twogether

Paper Technology Journal

News from the Divisions:
Eltmann PM 3: successful start-up.

New techniques in liner and fluting production.

Mentakab PM 1 – State-of-the-art technology for Malaysia.

Janus MK 2 – a concept confirmed.

Corporate News:
The top address for system know-how.

Voith Sulzer Automation – key to the "Perfect" Paper Machine strategy.

Paper Culture:
The art of making money out of paper ...

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Frontispiece: The new stock preparation of Papierfabrik Palm, Eltmann/Germany.

Hans Müller,
President and CEO
Voith Sulzer Paper Technology

Dear Customer, dear Reader,

Despite difficult market conditions, especially in Asia and America, Voith Sulzer Paper Technology can look back on a satisfactory business year with an order book of 2 billion German Marks.

Orders received included 13 complete paper machines, seven of which will be installed in Europe, three in the USA, two in China and one in Australia. Apart from smaller orders, 18 major rebuilds were also booked.

We are particularly proud of the start-ups of two writing and printing paper machines in Germany at Papierfabrik Palm GmbH & Co in Eltmann and at Gebrüder Lang GmbH in Ettringen. Both machines belong to a new, future-oriented generation of plants operating with totally closed draws. The technological breakthrough in this machine concept for increasing production speed and enhancing paper quality was achieved mainly by onward development of our NipcoFlex shoe press technology and by the new Janus Mark II generation of calenders. We believe the innovative role we have adopted in keeping ahead of the field will attract considerable attention in the paper industry, with our new ideas rapidly gaining worldwide acceptance.

In July 1999, the Voith Group of Companies acquired the roll cover, service and paper machine clothing activities from the Scapa Group. This significant expansion in our service capabilities means we can provide our customers with even better assistance and support. Today, we operate 45 Service Centers in Europe, America and Asia. With the expansion in paper machine clothing technology, we are consistently pursuing our objective of expanding our base as a comprehensive systems supplier.

In establishing Voith Sulzer Automation we have combined all Group paper technology automation activities in our company. This concentration of forces has already shown first successes in the new "Millennium" range of products, bringing us one step closer to the most reliable paper manufacturing process.

For the new Millennium we wish you every success and hope that this issue of our "twogether Magazine" again proves interesting reading for you.

Yours sincerely,

Hans Müller
on behalf of the Voith Sulzer Paper Technology Team

HIGHLIGHTS

Startup highlights in 1998/99

Stock Preparation

Recovered paper stock preparation lines and systems for graphical grades
UPM-Kymmene, Shotton, Great Britain.
Malaysian Newsprint Industries Ltd., Mentakab, Malaysia.
Norske Skog Golbey S.A., Golbey, France.
Stora Enso Langerbrugge N.V,. Langerbrugge, Belgium.
Haindl Papier GmbH, Schwedt, Germany.
Papierfabrik Utzenstorf AG, Utzenstorf, Switzerland.
Papierfabrik Palm GmbH & Co., Eltmann, Germany.
UPM-Kymmene, Grand-Couronne, France.
Kuebler & Niethammer Papierfabrik Kriebstein AG, Kriebethal, Germany.
Cia. Suzano de Papel e Celulose, Sao Paulo, Brazil.
Celpav, Sao Paulo, Brazil.
Asia Pulp & Paper Co. Ltd., Dagang, China.
Champion International Corp., Sartell, MN, USA.
International Paper Co., Franklin, VA, USA.
International Paper Co., Eastover, SC, USA.

Recovered paper stock preparation lines and systems for board and packaging papers
United Pulp and Paper Co. Inc., Calumpit, Philippines.
Papeteries de Gascogne, Mimizan, France.
Harzer Papierfabrik GmbH & Co. KG, Rhumspringe, Germany.
RAKTA, Alexandria, Egypt.
Mayr-Melnhof Eerbeek B.V., Eerbeek, Netherlands.
Mayen Techno GmbH, Mayen, Germany.
Kartonfabrik Buchmann GmbH, Annweiler, Germany.
Daehan Pulp Co. Ltd., Chongju, South Korea.
Les Papeteries Emin Leydier, St.Vallier, France.
Niederauer Mühle GmbH, Kreuzau, Germany.
Orsa, Sao Paulo, Brazil.
Industria de Papel Fernandez S.A., Sao Paulo, Brazil.
Rigesa Celulose Papel e Embalagens Ltda.,Sao Paulo, Brazil.
Sulamericana Industrial Ltda., Sao Paulo, Brazil.
Republic Gypsum Co. Lawton, OK, USA.
Solvay Paperboard Inc., Syracuse, NY, USA.
Willamette Industries Inc., Albany, OR, USA.
Willamette Industries Inc., Port Hueneme, CA, USA.

Recovered paper stock preparation lines and systems for tissue
Wepa Papierfabrik P. Krengel GmbH & Co. KG, Giershagen, Germany.
Procter & Gamble, Apizaco, Mexico.
Klabin Kimberly, Cruzeiro, Brazil.
Sepac, Parana, Brazil.
Kimberly-Clark Ecuador, Ecuador.
Colpapel, Columbia.
Van Houtum Papier B.V., Swalmen, Netherlands.
Gold Hong Ye Paper Co. Ltd, Suzhou, China.
City Forest Corp., Ladysmith, WI, USA.
Fort James Corp., Rincon, GA, USA.
Kimberly-Clark Tissue Co., Mobile, AL, USA.
Kimberly-Clark de Mexico SA de CV, Iztaczoquitlan, Mexico.
Kimberly-Clark de Mexico SA de CV, Ecatepec de Morelos, Mexico.
Chesapeake Corp., Flagstaff, AZ, USA.

Chemical pulp systems
Kanzan Spezialpapiere GmbH, Düren, Germany.

Waste paper stock preparation lines and systems for other grades
Brodrene Hartmann, Tondern, Denmark.
O.P. Papirna Lillehammer s.r.o., Olsany, Czechia.

Paper machines

Graphical papers
Asia Pulp & Paper Co. Ltd., Dagang PM 1, China.
Asia Pulp & Paper Co. Ltd., Dagang PM 2, China.
Papierfabrik Palm GmbH & Co., Eltmann, Germany.
Gebr. Lang GmbH, Ettringen, Germany.

Board and packaging papers
Guangzhou Victorgo Co. Ltd., China.
Lee & Man Paper Co. Ltd., China.
Zhuhai Hongta Renheng Paper Production, China.

Tissue machines
City Forest Corp., Ladysmith, USA.

Installations and rebuilds
Burgo Ardennes, Virton, Belgium.
Consolidated Papers Inc., Biron, USA.
Munkedals AB, Trebruk, Sweden.
Burgo S.P.A., Mantova, Italy.
Munksjö Paper Decor GmbH, Calparsoro Vsta, Spain.
UPM-Kymmene, Pietarsaari, Finland.
Dr. Franz Feurstein GmbH, Feurstein, Austria.
Inforsa Industrias Forestales S.A., Inforsa, Chile.
Munksjö Paper Decor GmbH, Besozzo, Italy.
Japan Paper Industry Co. Ltd., Geibo, Japan.
Otake Paper, Otake, Japan.
MD Papier GmbH, Plattling, Germany.
Mayr-Melnhof Karton AG, Frohnleiten, Austria.
Union Camp Corp., Eastover, USA.
Nippon Paper Ind. Co. Ltd., Iwakuni, Japan.
Triple Play, USA.
Papierfabrik Scheufelen GmbH & Co. KG, Oberlenningen, Germany.
Champion International Corp., Roanoke Rapids, USA.

Lake Utopia Paper, St. George, St. George, Canada.
MoDo Paper AB, Husum Paper Mill, Husum, Sweden.
Munkedals AB, Munkedal, Sweden.
Dong Ying Xie Fa Paper Industry Co. Ltd., Dong Ying, China.
Patria Papier & Zellstoff AG, Frantschach, Austria.
MoDo Paper AB Stockstadt, Stockstadt, Germany.
E.B. Eddy Forest Products Ltd., Espanola, Canada.
Wellkisten- und Papierfabriken Fritz Peters & Co. KG, Gelsenkirchen, Germany.
Ambro S.A. Suceava, Suceava, Rumania.
Cartiera di Carmignano S.p.A., Condino, Italy.
UPM Kymmene Oy, Tervasaari, Finland.
Holmen Paper AB Braviken Paper Mill, Norrköping, Sweden.
Allard, France.
Oy Metsä – Botnia AB, Kemi Board Mill, Finland.
Beaupre, Canada.
Cartesar, Italy.
Cascades Arnsberg GmbH, Arnsberg, Germany.
Cartiera Marsoni Treviso S.r.l., Villorba, Italy.
Buchmann Rinnthal, Rinnthal, Germany.
Stora Papyrus Grycksbo AB, Grycksbo, Sweden.
Aconda Paper, S.A., Flassa, Gerona, Spain.
Papier- und Kartonfabrik Varel GmbH & Co. KG, Varel, Germany.
Stora Feldmühle Kabel GmbH, Hagen, Germany.
Metsä-Serla Oy, Äänekoski, Finland.
Cascades Blendecques S.A., France.
Smurfit-Stone Container Corp., Quebec, Canada.
Mayr-Melnhof Karton AG, Werk Hirschwang, Austria.
SCA Fine Paper, Hallein, Austria.
Roermond Papier B.V., Netherlands.
Jiangsu Zhonghua Paper Making Co. Ltd., China.
W. Hamburger AG, Austria.
Balkrishna Paper Industries Ltd., India.
Zinc Nacional, San Nicolas, Mexico.
EHV-Weidmann Ind. Inc., St. Johnsbury, USA.
Fernandez S/A Industria de Papel, Brazil.
Champion Papel e Celulose Ltda., Brazil.
Votorantin Celulose e Papel, Luis Antonio, Brazil.
Roman Bauernfeind Papierfabrik GmbH, Austria.

Coating technology
Asia Pulp & Paper Co. Ltd., Dagang, China.
Consolidated Papers Inc., Biron, USA.
Consolidated Papers Inc., Rapids, USA.
Cartiera del Garda S.p.A., Garda, Italy.
Industria de Papel Arapoti S.A., Inpacel, Brazil.
Cartiera di Carmignano S.p.A., Condino, Italy.
Ziegler Papier AG, Grellingen, Switzerland.
Salach Papier GmbH, Salach, Germany.
Hafreström Paper Mill AB, Hafreström, Sweden.
Goricane Tovarna Papiria Medvode, D.D., Medvode, Slovenia.
Stora Enso Fine Paper, Hagen, Germany.
Cartiera di Toscolano, Toscolano, Italy.
VCP-Votorantim Celulose e Papel, Celpav, Brazil.
Champion Papel e Celulose Ltda, Champion, Brazil.
Kombassan A.S., Kombassan, Turkey.
Guangzhou Victorgo Co. Ltd. Victorgo, China.
Inpacel – Industria de Papel Arapoti SA, Brazil.

Winding technology
– Sirius
Gebrüder Lang GmbH, Ettringen, Germany.
Papierfabrik Palm GmbH & Co., Eltmann, Germany.

– DuoReel
MoDo Paper AB Stockstadt, Stockstadt, Germany.
Asia Pulp & Paper Co., Dagang, China.
Asia Pulp & Paper Co., Dagang, China.
Consortium with Andritz for Suzhou Hongye Paper Mill, China.
Fort James, Usine de Kunheim, France.

– Pope reel winders
Consolidated Papers Inc., Biron, USA.
Abitibi Consolidated Inc., Kenogami, Canada.
Klabin Fabricadora da Papel e Celulose SA, Piracicaba, Brazil.

Finishing

Janus Concept
Gebr. Lang GmbH, Ettringen, Germany.

Rebuilds
StoraEnso, Maxau, Germany.

Ecosoft calenders
Dow Europe, Horgen, Switzerland.
Henry Cooke Makin, Milnthorpe, Great Britain.
Visy Paper, Conyers, USA.
Visy Paper, Staten Island, USA.
Visy Paper, Sydney, Australia.
Visy Paper, Brisbane, Australia.
Cart. Cariolaro, Italy.
Papeterie du Leman, France.
Papeterie de Vizille, France.
Munksjö Decor, Besozzo, Italy.
Gloria S.A., Peru.
Papresa, Renteria, Spain.
Mentakab, Malaysia.
Dagang, China.
Modo Paper Hallein, Austria.
IP Miller Falls, USA.
Ohio Paper, USA.
CPI Stevens Pt, USA.
API West Carralton, USA.
Victorgo, China.
Visy Paper, Atlanta, USA.

Calenders
Papierfabrik Palm GmbH & Co., Eltmann, Germany.

Supercalenders
DaeWoo, Mudanjiang, China.

Twister/Roll Handling
Mentakab, Malaysia.
StoraEnso, Wolfsheck, Germany.
Madison, USA.
Süddekor, Laichingen, Germany.
Papresa, Renteria, Spain.
Sappi Maastricht, Netherlands.
Yuen Foong Yui, Taiwan.

Toro
Mentakab, Malaysia.
Dagang, China.
Stora Grycksbo, Sweden.
Gebr. Lang GmbH, Ettringen, Germany.

Automation

Papierfabrik Scheufelen, Oberlenningen, Germany.
MoDo Paper AB, Hallein, Austria.

HIGHLIGHTS

Recent large orders

Stock preparation

Recovered paper stock preparation lines and systems for graphical grades
Kübler & Niethammer Papierfabrik, Kriebstein AG, Kriebstein, Germany.
Steinbeis Temming Papier GmbH & Co. KG, Gemmrigheim, Germany.
Papierfabrik Utzenstorf AG, Utzenstorf, Switzerland.
Haindl Papier GmbH, Augsburg, Germany.
Haindl Papier GmbH, Schwedt, Germany.
Romanello Domenico, Basaldella, Italy.
Norske Skogindustrier ASA, Skogn, Norway.
Holmen Paper AB, Hallstavik, Sweden.
Munkedals AB, Munkedal, Sweden.
Stora Enso Langerbrugge N.V., Langerbrugge, Belgium.
P.T. Aspex Paper, Cileungsi, Indonesia.
Daio Paper Corp. Ltd., Iyomishima, Japan.
Daio Paper Corp. Ltd., Kawanoe, Japan.
Nippon Paper Industries Co. Ltd, Kushiro, Japan.
Oji Paper Co. Ltd., Nichinan, Japan.
Cia Suzano de Papel e Celulose, Sao Paulo, Brazil.
Champion International Corp., Sartell, MN, USA.
Alliance Forest Products Inc., Donnacona, QC, Canada.
International Paper Co., Franklin, VA, USA.
Donohue Industries Inc., Houston, TX, USA.
UPM-Kymmene Corp., Grand Rapids, MN, USA.

Recovered paper stock preparation lines and systems for board and packaging papers
Kartonfabrik Buchmann GmbH, Annweiler, Germany.
FS-Karton GmbH, Neuss, Germany.
Roman Bauernfeind Papierfabrik GmbH, Raubling, Germany.
Papierfabrik Hermes GmbH & Cie KG, Düsseldorf, Germany.
Moritz J. Weig GmbH & Co. KG, Mayen, Germany.
Delkeskamp Verpackungswerke GmbH, Nortrup, Germany.
Klingele Papierwerke GmbH & Co, Weener, Germany.
Mayr-Melnhof Eerbeek B.V., Eerbeek, Netherlands.
SCA Packaging de Hoop B.V., Eerbeek, Netherlands.
Les Papeteries Emin Leydier, St. Vallier, France.
Iggesund Paperboard (Workington) Ltd., Workington, Great Britain.
S.A.I.C.A, El Burgo de Ebro, Spain.
Daehan Pulp Co. Ltd, Chongju, South Korea.
RAKTA, Alexandria, Egypt.
Papel Misionero S.A.I.F.C., Misiones, Argentina.
Visy Paper, Australia.
Rio Pardo – Ind. de Papeis e Celulose, Sao Paulo, Brazil.
Miguel Forte, Parana, Brazil.
Ningbo Zhonghua Paper Co. Ltd, Ningbo, China.
Shandong Rizhao Wood Pulp Co. Ltd., Rizhao, China.
Willamette Industries Inc., Albany, OR, USA.
Willamette Industries Inc., Port Hueneme, CA, USA.

Recovered paper stock preparation lines and systems for tissue
Wepa Papierfabrik P. Krengel GmbH & Co. KG, Giershagen, Germany.
FACEPA, Belem, Brazil.
Astoria, Porto Alegre, Brazil.
De Luxe, Rio de Janeiro, Brazil.
Papeles Industriales, Chile.
Kimberly-Clark Tissue Co., Mobile, AL, USA.
Chesapeake Corp., Flagstaff, AZ, USA.
Kimberly-Clark de Mexico SA de CV, Orizaba, Mexico.
Kimberly-Clark de Mexico SA de CV, San Rafael, Mexico.
Fabrica de Papel Santa Clara SA de CV, Mexicali, Mexico.
Proctor & Gamble, Apizaco, Mexico.
Cascades Industries Inc., Rockingham, NC, USA.
City Forest Corp., Ladysmith, WI, USA.
Kimberly-Clark de Mexico SA de CV, Morelia, Mexico.

Chemical pulp systems
Julius Glatz GmbH Papierfabriken, Neidenfels, Germany.
Kanzan Spezialpapiere GmbH, Düren, Germany.
Papierfabrik August Köhler AG, Kehl, Germany.
SOPORCEL, Lavos, Portugal.
Champion Papel e Celulose Ltda., Sao Paulo, Brazil.

Recovered paper stock preparation lines and systems for other grades
Minfeng Special Paper Co., Jiaxing, China.
Sano-Fibercement Plant, Rio de Janeiro, Brazil.
Papel Misionero S.A.I.F.C., Misiones, Argentina.
Celulosa Argentina SA, Argentina.
Fox River Fiber Co., De Pere, WI, USA.

Paper machines

Graphical papers
Quena Newsprint Paper Co., Kairo, Egypt.
Alliance Forest Products, Donnacona, Canada.
Soporcel – Sociedade Portuguesa de Cellulose S.A., Portugal.
Haindl Papier GmbH, Schongau, Germany.
Perlen Papier AG, Perlen, Switzerland.
Papierfabrik August Koehler AG, Oberkirch, Germany.
Papierfabrik Hermes GmbH & Cie KG, Düsseldorf, Germany.
Minfeng Paper Mill, Jiaxing, China.

Board and packaging papers
S.A.I.C.A. (Sociedad Anónima Industrias Aragonesa), Spain.
Shandong Rizhao Wood Pulp Co. Ltd., China.
Modernkarton Sanayi ve Ticaret A.S. Turkey.
Republic Paperboard Co., USA.
Visy Paper PTY Ltd., Australia.
Klabin Fabricadora de Papel SA, Brazil.

Tissue machines
San Francisco, Mexicali, Mexico.
City Forest Corp., Ladysmith, USA.
Occonto Falls Tissue Co., Occonto Falls, USA.
Cascades Services and Achats, Rockingham, USA.

Installations and rebuilds
Trierenberg Holding, Tervakoski, Finland.
Hallsta, Holmen Paper AB, Hallstavik, Sweden.
PT. Indah Kiat Pulp & Paper Corp., Tangerang, Indonesia.
Kitakami Paper Industries Co. Ltd., Ichinoseki, Japan.
DAIO Paper Corp., Mishima, Japan.
PT. Tanjungenim Lestari Pulp and Paper, Musipulp, Indonesia.
Champion Papel e Celulose Ltda, Mogi Guacu, Brazil.
Papierfabrik Adolf Jass GmbH & Co. KG, Fulda, Germany.
West Coast Paper Mills, Kagajmill, India.
Champion International Corp., Sartell, USA.
Usine de Condat Le Lardin, Condat, France.
Grünewald Papier, Kirchhundem, Germany.
Visy Paper Inc., Tumut, Australia.
Smurfit Towsend Hook, Snodland, Great Britain.
Mishima, Japan.
Consolidated Papers Inc., Wisconsin, Rapids, USA.
Bosso Carte Speciale SpA Mathi, Canavese, Italy.
Longview Fibre, USA.
Patria Papier & Zellstoff AG, Frantschach, Austria.
Balkrishna Industries Ltd., India.
Cartesar S.p.A., Italy.
Mondialcarta S.p.A., Italy.
Tambox CCC S.p.A. Stabilimento di Tolentino, Italy.
Union Camp Corp., Franklin, USA.
Papel Misionero S.A.I.F.C., Argentina.
Papirus Industria de Papel SA, Brazil.
Melhoramentos Papéis Ltda., Mogi das Cruzes, Brazil.
Klabin Fabricadora de Papel e Celulose SA, Telêmaco Borba, Brazil.
Fernandez SA Indústria de Papel, Amparo, Brazil.
J. Bresler SA Indústria de Papel, Brazil.
Klabin Fabricadora de Papel e Celulose SA, Celucat, Brazil.
Celulose Irani SA, Brazil.
Ledesma SA, Argentina.

Coating technology
Modernkarton Sanayi ve Ticaret A.S., Turkey.
Quena Newsprint Paper Co., Quena, Egypt.
Zhuhai Hongta Renheng Paper Production Co., Ltd., Zhuhai, China.
Dong Ying Xie Fa Paper Industry Co. Ltd., Dong Ying, China.
Champion Papel e Celulose Ltda., Champion, Brazil.
Ningxia Meili Paper Industry Co., Ltd., Ningxia Zongwei, China.
Soporcel – Sociedade Portuguesa de Celulose S.A., Portugal.
Perlen Papier AG, Perlen, Switzerland.
Modo Paper GmbH, Stockstadt, Germany.
CNTIC Trading Co. Ltd., Rizhao, China.
Repap New Brunswick Inc., Miramichi, USA.
Mingfeng Special Paper Co. Ltd., Mingfeng, China.
Steinbeis Temming Papier GmbH & Co., Glückstadt, Germany.
Stora Enso Magazine Paper, Corbehem, France.
Shandong Rizhao Wood Pulp Co. Ltd., China.
S.A.I.C.A. (Sociedad Anónima Industrias Celulosa Aragonesa) S.A., Zaragoza, Spain.

