



Paper Machinery Divisions:

1

Bowater Halla one of the most efficient newsprint paper mills world-wide



*The author:
Dr. techn. Herbert Ortner,
Paper Machinery Division
Graphic*

In the third quarter of 1998, less than two years after Bowater Halla Paper Co., Ltd. South Korea, started production of its Voith Sulzer newsprint paper machine, PM 1 achieved an absolute efficiency of approximately 89 % (according to CPPA) and, thus, Bowater Halla Paper Co., Ltd., became one of the most effective paper mills world-wide. With a sustained operating speed of 1500 m/mm, already reached in September 1998, this paper machine is the fastest in operation throughout Asia. These achievements should be a good reason to reflect on the "Halla PM 1-project" by providing a short summary of the events.

The Bowater Halla Paper Co., Ltd. located within the Daebul Industrial Complex, Yongam District, South Cholla Province, not far away from the fishery-harbour

town of Mokpo in the south-eastern part of South Korea, is built on an area of more than 400.000 m² in close proximity to the ocean. For further plant expansion, Bowater Halla Paper owns sufficient additional free land area, directly adjacent to the existing paper mill. In the early 1990ies, the government of South Korea began to build up the Daebul Industrial Complex, especially, in order to encourage the investment in industrial ventures in this former agricultural and fishery region.

The contract signing on June 14, 1994, was the fulfilment of a vision of the then president of Hyundai International Inc., Dr. Chung In Yung, conceived in the mid-1960ies, to build a newsprint paper mill in Korea, utilizing 100 % deinked waste-paper as raw material. It was also the

Fig. 1: Bowater Halla Co., Ltd. South Korea.

Fig. 2: 4-stage cleaner plant, type KSE with light weight particles separation.

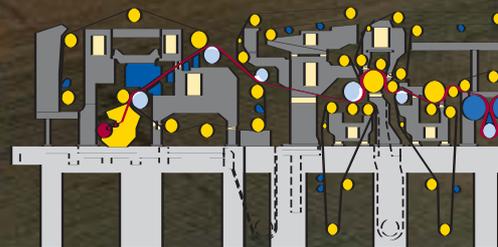
Fig. 3: Peroxide Disperger bleaching stage.

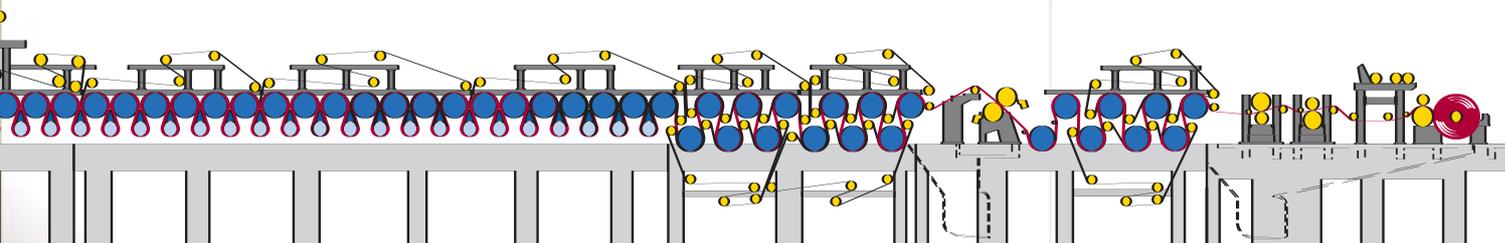
Fig. 4: One of the multiinjector flotation machines, type E.



result of Dr. Chung In Yung's long lasting friendship to the Voith Group of Companies, and especially, to the then vice president of the Voith Stock Preparation Division, Dr. Herbert Ortner. Moreover, Dr. Chung In Yung's (now Honorary Chairman of the Halla Business Group) conviction that buying from Voith not only meant obtaining the best technology, but also first class consultancy and services, was decisive for the award of this so important order to Voith.

The contract came into force on September 26, 1994 and construction work started in February 1995. Due to the adverse soil conditions at mill site several hundred concrete foundation piles, each more than 20 m long, had to be driven into the ground. This extensive additional foundation work lead to a three-months' delay in commencement of paper machine erection. When, at last, on December 10, 1995, everything was ready for the beginning of erection, deep winter, with icy temperatures and snowstorms, had set in – causing severe handicaps. Especially, the laying of sole plates and





Technical data of the Halla paper machine No. 1:

Untrimmed paper width: 7940 mm

Paper quality: newsprint paper 40-48.8 g/m²

Production capacity: 837 t/24h at 48.8 g/m²

Construction speed: 1700 m/min

Operating speed: 1500 (1600) m/min

Raw material: up to 100 % deinked wastepaper.

many other activities were massively impaired. But in spite of all these difficulties and certain cultural misunderstandings with the Korean contractors – Voith Sulzer was only responsible for the supervision of erection, commissioning and start-up assistance – erection work was accomplished within a record time of a little more than eight months and completed on August 30, 1996. Start-up (stock on wire) was on September 19, 1996 at a paper machine speed of 1150 m/min. Continuous operation (shift operation), that is to say commencement of commercial production, started four weeks later, on October 19, 1996.

Because of the fact that beside the Voith Sulzer Paper Technology supplies, the Korean partners, Halla Engineering & Heavy Industries and LG-Machinery, were involved in the delivery of equipment and components, the project management as well as erection management had to deal with various, and sometimes very difficult coordinat-

ing problems. These problems, however, were overcome by the sheer determination of all partners involved, by Voith Sulzer Paper Technology, by Halla Engineering & Heavy Industries Ltd. and by Halla Pulp & Paper Co., Ltd., who worked all with great responsibility and farsightedness; this also holds true for the design coordination, the plant engineering, the engineering of the control & instrumentation for the entire plant, and for the process control system.

