a look at future development trends.

Scope of supply for the finishing line

Apart from the Janus MK 2 offline calender with 10 rolls, the Voith Paper Krefeld GmbH scope of supply also covers an unwind and a rewind for paper rolls having a width of 8,920 mm and 3,400 mm dia., both equipped with a flying splice system *(Fig. 1)*.

Shop assembly procedure

With such large dimensions – each machine stands 15 m long and weighs 65 ton – the required welding and machining work clearly placed high demands on the Krefeld erection crew *(Fig. 2)*.

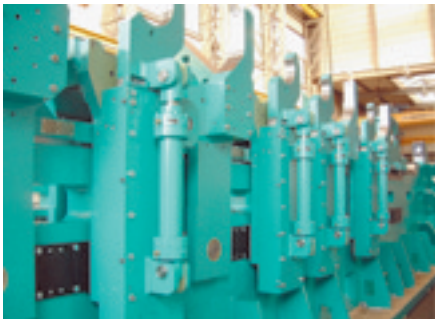


Fig. 1: Janus™ MK 2 with un- and rewind section including flying splice.

Fig. 2: Shop erection of the machine frames.

Fig. 3: Assembly of the roll bearings and hydraulically operated carrier arms.

Fig. 4: Frames erection with in-house and mobile cranes.

Fig. 5: Erection of the pipe racks and stairways.

Shop assembly started by installing the various modules and units, both for the calender and for the upstream and downstream winding components. All the guideways, levers, top, bottom and intermediate bearings, cylinders and roll retractors were pre-assembled, ready for installation on the frames *(Fig. 3)*. This increased the weight of each stand to about 100 ton each. A 250-ton mobile crane was therefore required to turn the pre-assembled stands from the horizontal into the lateral upright position *(Fig. 4)*. Each upper stand pedestal is mounted on a standard foundation module made up of several concrete blocks that can be adjusted to the calender size according to order.

For detecting any interference points, the frames and upper cross beams were precisely aligned in exactly the same way as they would be on-site. Subsequently, the inner traverse platforms, the pipe racks on both the drive and tender sides and the fixed or movable stairways on both sides were assembled *(Fig. 5)*.

In conjunction to this, assembly work continued around the clock on the cross-machine components such as doctor blades, steam moisteners, paper-rolls, top and bottom Nipco rolls, CeraCal-covered hard thermo-rolls and the intermediate calender rolls with Saphir-S covers *(Fig. 6)*.

Fig. 6: Installation of the rolls.

Fig. 7: Final calender assembly.

Fig. 8: Roll change testing.

Fig. 9: Completion!

Fig. 10: Machine frames with assemblies ready for transport.


6


7


8

Although installation of the roll steam moisteners and paper-rolls largely completed the mechanical assembly work, there still remained a good many details such as installing the rotary joints, lubrication systems, safety covers, etc. *(Fig. 7)*. At the same time, the electrical, hydraulic and pneumatic installations for all units were completed as far as possible.

Shop assembly was followed by carrying out operating tests on the various units, such as roll changing *(Fig. 8)*, doctor blade adjustment and replacement, paper-roll changing with a special traverse, roll retraction hydraulics, cross machine platform commissioning, etc. All these tests commenced exactly on schedule, and all were successfully completed according to plan.

Adopting the same procedure, the un- and rewind system was also completely pre-assembled, installed, and comprehensively tested using a reelspool provided by the customer.

Risk minimization thanks to shop assembly

Shop assembly not only covers the complete installation of machinery and units (components), the precise alignment of all frames and pedestals and verified compliance with the site interfaces, but also incorporates mechanical testing including interference checking and adjustment of all components.

Reasons for the Krefeld shop assembly policy

There are various reasons for pre-assembling such complex installations in the Krefeld shops:

To optimize design and quality, all errors must be identified and systematically eliminated whether in design, materials or manufacturing. Furthermore, particularly in the case of technical innovations, all components must be optimized by thorough testing. All this can be done much more rapidly and efficiently in the work-shops, thus reducing the risk of hidden deficiencies and ensuring greater product stability.

Another big advantage, certainly for the customer, is that site erection and commissioning times are significantly reduced by eliminating the need for structural changes and on-site optimization.

Apart from these objective aspects, there is also a psychological advantage: “finishing the job” brings a sense of attainment and enhances product identification among the design and production team *(Fig. 9)*.

Shop assembly is time well invested, as shown in this case by the customer’s appreciation during regular inspections, particularly close to completion. On-site problems are kept to a minimum and can be corrected fast and easily together with the customer’s team.

Prospects

With ongoing technical progress and the greater complexity of plant and machinery, installation and control system effort will continue to rise. For this reason shop erection in the future will involve much more than mechanical assembly: comprehensive system installation and pre-commissioning will also be required.

9

Short-term target for tomorrow

Not yet included in shop erection are the complete piping system assembly including flushing, the wiring systems, I/O and software checking, full operating tests and pre-commissioning of the hydraulics and pneumatics units, doctor blades, etc.

Our short-term goal is to develop this potential for more comprehensive shop assembly.

For new installations such as complete paper machines, pre-erection is not as time-critical as with rebuilds. For a calender replacement, for example, every day of a shut down saved reduces financial losses.

The substantial efforts in pre-erection allow shorter site-erection, installation and start-up times to the benefit of our customers. Prerequisite for a successful realization of this ambitious goal is the availability of a committed and dedicated team, delivering high quality machines to our customers.