Winding technology
– Sirius
Haindl Papier GmbH, Schongau, Germany.
Perlen Papier AG, Perlen, Switzerland.
Produits Forestiers Alliance Inc., Donnacona, Canada.
Soporcel – Sociedade Portuguesa de Celulose S.A., Portugal.
S.A.I.C.A. (Sociedad Anónima Industrias Aragonesa) S.A., Zaragoza, Spain.

– DuoReel
Consolidated Papers Inc., Biron, USA.
Fort James, Turkey.

– Pope reel winders
Haindl Papier GmbH, Schongau, Germany.
Holmen Paper AB, Hallstavik, Sweden.
Quena Newsprint Paper Comp., Cairo, Egypt.

Finishing

Janus Concept
Perlen Papier AG, Perlen, Switzerland.
Haindl Papier GmbH, Schongau, Germany.
Alliance Forest Products, Donnacona, Canada.

Ecosoft calenders
Sun Paper, China.
Rizhao, China.
Soporcel, Figuera de Foz, Portugal.
Holmen, Hallsta, Sweden.
Ningxia, Zhongwei, China.
Zhejiang Yalun, China.
GP Port Edwards, USA.
Papierfabrik Hermes, Düsseldorf, Germany.
Weyco Springfield, USA.
Jagenberg GmbH.

Calenders
Rizhao, China.
Perlen Papier AG, Perlen, Switzerland.

Twister/Roll Handling
Klabin Fabricadora de Papel e Celulose SA, Telêmaco Borba, Brazil.
Steinbeis Temming, Gemmrigheim, Germany.
Soporcel, Figuera de Foz, Portugal.

Toro
Rizhao, China.
Soporcel, Figuera de Foz, Portugal.
Triple Play,Lawton, USA.

Automation

Perlen Papier AG, Perlen, Switzerland.
Crown Vantage, Parchment, Michigan, USA.
Crown Vantage, Miford, New Jersey, USA.
Republic Paperboard, Lawton, USA.
Charles Turner Ltd., Bolton, Great Britain.
Gebr. Lang GmbH, Ettringen, Germany.
Huatai Paper Co. Ltd., Dawang, Dongying City, Shandong, China.
Haindl Papier GmbH, Schongau, Germany.

Eltmann PM 3: successful startup

The author:
Dr. Thomas Welt,
Mill Manager of Eltmann mill,
Papierfabrik Palm

After exactly fifteen months construction and erection time, with a total investment exceeding 250 million Euro, Papierfabrik Palm's third newsprint line at Eltmann mill started up troublefree last September. The long-standing cooperation between Papierfabrik Palm and Voith Sulzer Paper Technology thus bears fruit yet again.

At 5.30 a.m. Central European Time on September 3, 1999 came that moment again when every papermaker's heart beats faster – the first startup of a completely new paper machine. At the touch of a button. 50,000 kilowatts were unleashed on 10,000 tonnes of high-tech paper machinery before the expectant eyes of a tired but happy crew.

That day was the culmination of exactly fifteen months construction and erection time, with more than 500 people working long hours during peak phases. Not to mention the intensive design effort involved in this decision for future-oriented technology – with no existing basis or reference plants.

To come to the point: everything went extremely well – as expected – with this startup despite the exceptionally innovative PM 3 concept. Not only does this include a whole series of newly developed components, but also the latest stock preparation technology for recovered furnish, and a completely new effluent treatment system. The startup phase has already been completed in less time than planned, thanks to full compliance with

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Fig. 1: Papierfabrik Palm, Eltmann mill, showing the new PM 3 bay.

Figs. 2 and 3: Disperger and deinking systems in the new stock preparation line.

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Figs. 4 to 7: Eltmann PM 3, rated capacity 250,000 t.p.a. newsprint at basis weight 34-60 g/m². A team well satisfied both with technical results and product quality.

the speed rise curve. And even more gratifying – to end customers as well as Palm – is the paper quality attained. The target of improved sheet formation with optimally uniform fibre and filler distribution, tear strength and surface quality has been reached in full, as well as superior handling and stability characteristics.

This pioneering venture – setting a technological milestone in newsprint production from 100 percent recovered paper – has certainly paid off. Not only for Palm, but also for Voith Sulzer Paper Technology, whose courage of conviction ideally complemented our own. Eltmann PM 3 is indeed an exemplary reference for efficient and environment-friendly paper recycling to unprecedented quality standards.

Papierfabrik Palm, founded more than 125 years ago, has always used recovered furnish and was the first in Germany

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SensoReeling – the new Voith Sulzer winding technology, Sirius concept.

to produce good newsprint from 100 percent recovered paper. This firmly established recycling strategy meant venturing into new realms several times during the company's growth, both in process technology and machinery concepts. Fortune favours the bold, so the saying goes – and the ongoing success of Papierfabrik Palm is proof indeed. Not only courage is required, however, but also know-how and perseverance in developing new ideas and making them work.

As a family company now in its fourth generation, Papierfabrik Palm would hardly be able to compete with the large international mergers dominating today's markets without its flexibility and independence. On this basis, Palm has pioneered again and again the quality advances assuring the company of a competitive edge. And most important, the Palm philosophy is the only one which makes sense in central Europe today for publishers, consumers and newsprint producers alike: the highest possible degree of recycling. This strategy is backed up again and again by sizeable investments such as Eltmann PM 3: production will soon be increased from 180,000 to 430,000 t.p.a.

The centrepiece of expansion

Eltmann PM 3, built by Voith Sulzer Paper Technology in Heidenheim, has a rated capacity of 250,000 t.p.a. at an operating speed of 1,800 m/min or 108 km/h!

Technical concept

- Sectionally consistency-controlled ModuleJet headbox for optimal CD profile.
- DuoFormer TQ for optimal sheet formation.
- First ever tandem NipcoFlex press in a newsprint machine, for lowest possible dewatering pressure.
- TopDuoRun dryer section with 38 cylinders.
- HardNip calender.
- Sirius concept for uniform winding with minimal tear.

New techniques in liner and fluting production

The author:
Eckhard Gutsmuths,
Stock Preparation

Higher product quality demands on the one hand and lower furnish qualities on the other hand require specialist fine tuning of the stock preparation sub-systems pulping, high consistency cleaning, screening and process water management into a more efficient overall system concept.

Market developments for packaging grades over the past few years have been aimed at cost savings, basis weight reduction and quality enhancement. With new production techniques for these grades, there is a growing demand for packaging grades with lower basis weights. For example, the basis weight of fluting has dropped in recent years from 130-140 g/m^2 to 100-115 g/m^2. In future, this trend will continue to well below 90 g/m^2, as shown by production lines currently under construction. The only way of compensating for the associated loss in production tonnage is to increase paper machine speeds. Here we should remember that the speeds of some of the paper machines recently ordered are well over 1000 m/min, even up to 1500 m/min.

With the new technologies for fluting production and even higher paper machine speeds expected in the future, the demands on stock preparation systems such as product quality and the reduction in specific water consumption and additive costs also need to be increased to ensure reliable paper machine operation.

By selecting appropriate stock preparation system modules – such as pulping, screening and thickening – the necessary high-grade stock quality can be ensured. Another module important for high product quality is the water, sludge and rejects (WSR) system.

State of technology today

Pulping

The pulping system of a modern stock preparation line for packaging grades

Fig. 1: TwinPulp LC pulping system – higher pulping capacity

Features:
- *Higher pulping capacity*
- *Secondary pulper provides deflaking potential*
- *Efficient heavies and coarse rejects removal*
- *Fibre-free rejects from Junkomat and drum screen.*

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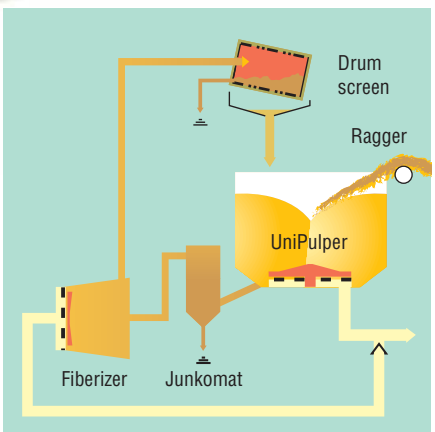
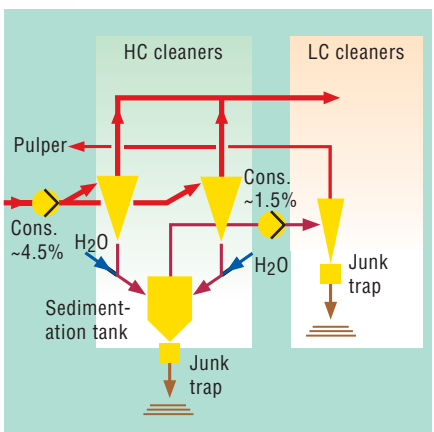


Fig. 2: Heavies removal with the Protector System – Protection of downstream screening stages from abrasive heavies

Features:
- *2-stage cleaner system*
- *Continuous rejects removal from HC cleaners*
- *Efficient heavies removal in second stage using LC cleaning.*

2



consists of low consistency (LC) pulper, Junkomat, TwinPulp continuous pulper detrashing system, and ragger *(Fig.1)*. Contaminants liable to stringing such as foil strips, strings and wires are removed by the ragger rope. The Junkomat removes coarse heavies which would otherwise cause serious wear or other severe mechanical damage in the secondary pulper (Fiberizer) of the TwinPulp System. In the TwinPulp System a partial flow continuously taken from the pulper is deflaked, the accepts being fed forward and large area light rejects are washed out in the drum screen. The rejects from the drum screen are virtually free of fibres, thus saving rejects dumping and freight charges as well as minimizing fibre losses.

Many stock preparation lines today have already been retrofitted with the TwinPulp detrashing system. It has been found that by using two secondary pulpers (Fiberizers) in parallel, the capacity of the primary pulper for the furnishes generally used in Central Europe can be boosted 20-25% by feeding the secondary pulper accepts forward. A further advantage of this machine configuration is that the stock is subjected to a specific pulping energy of up to 30 kWh/t, thus reducing flake content after pulping to < 12%.

Heavies removal

Efficient heavies removal is ensured today by the Protector System. This protects downstream screening stages from abrasive heavies *(Fig.2)*.

The 2-stage Protector System consists of HC cleaners with continuous heavies removal in the first stage, and LC cleaners with intermittent heavies removal in the second stage. HC cleaning is undertaken at about 4.5% stock consistency, with rejects continuously dumped in the sedimentation tank and diluted to about 1.5%. This ensures highly efficient separation of fibres and heavies in the following LC cleaners.

The advantage of the Protector System is that significantly higher removal efficiency is achieved thanks to the continuous heavies removal in the first stage, compared with single stage HC cleaning and intermittent rejects removal.

Coarse screening (holes)

The coarse screening stage for packaging papers comprises 3-stage hole screening *(Fig.3)*.

For the first two stages disk screens (Fibersorter) with 2.4-2.6 mm hole diameter are used. Disk screens are particularly well suited for these positions, since apart from good screening efficiency, they have a high deflaking potential. Flake content is reduced in the first two stages from 12% in the inlet to 2.5-2.9% in the accepts.

For the final screening stage in lines with a relatively high production rate, Combisorters are used. The machine is a combination of disk and basket screen. Flake content in the Combisorter accepts is about 5.9%, so that by feeding forward the accepts of all screening stages, flake content in the intermediate storage chest is about 3%. Another advantage of the Combisorter is that with inlet stock consistencies of 2-3%, rejects consistencies of 25-30% can be reached.

Fig. 3: Low flake level after hole screening.

Fig. 4: Relative stickies area flow in slotted screening – stickies size reduction 7%.

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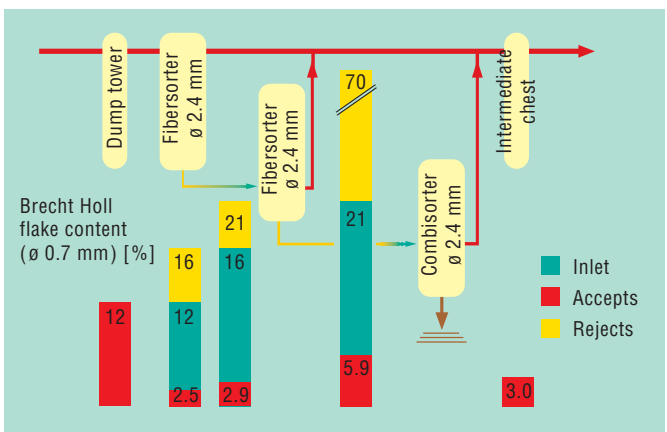

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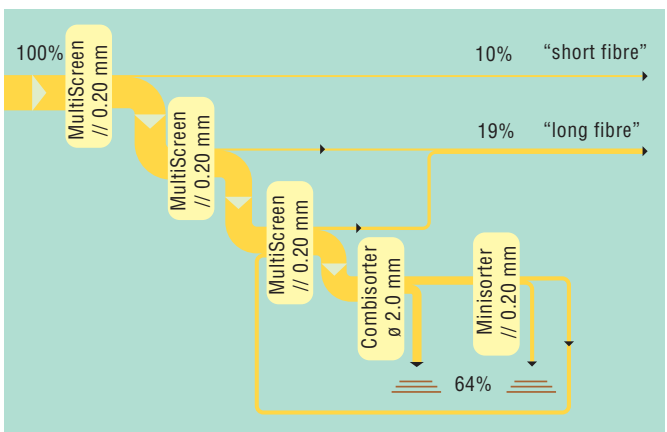

Fine screening

The fine screening module mainly comprises 3 to 4 stage LC slot screening *(Fig.4)*. In new plants, slot screening with slot widths of about 0.2 mm is used in stock preparation. For an optimum concept with multi-layer headboxes, it is better to generate the various stock qualities required (short and long fibre) in the slot screening stage.

Balancing the stickies area flow is undertaken here in fine screening. The stickies area flow in the inlet to the first screening stage is taken as 100%, with the accepts (short fibre fraction) showing a 10% content. The accepts of the second and third screening stages make up the long fibre fraction and contain about 19% of stickies area. The third stage rejects form the inlet to the final stage, comprising an A/B arrangement of Combisorter and Minisorter. Here, about 64% of stickies area is removed. The final stage accepts have the highest stickies area flow at about 15%. For this reason this flow is not fed forward, but partially returned to ahead of the third stage. Stickies size reduction in fine screening as a whole, particularly in the final stage, is about 7%.

Fig. 5 shows the flake mass flow, with 100% taken for the inlet to the first stage. Flake content in the first stage accepts (short fibre fraction) is about 7%, and about 15% in the second and third stage accepts (long fibre fraction). About 32% of flake content is removed in the final stage (A/B layout), so that flake content in the Minisorter accepts is about 13%. The accepts are partially returned to ahead of the third stage, thus recovering valuable long fibres. The high deflaking potential (flake size reduction) of 35% with the Combisorter, and the rejects removal at this machine, mean the Minisorter final stage is efficiently protected against a high flake content. Flake size reduction in fine screening as a whole is about 46%, relative to flake mass flow in the first stage inlet. This machine configuration therefore results in gentle screening without breaking down contaminants, but at the same time it provides a high deflaking effect.

WSR system

The process water system is closely linked with stock preparation. Various process water qualities are generated, and various water qualities are required for paper production, from pulping water to high-pressure shower water.

One of the simplest but most important measures for ensuring efficient process water management is the countercurrent principle. Fresh water for each production line is added in the PM loop only. Effluent is drawn off from the first (stock preparation) loop and fed to the clarification plant. The entire stock flow from

Fig. 5: Relative flake mass flow in slotted screening – flake size reduction 46%.

Fig. 6: Use of Deltapurge microflotation (DAF) and Trenner for fibre recovery and loop cleaning.

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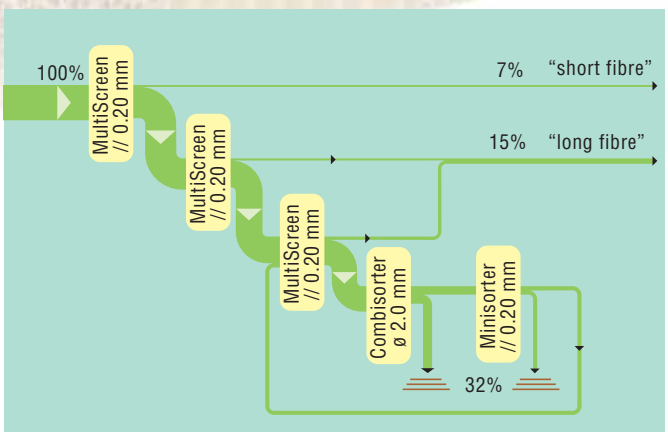

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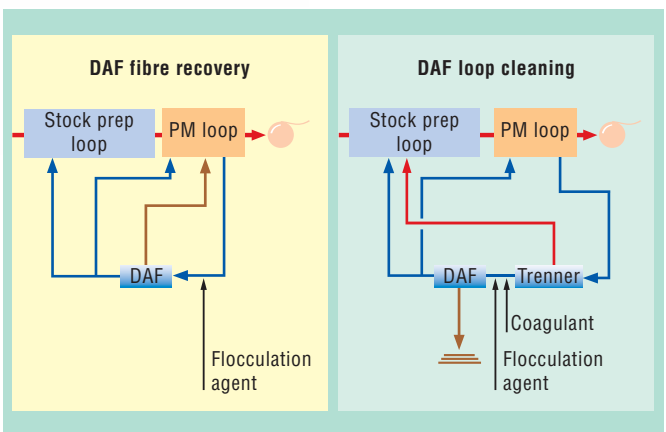


pulper to paper machine is in the opposite direction to the water flow. This largely avoids a build-up of dissolved or colloidal contaminants in the PM loop, which, apart from causing deposits on paper machine components (e.g. wires, felts etc.), also has a negative effect on chemical/physical processes.

Microflotation systems have already been used successfully for fibre recovery in the PM loop *(Fig.6)*. Solids in the whitewater are flocculated using a flocculation agent, and then returned to the production line. With the increasing closure of water loops, and the associated reduction of specific fresh water and effluent quantities, a build-up of colloidal contaminants can be detected in the PM loop.

The machine combination of Trenner screen and Deltapurge microflotation (DAF) is an effective and flexible way of counteracting this trend. Whitewater is first fed to the Trenner spray filtration unit, where the suspension is sprayed on to a special screen. Usable fibres (coarse fraction) are retained on the screen for direct return to stock preparation. Fines, ash and colloidal contaminants pass through the screen and are sent to the microflotation stage.

If microflotation is used for loop cleaning, a precipitation or coagulation agent is required as well as a flocculation agent. Apart from solids, the colloids are also agglomerated by this means and removed by microflotation. This flotate must, however, be removed from the process. The advantage of this machine combination is that the papermaker can react flexibly to fluctuations in recovered paper qualities with their different fines, ash and contaminant contents. He can also use this system without coagulation agent for stock recovery, returning the flotate back to the process, or he can remove ash, fines and, by using suitable agents, also colloidal contaminants from the system without losing valuable fibres.

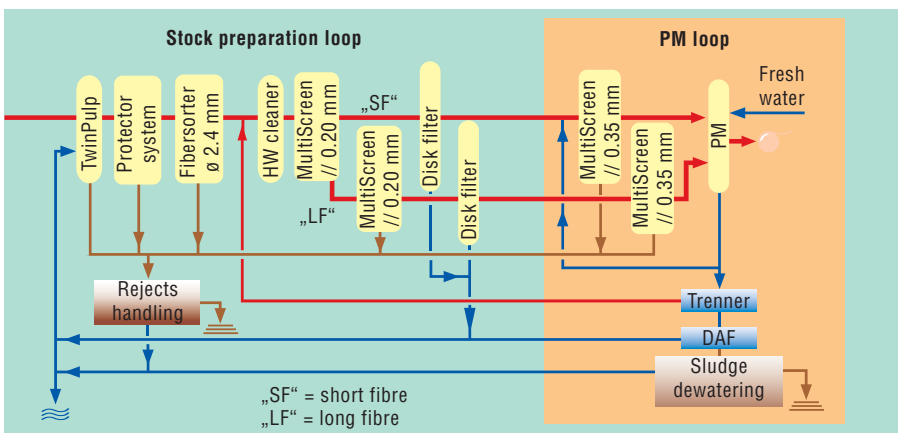
MET system

After explaining the more important individual system modules required for stock preparation, as well as the main components of the WSR system, *Fig.7* shows all subsystems integrated into a Most Efficient Technology (MET) system for packaging grades. The objective of this MET system, as indicated by its name, is to achieve precisely the required product quality for optimum efficiency in overall plant operation, yet with minimum investment and operating costs.

The furnish is slushed in the TwinPulp System, and the various rejects removed as early as possible by the ragger, Junkomat and drum screen. Further cleaning stages are the Protector System for re-

Fig. 7: MET (Most Efficient Technology) for packaging papers.

7



moving abrasive contaminants, Fibersorter hole screening, followed by heavies cleaning. Afterwards the stock is fine-screened in a multi-stage MultiScreen system, and the various stock qualities generated to suit the headbox configuration. The accepts from the first screening stage represent the short fibre fraction, while the accepts from the second and third screening stages form the long fibre fraction. At the end of stock preparation, each grade is thickened in disk filters and stored separately. Following dilution to the required headbox consistency, the stock then flows through a 0.35 mm slot screening stage (policing function) in the approach flow before being fed to the paper machine.

Whitewater is treated in the Trenner screen and microflotation stages. Here, fines, ash and, if necessary, colloidal contaminants can be removed from the system without losing valuable fibres. Fresh water is added at the paper machine only, whereas effluent is removed in the stock preparation loop, following the countercurrent principle.