For the project "Halla PM1" Voith Sulzer Paper Technology supplied:

- The complete flotation-deinking plant, including two Ahlström Fibreflow drum pulpers, Kvaerner-Eureka disk filters, Peroxide disperger bleaching and a Hydrosulfite post-bleaching stage for an accept capacity of 840 BDMT/24 h;
- The complete reject treatment and circuit water clarification with machinery and know-how by Meri Entsorgungstechnik;
- The stockpreparation for purchased thermo-mechanical pulp (TMP) for an accept capacity of 125 BDMT/24 h;
- The approach flow system with Deculator, Kvaerner-Eureka disc filter for fibre recovery, broke treatment and broke screening;
- The complete paper machine with GapJet headbox with Profilmatic, DuoFormer CFD, DuoCentri II press section with fourth press, Combi-DuoRun dryer section (60 % single tier, 40 % double tier), Speedsizer with GAW starch preparation, Soft-calender (2 x 1 nip) with Nipco® rolls, Reel with automatic Jumbo roll change;



Fig. 5: Softkalender.

Fig. 6: Duo Reels II.

Fig. 7: Roll wrapping system.



- Finishing with two DuoReels II and the complete roll wrapping and roll transportation system;
- The engineering and the hardware of the control and instrumentation including the process control system, and
- in cooperation with Halla Engineering & Heavy Industries Ltd., the plant-engineering.

Siemens supplied the electrical drives of the paper machine and the two Duo-Rollers II. Moreover, a great number of European and Korean firms participated in the realisation of that ambitious project.

With a freshwater consumption of approx. 12,5 m³ per ton of produced paper, resulting in an effluent of about 11,0 m³, this newsprint paper mill really sets new standards.

Due to the economic crisis in Korea, the Halla Business Group, like so many other large Korean corporations, experienced financial difficulties by the end of 1997. After extensive negotiations the newsprint paper mill was separated from the HALLA Business Group and taken over by the US-American Bowater Inc., Calhoun, Tennessee, in July 1998. Bowater Inc. is proud of this acquisition because now Bowater Halla Paper Co., Ltd. is one of the most modern newsprint paper mills within the Bowater corporation.

In order to further improve efficiency, productivity and product quality, and also for the best utilisation of the plant potential, an even closer partnership and intensification of cooperation with Voith Sulzer Paper Technology is planned.



Paper Machinery Divisions:

Speedcoater for Chinese market leadership

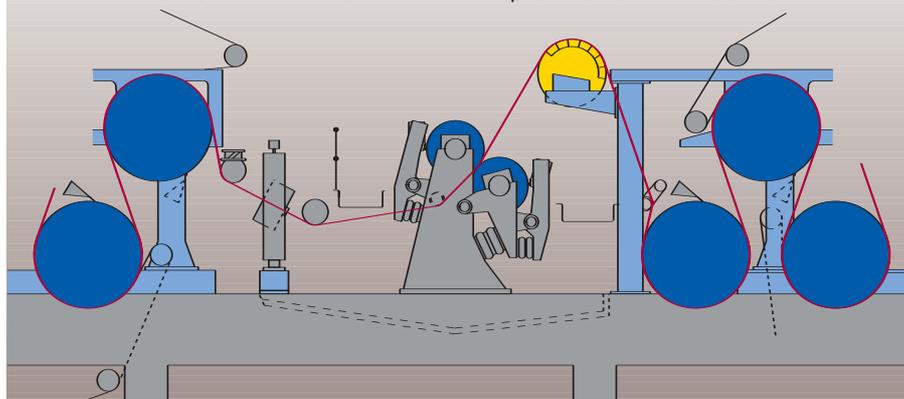
The Shandong Huatai Group, Dongying, Shandong province, is one of China's hundred largest paper producers. By adding a Speedcoater and an Ecosoft calender to its production facilities, the group has now become national leader in the online production of LWC papers.

A good many Chinese paper mills are currently faced with a fundamental decision. Should they invest in the new, wider paper machinery essential these days for cost-effective newsprint production? Or is it better to convert existing machinery, usually smaller, for producing wood-free LWC grades of higher quality?

After carefully weighing up the pros and cons, the Shandong Huatai Group decided

on the second alternative, using Voith Sulzer Paper Technology. And we are convinced that other Chinese paper mills will soon be following this example. For a very good reason: system components such as the Speedcoater and Ecosoft calender are outstandingly suitable for successful rebuilds and conversions. Thanks to substantially greater value added, combined with production cost reductions, such investments pay off very quickly.

The upgraded machine in Dongying, one of 23 operated by this company, operates at 550 m/min with a wire width of 3250 mm. After conversion, LWC papers with basis weights of 40 to 80 g/m² will be produced on this machine.