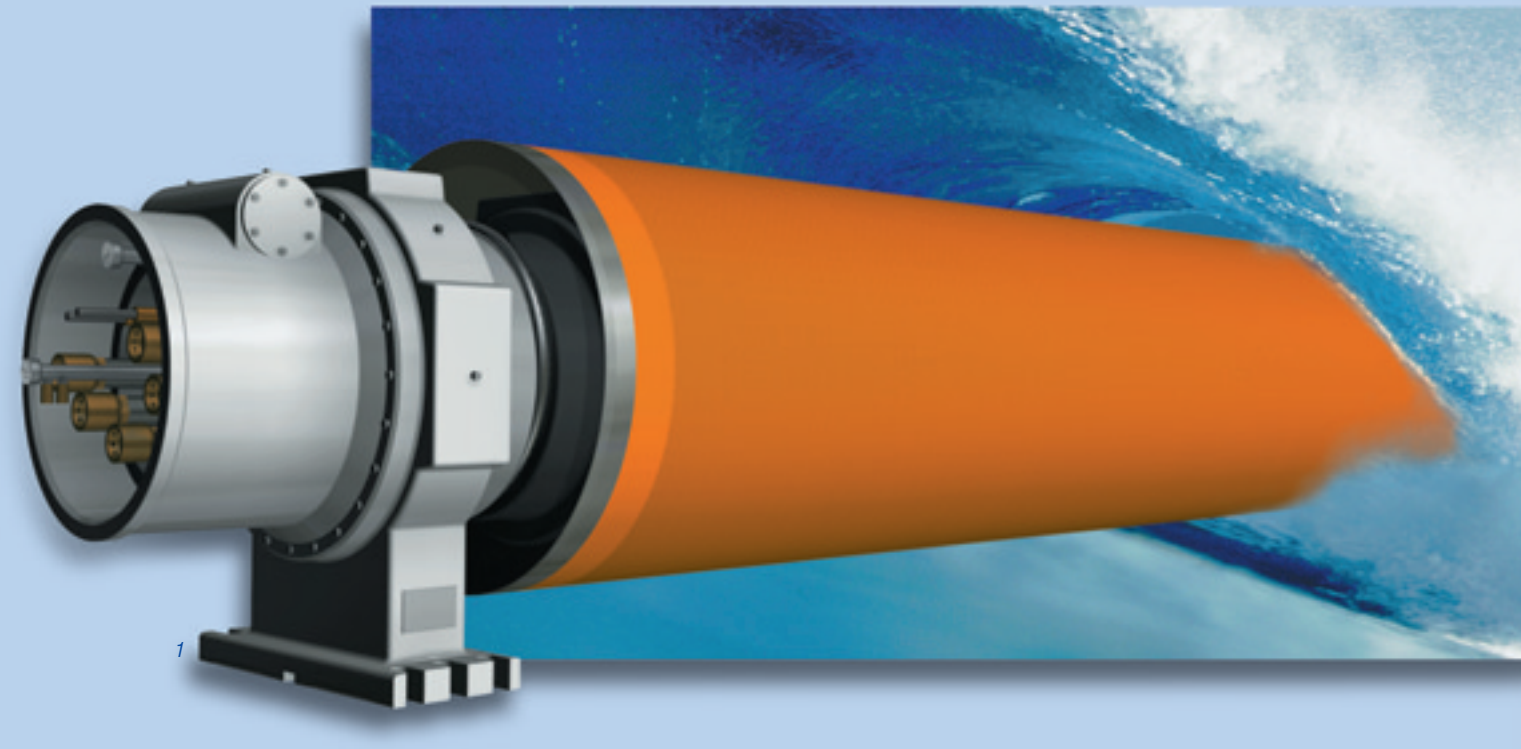
As apparent from the above description, Voith Paper Finishing in Krefeld, meets this goal.

10

Technical data of the Janus™ MK 2 calender	
Production speed	*1,300 m/min*
Maximum speed	*1,500 m/min*
Maximum line force	*500 N/mm*
Thermo-roll temperature	*150 °C*
Machine frame spacing	*10,360 mm*
Height	*11,680 mm*
Length	*10,460 mm*

Production data	
Paper grade	*SC-A +*
Basis weight	*54 g/m²*
Annual output	*240,000 t*
Web width	*8,920 mm*
Max. paper roll weight	*100 t*
Max. paper roll diameter	*3,700 mm*

Polyurethane Roll Covers – a technological overview



1

The author:
Dr. Michael Wokurek, Service

There are two basic product groups of Voith Paper polyurethane roll covers:

- **Aqualis, (PolyDyneSR), PolyDyne and G2000, for use in paper machine press sections**
- **PolyMate, for dry applications, mainly reel and support roll covers.**

A special-purpose product for marking presses in cigarette paper production is the ultra-hard HTP-1100 roll cover *(Fig. 2)*.

Aqualis – PolyDyne – G2000 design

With few exceptions, all roll covers used in the wet end are designed for the press section. They all have a very similar multi-layer construction comprised of a composite fibre-plastic base layer, the unique AST bonding layer and the polyurethane surface layer *(Fig. 3)*.

The reinforced base layer provides outstanding bonding to the metal core, high strength, and excellent resistance to water and chemicals even at high temperatures. This exceptionally sturdy design ensures optimally reliable operation and minimizes accidental damage in case of mishaps.

One of the worst examples of such damage experienced so far was a suction press roll core fracture, which was only

Fig. 1: Suction press roll.

Fig. 2: Product overview.

Fig. 3: Cover structure.

Fig. 4: Peeling resistance test.

Fig. 5: Fracture section through polyurethane/ base layer.

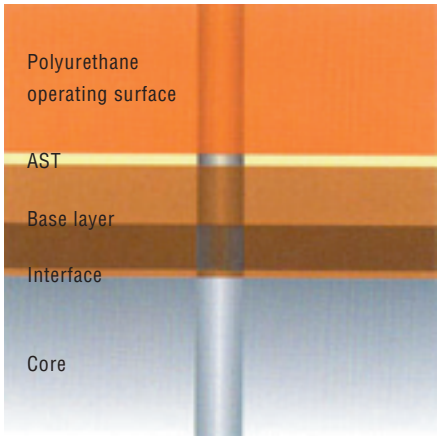
Fig. 6: Cover damage caused by steam box.

Fig. 7: AST bonding in damage zone.

2

Product	Operating environment	Loading	Hardness (P+J)	Surface design	Applications
Aqualis	wet	high	5, 10, 15	S, BD, G, P	Suction press rolls
PolyDyne	wet	high	5, 10, 15	BD, G, P	Press rolls
G2000	wet	very high	4	BD, G, P	Press rolls
HT 1100	dry	medium	0 (82 ShD)	P	Filigree press rolls
PolyMate	dry	low	5…50	P	Reels, support rolls, rewinders, …

3

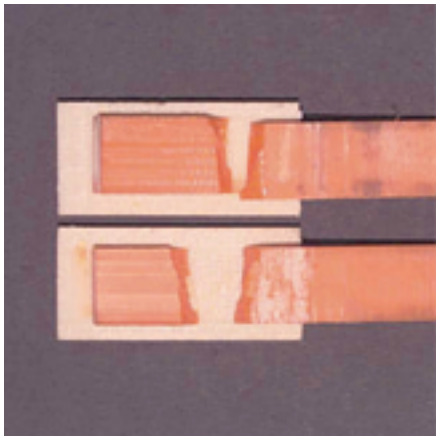


apparent from extreme eccentricity and confirmed by inspecting the roll interior: the cover surface remained unaffected.

The unique AST bonding layer is much stronger and hydrolysis-resistant than any other adhesion system *(Fig. 12)*. This is attributable to powerful chemical binding, phase mixing between the base and surface layers and waterproofing with special fillers.