With the MET system, mills have reported the following practical experience:

Efficient rejects removal

By a consequent full-flow cleaning in the stock preparation line, heavies and other abrasive particles are removed early on in the process. This significantly extends the service life of screen plates, baskets and rotors. It has been found that by installing a Junkomat, the service life of secondary pulper screen plates in the TwinPulp System can be extended by about 45%.

By installing a Protector System, the service life of screen plates and rotors in hole screening can even be extended by up to 300% in some cases. In addition, the reduced amount of abrasive particles in the product reduces machine wear in subsequent converting processes, such as at riffler rolls. This aspect will become even more important in future if we think of the significantly finer new flute profiles.

Cleanness

Fine intertuning the system's cleaning modules greatly improves stickies reduction between the dump chest and the headbox. For example, macrostickies (>150 µm) in the headbox are 40-60% less than in conventional systems. This reduces paper machine shutdowns for cleaning and increases runnability by up to 3%, thanks to fewer sheet breaks.

Quality constancy

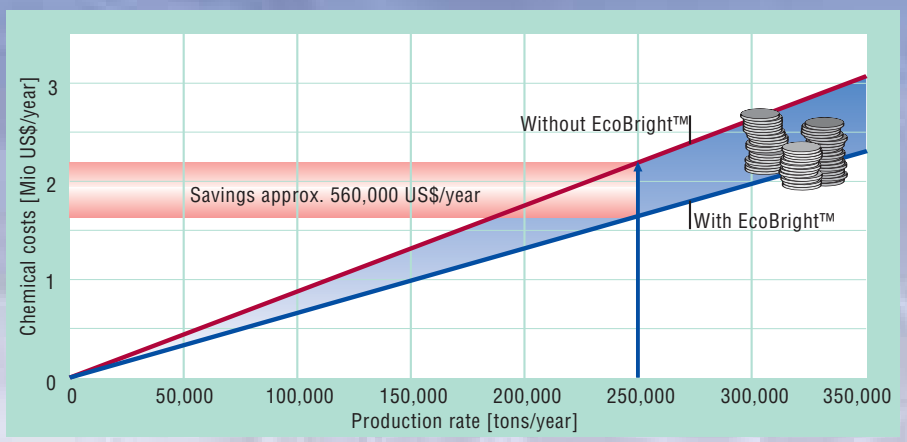
The MET system also means product quality can be selectively influenced. For example, fluctuations in furnish composition (ash and fines) can be compensated to a certain extent by the machine combination of Trenner screen and microflotation. And thanks to the more homogeneous stock composition and greater cleanness, the end product exhibits less scatter in SCT and CMT strength values. In some cases, an increase in SCT and CMT has also been noted. Based on these two observations, enormous savings can be made in additives such as sizing, or, alternatively, lower quality furnishes can be used.

For further details, please refer to Voith Sulzer Stock Preparation brochure VSR-SD-01-0013-GB-01.

EcoBright™ – a quantum leap in product quality constancy

Wouldn't it be fantastic if papermakers could produce fibre stock and paper with a significantly more consistent quality and even save money at the same time? Can't be true? EcoBright™, our intelligent new brightness control system, will help you achieve this objective.

The authors:
Volker Gehr, Thomas Köberl,
Boris Reinholdt,
Stock Preparation



1

The first EcoBright™ control package has been operating successfully since October 1998 in a recovered paper stock preparation line in a Central European newsprint mill. Here, final brightness of the finished stock is controlled in a peroxide bleaching stage by dosage of hydrogen peroxide directly at the disperger.

This installation has proved to be highly successful. Compared with the previous year, EcoBright™ has reduced hydrogen peroxide dosage by 30%, with similar savings in bleaching additives such as caustic soda and waterglass. Precise automatic control and extremely good correlation between on-line and laboratory brightness measurement has meant that the minimum brightness requirement for the finished stock has been reduced from 61% to 60.5% ISO. The mill no longer needs to set higher brightness levels to ensure a certain minimum brightness and so avoid the production of paper with an unacceptable brightness level. By registering variations in furnish quality and specific bleaching characteristics, EcoBright™ ensures chemicals are dosed precisely.

While direct cost-savings in bleaching chemicals can be accurately assessed, – here they amounted to US$ 1.90 per tonne of finished stock, – further benefits of the EcoBright™ system are not so easily quantifiable. As mentioned, these benefits mainly include a more consistent product quality, leading to reduced off-spec quality and lower loopwater loading thanks to less use of caustic soda and hydrogen peroxide. Reduced operator duties is a further significant advantage. Only the required brightness has to be set, which EcoBright™ then automatically targets and maintains by appropriate adjustment of chemical dosage.

The EcoBright™ control system uses high-precision optical on-line sensors

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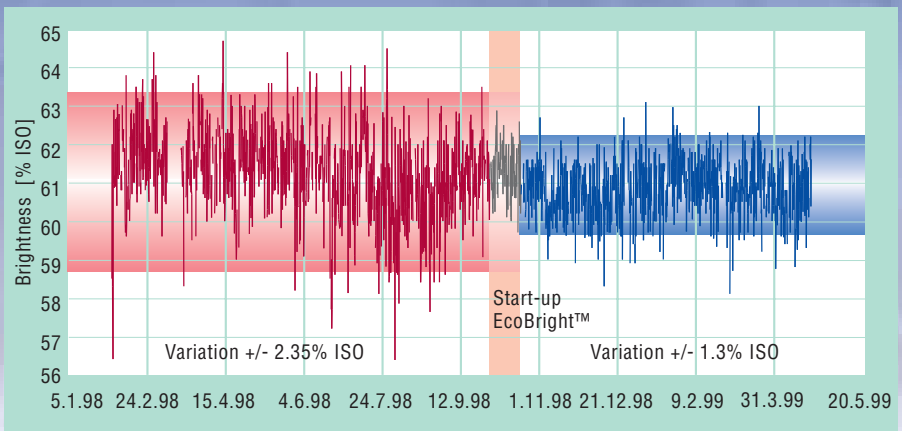

Fig. 1: Bleaching chemical savings with EcoBright™ Chemical costs: 1.3% peroxide (0.56 US$/kg, 100% concentration) 0.65% NaOH (0.26 US$/kg, 100% concentration).

Fig. 2: Final brightness values in 1998 and 1999 before and after installing EcoBright™.

which can be easily calibrated and require minimum maintenance. On the software side innovative control strategies such as SPC (Statistical Process Control), fuzzy logics and neural nets which have been "trained" beforehand in extensive laboratory and mill tests, are used. A feed-forward strategy is systematically applied so that action is immediately taken as soon as process changes occur, rather than waiting until they cause deterioration in product characteristics. EcoBright™ thus solves problems beyond the scope of conventional or manual control systems.

An important innovation of the EcoBright™ brightness control package is that for the first time more than one process stage is analysed and controlled. With EcoBright™ all stages following bleaching, such as post-flotation, are also integrated into the control system. For example, the synergy effects which hydrogen peroxide from bleaching brings in post-flotation are registered and taken into account. This makes EcoBright™ the first intelligent control system to be used in recovered paper stock preparation.

EcoBright™ is fully customizable since it can be adjusted to suit the specific conditions of the individual stock preparation system and technology. With EcoBright™ Voith Sulzer Stock Preparation therefore offers individual solutions for individual stock preparation plant, while at the same time drawing on the company's extensive technological know-how as leading equipment supplier in this field.

The chemical savings achieved with the EcoBright™ system cannot, of course, be precisely forecast. In general, however, the highest cost savings can be expected in cases where furnish quality fluctuates widely and/or large amounts of chemicals are used. Here, return on investment is fast, depending on production tonnage.

EcoBright™ – our services:

- *Definition of a customized brightness control concept to suit your individual needs*
- *Determination of measuring points*
- *Preparation of planning documentation for control and instrumentation*
- *Commissioning and calibration of brightness sensors*
- *Bleaching trials in the laboratory and in the mill*
- *Calculation of process dead times and process gains*
- *Software implementation for your customized brightness control system*
- *Implementation of the EcoBright™ system in your stock preparation line*
- *EcoBright™ system tuning*
- *Final system fine-tuning.*

EcoBright™ hardware:

- *Brightness sensors with optional self-cleaning module. The number of sensors depends on the individual system configuration*
- *Windows NT work station*
- *Link-up to your existing process control system (DCS) via OPC, various bus systems and/or serial interface.*

1

New drum pulper concept – continuous, compact, flexible, efficient and innovative

The author:
Wolfgang Müller,
Stock Preparation

A key role in recovered paper stock preparation is played by pulpers, which mechanically break down the recovered paper under simultaneous addition of water. The pulping system significantly influences both the cost-effective designing of the entire stock preparation line, as well as finished stock quality. All pulping systems aim to slush down the paper completely, without damaging fibres and without breaking down non-paper components. Minimum investment and operating costs as well as minimum energy consumption are further important requirements.

Existing systems, whether using continuous or batch pulpers or conventional drum pulpers, can only meet these needs to varying degrees. The new Voith Sulzer drum pulper, however, combines all the main advantages of pulpers and conventional drum pulpers in a completely new, patented pulping principle. Successfully proven in extensive testing with a trial drum pulper, the first order for this convincing new concept was placed with Voith Sulzer in less than one year from the original idea.

The new principle

The new Voith Sulzer drum pulper mainly consists of a drum rotating around a D-shaped stationary “displacement core”. The drum and displacement core wall together form a semi-annular displacement channel in which the furnish is carried upwards from the “collection zone” at the bottom of the pulper *(Fig. 2)*. Shear forces in the displacement channel generate intensive fibre to fibre friction, ensuring intensive kneading and slushing down of the furnish. The furnish then drops over the top edge of the displacement core and back down into the “collection zone”. Here, the large available volume provides a sufficiently long dwell-time. This secures complete wetting down and swelling of the furnish, – essential conditions for favourably influencing the pulping process.

Fig. 1: The recovered paper pulping system at paper mill Niederauer Mühle, Kreuzau/Germany: On the left the new drum pulper (3.5 m dia., 10 m long, 330 kW motor load, 18% pulping consistency, capacity 240 t/24h liquid packaging board). On the right, the drum screen.

Fig. 2: The Voith Sulzer displacement drum pulper principle.
V Velocity drop
F1 35% filling level (light yellow)
F2 60% filling level (light and dark yellow)
S1 Centre of gravity for F1
S2 Centre of gravity for F2

Fig. 3: Conventional drum pulper principle.

This continuously repeated wetting, softening and kneading process along the length of the drum ensures gentle, yet efficient pulping of the recovered paper, without breaking down non-paper components.

The special features

- The displacement principle ensures operation of the Voith Sulzer drum pulper with a significantly higher furnish input than with conventional drum pulpers *(Fig. 3)*. This can be up to 60% of total drum volume *(Fig. 2, light and dark yellow area F2)*. The high filling level, combined with efficient application of pulping energy, means displacement drum pulpers are considerably shorter in length, and thus more compact, than conventional drums.
- The displacement channel provides efficient upward transport of the furnish at lower peripheral speeds than conventional drum pulpers *(Fig. 3)*. Lower upward feed quantities in the channel are compensated by a more intensive furnish friction, i.e. higher pulping energy.
- Unlike in conventional drum pulpers, no rotary flows are generated in the displacement drum pulper so that operating efficiency is not negatively affected by stringing of non-paper components.
- By varying the amount of furnish *(Fig. 2, F1 and F2)*, dwelltime in the drum can be adjusted to suit the particular furnish whilst maintaining the same throughput rate. The filling level is easily adjusted via a discharge valve on the pulper discharge side.

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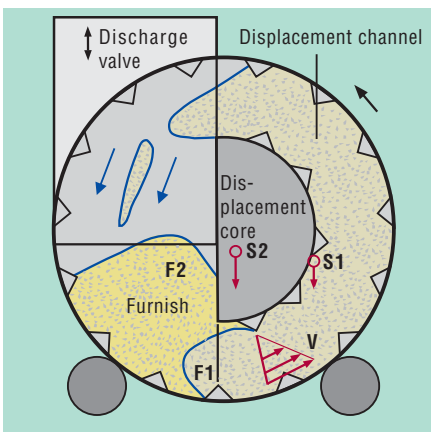

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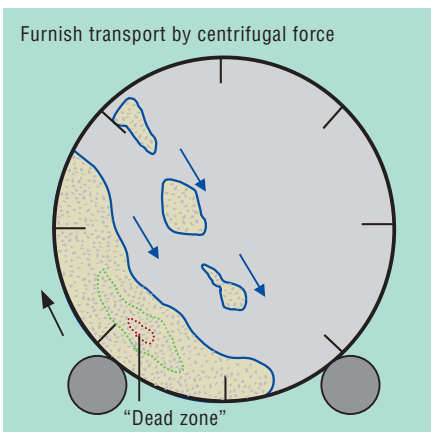


- Pulper power consumption remains virtually constant, independent of filling level.
- Thanks to intensive pulping, even difficult furnishes such as liquid packaging board or recovered brown grades present no problem. This was so convincingly demonstrated with the trial version that paper mill Niederauer Mühle, Kreuzau/Germany ordered a complete Voith Sulzer Paper Technology drum pulping and screening system for handling 240 t/24 h of liquid packaging board even before the test trials were finished.

Pulping of liquid packaging board at Niederauer Mühle

The pulping system consists of a 10 m long drum pulper, followed by a 12 m long drum screen. For efficient wetting down of the liquid packaging board, which is laminated on both sides with plastic foil, the board is first shredded and then pulped at 18% consistency in the drum pulper.

The pulp is then diluted ahead of the drum screen to ensure optimum separation of fibres from other components in the drum screen. Liquid packaging board consists of about 33% plastic foil together with fibres similar to virgin pulp and having a high CSF. The screening function therefore represents a considerable challenge. Nevertheless, the commissioning of this first Voith Sulzer drum pulping and screening system in August 1999 proved to be problem-free.

Even with wide variations in furnish input and consistency, the pulping results are constantly good. The drum screening is highly effective, with residual fibre content in the drum screen rejects remaining well below expected levels. As a result, the subsequent fibre recovery system, installed as standard in conventional drum pulping systems of the competition, has now been shut down. This impressive result confirms the process advantages of separate pulper and screen drums, an innovative concept allowing for optimum adjustment to suit the individual operating conditions.

Strategic reinforcement – Perlen PM 4

The author:
Bernhard Stützle,
Paper Machines
Graphic

Perlen Paper Mills, located near Lucerne in central Switzerland, currently produce newsprint, improved newsprint and telephone directory paper on PM 5, and woody offset printing paper on PM 1.

A furnish mix mainly comprising TMP and DIP is used, with virgin pulp for the lighter grades. Most raw material needs are covered by regional supplies, since adequate quantities of timber and recovered paper are available locally. TMP furnish is produced in high speed pressurized refiners, delivered from Andritz, Austria.

The deinking line in Perlen was supplied by Voith Sulzer Paper Technology in 1991, and the TMP line in 1994 within the framework of an extensive rehabilitation project. Both lines comply with the latest state of technology.

Project origins

During the course of strategic expansion studies, Perlen Paper investigated with external consultants various options for product types and output quantities. After detailed analysis, the decision was made for LWC offset paper production on a machine with 5,900 mm wire width.

The main goals behind this decision were as follows:

- To maintain and expand local furnish supplies. Both the TMP and DIP lines can be upgraded at relatively little outlay to enable greater output and higher quality.
- To exploit the company's excellent knowledge of local markets for launching new products.

Fig. 1: Perlen Paper Mills, central Switzerland.

- Adaptation of production output to achieve a good balance between furnish procurement and paper sales within a reasonable scale of activities.

The order

After a year of feasibility studies, a completely new paper machine line was ordered from Voith Sulzer Paper Technology. The scope of delivery includes a DuoFormer TQv in the wet section with a whitewater-regulated ModuleJet headbox. Special attention was paid to cleanliness in the design of this former for high runnability. It ensures excellent sheet quality and is also suitable for newsprint production as a startup grade.

The press section comprises two NipcoFlex presses, the first of which with double felting.

After the well-tried TopDuoRun predrier section comes a SpeedFlow coating aggregate. This is fitted with carbon fibre reinforced plastic applicator beams which are unaffected by temperature changes. A completely new predosing system was developed.

Coating is followed by a hot-air suspension drier, as well as an infra-red drier for regulating the humidity cross-profile.

The on-line Janus calender with six rolls has a variable nip threading system. Either all the nips can be used, or only the top or bottom nips. This enables calendering of the entire product range, from newsprint or matt offset grades to high-gloss LWC offset printing papers.

A Sirius roller ensures trouble-free winding of high-gloss paper on rolls up to 3,200 mm diameter, with lowest possible reject rates.

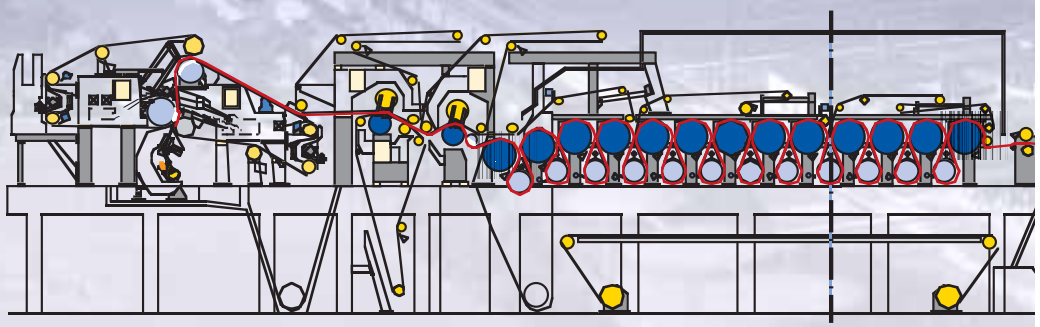
Engineering

Apart from the machinery, Voith Sulzer Paper Technology also received the order for project engineering. This covers machine design, process layout and MCR systems for the entire paper production line, including stock finishing and roll packaging. The scope of supply also includes procurement engineering by Voith Sulzer Paper Technology for all machinery as well as MCR and electrical systems. All requirements were established in teamwork with Perlen Paper, specifications compiled, tender invitations issued and subcontracts finalized.

Training

Right from the beginning of this project, Perlen Paper gave the highest priority to

personnel training as an indispensable success factor. Together with Voith Sulzer Paper Technology and Gernsbach school of paper technology, a comprehensive training plan was compiled which is based on thorough training by our production specialists and commissioning engineers. To complement this basic training, Perlen Paper is using a process simulator as described below.



Process simulator

A modern production line has a programmable process control system which receives operator inputs on the one hand, and process or plant feedback data on the other hand. From this feedback data it generates user display information on the plant operating status.

For Perlen, all the PM 4 production line parameters were programmed from the outset into the process simulator, including motors, pumps, limit switches, etc. This means that the process control system with its various monitors can be connected to the simulator, enabling the operating personnel to run the plant on a virtual basis with the original control and monitoring equipment – well before the actual machine comes on line.

Example: The original control monitor of the programmed control system displays among other data the headbox pump pressure. This can be set to a higher value by the operator, exactly as it will be when the plant comes into service. The control system then executes the necessary steps and issues a corresponding command not only to the process itself, but also to the simulator. Process reactions to this command are simulated, and the (virtual) headbox pump runs faster to increase the pressure and the flow rate through the headbox. Simulated pressure and flow sensor signals are then transmitted back to the process control system, and the operator sees on the display the results of his action.

By this means, the operating personnel can familiarize themselves on the original user interface with all main process functions several months before the machine actually starts operating. Another advantage for easier commissioning later on is that during simulator programming, the process control system was thoroughly checked.

Quality management system

The main scope of supply includes our well-proven Profilmatic cross-profile regulation system for the headbox, steam boxes, calender and infra red dryer. As a separate order, Voith Sulzer Paper Technology was also entrusted with the comprehensive quality management system comprising:

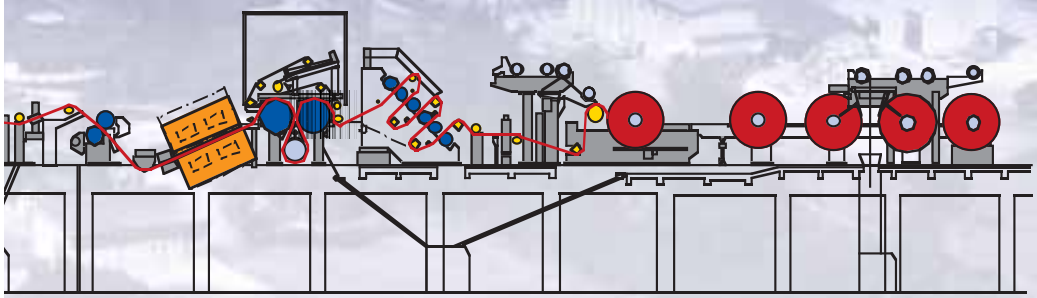
- Voith Sulzer Paper Technology "Advantage Plus" measuring frames with sensors for basis weight, moisture content, ash content, consistency, colour hue, porosity and gloss.
- Quality control system with machine-direction regulation of basis weight, moisture content and ash content, automated grade change and production data reporting.
- "Infopac" graphical quality analysis system.
- "Parsytec" web inspection system.
- "Web Eye" break analysis system.

Perlen Paper thus receives a fully comprehensive hardware and software system from a single source, without the interface problems usually encountered otherwise.

System partnership

Coated paper production is a new field for Perlen Paper. But by installing this

Fig. 2: Technical data of Perlen PM 4:
Design speed 1,500 m/min
Wire width 5,900 mm
Web width on roller 5,360 mm
Design output 572 t/day
Product grades: coated offset papers, glossy and matt, 45-70 g/m², newsprint and improved newsprint.



The PM 4 project as seen by Rolf Maisch, Managing Director Perlen Paper Mills

"Our goals with this new production line are very ambitious. But if the concept targets, time and cost schedules are complied with as well as they have been so far, this innovative machine will be producing top quality paper as of October 2000.