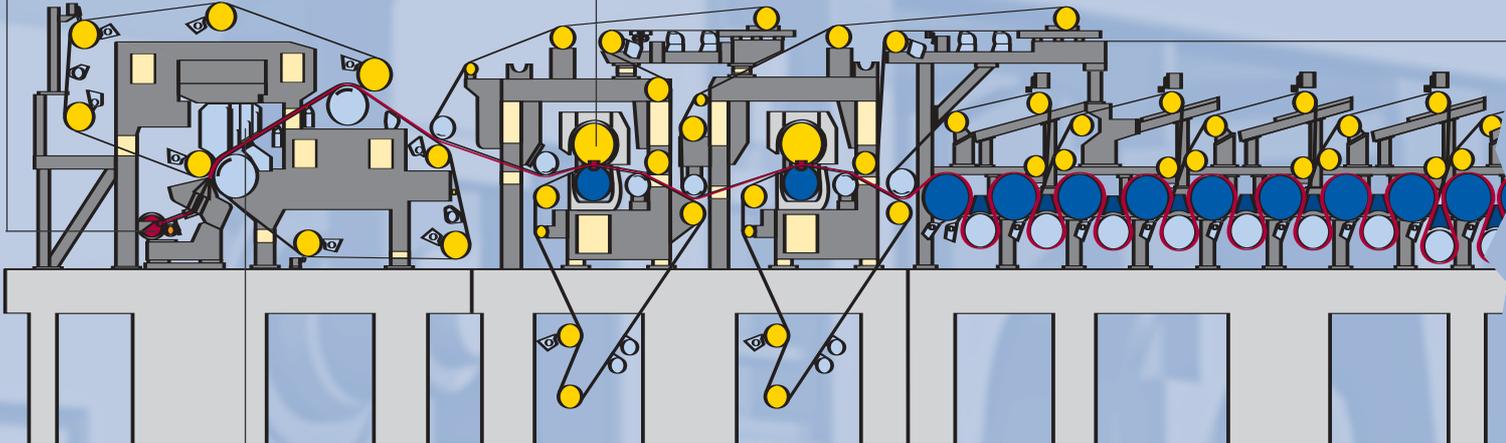


ModuleJet headbox with 2D control

*Optimal basis weight control
Shortest possible correction time*

Tandem NipcoFlex press with four felts

*Optimally uniform paper surface quality
Optimal equal-sidedness
Optimal runnability thanks to practically closed web run
Extremely high dry content
Designed for the highest operating speeds*

**DuoFormer TQ**

*Excellent paper uniformity with regard to
formation, basis weight profile,
ash profiles and sheet structure*

Paper Machinery Divisions:

One of the fastest SC paper machines – large order placed by Lang Papier GmbH, Ettringen, Germany



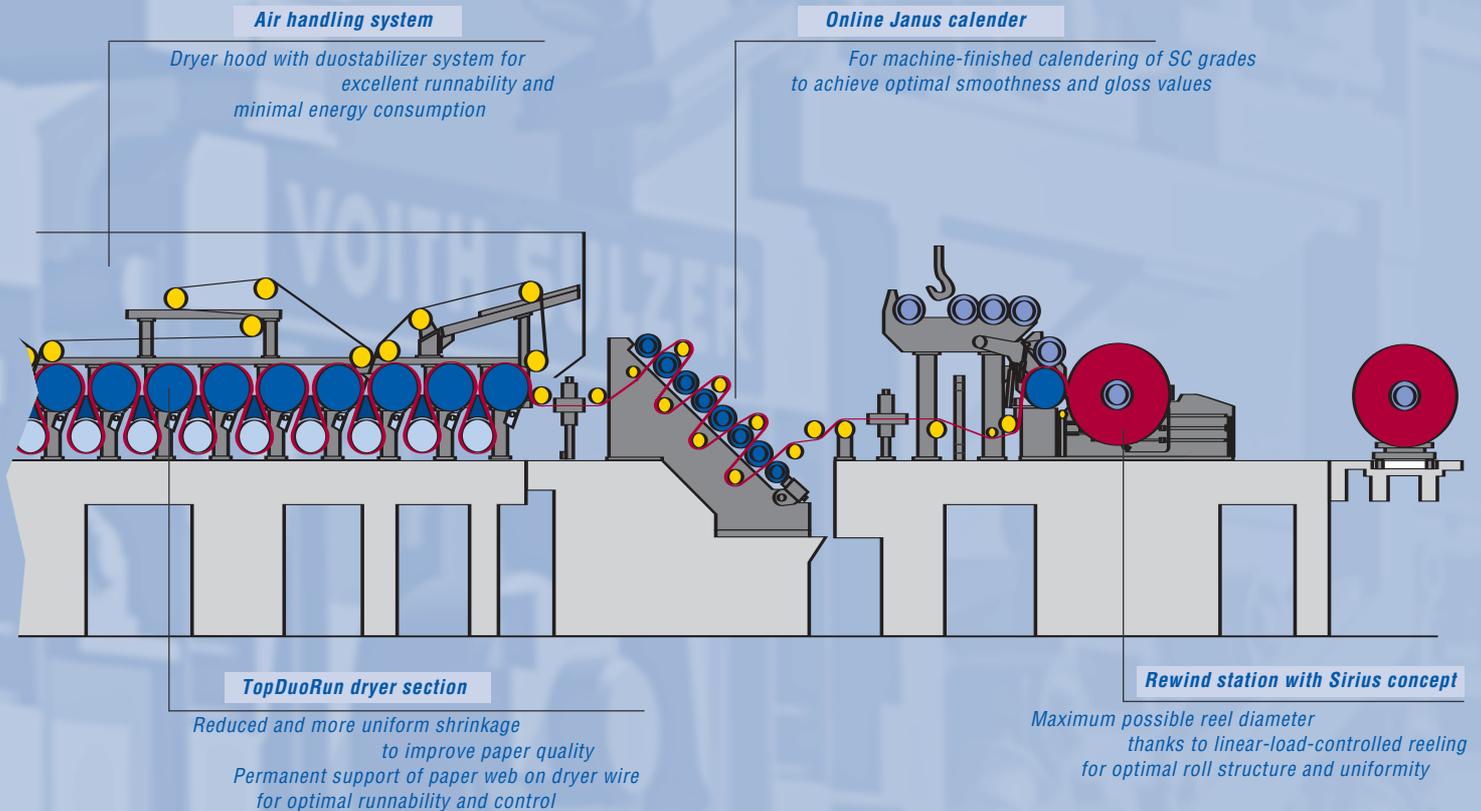
*The author:
Thomas Schaible,
Paper Machinery Division
Graphic*

After joining Myllykoski of Finland, the Bavarian paper manufacturer Gebrüder Lang GmbH, Ettringen, realigned production to high grade uncoated printing papers with high recovered fibre content. As always, the goal here was optimal quality at lowest possible production costs and furnish prices (up to 85% DIP). In the meantime, this company has become a pioneer in online calendered paper development and production.