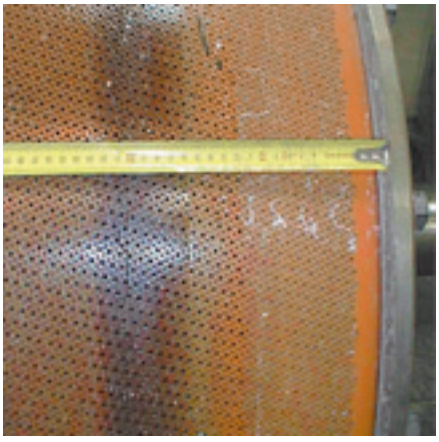
4

5

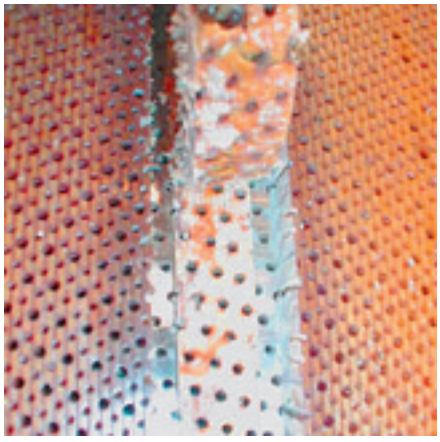


The strength and water resistance of the AST bonding system is even higher than those of the individual layers, as shown by the complete absence of adhesion ruptures in destructive testing *(Figs. 4 and 5)*.

6



7

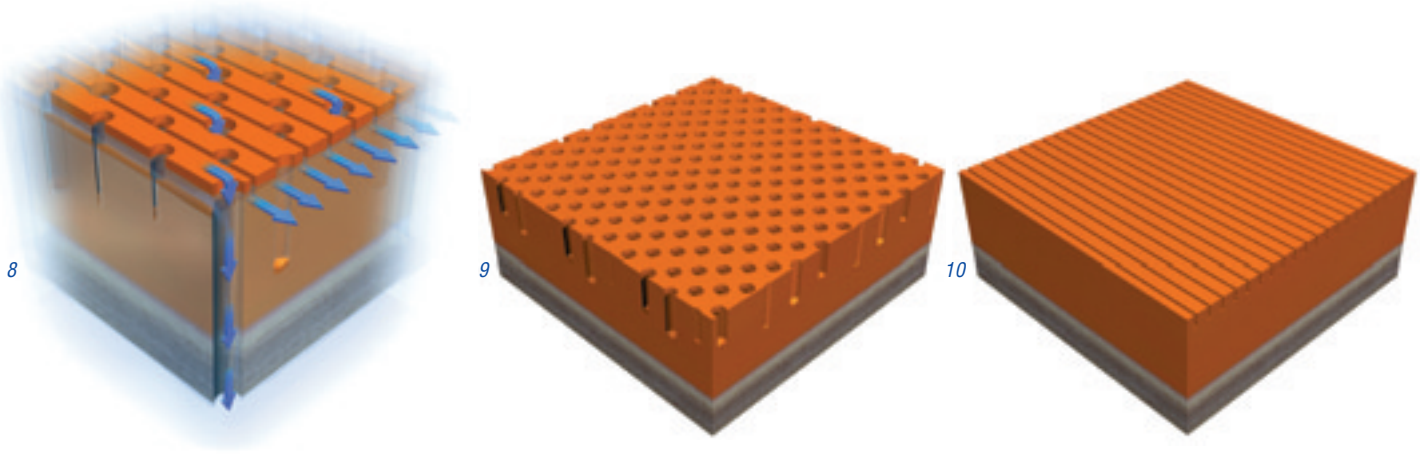


Impressive proof of the AST bonding layer strength was provided by a case of cover damage due to badly adjusted suction press roll steam boxes. Although the polyurethane surface was completely

Fig. 8: Drainage paths.

Fig. 9: Surface with blind holes.

Fig. 10: Fluted surface.



destroyed by hydrolysis, the bonding to the base layer remained virtually intact *(Figs. 6 and 7)*.

The surface layer normally comprises polyurethane materials on a poly-THF (PTMEG) basis. These PU materials uniquely combine high strength with outstanding elasticity, exceptionally good wear resistance and excellent resistance to hydrolysis. They are the best polyurethane materials available for this purpose at the present time.

The Aqualis – PolyDyne – G2000 drainage concept

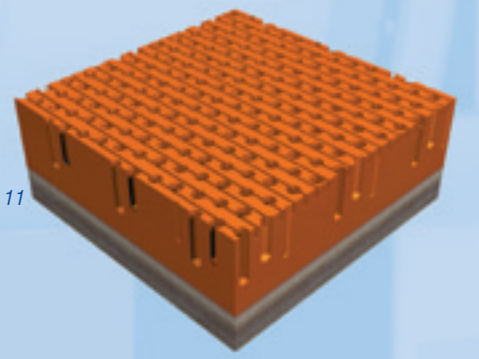
Nowadays, optimal computer-aided surfacing design saves up to 50% of the drainage ducting previously required *(Fig. 8)*. This significantly reduces surface flow resistance in all directions, so that web drainage is far more homogeneous. Furthermore, this innovative surface design optimally utilizes the effective water storage capacity of the blind holes without building up additional hydraulic pressure. This reduction also delays cover compaction and thus improves mean flow resistance.

The advantages of the new Aqualis drainage concept are proven in practice, as reflected by the more cost-effective operation of Aqualis roll covers.

Compared with rubber coatings, the high material strength enables practically unlimited combinations of holes and grooving with up to 45% free surface area *(Figs. 9 to 11)*, as well as outstanding durability. In many cases the optimized surface design has solved perforation imprint problems and also increased dry content. The advantage of the latter is either lower drying costs, or higher output with the same drying capacity. Further benefits of polyurethane roll covers include significantly longer felt life and conditioning advantages, when compared with an uncovered operation. In general the softer nip always has a positive effect on drainage and paper quality. The result is extremely gentle drainage, with less tendency to marking and crushing.