Coated paper quality depends very much on the furnish and the basis paper, which must have fine high-strength fibres and a uniformly high consistency. Innumerable trials with TMP and deinked recovered paper, using a wide variety of treatment methods, have shown that excellent fibre mixtures and basis paper qualities are obtainable with these furnish grades, so that our goals in this respect have already been reached.

A more difficult task is to develop coating materials and technology to the required quality. Thanks to unprecedented teamwork between pigment manufacturers, binding agent producers, Voith Sulzer Paper Technology and Perlen Paper Mills, a good deal of pioneering work in this respect has already been done and will continue well beyond the commissioning of our new PM 4.

Such a large project places the highest demands on the management of both partners. In order to comply with the short realization time of only 18 months, ongoing planning is required – in other words, simultaneous engineering.

The civil engineering schedule allows no room for delays: foundations and bedplate phases 1 and 2 have already been completed, and some imposing concrete pillars have changed our skyline. Furthermore, the project costs and deadlines are fully on schedule."

modern plant and the peripheral systems described above, they have laid the best possible foundations for success – including highly competent operating personnel thanks to virtual training in advance!

To reap the full benefits of product quality from these resources, a long-term cooperation agreement was signed between Perlen Paper Mills and Voith Sulzer Paper Technology which also covers the product optimization phase after plant commissioning.

Project teams have been formed comprising experts from both sides of this partnership, together with suppliers such as the coating colours, and even including printers for final product assessment. Led by a committee made up of management members from both partner companies, key matters are dealt with ranging from stock finishing and base paper optimization to developments.

Partnership results so far have already brought excellent progress in product development. All partners involved confirm that thanks to this transparent teamwork in solving difficult tasks, both sides gain extremely valuable system know-how. There is no doubt that with such a good start, PM 4 at Perlen Paper Mills will very soon be producing LWC offset paper of the highest quality after commissioning in October 2000.

Mentakab PM 1 – State-of-the-art technology for Malaysia

The author:
Douglas Miller,
Paper Machines
Graphic

On a 65 acre greenfield site near Mentakab, in Pahang state, is Malaysia's first newsprint mill using recovered paper – the third largest newsprint mill in Asia.

Since April 1999, the long-term goals of **Malaysian Newsprint Industries (MNI)** have now become reality:

- Newsprint production from 100% recovered paper, using modern plant according to the latest state of technology.
- Coverage of nationwide newsprint needs (currently 315,000 t.p.a.) as well as export trading with neighbouring countries.

In October 1996 MNI took over from Genting Sanyen Corporation – Malaysia's leading producer of packaging paper and corrugated board – a newsprint production project which was at the planning stage. Genting Sanyen relinquished its diversification plans and handed over the project to MNI, including the order which had been placed for a Voith Sulzer newsprint machine.

First it was necessary to find a suitable site for Malaysia's papermaking debut. The stage was finally set in the middle of the peninsula near Mentakab, a town with 22,000 people. There were several reasons for choosing this site:

- Its proximity to the Sungei Pahang river, Malaysia's largest, thus ensuring adequate water supplies and enabling disposal of treated effluent.
- Its central location halfway between the east and west coasts.
- Its nearness to Malaysia's main rail connection with Singapore and Thailand.

In a region still surrounded with jungle, whose main source of income has so far been the timber industry, erecting a newsprint production plant using 100%

Fig. 1: LC cleaning in the Protector system.

Fig. 2: Flotation deinking plant.

Fig. 3: LC screening and partial washing with two VarioSplit units.

Fig. 4: Deltapurge microflotation.

recovered paper is a courageous and visionary step. By creating jobs for 265 people here and providing the necessary training, this plant sets a milestone for the future in the conservation of resources.

In March 1967 construction work started simultaneously on the paper mill, the water supply and effluent treatment infrastructures, and on an oil-fired combined cycle power plant – in this isolated location, all heat and power has to be generated on site. The power plant has three steam turbine units, each generating 24.2 MW with 47 t/h of steam. Two of the generators cover normal production and in-house needs, while the other is held in reserve.

The preparations for paper machine installation began on November 17, 1997 with site surveying and foundation alignment work. By November 30, 1998 – only one year later – installation had been completed. The entire responsibility for erection and commissioning was entrusted to Voith Sulzer Paper Technology.

On February 3, 1999 – nine days before the scheduled date – at 8.08 local time, the first roll of paper was completed at an operating speed of 1,188 m/min. Since eight is a lucky number in Malaysia, this numerical combination both in time and speed might well be a good omen for the future. Commercial paper production had originally been scheduled to start on April 1, 1999, but by then the production was already well above the guaranteed 625 t/day. Output soon exceeded the projected production by 20 percent. Likewise the operating speed of 1,350 m/min was not only reached much earlier than three months after commissioning, but significantly exceeded. This made Mentakab PM 1 the fastest paper machine in the entire Fletcher Challenge Corporation.

The customer's requirement for peak paper technology was certainly an important factor in the cooperation with Voith Sulzer – but that was only one of the reasons. At least as important was the confidence of the customer in benefiting at the same time from comprehensive know-how transfer and professional support in building up a well-trained operating and maintenance team. In fact this thorough training started well before commissioning – thanks to modern process simulation techniques.

This confidence in reaching the goal ***"twogether"*** paid off in no uncertain terms: the commissioning figures speak for themselves.

The scope of supply by Voith Sulzer Paper Technology and subcontractors for Mentakab PM 1 was as follows:

- Complete flotation deinking plant including dual pulping systems, disk filters, oxidative disperger bleaching and reductive bleaching stage, for an output of 840 BDMT/day of finished pulp
- Complete rejects treatment and loop-water purification systems, incorporating Meri Effluent Technology machinery and know-how


3


4

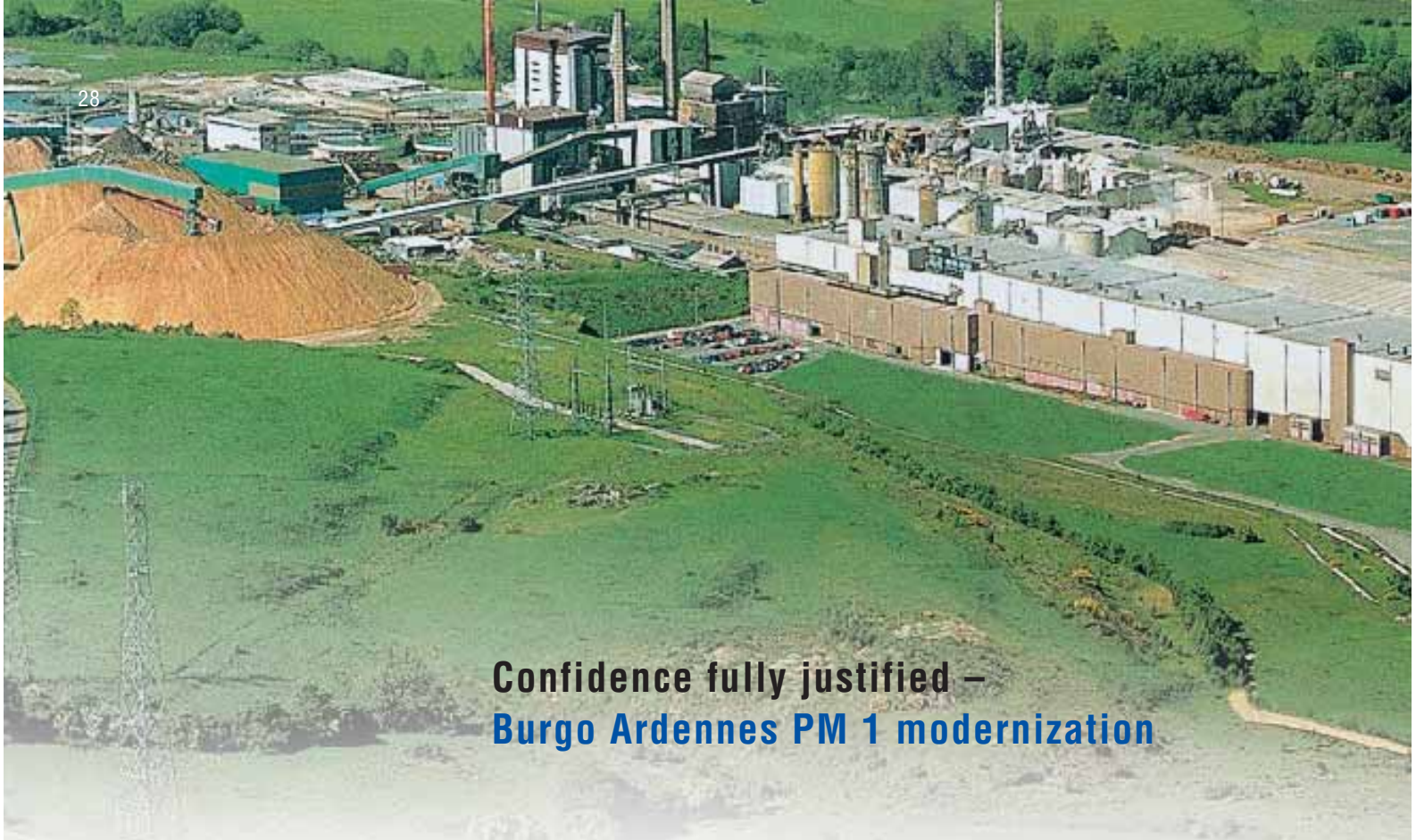
Mentakab PM 1 – key technical data
Furnish: 100% recovered paper
Product: newsprint at 40-48.8 g/m²
Uncut web width: 7,940 mm
Design speed: 1,700 m/min
Production speed: 1,500 m/min
Output: 837 t/day at 48.8 g/m²
Rated annual output: approx. 250,000 tonnes

Annual consumption of recovered paper: approx. 300,000 t.p.a.
Freshwater consumption: 14,000 m³/day
Treated effluent: 11,000 m³/day
Solid waste: 80 t/day.

- Stock preparation line for bought-in thermomechanical pulp (125 BDMT/day)
- Stock feed system with Deculator, disk filter for fibre recovery, rejects treatment and screening systems
- Complete paper machine including GapJet headbox with Profilmatic, DuoFormer CFD, DuoCentri II press section with fourth press and steambox with Profilmatic, CombiDuoRun dry section (60% single tier, 40% double tier), soft calender (2 x 1 nip) with Nipco® rolls, pope roller with automated reel change
- Finishing section with two DuoRoller II and complete roll packaging and transport system
- Engineering and hardware for the entire measuring, control and regulation systems.

The electrical drive system for the paper machine and DuoRollers as well as the DCS system were supplied by Asea Brown Boveri.

We wish MNI every success in their venture for setting up a newsprint production industry in Malaysia. May they achieve a leading position in this growth market, both in Malaysia and the neighbouring countries.



Confidence fully justified – Burgo Ardennes PM 1 modernization

The author:
Gerhard Kaiser,
Paper Machines
Graphic

"For this vital modernization project, we placed our entire trust in Voith Sulzer Paper Technology. We are extremely satisfied both with the project handling and execution, with the commissioning and above all with the results."

2

This how Claude Taverdet, General Manager Burgo Ardennes Paper Mills, lauded the successful modernization of PM 1 at his plant in Virton, Belgium. The resultant improvements both in production capacity and quality now make this company one of Europe's leading manufacturers of coated base paper.

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In 1989 the decision by former pulp mill Cellulose des Ardennes to commence paper production created quite a stir in the papermaking world. Three years later in 1992, the company's first Voith paper machine went into service with two offline coating aggregates for an output of about 580 tonnes/day.

After some structural problems and lengthy shutdown periods, the company was taken over in 1994 by Cartiere Burgo

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Italia, who proceeded with expansion plans which also included substantially increased production.

During the following years, production outputs were achieved with PM 1 in the 54-200 g/m^2 range which significantly exceeded the original design output. However, further increases aimed at 1,000 t/day were thwarted by bottlenecks in drying capacity and in various peripheral aggregates.

Investigations soon showed that the paper machine itself could certainly produce more – subject to modernization. Against strong competition, Voith Sulzer Paper Technology received the modernization order in 1998.

Upgrading this paper machine involved retrofitting a ModuleJet to the existing headbox for basis weight cross-profile regulation, replacing the third press with a NipcoFlex shoe press, and carrying out small modifications to the predrying section. The result was that immediately after recommissioning, all guarantees were not only fulfilled more quickly than expected, but significantly exceeded.

After a "paper to paper" interruption lasting only 14 days, Cartiere Burgo restarted production in July 1999 at the Belgian plant with what is now its most efficient machine for coated base paper. Operating speeds and outputs well exceeding 1,000 m/min and 1,000 t/day respectively are no longer any problem.

Scope of modernization

- Detailed engineering, delivery and retrofit of Voith Sulzer ModuleJet and Profilmatic cross-profile regulation system to the existing headbox.
- Installation of dilution water loops to the ModuleJet, with deaeration tank and vertical screen, including electropolished piping both for the LC and HC loops from vertical screen to headbox.
- Installation of NipcoFlex press for the third nip, complete with hydrostatic oil supply aggregate and control system.
- Hot air injection piping for the predrying section.

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Fig. 1: Burgo Ardennes Paper Mills, Belgium.

Fig. 2: Claude Taverdet, General Manager Burgo Ardennes Paper Mills.

Fig. 3: Julien Verhoeven, Technical Manager Burgo Ardennes.

Fig. 4: Final installation of the pre-assembled NipcoFlex press.

Successful rebuild of board machine 3 at Frohnleiten mill of Mayr-Melnhof Karton

The author:
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Paper Machines
Board and Packaging

In January 1999, the Mayr-Melnhof group rebuilt board machine 3 (BM 3) at its Frohnleiten mill in Austria. The seven suction formers were replaced with two fourdrinier wires and new headboxes for underliner and middle layer. In the press section, a NipcoFlex shoe press ensures gentle drainage with high dry contents. The stock preparation system and approach flow systems have also been adapted.

Detailed scheduling and excellent cooperation of all companies involved made it possible to put the machine back into operation ahead of schedule, with enhanced quality and increased output.

The Mayr-Melnhof group and Frohnleiten mill

The Mayr-Melnhof board group, with 2,000 employees and an annual capacity of approximately 1.2 million tons, is the world's leading recycled board producer. The parent company of the Mayr-Melnhof board group is located in Frohnleiten, Austria. With an annual output of 375,000 tons, the Frohnleiten mill is also the largest producer of recycled folding boxboard in Europe.

BM 3 rebuild

Two board machines are presently operating at the Frohnleiten mill. In late 1997,

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Fig. 1: Mayr-Melnhof Karton GmbH, Frohnleiten mill, Austria.

Fig. 2: Board Machine 3 before the rebuild.

the decision was made to adapt BM 3 to the future market requirements by an extensive rebuild of the wet end. With an operating speed of 400 m/min, the suction formers had reached a limit where satisfactory sheet formation was no longer ensured. The main goal of the rebuild was, therefore, to improve the board quality in terms of formation with constant specific bulk and to increase the output.

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The concept and the new components

BM 3 produces white lined chipboard (duplex and triplex grades). Before the rebuild, the sheet forming section included two fourdrinier wires for the top and back layer and seven suction formers for the middle layer. All layers are produced from 100% recycled furnish.

For high-quality grades, with special demands placed on bending stiffness, a small quantity of groundwood (refiner mechanical pulp) is added to the middle layer. Such pulp is supplied from a mill-owned refiner mechanical pulp system with a maximum output of 170 t/d.

To realize conversion into a multiple fourdrinier section, the existing fourdrinier wire for producing the top layer had to be extended to provide space for installing the new wires for the underliner and middle layer. On this fourdrinier wire, the top layer is formed, which is on the bottom side of the produced board web.

As a result of extending the length of the top layer wire, it was also necessary to reposition the existing headbox together with the approach flow system.

The new Step Diffusor headbox for the underliner is arranged in machine direction.

It is equipped with a centrifugal distributor to ensure as good fiber orientation as possible across the machine width. A new Step Diffusor headbox with pulsation attenuator and double diffusor block with intermediate chamber is also used on the middle layer wire. This ensures optimum conditions to eliminate variations in fiber orientation.

The middle layer is produced against machine direction; first it is couched with the underliner and both are then placed onto the top layer. The fines distribution of all layers can, thus, be utilized to ensure optimum bonding strength.

A hybrid former (DuoFormer D) is installed on the fourdrinier wire for middle layer. In this unit, up to 30% of the amount of water discharged in three drainage zones are drained through a top wire. Apart from increasing the drainage capacity, the DuoFormer D unit improves formation. Due to the high layer weight, the formation of the middle layer influences the board quality significantly.

CD profile control is effected by a ModuleJet dilution water system at the headbox for the middle layer, since the highest layer weights are produced here, and the CD basis weight profile can be optimally adjusted by 72 valves across the machine width. For dilution, suction box water passing through a vertical screen is used.

The fourdrinier wire for the back layer, also operating against the machine direction, and its headbox have not been changed.

The couch press on the suction couch roll is followed by a double-felted suction press in the first nip position. The third nip is formed by a single-felted press. These components have not been changed.

With the decision to replace the second press with a double-felted NipcoFlex press, Mayr-Melnhof has taken an innovative step forward. Within the Mayr-Melnhof group, this is the first shoe press used in a board machine. The maximum nip pressure of this press is 800 kN/m. However, to achieve optimum specific bulk, the press is not loaded with more than 500 kN/m during operation. Still, the dryness compared to that before the rebuild could be increased considerably.

Apart from the upgrades of wire and press sections, modifications were done by Andritz AG, Austria, in the stock preparation system (new disk filter and cleaner system for middle layer). The scope of supply from Voith Sulzer Paper Technology included the three new approach flow systems, a new couch broke chest and a separate line with vertical screen for headbox dilution water.

Startup completed in record time

The deadline for this rebuild was extremely short and could only be met by very detailed scheduling.

On January 4, 1999, the machine was shut down and the old suction formers were disassembled.

February 1, 1999, was the scheduled start-up date for the rebuilt machine.

Excellent and constructive cooperation between Mayr-Melnhof, Voith Sulzer Paper Technology and all other companies involved made it possible to complete the rebuild slightly ahead of schedule, and to start production again on January 31, 1999.

Dir. Dipl.-Ing. Martin Mühlhauser, Technical Director of Mayr-Melnhof Board Division, on the rebuild of BM 3 at Frohnleiten:

The modernization of BM 3 was Mayr-Melnhof's first project with the "new" Voith Sulzer Paper Technology. The team of Voith Sulzer Paper Technology and the staff at Frohnleiten have done an excellent job. What we appreciate in particular is that our customers are well aware of the superior quality of our product and that the same quality is now demanded from our competitors as well. With regard to BM 3 output, we have successfully set a new milestone in the development of enhanced white lined chipboard quality.

Goals achieved

The rebuild was a success in a very short period of time:

Just four hours after start-up, salable board was produced. Only two days later, the highest output of BM 3, achieved before the rebuild, was already exceeded, and with better surface quality.

Compared to the suction formers, formation of the board could be greatly improved after a short optimization phase. Improved sheet forming results in higher smoothness of the base board, which positively influences printability and/or the finishing and converting characteristics of the finished board.

This board quality has set new standards for white lined chipboard from recycled furnish in Europe.

The ModuleJet™ system of the headbox for the middle layer ensures the smallest 2-sigma values of the CD basis weight profile, and the NipcoFlex shoe press improves the moisture profile significantly, resulting in improved MG cylinder operation.

Just after the first few months, the guaranteed increase in production was far exceeded due to the satisfactory operation of the NipcoFlex press. Despite the high nip loads, high dry contents after the press section can be achieved through gentle dewatering by the shoe press, without reducing bending stiffness.

At the time when this article was written, the NipcoFlex press and the Qualiflex sleeve had been operating without any problems for nine months.

To strengthen the good and successful partnership between Mayr-Melnhof and Voith Sulzer Paper Technology, a meeting at St. Pölten took place in to 1999. Following a football match (unfortunately *not* successful for the Voith Sulzer team, but *very* successful for Mayr-Melnhof) and a very pleasant evening in the Austrian Wachau, both companies look forward to working together again on future projects.

Key data of BM 3:

- Wire width: 5,000 mm
- Design speed of new parts: 600 m/min
- Max. operating speed: 550 m/min
- Main grade: white lined chipboard (100% recycled furnish) of 300 g/m^2 at 400 m/min.

Main components of rebuild:

- Two wire sections including hybrid former DuoFormer D
- Two headboxes
- ModuleJet dilution water system for CD profile control
- Approach flow systems of new wire sections and of ModuleJet
- Extension and adapting of existing top layer wire
- Double-felted shoe press in second position
- New couch broke chest
- Engineering work for the entire rebuild
- Complete installation
- Supervision of startup.

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Adolf Jass paper mill – Fulda PM 3 fit for 2000

The author:
Jürgen Gutzeit,
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Board and Packaging

The paper mill Adolf Jass GmbH & Co KG, Fulda, Germany, is among the 10 largest producers of corrugated board base papers in Europe today. In 1998, together with Voith Sulzer Paper Technology, a major rebuild of the PM 3 production line was accomplished. After having placed large-scale orders for PM 4 in 1988 and 1991 and for PM 3 in 1991 and 1996, the mill has taken a further step toward strengthening its position in the corrugated board base paper market with the investment made in 1998.

PM 3 of Adolf Jass Paper Mill in Fulda, produces corrugated medium from 100% recycled furnish. The mill's most recent rebuild of this production line follows a trend towards thinner flute profiles in corrugated board production. As a result, the producer of corrugated board base papers is demanded to produce lower basis weights.

At the same time, it can be noticed that the quality of the recycled fiber grades used for paper production deteriorates. Nevertheless, advanced machine concepts and the correlating technological know-how counteract the declining recycled fiber quality and allow superior final products. The rebuild concept of PM 3 has also taken this development into account.