Based on years of fruitful teamwork in plant modernization and product quality enhancement, Voith Sulzer Papierma-

schinen GmbH received an order in May 1998 for the biggest investment ever made by Lang Paper GmbH. This comprised a complete new production line for newsprint and SC papers, with an annual output capacity of 280,000 tonnes.

When the new COMPACT PM 5 starts up, the existing PM 3 will be taken out of service. The Ettringen mill will then have a total capacity of about 420,000 tonnes p.a., comprising about 160,000 t.p.a. of newsprint and 260,000 t.p.a. of magazine paper.



On June 8, 1998 the first excavator got down to the job in Ettringen. Installation of the new machinery should commence in February 1999. And plant commissioning is scheduled for the third quarter 1999. A tight schedule indeed, but the machinery design demanded at least as much concentrated effort.

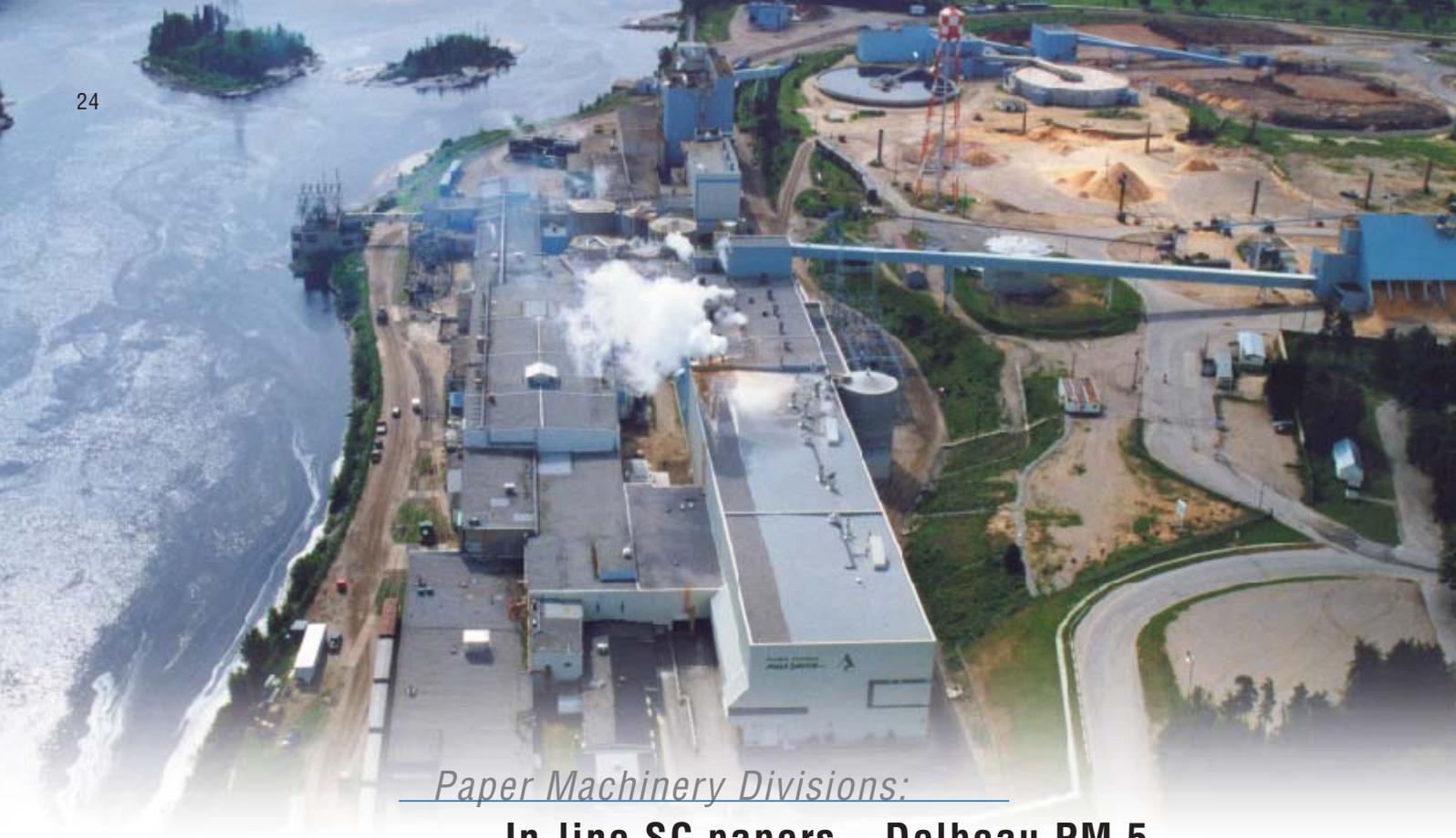
Comprehensive optimization studies first had to be carried out – one of the main reasons why Voith Sulzer Paper Technology were selected as a competent and dependable partner for this challenging task.

The new COMPACT PM 5 in Ettringen represents the online machine concept of the future for SC grades. It comprises an optimally efficient and cost-effective technical synthesis of well-proven system components, logical developments and future-oriented innovations. The overall result is a fully integrated design for first class end product quality.

Apart from this new PM 5, the project as a whole also includes investments for capacity increases and modernization of energy supplies as well as water and effluent systems.