G2000 – the tough press roll cover

The G2000 press roll cover is even tougher than the standard covers Aqualis (PolyDyne SR, for suction press rolls) and PolyDyne (for press rolls). The main advantage of the G2000 polyurethane material is its far lower heat development under fluctuating loads (less flexing friction). This enables its use in presses with extremely high dynamic loading, where so far only grooved steel rolls were possible. These usually comprise high-speed

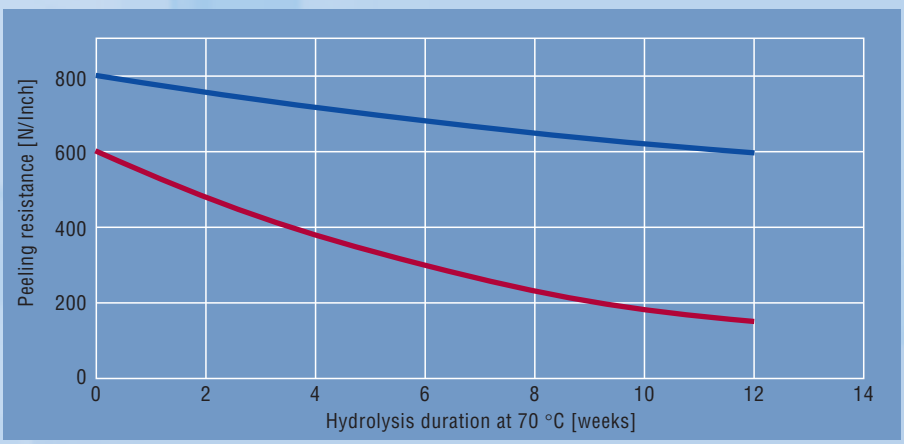


11

Fig. 11: Surface fluted and with blind holes

Fig. 12: Hydrolysis resistance of binding systems.
HT 990 (BKU binding)
PolyDyne 5 (AST binding)

12



third or fourth stage presses with small roll diameters and high line forces. The primary advantages here are much longer felt life, less vibration and less crushing. This material is also much more heat resistant than the standard covers, i.e. its melting point is higher. This is very important in the case of felt failures, because melting of the cover material is delayed long enough to prevent serious damage. The G2000 is also ideal for use in felted shoe presses.

Press optimization

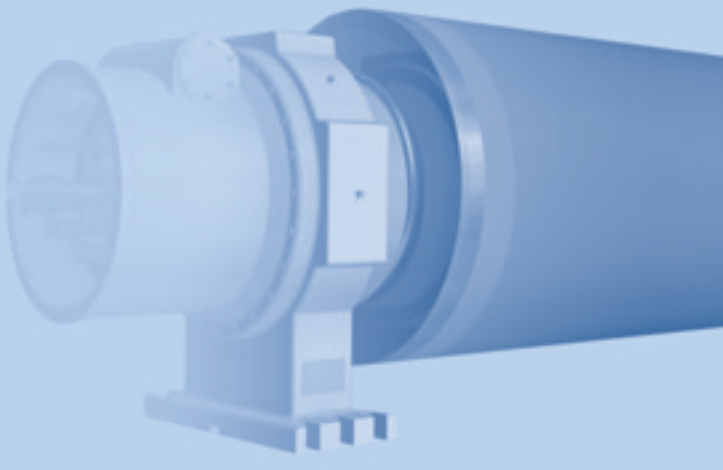
Due to the high complexity and interdependence of the various drainage processes in the press nip, neither perfect roll cover design nor optimal felting alone guarantees the best possible drainage. Only optimal balancing of the two elements ensures the highest drainage efficiency in the press nip. Any felting or roll cover changes must therefore be carried out jointly by both product specialists.

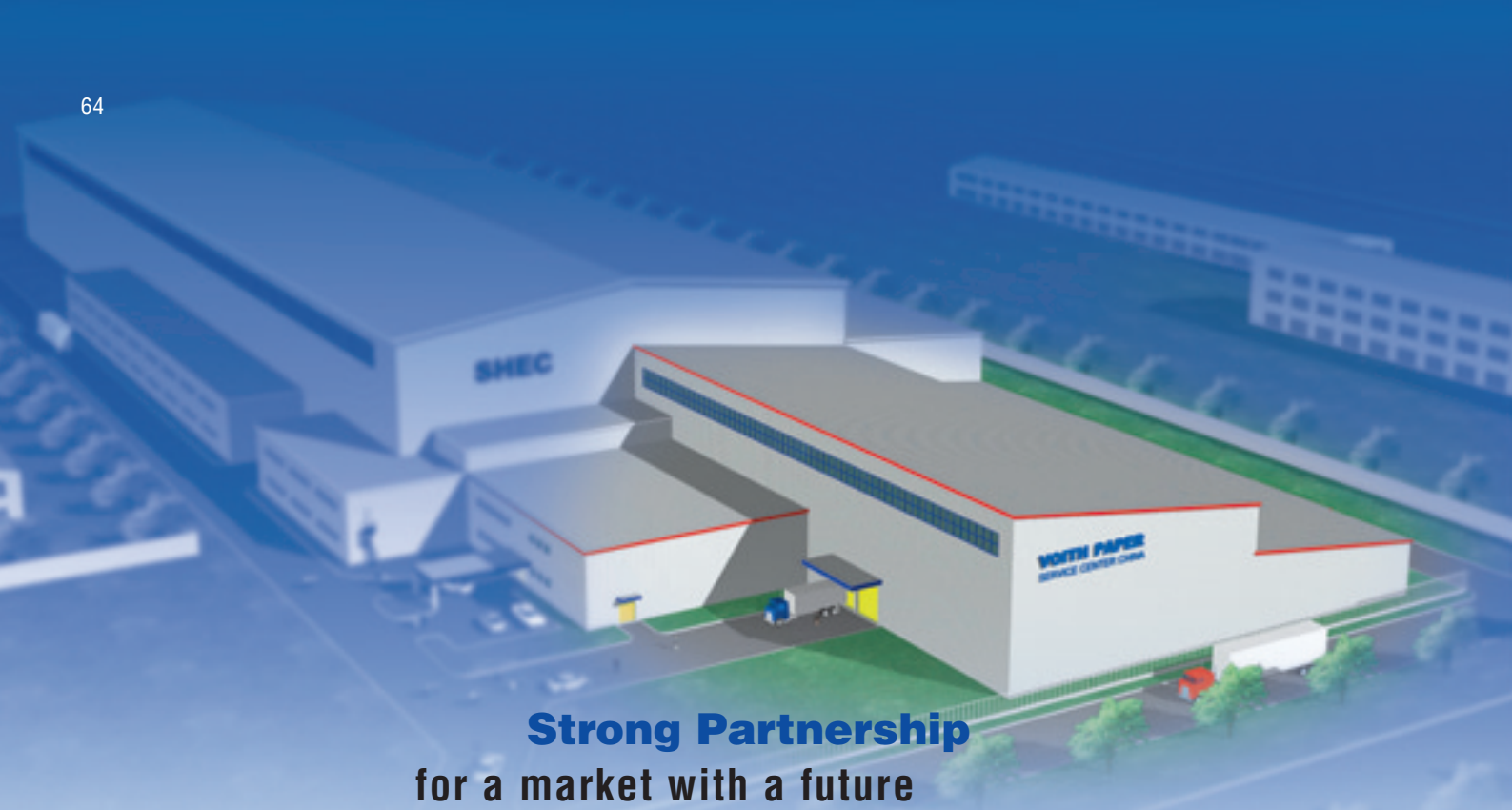
Future potential and prospects

Several other promising applications for polyurethane covers are currently under development or in the field trial phase. This particularly includes the application of Aqualis and PolyDyne roll covers for tissue machines, requiring the development of **softer** covers with very high resistance to hydrolysis and heat.