The goal of the recent rebuild of PM 3 was, therefore, to increase the output and improve quality and at the same time to reduce the corrugated medium basis weights from 115 to 100 and to 80 g/m^2. An important task was to increase the strength values. In addition, the susceptibility to faults was to be reduced and the runability was to be enhanced.

After the rebuild, the operating speed increased from approximately 630 m/min to 900 m/min. On a wire width of

Fig. 1: DuoFormer CFD.

Fig. 2: Slotted find screening system.

5,550 mm, 700-800 tons/day of paper are produced depending on the basis weight, which corresponds to an annual output of 220,000 tons. Together with the testliner machine PM 4, Adolf Jass Paper Mill produces approximately 450,000 tons/year of packaging paper.

The most recent rebuild project on PM 3 involved both the stock preparation system and the paper machine. High importance was placed on jointly realizing a comprehensive and well-adapted overall concept for the production line.

Stock Preparation

For enhanced paper quality and runability with lower basis weights, an especially high and uniform finished stock quality is needed, in particular the amount of contaminants such as stickies was to be reduced. To this end, the stock preparation system was equipped with new components and up-to-date automation equipment.

The two existing pulpers, feeding the PM 3 and PM 4, were upgraded into two separate slushing systems. The new stock screening concept, with new machines, permits discharging the rejects from the individual stages of the cleaning process as early as possible. The MC hole prescreening stage was equipped with fiber sorter, drum screen and Combisorter for final stage screening.

The existing cleaner system of the old approach flow system was integrated with the new stock preparation system, with the accepts fed directly into the multi-

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stage LC slotted fine screening system comprising vertical screens, Combisorters and Minisorters. Thickening of the finished stock is effected by a new disk filter system supplied by Andritz.

The existing rejects systems were extended by several components from the MERI product range. The rejects handling equipment also accounts for the more stringent environmental regulations announced for the years to come, demanding a separation of the rejects depending on specific properties.

To reduce stickies and to separate the water circuits of PM 3 and PM 4, a new microflotation equipment was installed in PM 3.

Paper Machine (PM 3)

To upgrade PM 3, the most important modifications had to be done in the wire section: PM 3 was equipped with a new two-layer StepDiffusor™ headbox with ModuleJet, SD for CD basis weight profile control by dilution water injection.

Fig. 3: Mill owner Adolf Jass and mill manager Friedrich Specht in front of the DuoFormer CFD.

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A DuoFormer CFD has replaced the fourdrinier wire. The combination of a two-layer headbox and gap former essentially contributes to improving the paper quality. Above all, the strength values and CD profiles could be positively influenced. Two new approach flow systems were also installed in PM 3.

The press section had already been revamped during an earlier rebuild, so only the existing three-roll combined press with Nipco-Intensa press had to be integrated with the new rebuild.

The existing dryer section was extended by two new UnoRun dryer groups. To extend the dryer section, it was necessary to relocate the size press, and in the end, the entire dryer section was fitted with a ropeless transfer system. On the one hand, the new transfer system improves the machine runability; on the other, it increases the safety of the operating personnel.

At the final section, a new horizontal reel with roll density control and automatic reel spool changing device as well as transport equipment for transporting the parent rolls to the winder, was installed.

Finally, the broke pulping system of PM 3 had to be upgraded: Some of the pulpers were relocated and equipped with new slushing equipment and pulper vats.

Apart from the upgrades/extension of ancillary systems for the PM, the rebuild project of the entire line involved extensive services, such as plant engineering, engineering for buildings, logic diagrams for process control system and engineering for electrical equipment and instrumentation. In the last phase of the rebuild project, the complete machine was disassembled and the installation work was done in the stock preparation system and on PM 3, as well as the operational and technological start-up and optimization of the production line.

Project Execution

The production line was put back into operation in early September 1998 just 12 months after placing the order.

For the rebuild work, Adolf Jass Paper Mill set a goal to manage with as few downtimes as possible during the entire project. Thus, the new stock preparation equipment was installed step-by-step in the first six months of 1998 and went online while PM 3 and PM 4 were continuously producing. A large number of interim solutions were necessary to integrate the new processes with the existing line.

With production stops of not more than one week required to connect the new

equipment, the new stock preparation system finally supplied the old PM 3 with stock.

The rebuild of the paper machine and of the ancillary systems took 42 days to complete, including checking work for the new process control system. Up to 520 fitters and construction workers, as well as 50 start-up engineers worked around the clock, and paper was on the reel again on the scheduled start-up date of September 6, 1998.

To comprehensively control and supervise the progress of the project, Voith Sulzer Paper Technology appointed a site project manager who was responsible for all Voith Sulzer and customer activities from order placement to contract fulfillment. The primary tasks of this project manager were the scheduling and follow-up of dates as well as the coordination of interfaces between the suppliers. In addition, the project manager was the first contact partner for the customer and assured that an active flow of information between the customer's project team, the Voith Sulzer company and the subsuppliers, was ensured.

In the course of the sophisticated rebuild project and during the start-up, Voith Sulzer engineers were also present on site for extended shifts. Short information channels were thus achieved, and the highly motivated team succeeded fulfilling the customer's expectations, despite the enormous pressure of time.

Within a short period of operation of the new PM 3 production line, the innovative overall concept of stock preparation system and paper machine proved a suc-

Consolidated Papers, Inc. expands to SCA Plus Grades

Dave Beal, Operations Manager from Lake Superior Papers reports: *"The rebuild of Lake Superior Paper's (LSPI) SCA paper machine in Duluth, Minnesota, that began on February 2, 1998, was completed in less than 20 days and has started up very successfully. In fact, the first day of production produced over 700 tons, most of it as first-line quality. The focus now is to optimize the printability and runnability characteristics.*

The rebuild to a Voith Sulzer DuoFormer CFD gap former has already made a dramatic improvement in print quality. The striking improvement in printability comes from a strong and clear dot impression that is sharper in appearance and has fewer skips. There is an improvement in ink holdout in the darker color tones and a cleaner contrast due to changes in sheet color or shade.

The improvement in skipped dots is particularly noticeable in flesh tone areas and light background tones. The overall printability improvement will not only benefit all customers; it will allow Lake

Fig. 1: The paper machine after the rebuild.

Fig. 2: Roger L. Wangen, vice president Consolidated Papers Inc.

Superior Paper to penetrate the magazine publication market with a new SCA+ grade later in the second quarter.

The increased smoothness and improved printing surface was dramatic from the very first production. The gloss at the supercalenders was much easier to attain, and production crews on the finishing line immediately noticed the differences. They also noticed the improvements in optical properties, such as increased opacity and brightness after supering.

Strength properties, depending on which characteristic is measured, are either improved or about the same. The degree of uniformity, however, is greatly improved as measured by cross deckle basis weight profile, machine direction profile and randomness. Formation and ash distribution have also been dramatically improved.

By the end of the first week of operation, everyone at LSPI was tremendously proud and excited about the opportunities the new gap former provides to better serve our customers. We are particularly grateful that Consolidated Papers (CPI) has put their confidence in Lake Superior Papers with such an investment. The gap former will position LSPI to better serve the customer with new and improved product in the future."

Voith Sulzer Paper Technology built the original machine in 1988, with the first SC paper being produced 20 days ahead of schedule. The decision to rebuild of the machine's forming section from a DuoFormer F into a DuoFormer CFD gap former 10 years later came from the company headquarters in Wisconsin Rapids, WI. This is the third CFD unit purchased by Consolidated, which was one of the deciding factors in the final supplier selection for the project. Extensive testing of the furnish on pilot equipment was performed, as well as visits to other mill locations already using Voith Sulzer's CFD gap formers on similar grades.

Roger Wangen, vice president of groundwood operations stated, *"We are very pleased with the quality gained from this project. It allowed us to make a strong entry into the SCA+ market and further improve our excellent SCA grade."*

The CFD unit is designed for high groundwood containing stock and was used by Consolidated Papers on lightweight coated grades. The wrap on the forming roll can be varied, thus adapting to various grade productions – newsprint to SCA. The lower the freeness the greater the wrap.

The new forming system allowed Consolidated Papers, Inc. to develop and market a magazine publication grade called SCA Plus for rotogravure printing. The SCA Plus grade is designed to compete with LWC and other grades of this type.

Standard SCA is still Lake Superior's main product, however, after the installation of the new gap former, they are now equipped to produce a high-quality SCA Plus grade. The new grade is being sold under its trade name "Expedition". It has received top recognition for its higher

Fig. 3: Lake Superior Paper in Duluth, Minnesota, USA.

Fig. 4: Charles A. Schultz, Director of Engineering Consolidated Papers, Inc.

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brightness, gloss and better printability due to increased smoothness – above the standard SCA grade. LSPI states that they are the first North American mill to commercially qualify for the SCA Plus grade.

Another major machine component replaced during the rebuild was the original W-headbox. The new Voith Sulzer ModuleJet dilution control headbox technology was selected to replace the older, slice-control type headbox.

Voith Sulzer Paper Technology supplied all screens and pumps required for the project, as well as air-removal systems. The Duo-Centri II press followed by a conventional straight through fourth press remained, for the most part, intact.

A Voith Sulzer press-to-dryer section ropeless sheet transfer system was successfully installed at the time of the rebuild. Wire changes are quickly accomplished with use of the Voith Sulzer's wire changing system, eliminating the use of cumbersome heavy metal poles.

"Key members from CPI Corporate Engineering and Purchasing, LSPI Engineering and Production worked very closely with Voith Sulzer engineers and erectors to successfully bring this project in ahead of schedule. Once again, we were very impressed with the detailed involvement shown by Voith Sulzer team members and the timely, staged delivery of key machine components from both Appleton and Heidenheim". So Charles A. Schultz, Director of Engineering Consolidated Papers, Inc.

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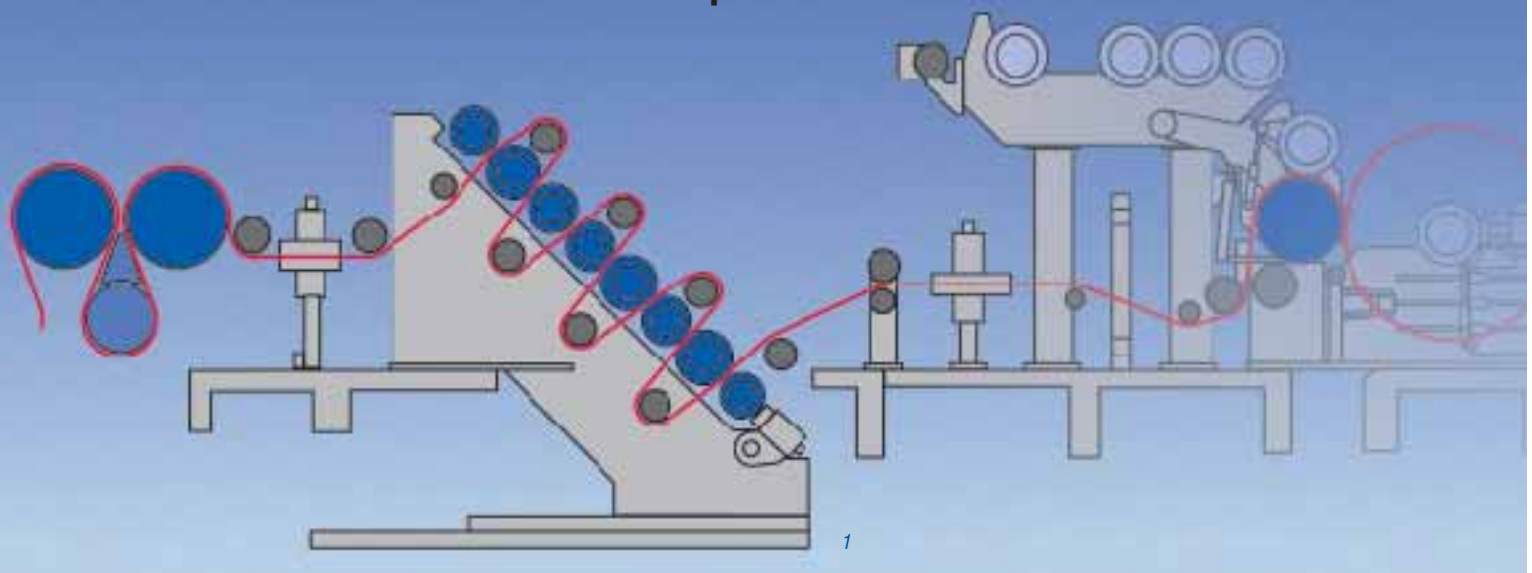
One very important consideration during the project's planning stages, was the ability to produce larger diameter rolls. Improved sheet profiles were, therefore, a major target in preliminary project discussions.

The DuoFormer CFD, as well as the ModuleJet headbox, would directly show a positive influence in improving sheet formation, which would not only aid in the production of larger diameter rolls but have the desired improvement in print quality. Improvements in cross direction profiles and basis weight control have been significant. Both CD and MD 2-sigma deviations were substantially lowered.

The 8,050 mm wide paper machine is another positive step into the new millennium for Consolidated Papers and Voith Sulzer Paper Technology.

A concept confirmed



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The author:
Hans Witschel,
Finishing

A good many articles – quite controversial in some cases – have already been published on the new Janus calender generation, i.e. the MK 2. Successful startup of the new PM 5 with its MK 2 Janus calender at Gebrüder Lang, Ettringen *(Fig. 1)* now confirms this concept in full.

The target set for this new machine was ambitious: online production of calendered rotogravure printing paper matching all the surface characteristics of an offline supercalendered paper.

When the Janus concept was first introduced, offline calendering speeds had jumped from 600 to 1,000 m/min. The Janus MK 2 in Ettringen brings another quantum leap from 1,000 to 1,500 m/min – but this time online. After Lang had decided not only for the Janus concept again, but also to install the first MK 2 calender, a good many risk assessment meetings were held to ensure successful project implementation.

This project greatly benefited from the open cooperation between all concerned – which was indispensable to ensure success in the face of pessimistic attitudes which had been spread on the market.

Detailing all the differences between a conventional vertical calender and the MK 2 design would exceed the scope of this article. Even checking the new roll

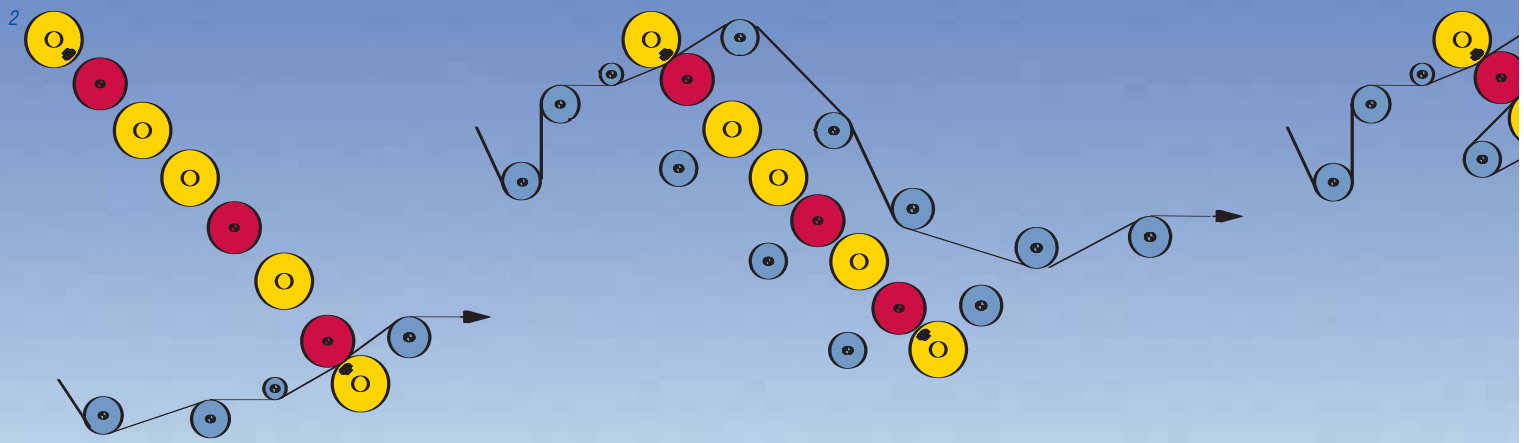
Technical data

- Furnish components:
  - 55 g/m² SC paper
  - DIP approx. 83 %
  - Groundwood approx. 12 %
  - Softwood pulp approx. 5 %
- Gloss ✞ 45% Hunter 75°
- Roughness ✣ 1.2 ❍m PPS-S10
- Porosity < 20 ml/min Bendtsen
- V_{max} for newsprint 1,800 m/min
- V_{max} for SC-A grades 1,500 m/min

Fig. 1: The Janus MK 2 calender.

Fig. 2: Web threading on the Janus MK 2.

Fig. 3: Janus MK 2 at Lang Papier, Ettringen, Germany.



changing concept required not only 3-D computer simulation, but also a physical 1:10 scale model of the complete calender.

At the end of August 1999 the first milestone was reached: the calender was closed without any problem. This had been preceded by initial optimization of the paper machine, including test-threading through the calender from the end of the dry section to the Sirius reel *(Fig. 2)*.

The MK 2 was then started up in one of the three possible operating modes: newsprint calendering in the lowest nip only. The second alternative is newsprint calendering in the upper nip – and the third alternative is of course the actual design mode, using all three calender rolls for rotogravure paper.

Although no speed records were broken to start with, the first reel of paper was nevertheless calendered at 1,250 m/min.

In addition to the new MK 2 calender, the numerous innovations on the paper machine included a completely new control and visualization concept. Commissioning was therefore a special challenge both on the side of the customer and the supplier.

After a successful startup, the general sense of relief around midnight was certainly worth a celebration!

This was followed by a phase of very intensive optimization, during the course of which all functions of the Janus MK 2 were coordinated to perfection with the paper machine and Sirius functions.

Toward the end of this phase in the second half of September, rotogravure paper was calendered for the first time using all nips.

This had not really been planned as yet, but in view of the completely stable transfer from Janus to Sirius at a speed of 1,350 m/min, it was spontaneously decided to open up the entire width and use all calender nips.

The other operating mode – newsprint calendering in the upper nip alone – was then tested straight away the next day.

As shown by the technical data, the design operating speed for fully calendered SC grades is 1,500 m/min. The design speed for newsprint increases to 1,800 m/min, and at the time of writing (November 1999) test runs had already been carried out at 1,465 m/min with newsprint.

Here are some of the calendering areas where the innovations involved in this concept demanded special attention:

3

- Post-humidification
- Web threading
- Frame layout
- Roll deflection
- Vibration freedom
- etc.

The conventional way of humidifying SC-A grades – rapid drying followed by water spraying to the required web humidity – was not possible in this case due to the risk of transparent calendering in case of water drops. Instead, measures were taken to ensure the flattest possible humidity cross-profile – at a high level – already at the paper machine/dry section.

Fine correction of the humidity level is carried out afterwards by precisely controlled spray nozzles installed before the last drying aggregate, due to the necessary dwell time for conditioning. This concept proved very successful.

Web transfer through the calender for winding is based on the concept already well-proven on PM 4 in Ettringen. The leading edge is transferred from the last drying roll by Fibron vacuum belts to the calender rope system. After leaving the calender, a so-called pullstack generates the web tension indispensable for stability of the leading edge, which is then transferred by vacuum belts to the Sirius reel. Despite the experience gained on PM 4, it goes without saying that the right settings had to be established empirically for each of the various paper grades. Those grades with high moisture content and high fillers content demanded the greatest efforts for establishing the right settings.

As expected with the 45° orientation of the MK 2, most of the questions arising before startup concerned the calender stand and stack layout. Throughout the entire project design phase, attention was repeatedly paid to matters such as vibration and noise damping as well as resultant cross-profile effects.

But all these suspicions were dispelled on the first startup. Simply a “laying on of hands” is enough to establish the almost complete freedom from vibration of the calender.

Although PM 5 has not yet entered into routine operation, we and our customer already have every reason to celebrate:

Choosing a Janus MK 2 was the right decision.

1

Ground-breaking ceremony – new Service Centre in Indonesia

The author:
Martin Scherrer,
Voith Sulzer Paper Technology
Service Indonesia

After some delay because of the political and economic situation, the ground-breaking of the Voith Sulzer Paper Technology service centre in Jakarta has finally taken place in November 1999.

Indonesia has the highest pulp and paper production capacity in South-East Asia. It is also not far from Australia and other important paper production centres. Voith Sulzer Paper Technology therefore decided years ago to open not only a sales office here, but also a service centre.

Located 60 km east of Jakarta in the Karawang industrial zone, this new centre should open its doors on September 1, 2000. National and international connections in this region near the capital are excellent, with port and airport only about one hour away. Together with good highway links to the West Java paper mill zone, this was the reason why the location was chosen.

Service offering

The centre will first be equipped with the normal facilities of a modern roll service workshop. In addition, there will be a Nipco test facility together with roll honing, mobile grinding and polishing equipment.

Later on, a polyurethane covering service using ribbon flow technology will be added. That will greatly improve the current situation in this region: most rolls now have to be shipped to Europe, Japan or Australia for overhaul and recovering, which is both time-consuming and expensive.

In the final phase, composite covers for calender rolls will be produced at this

Fig. 1: Simulated image of the new Voith Sulzer service centre in Indonesia.

Fig. 2: Martin Scherrer, General Manager of the new Voith Sulzer service centre in Indonesia.

Fig. 3: The new Voith Sulzer service centre is located 60 km east of Jakarta.

Fig. 4: Laying the foundations: the first pile has been driven.