Main data of the new COMPACT PM 5

Wire width 8900 mm
Working width with cutoff 8150 mm
Max. winding diameter 3700 mm
Max. rated speed 2290 m/min
Max. operating speed 2000 m/min
Production capacity 280,000 t.p.a.
Products: 40-48.8 g/m² newsprint, 45-60 g/m² SC grades
Commissioning date: third quarter 1999



Paper Machinery Divisions:

In-line SC papers – Dolbeau PM 5



*The author:
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In 1994, the Canadian pulp and paper giant Domtar split off their groundwood paper division as an independent company. The new company was named Alliance Forest Products, and its management moved quickly to upgrade from newsprint to higher value products.

The first project carried out was the rebuild of No. 5 paper machine at Dolbeau mill in the Lac St. Jean area north of Quebec City. After careful project studies and pilot trials, Alliance entrusted the rebuild to Voith Sulzer Paper Technology. In the end, the only parts of the existing machine to remain were the drying cylinders.

The machine configuration chosen was as follows:

- GapJet headbox with ModuleJet for dilution control
- DuoFormer CFD
- DuoCentri II press
- Combi Duorun drying section
- Two soft calenders
- Pope reel

The concept was developed in close teamwork between Alliance, the consulting engineers and Voith Sulzer Paper Technology.

Jean-Guy Sauvageau, Vice-President Technology for Alliance Forest Products Inc. reported as follows:

“Excellent cooperation and support during project engineering, installation of equipment, commissioning, start-up and optimization made this project an experience to remember. Thanks to all employees involved, who worked «twogether» to make this project a success. The collaboration was instrumental in the launching of the Donnacona project, whereupon Voith Sulzer Paper Technology was also awarded the contract to supply a second paper machine.”

Rebuild work on PM 5 started in late 1996, and official start-up was on August 4, 1997. From the start, the press rooms praised the quality of paper produced on PM 5 after rebuild, and their satisfaction increased as optimization proceeded.



Fig. 1: Jacques Perrault,
Technical Manager
Alliance Forest Products.

Fig. 2: **Dolbeau PM 5**
Main data
Wire width 6425 mm
Trim width 5840 mm
Design speed 1200 m/min
Basis weight range 45-56 g/m²
Products SCB and newsprint.

To quote from the Alliance 1997 Annual Report, “Buyers are extremely satisfied with the papers, which have been lavishly praised by many customers.”

In November 1997 Alliance launched the “Eminence” brand, soon followed by “Eminence Plus”.

“Offering excellent printability, Eminence papers have received a good market acceptance and are highly praised by many of our customers” said Pierre Monahan, President and CEO of Alliance Forest Products Inc.

This high praise notwithstanding, optimization continues as Alliance drives toward better and better quality. One of the principal players in this project is Jacques Perrault, well known in Canadian as well as international papermaking

technology circles. Let Jacques have the last word on the machine:

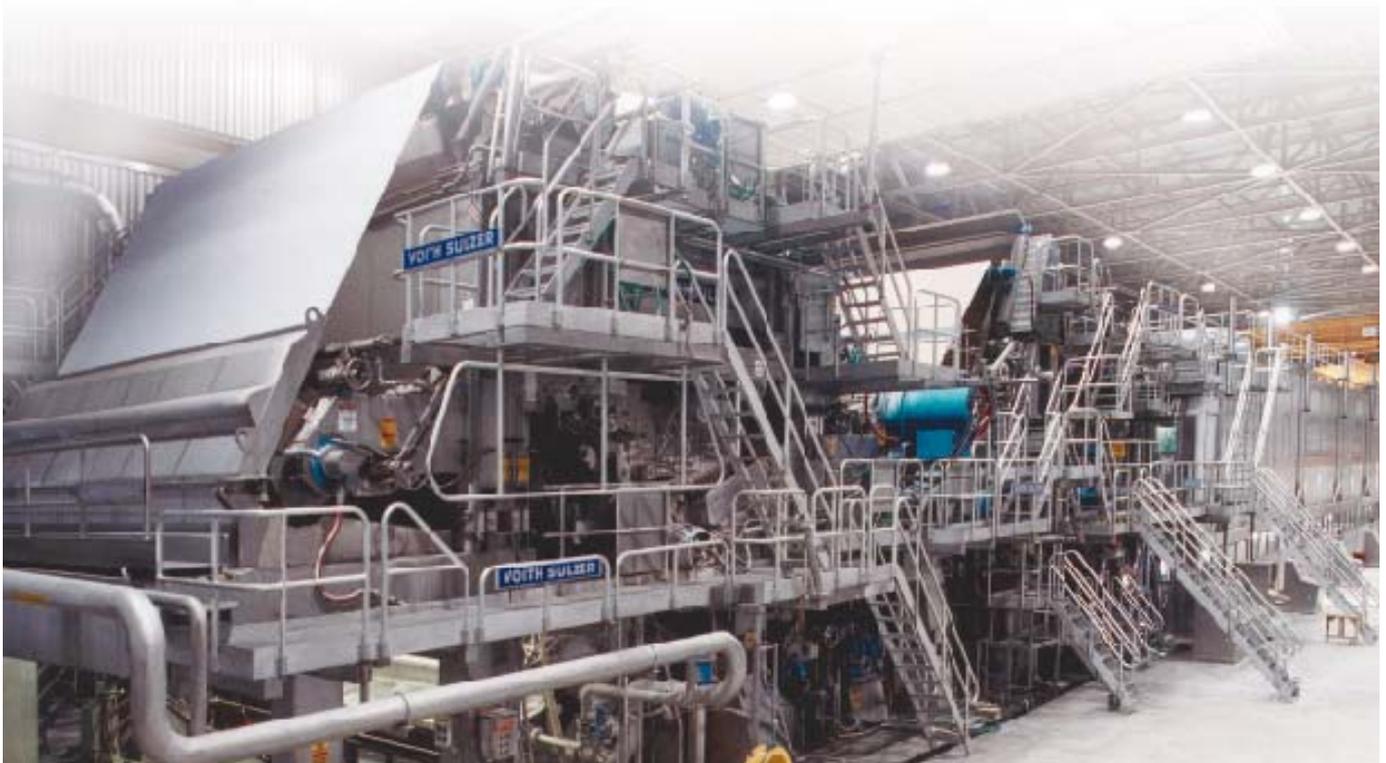
“Thanks to the ModuleJet dilution headbox, PM 5 has consistently produced excellent dry weight profiles, as shown by 2-sigma spreads typically between 0.12 and 0.17 g/m². Such a level of profile uniformity is clearly beyond what could be achieved with a conventional headbox. This was of prime importance, considering the use of soft calenders. Roll build and pressroom performance reflect these very good profiles.