Further potential lies in the development of polyurethane covers for sizing rolls, mainly requiring high surface quality, homogeneity, and resistance to damage and melting.

Development work is also underway on polyurethane covers for paper-rolls in the wet end. The special challenge here is to produce a high quality yet cost-effective roll cover, meeting the respective requirements for corrosion protection, water and heat resistance and doctoring.





Strong Partnership
for a market with a future

Voith is not an unfamiliar name in China's paper industry, or in Chinese industry as a whole for that matter. This traditional partnership goes back a long way. For three-quarters of a century in the Middle Kingdom, Voith machines have been a hallmark of quality "made in Germany". Not long ago yet another Voith installation – built in 1929 – was modernized for further decades of dependability.

The author: Martin Scherrer, Service

China's successful economic policy and intensive industrial expansion has revitalized this long-term partnership.

Not only is Voith involved in China's most ambitious power project, with water turbines for Sanxia hydro station, but also with drive and traction systems for industrial installations, rail and road vehicles.

Voith's partnership with the Chinese paper industry is particularly fruitful. The delivery of powerful new machinery is accompanied these days by a higher degree of know-how transfer, and Chinese subcontractors are increasingly included.

Voith's commitment to China is long-term oriented. Voith is on the spot! This is emphasized by the Beijing Representative Office opened some time ago, the new Voith Siemens Hydro works in Shanghai, and the Voith Turbo drive systems plant. As one of the most important members of Voith Paper Technology, Voith Fabrics has a large manufacturing facility in Kunshan near Shanghai for former wires, press felts and dryer fabrics. It is therefore logical to expand Voith's presence at the growing industrial centre of Shanghai with a Voith Paper location.

Shanghai Service Center

The first step in this direction is to set up an efficient service center. Detailed planning is almost complete, and construction work will start in April 2002. At the beginning of 2003, the machine tools and testing equipment will be installed, so that by April 2003, the service center should be open for business after only twelve months of construction.

With 5,500 square meters of floor area and 700 m^2 of office space, the new service center is designed to meet all future needs. At first, the service offered will

mainly include comprehensive roll servicing, with machining capacities up to 100 tonnes roll weight, 15 m length and 2 m diameter. Covers and coatings will be available in rubber, polyurethane, composite high-tech and ceramic. Complete service facilities will also be provided for deflection compensating rolls.

The purpose of this investment is to deepen our partnership with the Chinese paper industry and to cut roll servicing times drastically for the benefit of Voith Paper customers. Clearly, a good many companies have been waiting for some time to have their roll servicing and covering, overhaul and grinding work done in China.

Another Service Center in Shandong Province

A thousand kilometers north of Shanghai, the paper industry in the Shandong province has substantially increased its capacities. This increase has also created a need for local professional roll servicing.

True to the Voith philosophy of being conveniently located, Voith Paper will, therefore, be opening an additional service center in this region. The main emphasis here will first be on roll machining and repairs, but additional services will be added later on according to demand.

Stronger Engagement in General

Since 1999, Voith Paper machinery start-ups and orders in China represent a production capacity of well over two million t.p.a. in a wide range of grades. Including the capacity of previously installed machinery, the importance of the Chinese paper industry as a Voith Paper customer becomes very apparent.

For this reason, Voith Paper is founding a new company in Shanghai specialized in sourcing and assembly. Speed, flexibility and cost-effective procurement are only some of the reasons for this. Another reason is our corporate policy of transferring an appropriate portion of value-added to the country where Voith Paper earns a good deal of its income.

In this connection, cylinders and dryer section components are already being manufactured in Liaoyang – proving that with intensive know-how transfer, close teamwork, systematic quality management and certification, Voith's globally accepted production standards can be met in China for selected components. Additional companies will be included in this cooperation policy.

To ensure perfect coordination of technology, service, sales, customers and suppliers, the Voith Paper Representative Office in Peking will also be transferred to Shanghai.

Voith Fabrics will be significantly expanding production capacities in Kunshan, extending the line of products, offered so to also improve exports from China soon, not only to other Asian markets, but also to North America and Europe.

In the past, the market for stock preparation lines in China and several other countries has been served by Andritz. In view of the growing customer preference for complete single-source installations, including overall responsibility for optimal process technology from pulper to reel, Voith Paper will be terminating this cooperation with Andritz as of June 30, 2002. In the future, all stock preparation needs will be covered by Voith Paper in China, including service and spare parts for the systems previously provided by Andritz.

"We want to move ahead with our leading technology in the Chinese market, offering an outstanding performance worthy of our reputation. We want to be even more so a long-term partner to the Chinese paper industry, rather than merely exporting from Europe to China. By creating jobs in China, we want to uphold and increase the prosperity of this country and its people".

These were the words of Hans Müller, Managing Director of Voith Paper, at the new service center project presentation in Shanghai.

PROCESS & PROGRESS

China Paper 2001 – Process & Progress

The author: Frank Opletal, Beijing Central Representative Office

The tenth China Paper and Forest Exhibition in Beijing impressively showed the progress made by China's paper and board industry in only one decade. There is still no sign of any slowdown in China's headlong but systematic advance toward an international market standing, appropriate to its size and global significance. Accordingly, great interest was shown at this exceptionally well attended trade fair in the latest paper technology developments and current trends in integral process solutions.

Voith Paper's status as a dependable partner to the Chinese paper industry is reflected in our production plants and local service centers in the People's Republic. This high commitment was underlined at the country's most important trade fair by a new exhibition stand, new information media and publications – all in the local language. No wonder the Voith Paper staff could hardly cope with all the questions and the rush for information and brochures. Indeed, the Voith Paper stand had to be barricaded off at times for the sake of public safety!

This situation was similar at the press conference, with every available seat taken. Here the Voith Paper management, represented by Hans-Peter Sollinger, Otto Heissenberger and Lothar Pfalzer, answered a barrage of questions assisted by Martin Scherrer and Ming Ming Liu from the Voith Paper China Representative Office. Main interest was in the new service center and production expansion in China *(see report overleaf)*.