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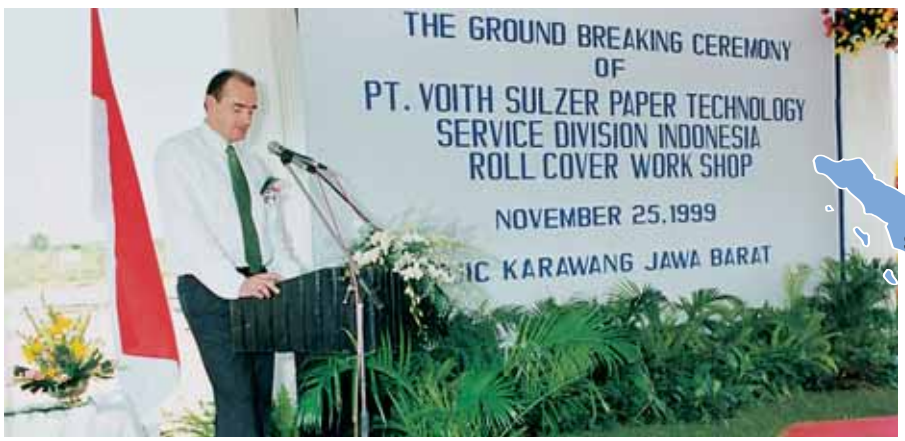

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centre. Appropriate employee training is also planned for expanding our mobile roll-grinding and thermal coating service, thus enabling this work to be carried out in paper mills by local personnel in Indonesia. In the future it is also planned to extend the services to other parts of the papermaking process, such as stock preparation.

Staffing and facilities

About 50 people will be employed at the new service centre to start with, some of them experienced professionals from Europe and Canada. In the medium term, personnel will be expanded to about 100 people.

Technical facilities at this 6,200 m^2 service plant will be state-of-the-art right from the beginning: large CNC lathes, grinding, milling and balancing machines as well as heavy-duty overhead cranes big enough to handle 100-ton rolls, 15 m long and 2 m in diameter. The materials for extruded or manually finished rubber roll covers will largely be made on site – another way of saving customers time and money.

Prospects

It seems that the South East Asian economies have largely overcome the crisis of recent years. Likewise Indonesia is recovering, and after a phase of recession the paper industry here will need to make substantial investments for holding its own on markets both national and international. Voith Sulzer Paper Technology will provide solid partnership in this development by continuing with long-term plans for expanding our local presence and service offering in Asia, well beyond Jakarta.

4

Roll grinding machine for Vietnam

The author:
Peter Biener,
Voith Sulzer Roll Grinding Machines Europe

Bai Bang Pulp and Paper Mill, Phong Chau, is located in Phu Tho province about 60 km north-east of Hanoi on the Red River. Constructed in the mid-seventies, this plant has a pulp production capacity of about 50,000 t.p.a., and 100,000 t.p.a. paper and board.

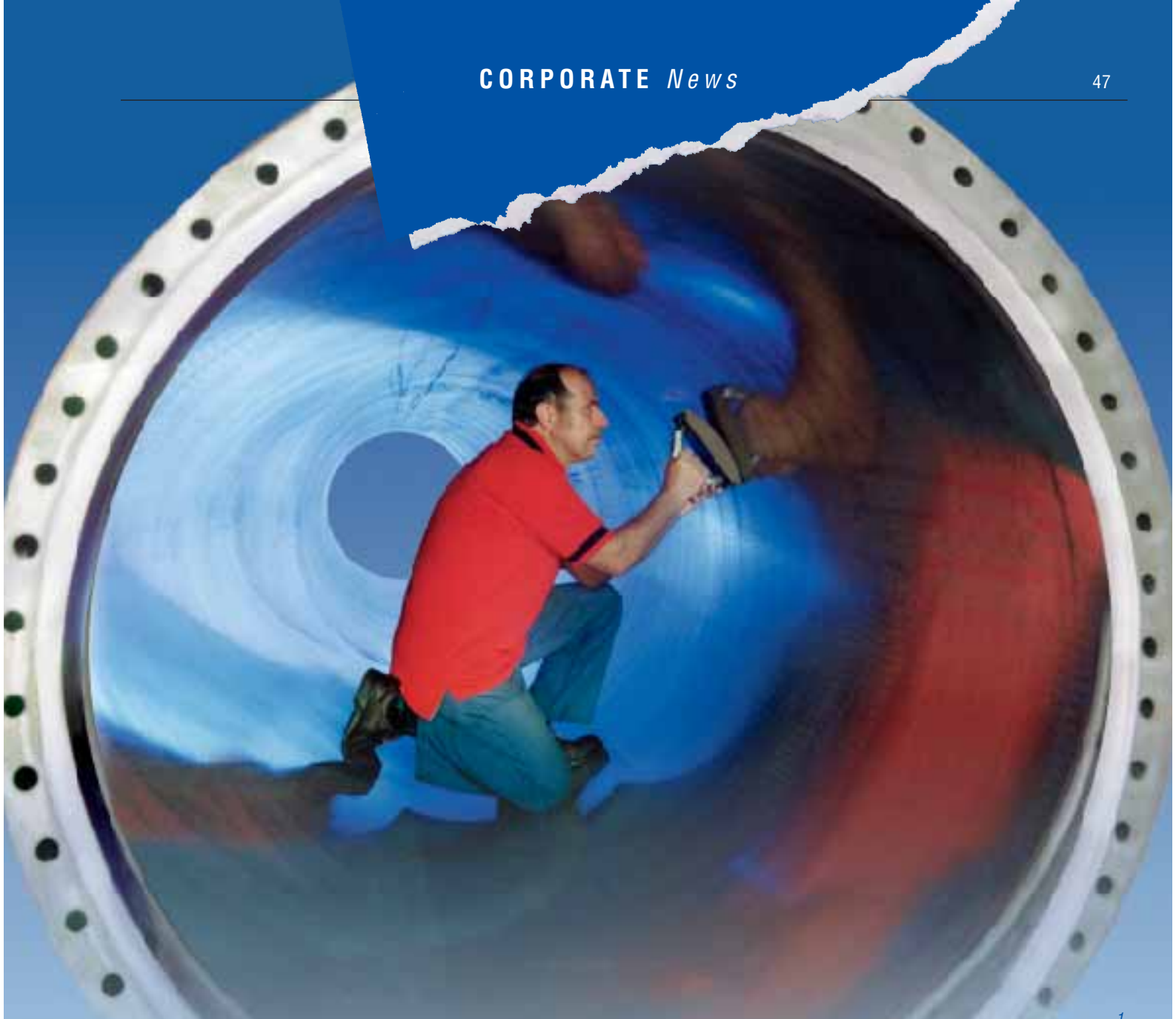
The completely state-owned Bai Bang mill is to be expanded, and one requirement for this is modernization or replacement of the existing Bruderhaus roll grinding aggregate.

Initial negotiations in this connection during the mid-nineties were followed by inspection of the existing machine to decide whether it should be upgraded or replaced. Against tough competition, Voith Sulzer Paper Technology then received the order in April 1999 for delivery and installation of a modern roll grinding machine. The new machine is currently being manufactured at our Appleton works in Wisconsin, USA, for delivery and installation in June 2000.

This is the first order booked in Vietnam by Voith Sulzer Paper Technology, and visiting Bai Bang mill in 1998 was the author's first opportunity to travel in a country where the ravages of war are still all too obvious, not only in Hanoi. But this sad impression was more than offset by my cordial reception in Bai Bang and by the friendly people in Phong Chau, whose livelihood depends almost exclusively on the paper mill as main regional employer, whether directly or indirectly.

We are delighted at this first order in Vietnam, and trust that prompt delivery with full customer satisfaction in June 2000 will set the scene for ongoing fruitful cooperation in the future.

Currently 315 Voith Sulzer roll grinding machines are in service worldwide, with capacities up to 15 metres roll length.



1

The top address for system know-how

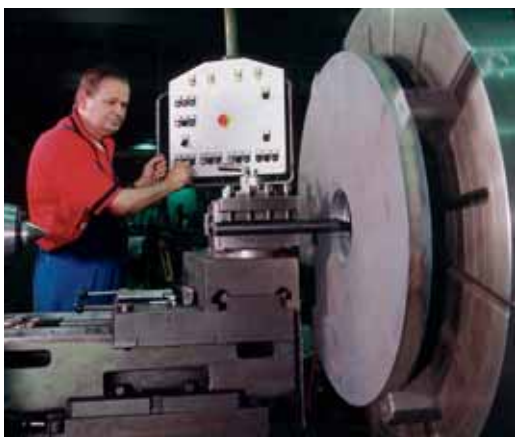
On July 1, 1999, the Voith Group acquired the roll covers, roll service and paper machine clothing businesses of the Scapa Group plc, Blackburn/UK. After integrating these companies into the corporate structure, Voith became the first company in the world capable of meeting all the papermaker's machine needs from headbox to reel, including stock preparation and sheet finishing. Voith now can supply the paper machine, clothe it and service it, regardless of the original equipment manufacturer. No other company today can offer such broad-ranging and complete papermaking equipment sales and service as Voith. With this strategic expansion in roll covering, roll repair and service as well as clothing technology, Voith is ideally positioned to help papermakers optimize their papermaking process and produce more and higher quality paper at a lower cost.

Fig. 1: Inspection of inner surface of a suction press roll.

Fig. 2: High precision tooling of a dummy head.

Fig. 3: Inspection of suction press roll on the drilling unit.

Fig. 4: Manufacturing of a rubber cover.



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The industrial globalization and consolidation currently taking place worldwide, particularly in the paper industry, demands a radical change of approach among suppliers. Today's papermakers expect true partnership from their suppliers, with full system competence and turnkey responsibility. They want a single-source supplier that can handle comprehensive solutions and provide excellent service. By acquiring the Scapa assets with proven products and highly competent personnel, Voith is better able to meet such demands. Thanks to this strategic expansion, the Voith brand provides increased customer benefits. The former Scapa companies have been assigned to two independent business units of the Voith Group. They work together closely both in customer service and R&D for ongoing product development.

Roll cover and roll service sector

The Scapa roll covering and service activities have been integrated into the Voith Sulzer Paper Technology Service Division with headquarters in Charlotte, North Carolina, USA. The operation remains in the capable hands of Ray Hall. The acquisition has enabled Voith Sulzer to add service centers and products such as Scapa's well-proven roll covers and expand its existing roll repair and servicing function. Voith Sulzer now offers unmatched technical expertise and a full complement of exceptional products and services that include:

- operations and optimization products – regardless of the OEM
- paper machine and roll servicing
- roll coverings and thermal coatings
- technical and diagnostic services
- stock prep, paper machine and finishing equipment and parts.

Scapa was noted for technological advancements that include:

- the industry's toughest premium polyurethane cover system for press rolls
- high-performance drilled polyurethane roll cover for suction press rolls
- outstanding resin composite covers that yield improved sheet finishing
- state-of-the-art ceramic covers that usually eliminate the need for release agents.

Now Voith Sulzer has technological leadership in polyurethane, resin and ceramic

Fig. 5: 25 Voith Sulzer Paper Technology Service Center worldwide.

Fig. 6: Ivan J. Fearnhead, Voith Fabrics.

Fig. 7: High speed weaving machine.

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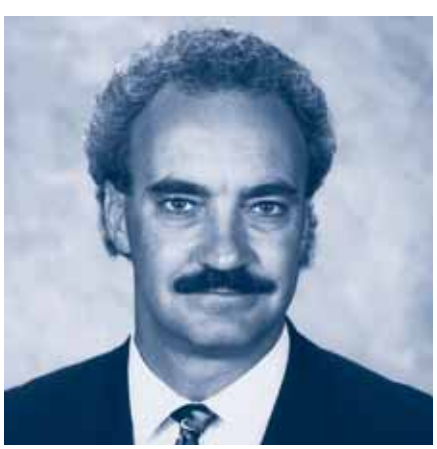
product lines and, along with the Magna series of premium rubber covers, is able to provide operational and service life benefits for any paper machine or finishing application.

Merging the Scapa and Voith Sulzer businesses has substantially improved customer benefit with regard to field services. Voith Sulzer now has 25 first-class service centers located in almost every major papermaking region in the world and can provide a rapid response when a papermaker calls with a problem or need. Further 20 service centers for paper machine clothing are added to these. The addition of Mill Service Managers offers the coordination of all the resources of the Voith papermaking concerns for paper mill management. Each is supported by the Voith global network to ensure that customers receive the Voith products and services where and when they are needed.

Paper machine clothing sector

The paper machine clothing business acquired from Scapa was merged with the former Voith Appleton Mills division to form a new, independent company. **Voith Fabrics** is headquartered in Raleigh, North Carolina, USA. CEO is Ivan J. Fearnhead.

With annual sales around DM 700 million and about 3,500 employees, Voith Fabrics



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is a world leader in clothing for forming, press and dryer sections. Voith Fabrics engineers and manufactures high quality paper machine clothing suitable for every position in every section of every paper machine in the world. The entire offering is backed up by first-class service, with a close-knit global network covering all customer locations. Voith Fabrics has production plants in Germany, Great Britain, France, Italy, Austria, Holland, Sweden, Spain, the USA, Canada, Mexico, China, India and Malaysia.

Voith Fabrics will continue the existing product lines of Voith Appleton Mills division and Scapa Paper Machine Clothing and further develop them whilst exploiting synergies at the same time. The new company is focusing on developing innovative new materials that increase runnability and lower the cost of making paper.

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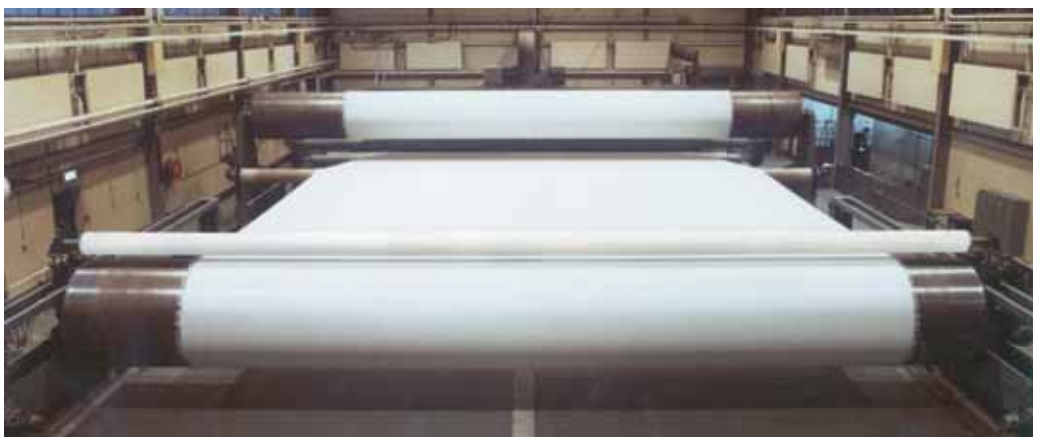
Fig. 8: Automatic seaming.

Fig. 9: Heat setting equipment.

Fig. 10: R. Ray Hall, Service Division.

Fig. 11: Checking of surface micro structure.



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"We have identified numerous areas of synergy between Voith Fabrics and Voith Sulzer," observed Voith Fabrics CEO Ivan Fearnhead. *"We are particularly excited about working closely on the development of fabrics for the new generation of machines and the new technologies that are on the drawing board. The merger of Scapa Paper Machine Clothing and Voith Appleton opens up opportunities neither company had before."* He points to such technological advances as Voith Appleton's development of a new, non-woven membrane and Scapa's production of a cast polyurethane composite structure for use within the press felt.

"We now have the ability to combine flow control technology with composite technology. This will permit us to make products that will be the benchmarks for press felts in the 21st century," added Fearnhead.

Research and development

Research and development will continue as the cornerstone of Voith Fabrics and Voith Sulzer's product offerings. Engineers from Voith Sulzer Paper Technology and Voith Fabrics will work very closely at the R&D centers in Europe, North and South America, and on pilot paper machines located throughout the world. This enables customized trials and precise diagnostics, thus identifying the optimal solution for each specific application.

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Ray Hall sums up future prospects as follows: *"New developments in paper machine technology directly influence the choice of roll covering materials and fabric design and vice-versa. Advances in these materials can also bring improvements in machine design. For optimal progress, all system components have to be precisely coordinated – which is naturally much easier for a single-source supplier. With the acquisition of Scapa Paper Machine Clothing and Scapa Rolls, Voith offers unprecedented system competence. With Scapa, Voith has not only gained vast experience in roll cover technology and service, but also enhanced local contact and global market positioning – to the benefit of papermakers worldwide."*

Voith Sulzer Automation – key to the "Perfect" Paper Machine strategy

The author:
Geoffrey Lawrence,
Voith Sulzer Automation

With the Millennium product family on the way to the "Perfect" Paper Machine:
Advantage Plus™
Profilmatic™
InfoPac™
Smart Paper Machinery

"Our goal is nothing short of the 'Perfect Paper Machine'," says Mr. Hans Müller, president of Voith Sulzer Paper Technology. *"This is a machine with negligible quality variations, no breaks and two minute grade changes. We can only achieve this objective with the new breed of 'smart' paper machinery that includes embedded application-specific sensors, actuators and controls to eliminate variations at their source and enable faster machine transitions."*

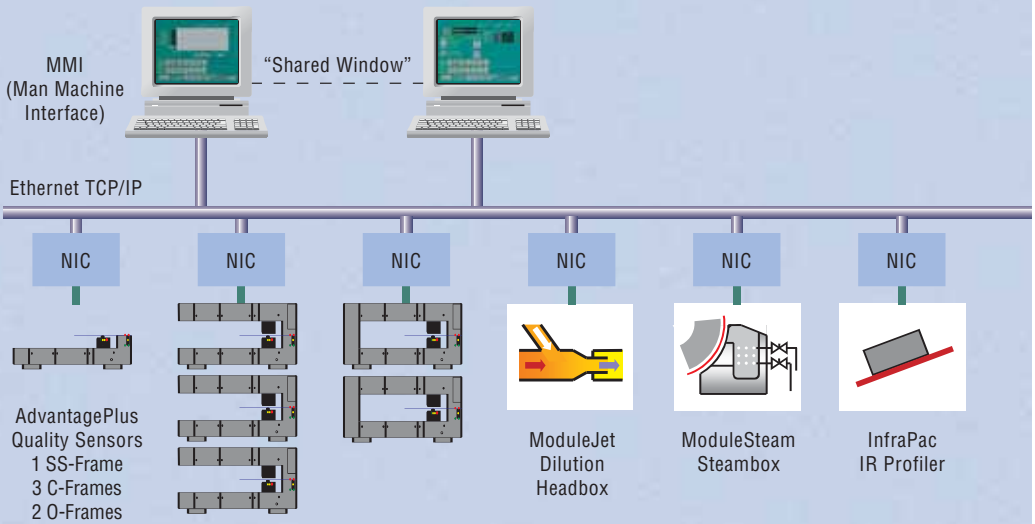


Fig. 1: Millennium system for new Voith Sulzer machine being built for Perlen in Switzerland. System includes full integration of DCS, drive system, web break and web inspection systems.

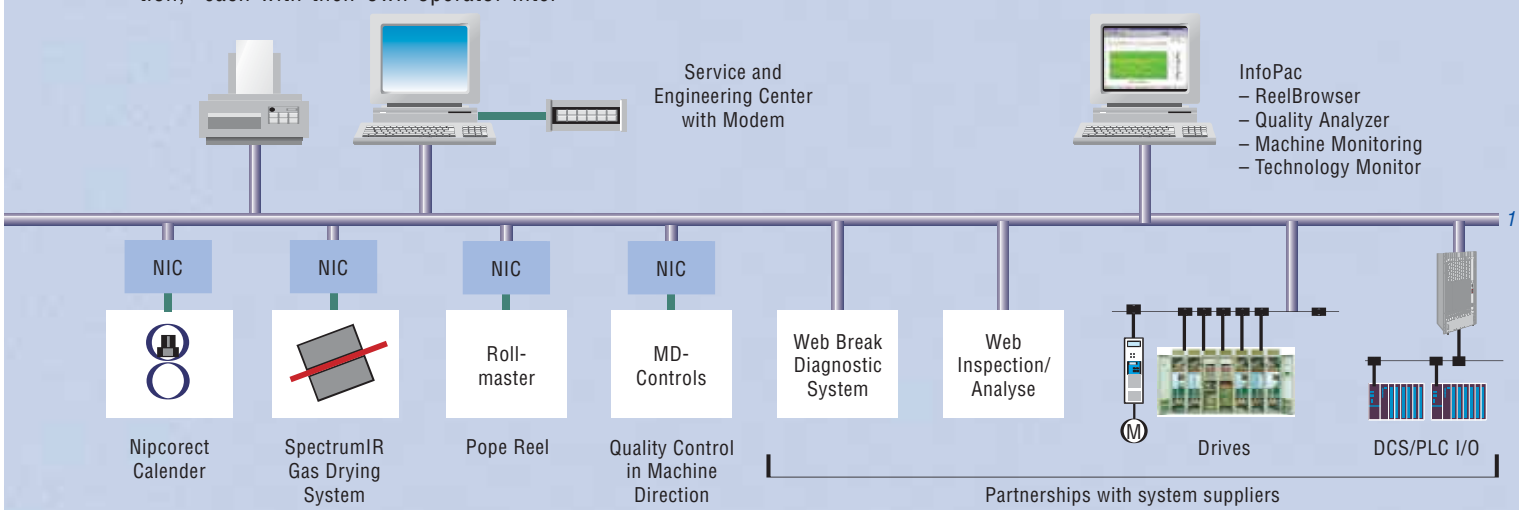
Toward that end, Mr. Müller announced the formation of Voith Sulzer Automation (headed by Geoffrey Lawrence), a new company formed by the combination of Impact Systems (acquired by Voith Sulzer in January 1998) of Los Gatos, California and Voith Sulzer Controls, of Heidenheim, Germany. Impact Systems pioneered the development of CD actuators and IR dryers, and later introduced an innovative on-line Quality Control System (QCS); Voith Sulzer Controls is well-known for its development of ModuleJet dilution headbox as well as major advancements in CD control theory.