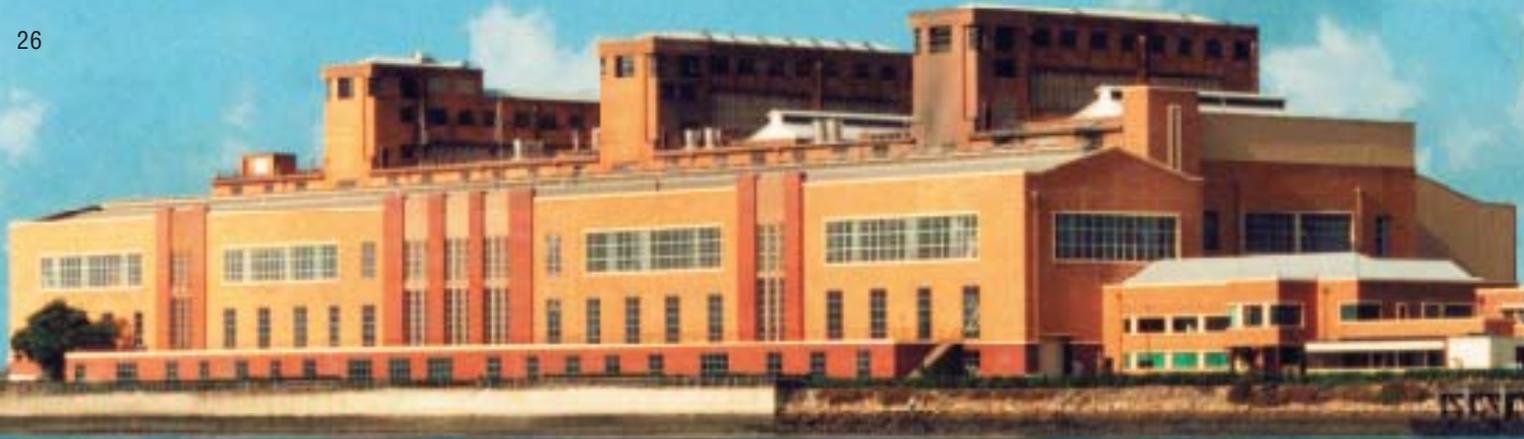
Although the forming section is still being optimized, the sheet generally shows a ‘smile’ z-ash distribution, with basically no two-sidedness.

Paper machine runnability has been very good because of very short web trans-

fers from the press and throughout the dryer section, the use of DuoStabilizer boxes and vacuum rolls, as well as operating with very light draws. A clean operation of the DuoFormer CFD and the DuoCentri press in addition to the use of slotted screens in the stock system contribute to this strong performance”.

The Donnacona project team is almost unchanged from that responsible for the Dolbeau PM 5 rebuild. This was an excellent example of how well the Voith Sulzer Paper Technology partners work «together». Although the major supply was from Appleton, entire aggregates were delivered from Middletown, Krefeld and Heidenheim, with significant components from Brazil and Ravensburg. The successful integration of all these parts into the machine reflected the successful merging of the two companies.





Paper Machinery Divisions:

Corrugated medium and testliner – Visy Paper VP8 breaks the 1000 metres per minute barrier



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One of the world's fastest paper machines for testliner and corrugating medium has been installed at Visy Paper in Brisbane, Australia. Built by Voith Sulzer Sao Paulo in 1996, the machine produces corrugating medium and testliner at basis weights from 113 to 275 g/m².

Group History & Overview

Visy Industries, established in Melbourne, Australia in 1948, has grown to become one of the world's largest privately-owned paper recycling and packaging companies. Visy now employs more than 5000 people in Australia, New Zealand and the USA. Total manufacturing revenues exceed AUS \$1.5 billion and total manufacturing assets exceed AUS \$1.7 billion.

During its first 30 years of operation Visy Industries' activities concentrated on the manufacture of corrugated cardboard boxes. The flagship Visy Board Packaging Division is now the Australian market leader and operates some of the world's most modern facilities.

Visy Industries is especially committed to recycling and the environment. In 1990 the company won a prestigious Banksia environmental award for its recycling efforts in Australia.

Visy Paper

Visy Paper is the paper making division of Visy Industries. Its vision is to continually apply the latest technology to achieve world leadership in recycled papermaking.