Voith Paper is taking account thereby of China's expansive industrial development, particularly in the paper industry. With the growing sophistication of technology, increasingly professional service is required. And further production expansion will soon bring new challenges, demanding specific solutions – for example, in raw materials procurement.

The enormous investments of recent years already raise the questions of how to ensure enough raw materials supplies, which technologies to use for recycled paper processing or for greater use of fast-growing annual plant furnish.

During the Voith seminar, ten of our staff informed the numerous customers present about the latest technologies and solutions. Papers were translated for the attentive audience by the Mill Account and Mill Service managers of the Voith Paper Beijing Central Representative Office and Voith Fabrics Kunshan office.

The conference centre remained almost completely full right into the evening hours.

At the traditional VIP dinner held on the last night, Chinese government officials and German embassy staff heartily applauded the harmony found between Voith staff and guests from the paper industry in singing Chinese-English Karaoke together.

This one-week trade fair in Beijing upheld our contacts and intensified them through new inspiration. China has an exciting future, and Voith Paper intends to play a full role in this process with ongoing progress.

Founding of Voith IHI Paper Technology, Japan

On June 6, 2001 the founding ceremony of Voith IHI Paper Technology Co. Ltd was held in the Golden Room at the Palace Hotel, Tokyo. More than one hundred invited guests from the Japanese paper industry brought good wishes for the new company – an encouraging start into a promising future on a new basis.

On the left: Mr. Takeo Nakazawa, President Voith IHI, with the Voith IHI Paper Technology management team: Mr. Yuji Kose, Bernhard Müller and Mr. Hideo Joshida.

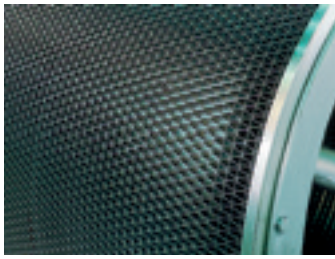
On the right: Hans Müller, President Voith Paper, and Mr. Shozo Ojimi talking with a customer.

Below: Welcome address by Masao Kobayashi, Chairman of the Japan Paper Association.

After more than twenty successful years as a Voith Paper Technology licensee, IHI (Ishikawajima-Harima Heavy Industries Co., Ltd.) has now formed a joint venture with Voith Paper for machine-building, erection and after-sales services in stock preparation, paper machinery, coating and finishing. The Japanese paper industry – one of the world's largest and most technologically demanding – will thus receive even better support with papermaking equipment and service.

The participation of IHI and Voith Paper in this joint venture are initially 70% and 30%, respectively. Voith will manage the business and plans to increase its participation accordingly in the future. The joint venture incorporates all the independent stock technology know-how of both partners, Voith Paper Japan and Ishikawajima Industrial Machinery. Sales activities in the Japanese market are the exclusive responsibility of Voith IHI Paper Technology, while export sales of the new joint-venture company will be handled by the Voith Paper global marketing organization. Voith IHI Paper Technology currently employs 100 people. Company headquarters are located near the Tokyo central rail station.

Finckh becomes Voith Finckh Fiber Systems



As already published in the paper industry magazines, Voith acquired the shares of Hermann Finckh Maschinenfabrik GmbH & Co., Pfullingen, Germany in October 2001.

The products of the traditional company Finckh ideally supplement the product range of Voith Paper's Fiber Systems Division. Finckh is well-known as a leading manufacturer of screen baskets and screen plates for the paper industry. Together with Finckh, Voith Paper is now able to offer the complete product range of screen baskets and screen plates from one source, whether perforated, slotted or milled, as well as wedge wire type screen baskets (C-bar™).

A company that has been active in screening technology as long as Finckh can, of course, also contribute a number of additional synergies in the joint development of screening technology for the future. Combination machines, such as the CYCLO™ unit or horizontal screens, now complement Voith Paper's existing range of products.

In addition, there are other Finckh products also of strategic importance for us. With its system of soaking – mixing – screening, Finckh possesses extensive process knowledge in the field of drum pulping. Voith Paper will apply this know-how in the application of the TwinDrum™ for raw materials that are easy to pulp down.

The management team of Voith Finckh Fiber Systems: (from left to right) Jochen Pfeffer, Manager, Sales; Bernhard Wandinger, Managing Director; Erich Czerwoniak, Manager, Technology.

Picture sequence at top: (from left to right) fold-design drum thickener, screen baskets and screen plates, dandy roll in honeycomb design.

Using Finckh's expertise in honeycomb-type designs, Voith Paper's range of paper machine components is now supplemented by dandy roll equipment, forming and couch rolls, as well as cylinder moulds.

With the acquisition of Finckh, approximately 120 additional employees have joined the Voith Group, the majority are situated in Pfullingen and some in the USA.

The first joint project discussions have not only shown that the Voith Paper and Finckh products complement each other perfectly, but also – and this is actually the more important point – that the teams harmonize together very well. This comes as no surprise since Pfullingen is only about two hours' drive away from both Ravensburg and Heidenheim.

Voith Paper acquires dewatering product line from Kvaerner

From left to right: Dag Ivar Caspersen, Manager, Sales and Project Management; Pål Bendiksen, Manager, Product Development; Lars Smedsrud, Product Manager, Dispergers; Morten Haga, Product Manager, Screw Presses; Even Gulowsen, Manager, Finance and Administration; Terje Fjellkleiv, Product Manager, Disk Filters.

Picture top left: Two disk filters in a newsprint mill.

Picture below: Christen Grønvold-Hansen, Managing Director, Voith Paper AS, in front of two screw presses in a kraftliner mill in Sweden.

Yet another important acquisition of enormous strategic significance has been completed within the Voith Paper Fiber Systems Division almost simultaneously with the take-over of Finckh, – the purchase of the Recycling and Dewatering Division of Kvaerner Pulp and Paper, Norway.

With effect from November 30th, 2001, all previous activities as well as the complete know-how and in particular all employees have been taken over by Voith Paper. The Centre of Product for dewatering is now Voith Paper AS in Lier, Norway, where approximately half of the 60 employees are located. The others are employed at the locations in Charlotte (USA) and Laval (Canada) and have been integrated into the organizational structure of Voith Paper Fiber Systems in North America.