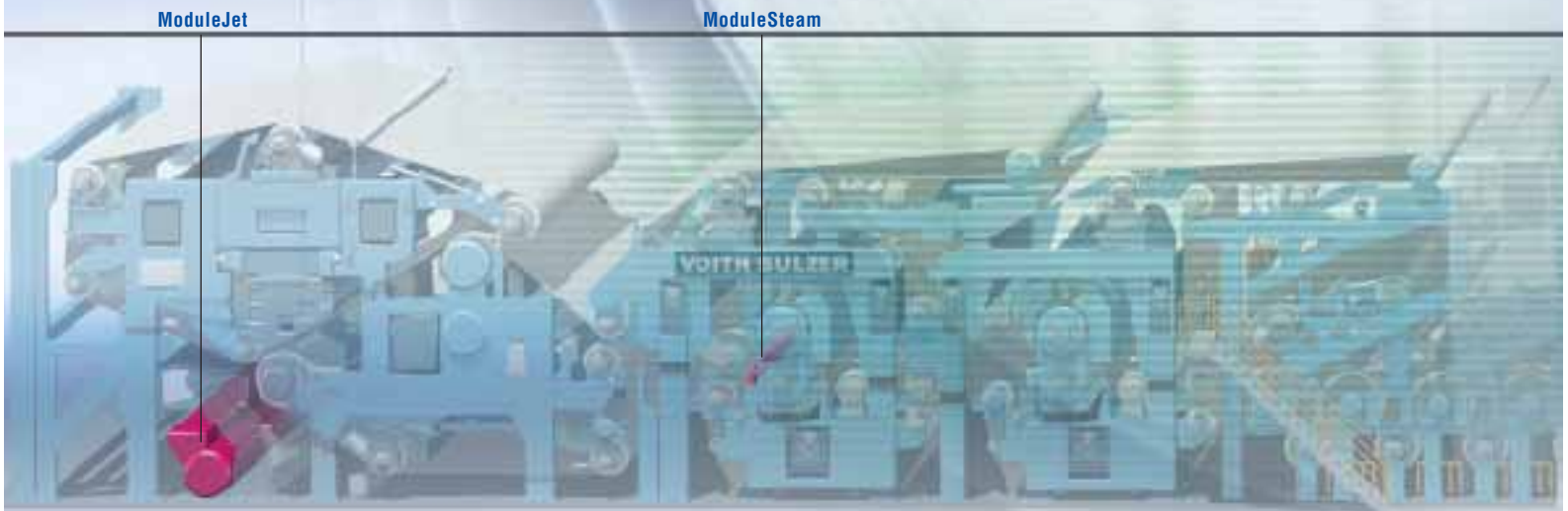
A new paradigm in paper machine control

During the last decade, process control systems have moved from stand-alone PLC, DCS and QCS "islands of automation," each with their own operator interface, toward "single window" systems integrated into a single DCS platform. Though a step forward in system evolution, these single DCS platform solutions present several drawbacks including restricted access to information, excessive complexity, high maintenance costs, and limited flexibility and expandability. In addition, in recent years the QCS functionality has shown signs of a maturing with few new products that add significant value for the paper mills and their customers. Consequently, most paper mills are quickly approaching a **"results ceiling"**.

Voith Sulzer Automation provides new application-specific solutions to paper-making problems by introducing the Millennium-concept. The major strength of the Millennium architecture is the distribution of QCS functionality into fully functional, stand-alone subsystems (e.g. scanning platforms, CD actuators, etc.) that are integrated on a high-speed Ethernet network.

AdvantagePlus™	Measurement of quality data	Scanners and Sensors
Profilmatic©	Reduction of quality deviations	Actuators and CD Controls
Smart Paper Machinery	Components with embedded quality controls	e.g. ModuleJet dilution headbox with Profilmatic MQ, embedded stockflow control
InfoPac™	Analysis and Diagnostics of quality and machine parameters	e.g. quality maps of reels and rolls, video surveillance of sheet breaks





AdvantagePlus™

Measurement Platforms

The scanning platform, AdvantagePlus, measures all relevant quality data during the paper-making process, see *Fig. 2*.

Profilmatic™

Actuators and CD Control Systems

The Profilmatic family of subsystems includes actuators, e.g. the gas drying system SpectrumIR, the electric drying system InfraPac or the caliper profiler ThermaJet and the CD controls for the various systems and applications.

Each subsystem freely communicates with any other through its Network Intelligent Controller (NIC). The result is an integrated Quality Control System with all the benefits of full network distribution including subsystem independence, true "plug-and-play" modularity, independent subsystem maintainability, and highly flexible expandability.

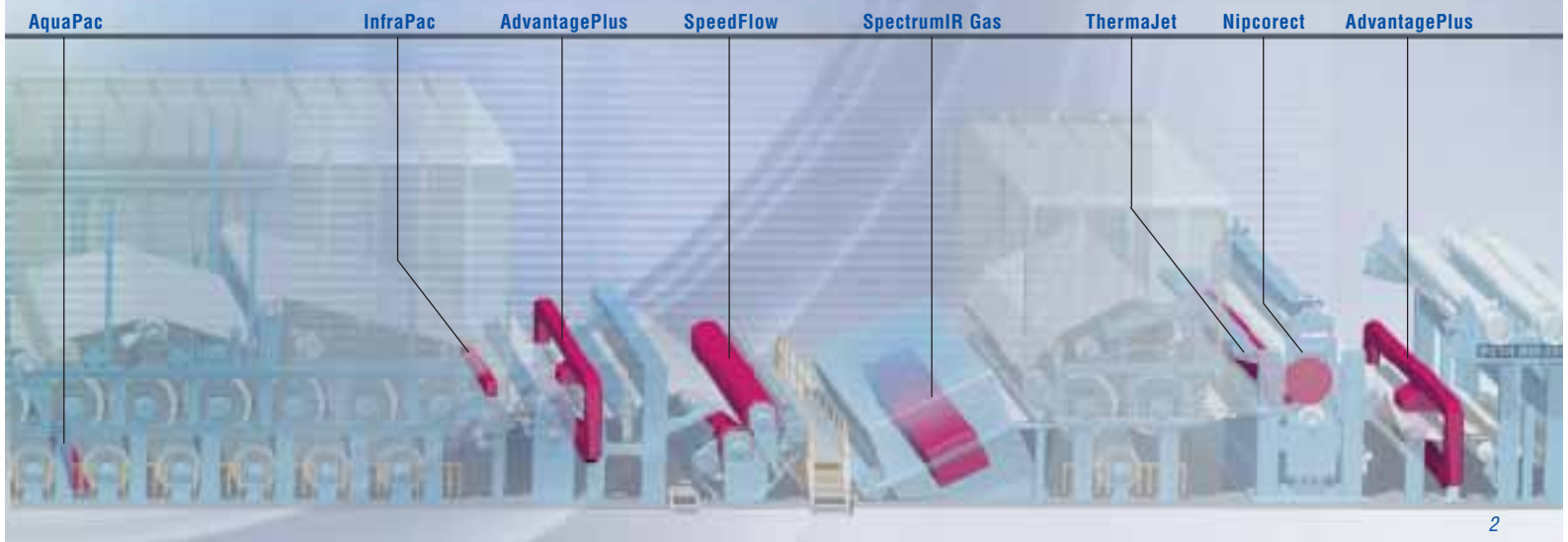
System communications, both internally and externally, conform to the latest Microsoft and other open communication standards, allowing easy and complete integration with other standards-based control and information systems.

In addition, the operator and maintenance video displays from the Millennium subsystems and from other suppliers control and information systems are integrated on a "shared window" using web-browser, ActiveX and other display standards. This unique approach provides all the benefits of a "single window" without the major disadvantage of having to rewrite the displays in the DCS platform.

Thus, the Millennium architecture permits Voith Sulzer Automation to focus all of our resources on paper machine optimization, while offering full integration of the 'best-of-breed' general purpose automation systems (e.g. PLC, DCS, roll-tracking, etc.).

The performances of the Millennium system has been very impressive. The Profilmatic CD controls have shown astounding results at a recent installation at a customer in the United States. The new Millennium control algorithms, achieved a **56% and 62% improvement** in CD weight and CD moisture control respectively. Voith Sulzer Automation achieved these results using the mill's existing CD actuators.

Also the new Voith Sulzer LWC paper machine at Perlen in Switzerland benefits



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from the power and flexibility of the Millennium system *(Fig. 1)*. It includes the full integration of PLC/DCS, drive system, and other systems from outside suppliers.

Smart Paper Machinery

Paper Machine Components with embedded sensors and quality controls

In a next step we are working on combining paper machinery, process knowledge, and automation expertise to create embedded application-specific sensors and controls into the various sections of the machine (e.g. headbox, former, presses, coater, dryers, etc.). These new "smart" machines eliminate variations at their source. For example, Voith Sulzer Automation has developed a consistency sensor to be embedded in each dilution approach line to the ModuleJet headbox *(Fig. 2)*. The sensor and new related controls will reduce short-term CD and MD variations and significantly decrease grade change times. The patented ModuleJet was the first dilution control headbox, and today there are over 120 successful installations worldwide. ModuleJet, using the unique Profilmatic M controls, has already produced paper with ±0.1 g/m^2 2-sigma CD basis weight variation.

InfoPac

Information Systems for Paper Machines

Papermakers can look to Voith Sulzer Automation for innovative process-improvement solutions. For example, the new "InfoPac" family of Paper Machine Information Systems has proven to be a big hit in the mills. Over 20 InfoPac orders have already been received, for use with Millennium and other control systems. Our customers like the fact that they can map the quality of a full reel or roll, and trend paper machine performance for any selected time period. The InfoPac "ReelBrowser" has been particularly well received. In just about every case when we started up ReelBrowser, within hours the mill detected performance problems that they simply didn't know existed *(Fig. 3)*. If a mill moves to a complete millwide information system, then InfoPac readily ties in since it follows standardized database and communications standards.

Your vision is our mission

The "Perfect Paper Machine" – with no breaks, two-minute grade changes, and negligible paper quality variations, – is the mission of Voith Sulzer and Voith

Fig. 3: InfoPac ReelBrowser showing quality map for one reel of paper. Mill determined that high moisture streak was caused by felt shower.

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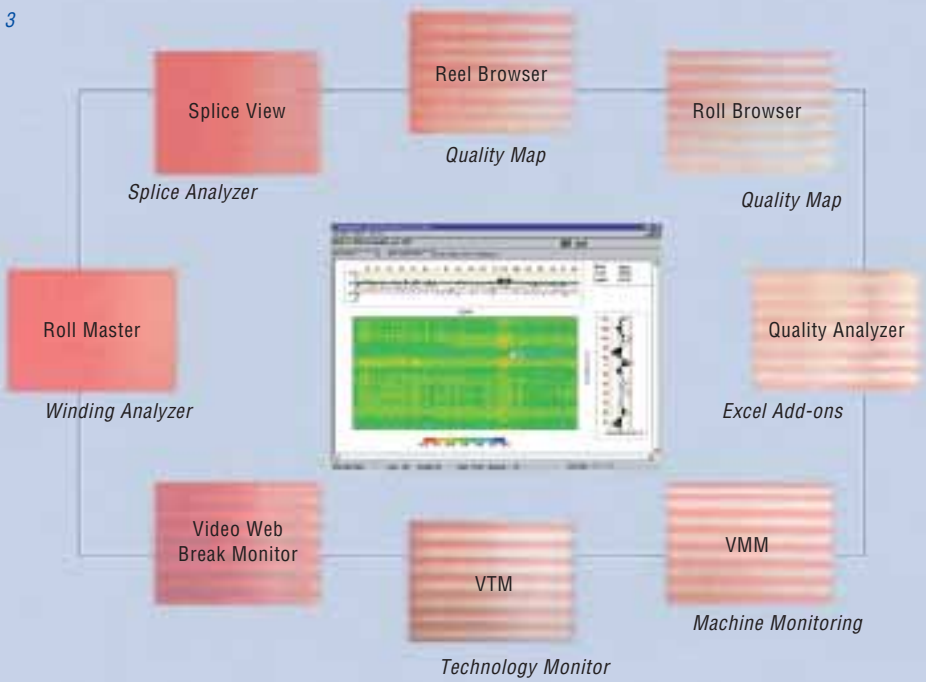

Sulzer Automation. We are moving rapidly toward this objective by combining world-leading paper machinery knowledge and advanced automation expertise. Our new generation QCS along with new "smart" paper machinery and integral paper machine information systems now allow mills to gain a new level of benefits. These new capabilities are already producing some dramatic results; we are breaking through the "results ceiling" now being approached by traditional QCS "add-on" systems. The paper business is our only business, and our mission is aligned with the visions of papermakers worldwide. Together we will move toward the "Perfect" Paper Machine... indeed, that future is not so far away.

New "NIC" Technology

The Millennium System provides a new modular architecture, including a "Network Intelligent Controller" (NIC) associated with each subsystem (e.g. scanner, actuator, etc.) on the Ethernet network. The NIC technology allows each subsystem to operate independently, freely communicating with any other subsystem. The overall system operates as if it were programmed on one large computer, though it is distributed over the network using a highly efficient communications technology. Today's scanning sensors each generate a high-resolution profile array of 500 or more data boxes every 10-25 seconds, and various CD actuators need this data immediately. These demands could easily overload traditional communication networks and compromise control performance. The new Voith Sulzer Automation "Data Distribution System" (DDS) addresses this issue by providing the next generation in real-time control communication technology. Each subsystem NIC is "publisher" and "subscriber" for sending and receiving information.

For example, a scanner NIC is a publisher that transmits the high resolution profiles immediately after each scan and each CD actuator NIC is a subscriber that receives the appropriate profile data immediately. This automatically occurs without any custom communications setup or configuration.

Full distribution of functionality to stand-alone subsystems allows Voith Sulzer Automation to build, test, install and troubleshoot the system more efficiently; allowing for faster installation and startup, less risk of total system failure and lower ongoing maintenance costs.

The stand-alone subsystem design provides the system with a new level of modularity, allowing "plug and play" additions of new subsystems without expensive upgrades and reprogramming. Millennium users now have unlimited expandability, allowing them to take full advantage of future Voith Sulzer Automation developments.

1

Building the future:
Voith Sulzer Paper Technology in China

The author:
Frank Opletal, Voith Sulzer Paper Technology, Beijing Central Representative Office

Beijing on a dull November morning. Our limousine makes its way slowly through the yellow-grey smog, for traffic jams have already built up on the third ringroad. What a contrast to the "good old days" when a lonely black limousine sailed through a throng of bicycles – now they overtake us all the time!

After quite a long journey, Beijing International Exhibition Centre looms up through the fog. We soon find a warm welcome at the Voith Sulzer Paper Technology stand, where the message is clear: Chinese customers can shop here for all their papermaking needs. In other words, Voith Sulzer Paper Technology has come to stay.

Our customers stayed on for some long discussions and friendly chats, in fact they felt very much at home: "Your booth this year is very Chinese and very very good!". The new Chinese brochures and our first two coloured Chinese editions of ***"twogether"*** magazine (Nos. 7 and 8) were so popular, that only one day later

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they were nearly all gone. Happy reading to all our Chinese business friends!

At the Voith Sulzer press conference held on the opening day of this trade fair, questions asked by journalists clearly showed what interests China's paper industry most of all: local manufacturing, service and roll cover centres, and high-tech equipment such as our ModuleJet headbox.

Voith Sulzer's customer seminar, held on the last day of the China Paper & Forest '99, was a rendezvous for high-ranking officials and top paper industry managers from all over China. Here again, the main focus was on **Building the Future** in the Chinese paper industry – comprising some 4700 mills, mostly small and outdated.

Chinese leaders have seen the necessity of modernizing their paper mills for meeting tougher competition in years to come. But an industry with around 4700 mills churning out 28 million tonnes of paper and board annually – and still importing 6 to 7 million tonnes p.a. as well – is not so easily retrofitted.

The last few years have seen some of the world's biggest and most efficient machines come on stream in China for various grades, but so far they only cover about 20 percent of national paper and board needs. At this rate, replacing all the outdated machinery will take quite some years.

At the same time, according to Chinese economy growth forecasts, paper and board consumption will rise by 2010 to about 60 million tonnes p.a. as against 34 million t.p.a. at the present time. In other words, another 60 or so machines, each with 200,000 t.p.a capacity, will be required for graphical grades and 70 more for board production. This is on top of the 40 paper and 50 board machine replacements required for current needs.

Just think what that means – ***120 board machines and 100 paper machines are going to be required over the next decade!***

Although the challenges to be faced in China are quite different to those in Europe or America, our seminar guests in Beijing were asking the same kind of questions:

- Which supplier should I choose as my overall papermaking process partner in order to minimize risk?
- Which high-tech components are most appropriate for upgrading my old paper machinery?
- Will investing in the greater efficiency of a high-tech paper machine and/or stock preparation line give me a leading edge over competitors?
- Which concept best utilizes the raw materials already so scarce in China?
- Where do I get the necessary financing?

Despite the advent of computers and Internet technology in China, books and newspapers will be a more economical

Fig. 1: The Voith Sulzer Paper Technology stand at the China Paper & Forest '99 trade fair in Beijing.

Fig. 2: Lu Shin Lin, President Director Minfeng Corporation, talking with Hans-Peter Sollinger and Harry Hackl.

Fig. 3: Official opening of China Paper & Forest '99 in the presence of high-ranking government officials, including Deputy Light Industry Minister Yang Hay Shan.

Fig. 4: Information centre on the Voith Sulzer stand.

Fig. 5: Frank Opletal and B. Z. Chen (both of VPT Beijing office) welcoming guests to the customer seminar.

Fig. 6: Jiang Heping (Chairman Jiangxi Paper Group) and VPT Beijing office manager Ming Ming Liu, singing a Chinese folk song together.

Fig. 7: Ming Ming Liu talking with Zhao Wan Li, General Manager Hongta Renheng, Zhuhai.

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answer for decades to come – especially with regard to education: each year 15 to 20 million children start school in China.

With growing competition, there will also be a higher demand for packaging. Better wrapping and protection of all the goods produced by Chinese and foreign enterprises will increase folding boxboard and corrugated container needs enormously. Furthermore, tissue requirements for cosmetic and hygiene purposes are also growing rapidly.

Against this background of economic expansion and promise for the future, the Voith Sulzer Paper Technology seminar in Beijing was particularly appurtenant. Our most reputed customers in China gave some very interesting reports on experience with their LWC and cigarette paper lines, packaging paper and folding boxboard machines – in fact their boundless enthusiasm was so infectious, that these addresses were the highlight of the seminar.

The day was rounded off by a much-appreciated address from the banking world – how many interesting possibilities there are for financing such a vast modernization process!

And during the traditional Voith Sulzer banquet that evening, appropriately entertained by Chinese folk singers, a special kind of "Twogetherness" was celebrated: an exciting partnership for Building the Future.

Sincere thanks to all our customers for being with us: you made this seminar a memorable occasion! We also owe a great deal of thanks to our colleagues from all over the world for their outstanding presentations. And finally, where would we be without all the help and hard work by our enthusiastic people in Beijing?

High distinction for Dr. Herbert Ortner

Paper Industry International
HALL OF FAME

On September 30, 1999 Herbert Ortner was inducted into the Paper Industry International Hall of Fame in recognition of his outstanding services to paper technology research and development.

Paper is such an everyday part of life these days, that only insiders have any idea of how much ingenuity and sheer hard work it takes behind the scenes to keep the printing press well fed. What would we know about the world's great writers and composers, scientists and engineers, politicians and economists, for example, if they had not put down their ideas in writing? And what would have been the point of inventing the printing press without paper? Furthermore, how many Nobel prizewinners would there be without reading and writing?

But the very people who make paper possible in today's high qualities at such low cost are not necessarily known even to insiders. Some international paper industry leaders, therefore, thought about improving this situation, how the most outstanding of these people could be honoured in an appropriate manner. So with the assistance of the Neenah Historical Society, in 1992 they founded the Paper Industry International Hall of Fame in Wisconsin, USA. The declared aim of this institution is to make public outstanding achievements in the paper industry, and pay due tribute to the persons responsible. Induction into the Hall of Fame is reserved for those who have made outstanding contributions for the benefit of the entire paper industry, whether in research and development, engineering or management.

One of the few personalities to be honoured with this high distinction since 1992 is Herbert Ortner, long-standing head of Voith Stock Preparation Technology, and from 1994 to 1998 Senior Vice President Integrated Paper Mill Projects, Voith Sulzer Paper Technology Heidenheim, Germany, with main emphasis on Far-East and Southeast Asia. He received the award last year for his outstanding contributions to modern papermaking technology based on well-founded scientific methods and principles, in particular with regard to the preparation of recovered paper.

Herbert Ortner combined his vast knowledge of the entire papermaking process with innovative ideas and a great deal of foresight. He played a decisive role, for example, in developing the flotation deinking process. The worldwide breakthrough of recycling as a fundamentally environment friendly and economical principle in the paper industry today was

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largely achieved thanks to his enthusiasm, determination and sheer hard work. Herbert Ortner was convinced long ago that in a world more conscious of the need to conserve resources, the recycling of recovered paper would be necessary for the future of a paper industry bound to global responsibility and credibility.

His publications and presentations, his ideas and patents cover an enormous range of themes. Apart from his pioneering work in flotation deinking, he has also played a decisive role in paper surface sizing developments, coating methods, preparation of recovered paper, dispersion, refining, screening and in the development of various process-oriented systems and machinery.

Herbert Ortner is a member of the Academic Society of Paper Engineers (APV) at Graz Technical University, Austria; the Austrian Association for Pulp and Paper Chemistry and Technology (OEZEPA); the Institution of Pulp and Paper Chemists and Engineers (ZELLCHEMING), and the Technical Association for the Pulp and Paper Industry (TAPPI).