Some key data of Visy Paper VP8:

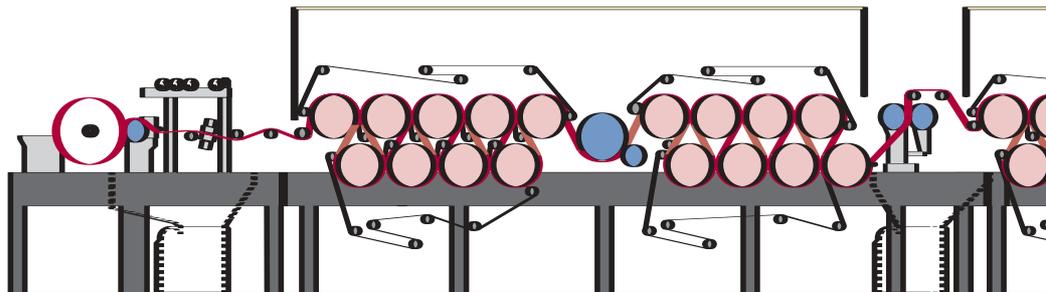
Maximum deckle at the pope reel: 2950 mm

Maximum production of the machine:

537 tonnes in 24 hours

Production off the winder: 511 tonnes in 24 hours

Maximum production rate: 23 t/hr on 150 g.





1

Originally established in 1980 to produce packaging paper for the Visy Board corrugated cardboard box group, Visy Paper has since built nine of some of the world's newest recycled paper mills – six in Australia and three in the USA. Together these machines produce more than 1.2 million tonnes of high performance 100% recycled packaging paper each year.

Of this, 750,000 tonnes are consumed by Visy's integrated box making operations in Australia, New Zealand and the United States.

Visy Paper PM8

Located on Gibson Island in Brisbane, VPM8 was designed to produce a wide range of packaging paper at the fastest speeds in the world. As one of the world's technologically most advanced paper recycling mills, VP8 was the winner of a 1997 Engineering Excellence Award.

Since the start up of the mill in 1996, the machine has operated beyond design

expectations and can already claim to be among the fastest paper machines of its type in the world.

The mill is built in the shell of an old power station situated on the banks of the Brisbane River. It was decided to restore the existing landmark building, and only demolish the internal building structure.

The aim was to develop the site into the flagship for the entire Visy Group. The Visy project team was led by the most experienced managers and engineers from the other Australian mills. Visy Paper is a unique company in that it utilises "in-house" engineering and project management. This enables the company to have complete control of the project and also allows the experience gained during design and construction to be utilised in the operation of the plant as well as future projects.

The location of the site, technical goals as well as the environmental considerations required input from all disciplines of engineering. The new mill has utilised

Fig. 1: The Visy Paper 8 mill is situated on the banks of the Brisbane River.

the latest technology in all of the facets of the recycling process with new and innovative ideas both for the paper making process and the auxiliary services. The design of the paper machine itself, the steam generation multi fuel boiler and the water treatment facility are excellent examples of unique engineering applications.

The Visy Paper 8 mill was completed ten months after construction began, two weeks ahead of schedule and within budget. The project's success is demonstrated by the achievements made in its first two and half years of operation, which justifies the pioneering design of the machine.

The Process

Waste paper collected from the urban forest of Australia's cities is transported to the site by road transport and emptied in the waste pit able to contain 2000 tonnes. The unique process of loading a waste paper high density pulper is by crane and "orange peel design" grapple, each pick up weighing up to ten tonnes.

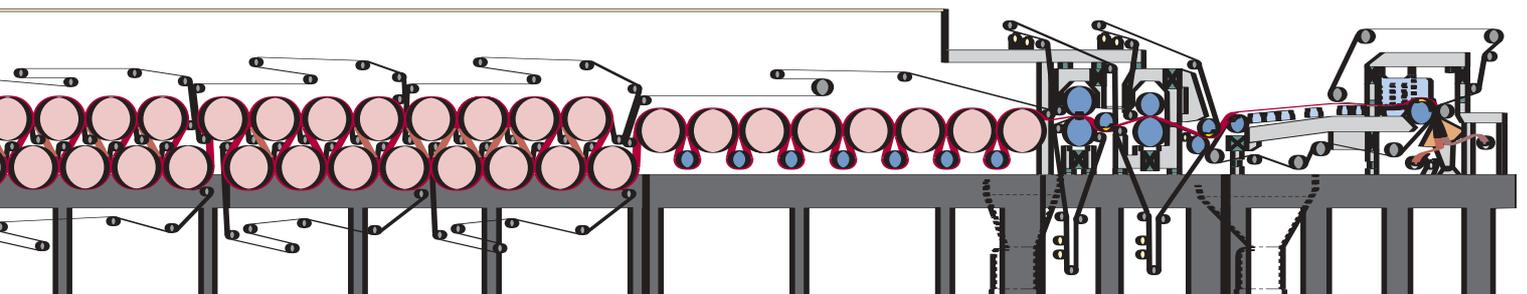




Fig. 2: Mill Manager Daryl Whithead (center, back row) and his team.

The water clarification in the plant uses disk filters and then utilises dissolved air flotation and sand filtration to remove a large proportion of fillers/ash. This enables a cleaner furnish and water system and permits reducing the fresh water amount in the plant.

All the contaminants generated from waste paper collection are screened from the pulp stream and utilised as a fuel source in the multi fuel boiler with direct savings in coal usage and elimination of costs involved with land fill. The multi fuel boilers generate 42 bar steam using coal as the primary fuel and mill rejects, wood waste and even sewage treatment plant sludge as secondary fuel. Methane gas produced by the effluent treatment plant can be used as another fuel source by the boiler.

The development of liner grades on the CFD former and the expansion to the higher g/m^2 and higher speeds involved numerous hours of trials. The result is the successful machine operation manufacturing paper at high quality and production rates far exceeding design figures. The ultimate result was breaking the world record by running 1020 m/min for 8 hours making $108 g/m^2$ corrugated medium and averaging at 1015 m/min for 24 hours. Breaking the 1000 m/min barrier for an extended period of continuous production was a just reward for the efforts of all the personnel at VP8 in the two and half years of operation.