This acquisition complements the Voith product range, especially in dewatering, where Kvaerner is the world's leader for screw presses and disk filters for the pulp and paper industry. Voith Paper has thus extended its product range with equipment of high strategic importance, and at exactly the right time, now that the co-operation with Andritz will come to an end. The desired co-operation with Kvaerner FiberLine will, if not immediately, certainly be of importance in the medium term. As a process supplier, we need to extend our knowledge of the characteristics of virgin fibres. In addition, both partners see interesting synergies for their products. Timing was the decisive factor for the acquisition of Kvaerner Recycling and Dewatering. From now on, Voith Paper offers a competitive product line for thickening, dewatering and fiber recovery. We can now concentrate our know-how and fully dedicate our efforts to the ongoing development of a proven product line.

After all the uncertainties the employees of Kvaerner have had to endure over the past few years, and even more so in the past months, we could feel how relieved the Kvaerner team was when the future co-operation with Voith was signed and sealed. In the meantime, we have got to know our new colleagues and find it a pleasure to work with such friendly and uncomplicated people.

Off to a good start: Voith Paper Technology Ltd., India

Fig. left: Offices of Voith Paper Technology Ltd., India.

Fig. right: The Victoria Memorial, Calcutta.

In April 2000, the long-standing licence agreement between Voith Paper and Larsen & Toubro Ltd., India's largest engineering and construction group, was transformed into the joint-venture company Voith Paper Technology Ltd., India. A particularly good reference for the fruitful teamwork leading up to this new company was the "Tamil Nadu" newsprint line, commissioned in 1994 for bagasse furnish, a sugar cane residue product.

A bright future together: the Voith Paper team in India.

Paper and board consumption in India, one of the world's largest and most heavily populated nations, is steadily growing with ongoing economic development. Because of the shortage of primary raw materials and the technological resources required for processing recovered furnish part of this demand is still covered by imports. The market prospects for Voith Paper are therefore very good, especially with the company's know-how in processing fast-growing annual plant residues and recovered paper. This joint venture takes full account of future needs by further strengthening the partnership between Voith Paper and India's paper industry.

The new company offices in Calcutta are directly opposite the Victoria Memorial. All fifteen members of the team here have years of paper industry experience and most of them have worked in our Heidenheim or Ravensburg facilities. They are off to an excellent start, and have already booked a number of attractive orders. Apart from some smaller projects, these notably include two press rebuilds for "Tamil Nadu" where the machines will be upgraded with the latest NipcoFlex technology.

PAPER CULTURE

Quite something – the Emperor's favorite wife

or the fascinating play of light and shadow

Paper, scissors, a quantity of Indian ink and a source of light: that's all one needs to put on a Chinese-Style shadow play in its simplest form. Of course, such simple silhouettes and professional shadow play theaters are worlds apart. But even the lavishly designed stages of the traditional Chinese shadow theater and the productions of modern ensembles depend far more on the simple effects of light and shade than on the use of costly materials.

1

Unlike all other conventional theater characters, the shadow-theater figure could be said to be in hiding, revealing only its outline to the audience. This 'disembodied' appearance gives it something unreal, dreamlike, fantastic. Small wonder, then, that Chinese and other shadow-plays are only made for the presentation of fairy-tales, sagas and myths.

The shadow figure can grow into a giant or shrink to the size of a dwarf. Within the twinkling of an eye it can be transformed from a human being into an animal; objects can appear and disappear, clarity can dissolve into empty space.

Day and night, darkness and fire, bright and dark objects, light and shadow are all elementary phenomena of the Earth. One can easily imagine that from time immemorial humans have sat in front of a warm fire in the shelter of a cave and seen their own images as shadows or dark silhouettes on the cave wall.

The shadow is an elemental symbol of the human psyche, showing, one could say, the dark side of our existence. One must, remember that in the colder regions of the world totally different associations are attached to shadows than in warmer countries where the shadow is the protector of life, offering shelter from a allburning sun beating mercilessly down from the sky. [2]

Another phenomenon of the shadow is the way in which it acts as our constant companion, our double. It follows us silently, does exactly what we do – but we never succeed in catching it.

Something eerily outlandish, something magical yet larger than life attaches to the shadow, something incomprehensible to our minds and reason. It is part of our spiritual world. Mythologies in numerous cultures depict the shadow as the domicile of the soul and the spirit: anyone who has no shadow is dead.

3

4

5

Fig. 1: Shadow-theater performer Norbert Götz from Bamberg (Germany).

Fig. 2: A French-African co-production narrates the African fairy tale "Sunjata".

Fig. 3 to 5: Traditional shadow theaters in Asia – the figures and fabrics have remained almost unchanged until today. (Fig. 3 China, Fig. 4 Java, Fig. 5 India.)

Fig. 6: Traditional shadow-plays in the Far East – Yasuaki Yamasaki: "The History of Du-Zi-Chun".

Origins of the traditional shadow play

Like paper itself, the birthplace of the shadow play is in the Far East, though scholars argue over exactly where it first appeared. China, India and Indonesia are considered as possible countries of origin, and of course it is conceivable that shadow plays may have developed simultaneously from various roots.

The first written records from the Chinese Sung dynasty are about 1000 years old, but the shadow theater's origins almost certainly go back to a much earlier date. Chinese mythology tells of a magician who performed shadow plays around 100 BC, at the court of Emperor Wu.

The magician stretched a piece of cloth in front of a source of light and asked the Emperor to take a seat on the other side of the cloth.