On September 30, 1998, Herbert Ortner entered his well-earned retirement at the age of 66. Dr. Herbert Ortner continues to be available to the company as a special consultant. The editorial team of Twogether Magazine sincerely congratulates him on this well deserved tribute to his life work and achievements. And we are joined in this congratulation by all his colleagues and friends at Voith Sulzer Paper Technology, who owe a good deal of their international recognition to his outstanding work.

Fig. 1: The flotation deinking process – a development in which Herbert Ortner played a decisive role.

Fig. 2: Together with Herbert Ortner (centre) seven outstanding personalities from the paper industry and papermaking technology were inducted into the Hall of Fame in 1999.

Fig. 3: Among the first people to congratulate Herbert Ortner were his wife, Christa Ortner-Fiala (left), Martina Mann-Voith, the daughter of Hanns Voith, and Werner Witek, Senior Vice President Voith Sulzer Paper Technology USA.

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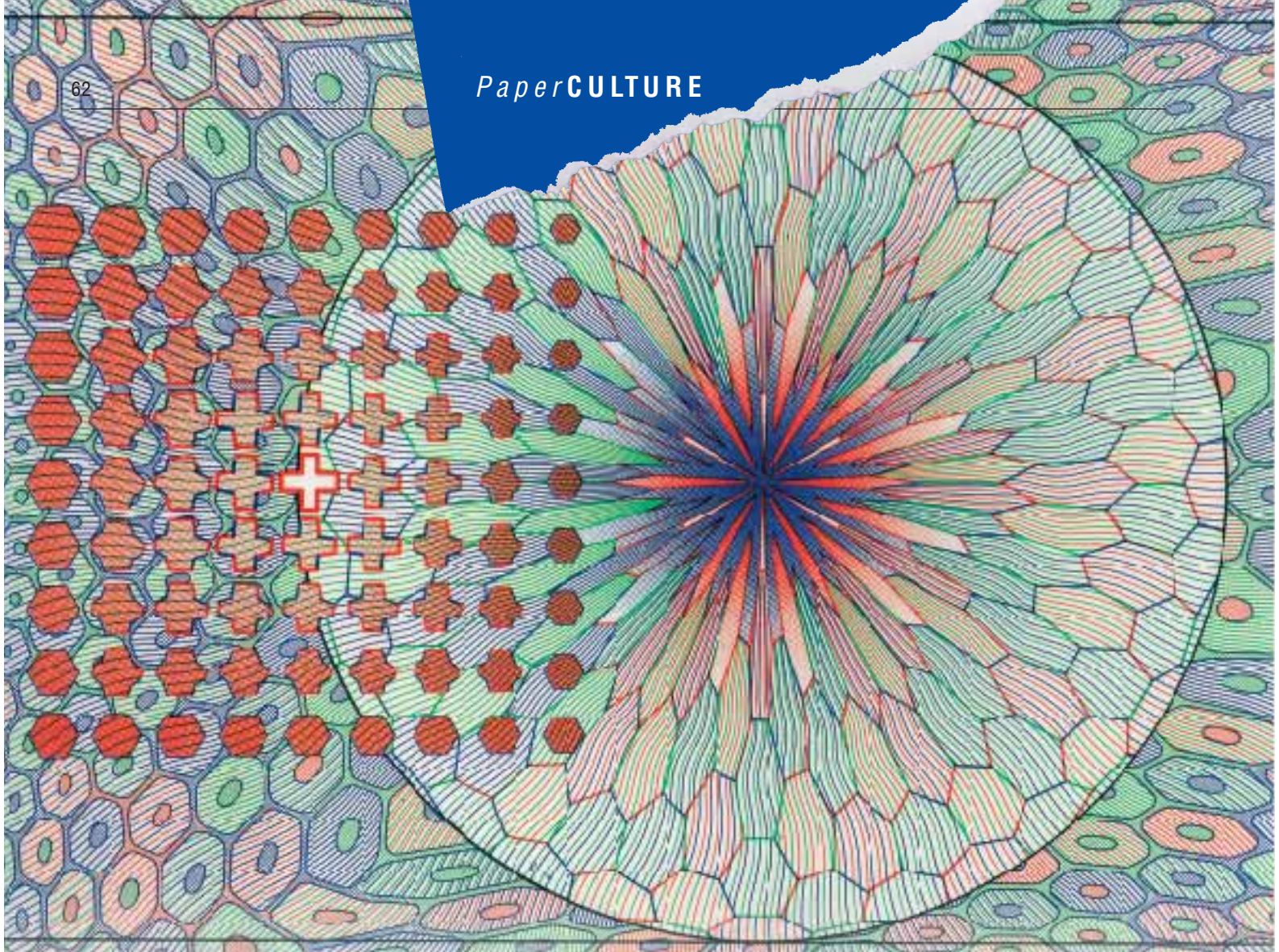

The art of making money out of paper ...

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... this is what papermakers ought to be good at, simply on account of their profession. In the following article, however, we shall not be looking at making money out of paper production in general, but specifically at the production of paper money in the true sense of the term, and at the art and culture associated with this trade, its history and some of its peculiarities.

Arguments between experts as to who first had the notion of inventing money, and where and when this ingenious principle was born, have been going on almost as long as money itself has been in circulation. Nobody knows the answer exactly. At some time after division-of-labour social structures began to develop, somebody must have become tired of the wearisome principle of the barter economy with one commodity exchanged for another, and become aware of the benefits of alternative, lightweight and more easily carried means of payment. That was when money began its breathtaking career, with a gradual metamorphosis from mussels and birds' feathers, from pearls and stones, to gold, silver, copper and nickel, finally to paper and even more recently to plastic rectangles coated with an informative magnetic strip – a process that has obviously not yet been completed.

The change from the first primitive types of payment in kind to coined money made of metal took several thousands of years. The invention of gold and silver coins is ascribed to the Lydian King Kroisos, who has entered many other languages as the proverbially rich "Croesus". Humanity has thus known minted and stamped coins since the seventh century before our calendar. Compared with these epochs of development the era of our printed paper money can almost be considered as an episode.

The first banknotes appeared as early as the 11th century, as it happens. Like many other innovations we owe this innovative use of paper to China, the country where paper originated: In 1024 China was the first country to decree the printing of paper money. When Marco Polo (1268-1298), a citizen of Venice, reported this after his return from China and also exhibited samples of Chinese paper money, he was accused of telling infamous lies. Neither in Venice nor in Genoa, then the most significant trade centres of the Western world, was anybody capable of

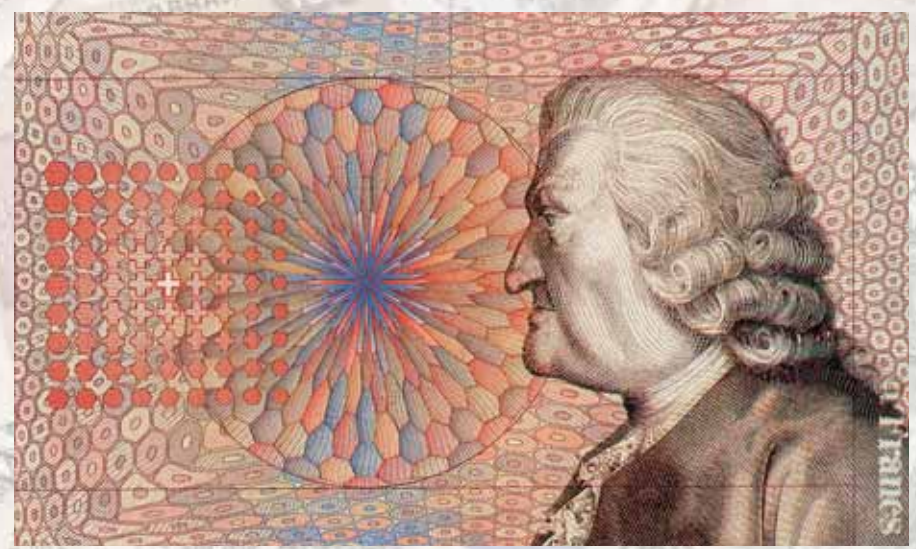
Figs. 1 and 2: Draft and final design of modern paper money – a 500 Swiss Francs note from the reserve series of the Swiss National Bank in Berne.

Fig. 3: Chinese paper money from the time of Marco Polo's journeys.

comprehending the brilliantly abstract thinking that lay behind the Chinese payment system, based on simple paper notes of different value.

Like the production of paper itself, the use of paper money continued its advance towards the West. Reports about a paper money printing shop in Tabriz have survived from the year 1293. But it took another 300 years or so before the first precursors of paper payment appeared in 1606 in Bologna, in 1608 in the Netherlands and 1681 in England in the form of cheque forms from the banks.

On the whole, the issue of printed money in Europe was considered more of a substitute, a type of promissory note, which could then be exchanged for hard cash. This also explains the term "money" which became more and more common as printed currencies came into use. Curiously enough, it is derived from the Latin "moneta" and just as clearly associated with the English "mint", the word used both for the production of coins and the place where they are made. Other languages use words such as "Geld" (German), which goes back to the Anglo-Saxon and Low German term "gildt", meaning debt, charge or tax. As understood initially, paper money did not represent the actual act of payment, but only a generally accepted liability to pay. Although paper money had long since proved successful in the very advanced civilisation of China under a largely standardised government and tax system, the West persisted with the use of coined precious-metal talers, talleros, taaldars and the later dollar for another couple of centuries. In a population where the majority could not read and write and in unsafe times, one tended to trust the gold and silver coins, generally termed "talers", which could be melted down if necessary. This very common European designation of coined money, of which the current "dollar" is clearly a derivative, goes back to the extremely widely circulated "Reichs-Thaler" of Charles V, coined in Joachimsthal, Germany, from 1520 onwards. Charles V's empire extended from the Caribbean to the Carpathian Mountains and was therefore, as everyone knows, "where the sun never set".



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In 1661 the Bank of England put paper money into circulation for the first time. Its example was followed by the Royal Bank of Sweden in 1694. In 1720 France became the first European country to introduce paper money as a generally valid means of payment, and in 1790 in the same country, the first paper mill in the Western hemisphere was awarded the contract to make a special paper for the production of "assignments", with the help of which the First Republic tried to withdraw and replace the currency of the ousted monarchy.

In Germany in particular, every attempt to change the currency to paper money

Fig. 4: The banknote with the highest value ever printed.

initially provoked a storm of indignation. It was condemned as the "devil's tool" and the "paper plague". Like playing cards, the paper "notes" with their figures, their pictorial symbols and their often wrongly interpreted inscriptions were associated with all sorts of witchcraft, myths and dark dealings. The latter association has clung to the exchange of mysterious bundles of paper money until this very day, though money itself can hardly be blamed. "Non olet. (Money) does not stink", as Vespasian had correctly observed long before.

It was not until the middle of the 19th century that banknotes finally prevailed for payment transactions in Germany. This late start into the paper-money era seems symptomatic. Even today Germany is noted for its marked restraint when it comes to currency modernisation. In the United States up to 90 per cent of all transactions are paid for with "plastic money", whereas in the Federal Republic of Germany cash transactions still predominate. Scepticism towards alternative means of payment is reminiscent of the disapproval of "notes" 200 years ago.

Of course, the valid banknotes with the highest value can be found today in the land of limitless opportunities. We are talking about 100,000 dollar notes, which are reserved exclusively for payment transactions between the Federal banks and the Treasury Department. The highest notes in regular circulation have a denomination of 10,000 dollars: of these, a limited edition was printed in 1969. The cost of producing such a banknote: four cents! Only paper has such an unbeatably low price, bearing in mind that a quarter-dollar coin today costs almost as much as its purchase value to produce.

Germany, on the other hand, can claim the doubtful fame of having circulated the notes with the highest denominations in the history of paper money. They were issued during the years of hyperinflation in 1922/23, after the First World War, bearing figures with 12 and 14 zeroes, and eventually reaching such astronomical sums as one hundred trillion Marks. They documented the irrationality of a currency collapse with a dimension that is today scarcely comprehensible. At the end of October 1923 a kilogram of potatoes cost 90 billion Reichsmarks, an egg 320 billion. On 15 November 1923 the nightmare came to a halt with the introduction of the new Rentenmark currency. Here are some excerpts from the chronicle of the Palm paper mill, which at that time was one of the few mills that specialised fully in waste paper recycling:

"At the beginning of 1924 we were literally 'rolling in money'. Load after load of the valueless billion and trillion Reichsbank notes arrived by freight train at the recycling plant. This unexpected flood of waste paper was at first more of a burden than a blessing. The extremely bad print quality of the notes made separation of the poor, oily inks very difficult. Special methods had first to be developed and the flood of money stockpiled temporarily. Only a year later, in the spring of 1925, was this mountain of monetary memories reflecting the consequences of the First World War finally cleared away to a large extent".

Although the appearance of the first paper currency was simply geared to communicating its value and details of its origin, the designs developed in the course of time into a heavily symbolic demonstration of power and national consciousness. This trend was full of dangers, since one or the other system of state or rule which had hitherto been considered stable was always likely to be toppled more rapidly than one might have imagined. Of what use is a currency to a new government if it still glorifies the portraits and heraldry of the ousted predecessors? It had to be replaced right away, or else the new powers-that-be would be putting their own status at risk.

This was easier said than done. Even today, with the help of ultra-modern tools and machinery, the changeover to a new series of banknotes can take 2 to 3 years or even longer. For example the Russia that emerged from the October Revolution had to tolerate the hated money of the tsar for a very long time. Since then, people have learned from experience. Occupying powers and subversives tend to prepare their new currencies secretly and in good time. This is a profitable business for the relevant suppliers, since the merchandise is generally paid for in advance, and is often left behind as waste paper if the coup d'état should fail, as happens now and again. Respectable, farsighted state banks try to avoid too much contemporary political symbolism on their notes. They prefer harmless motifs: portraits and achievements from the arts and sciences or images from the country's animal and plant life.

Modern anti-forgery devices can be perfectly integrated into such motifs, for example the quite common multiple water

mark, the metal safety thread, perceptible surface printing, fluorescent colour effects or hologram-type changes to the pictorial elements. Despite these sophisticated anti-counterfeit measures, the number of cases of counterfeiting has remained more or less unchanged for many decades. Every year there are about 25,000 cases of attempted forgery of the German Mark alone, although its safety features, among the best in the world, are to all intents and purposes not reproducible. According to estimates, worldwide attempts to forge US dollar bills exceed the 100,000 mark every year. However, none of these counterfeit banknotes stand up to close examination.

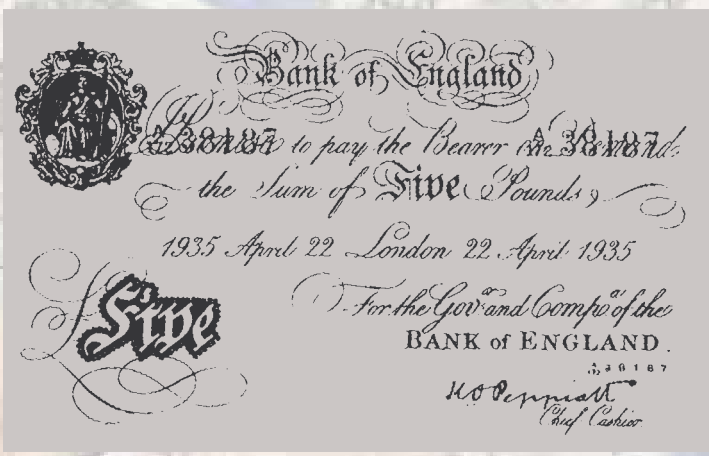
In the history of paper money, no absolutely perfect counterfeits are known – except for one nearly successful fraud of particularly significant dimensions.

When the Hitler regime threatened to run short of foreign currency at the end of the Second World War, operation "Bernhard" was launched, named for a sabotage specialist whose first name was Bernhard. English banknotes with a denomination value of 135 million pounds were printed, a sum which in 1944 equalled the value of the British Empire's entire gold reserves. Agents presented these forgeries to international banks, for example in Zurich and in London, and behold, even the Bank of England declared them to be authentic. Only when an aeroplane crashed in 1945 into the Mediterranean, resulting in several tons of forged notes being fished out of the sea, was the fraud exposed; it was not only aimed at procuring foreign exchange but to an equal extent at destroying the British currency. After the war the network of agents which was appointed to distribute the counterfeit banknotes and which had already spread as far as South America was never revealed in full, and only part of the remaining forged money was seized. Certain amounts were found in Northern Italy, Austria and Turkey. This was one of the reasons that later prompted the British Government to issue new pound notes of noticeably different appearance as a precautionary measure. To sum up, this criminal operation was of a perfection and perfidy that will hopefully remain unique in the history of paper money.

Fig. 5: Large-scale forgery.

In terms of the amount of paper used, the production of banknote paper itself is relatively insignificant, but its reputation within the guild of paper makers is relatively high nevertheless. Banknote paper – which even today is normally produced only from rags – with its water marks and cunning safety features and its consistently high quality, is still considered something special, as indeed is the teamwork among the experts responsible for it. From preparation of the paper stock, the draft design – which today is generally supplied by renowned artists – to the engraving of the print cylinders and the actual printing process, this complex procedure calls for an exceptional degree of cooperation, skill, experience and excellent technology. In this latter area Voith and Sulzer have been involved worldwide ever since the breakthrough of paper money in the 19th century. Approximately three dozen paper machines specially installed for the production of banknote papers around the globe since then, bear the name of Voith Sulzer. They have contributed a great deal to the history of paper money.

Compared with other quantities of paper, for example that required for newsprint or magazines, consumption in the production of banknotes is very low worldwide. The German Central Bank, the Bundesbank, needs only a mere 700 tons of paper per year to produce new notes to replace damaged ones or money withdrawn from circulation. Of course when it comes to the introduction of a new currency such as the Euro, things are completely different. But changeovers of such magnitude take place only on very rare occasions: the issue of a complete new series of banknotes has become a very costly undertaking. In addition, the "stability" of a currency tends to be defined by its ability to keep its appearance unchanged for as long as possible.



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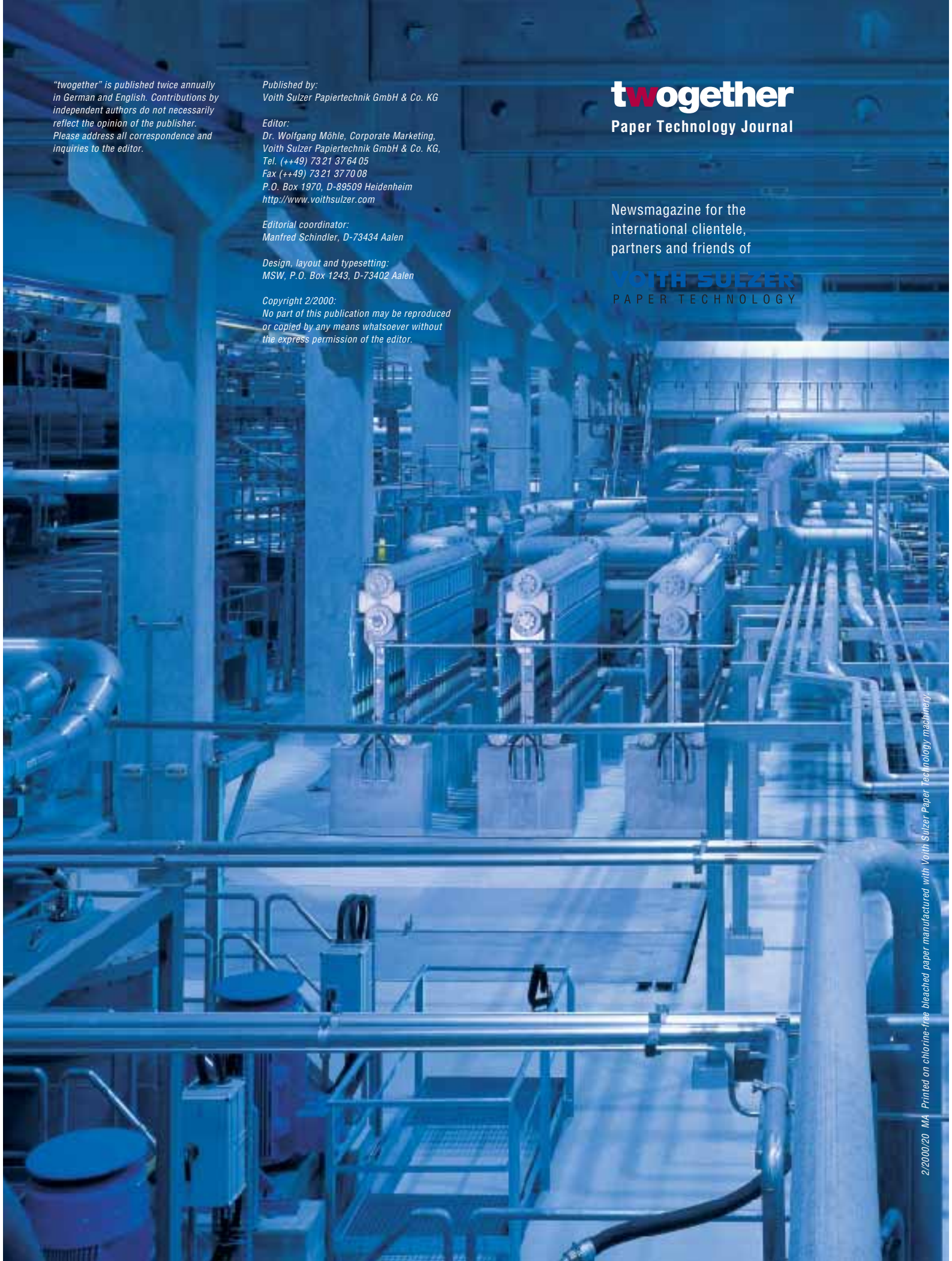
Paper Technology Journal

Newsmagazine for the international clientele, partners and friends of

VOITH SULZER
PAPER TECHNOLOGY



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