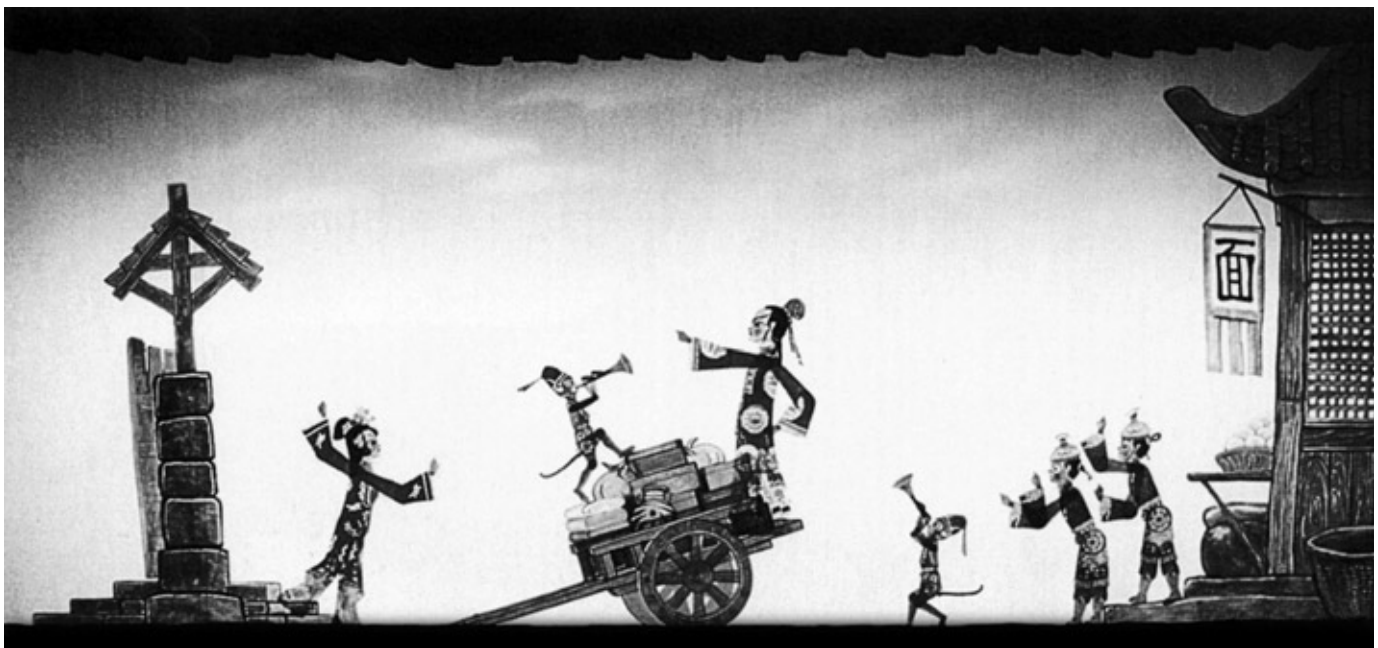
He then created a picture on the curtain in which the Emperor was convinced that he recognized his favorite deceased wife.

Numerous other records also refer to links between the cult of the dead and the origin of traditional Asian shadow theater.

That shadow plays emerged from this cult can be regarded as certain.

Even today, Indonesian shadow players make a sacrifice to the gods before the start of the play. These players have the status of a priest: they are invited to attend births, weddings and cremations, and to officially open a temple.

In India, the play of light and shadow also has its roots in religion. Parts of both the Remayana epic and the Krishna legend are still performed in this way in Southern India.



6

Fig. 7: German classic playwright Friedrich Schiller in a "silhouette" version.

Fig. 8: In 19th-century Paris the shadow theater "Cabaret du Chat Noir" was triumphantly successful.

Fig. 9: A cut-out by Ernst Moritz Engert, the German expressionist, dating from 1930.

Fig. 10: "Prinz Achmed" – a legendary figure by the German artist Lotte Reiniger. She was the first person in the world to make a full-length animated shadow-play film.

8


9


10

Chinese shadows in Europe

For many years, European shadow plays had only a secondary role to perform. The technique reached Europe in the middle of the 17th century via the old trade routes. However, to the Europeans, with their one-sided intellectual approach, the intangible shadows meant very little. The three-dimensional, "physical" character of marionettes and glove puppets appealed more to them. The play of light and shadow spread through Persia, Turkey and the Arabian cultural regions. The "ombres chinoises" (Chinese shadows) were initially referred to as "Italian shadows" in Western Europe, indicative of the fact that the play had traversed the Alps via Italy. Itinerant artists carried their stages with them, and were able to easily set them up almost anywhere. With figures made of cardboard, parchment, string and wire, with cloth or paper as a sunshade and with a suitable source of light, shadow theaters were extremely portable. In due course, many such artists used the "laterna magica" (magic lantern), a precursor of today's slide and film projectors.

Black ink and white paper

In the mid-18th century, silhouette portraits became fashionable in France. Anyone who took pride in his or her appearance needed a portrait drawn in black ink on white paper. A clever contemporary even invented a special chair as a means of ensuring an unquestionable resemblance between the silhouette pictures and the persons portrayed. A frame with a glass sheet was attached to it and covered with greased paper. A candle threw the light onto the paper in such a way that the shadow was free from any form of distortion. The contours were traced in, the inner area was filled with black ink and in no time at all the resulting lifesize portrait was finished. It could subsequently be scaled down by means of a pantograph.

These black silhouettes on white paper were not just popular in the drawing rooms and salons of the upper classes. In the 19th century, scientists tried to draw conclusions on human character with the aid of this technique.

The "Theatre Seraphin" was founded in Paris in 1772. A century later, the famous shadow theater "Cabaret du Chat Noir" achieved great triumphs. The all-round genius, Rudolphe de Salis, and the painter, Henri Rivière, did not attempt to stage a major drama play with mobile figures. Their recipe for success was to fascinate the audience with impressive pictures accompanied by ingenious lighting effects. With background music and daring texts, theirs was not slapstick but entertainment at a distinctly superior level.

European shadow theater celebrated its heyday in the age of Romanticism. In Germany Goethe, Brentano, Mörike, Uhland and Kerner wrote and staged shadow theater plays. At that time, plays with hand or body shadows and cut-out silhouettes were considered by any bourgeois household to be in the best of taste. In most cases, the early silhouettes were cut out of white paper and glued to a black background.

Even in modern times, Polish farmers' wives decorated their houses with col-

11

12

ored-paper cutout pictures. In China too, colored silhouettes are still very popular.

With the advent of film around 1900 – shadow plays can well be considered its direct predecessor – the great days of this art form came to an end. In Europe, some stages eked out a more or less miserable existence as unfamiliar entertainment for children or a few enthusiasts. In Asia, on the other hand, the shadow-play tradition is still respected and cultivated.

Festival on Voith Paper's doorstep

In Southern Germany during the 1980s, shadow player and teacher Rainer Reusch decided to take stock of the shadow theater and its situation. He discovered that a few stages were still in existence. From 50 countries, he collected the addresses of more than 300 professional modern shadow theaters, a figure to which numerous amateur stages had to be added. However, the total is certainly below the 1000 mark, whereas in Asia, according to expert estimates, the number of traditional shadow stages runs in the tens of thousands. During this research work the idea of an international shadow-theater festival was born. In 1998 the world's only festival for contemporary shadow play was launched in Schwäbisch Gmünd, South Germany – on the doorstep of Voith Paper, one might say. A year later, the International Shadow Play Center was founded in that town in cooperation with the world federation 'UNIMA' (Union Internationale de la Marionnette).

13

Fig. 11: Modern French shadow theater – Luc Amoros and Michèle Augustin.

Fig. 12: "In Xanadu" by Larry Reed, USA.

Fig. 13: A razor cut by Prof. August Holtgreve (Germany).

Our thanks are extended to Reiner Reusch and the International Shadow Center in Schwäbisch Gmünd for making the pictures available.