2

The stock preparation then processes the waste paper with the priority being cleanliness and efficiency. Fractionation is adopted with the short fibre fraction being thickened and sent to the approach flow. The long fibre fraction is processed via coarse screening, low consistency centrifugal cleaners, fine screening, dispersion and refining prior to being sent to the approach flow. The low consistency cleaners in the stock preparation enable the approach flow to be simplified to exclude cleaners. The stock is de-aerated, screened and sent to the paper machine.

The paper machine uses a Voith Sulzer DuoFormer CFD. This technology permitted to exceed the previously known gap forming limit and increase basis weights to $275 g/m^2$. This is the highest basis weight manufactured on a gap former and confirms the flexibility of the machine.

The press section incorporates a mini press of 80 kN/m followed by a Jumbo press at 220 kN/m. The third nip is a NipcoFlex press loading to 1100 kN/m. This is a design for an easy conversion to a second NipcoFlex in stage two of the project.

The dryer section consists of 52 dryers with a single tier first section followed by a two tier dryer configuration. The dryers are bisected by a pond size press where starch is added to enhance strength characteristics.

The finishing section consists of winder and automated reel handling and labelling, and conveying to the site reel store. Over 50 % of the paper produced is sold to the export markets of Asia and the Middle East.



Paper Machinery Divisions:

Tamil Nadu PM 2 – Newsprint from 100% bagasse



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Tamil Nadu Newsprint and Papers Ltd. – popularly known as TNPL – started commercial production of newsprint on its new Paper Machine No. 2 from January 1996. The machine was supplied jointly by Voith Sulzer Paper Technology and its licensee in India, Larsen and Toubro Limited and has opened up new vistas for newsprint making. The technical brilliance of the design and quality of supplies were reflected in the excellent technological results achieved. The machine is designed to run with 100% bagasse furnish which is both unique and unprecedented in history of newsprint making.

This paper aims to recount the success achieved in this newsprint machine with particular reference to the technology behind it.

Introduction

A small village on the Banks of river Cauvery in the southern part of India has become a place of pilgrimage for the Paper Makers of the world. In 1985, the mill Tamil Nadu Newsprint and Papers Ltd (TNPL), located here started com-

mercial production of writing printing paper and newsprint using sugarcane bagasse as the major raw material. It achieved the distinction of being the world's first mill to produce newsprint from bagasse in commercial scale.

Having tasted success – TNPL dared to dream to make newsprint using 100% bagasse fibre and they embarked upon an expansion project for doubling the mill's capacity in 1992 to 180,000 t p.a., making TNPL the largest single-site integrated paper mill in the world using bagasse as the main raw material. The World Bank supported the expansion project with a loan of US\$ 75 Million. In their search for the best of plant and machinery TNPL went global and finally the choice fell on Voith Sulzer Paper Technology. The machine has a design capacity of 400 tons/24 hrs. with design speed 1000 m/min and trim width 6.6 meter. The machine configuration was evolved by Voith Sulzer Paper Technology in close co-operation with TNPL after a large number of laboratory and pilot plant trial, to handle a weak furnish like bagasse.



Machine Concept

The machine was equipped with a “DuoFormer CFD” Gap Former, DuoCentri-2 Press Section, “CombiRun” Dryer Section and a Hard Nip 4-Roll Calender Stack. The machine incorporates high level of instrumentation and enables the operations to be monitored and controlled through a state-of-the-art ABB Master Distributed Control System. The DCS enables controlling the entire Paper Machine, with help of visual display units which are available at a single location.

GapJet Headbox and CFD former

The Gapjet Headbox, in conjunction with the corresponding DuoFormer, forms a finely tuned, highly accurate sheet-forming system. High availability of the machine is guaranteed by Thermal stabilization and good accessibility.

The DuoFormer CFD offers a wide range of application with respect to grade, basis weight and speed. It incorporates the positive attributes of roll and blade formers and therefore combines the requirements for optimum paper properties and ease of operation. Further more, its clean

TNPL PM 2 – design data

Product	Newsprint grades
Furnish	Bleached chemical bagasse pulp – 60% Mechanical bagasse pulp – 40%
Production	384 tons at reel
Trim width	6600 mm
Operating speed	850 m/min
Design speed	1000 m/min

design ensures excellent runnability and high availability.

A Suction forming roll initiates drainage and formation of the two outer layer in DuoFormer CFD. Drainage is continued upto and beyond the immobilization point by the subsequently arranged D-section with a curved suction box in the top wire and a formation box with adjustable blades in the bottom wire. The alternating blade arrangement of the D-Section helps in a uniform effect of shear forces through the web thickness. The formation blades prevent flocculation in the middle of web and simul-

tanously move fines and fillers to the paper surface due to the active shear forces.

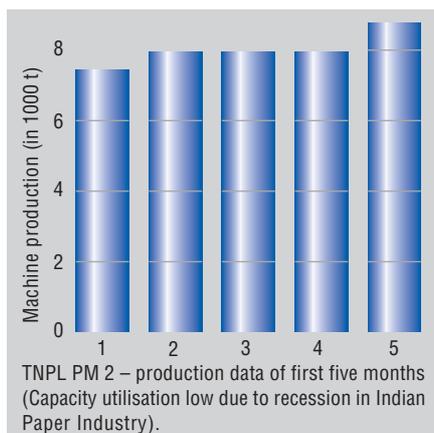
Press and Dryer Section

The press section is of Duo-Centri-2 design. The first press nip is double felted, with additional press nips located at circumference of a central roll. All free paper draws have been avoided and the web is supported by Suction Roll after the leaving the third nip. This ensures a close draw between the Press and Dryer Section. Due to runnability reasons, the first two groups of Dryer Section is in single tier arrangement with Suction Rolls. The next two groups are arranged in double tier manner. All dryers are equipped with Spoiler Bars to increase the drying capacity and optimise moisture profile.

Start-up and Production Experience

The start-up of the machine was in September 1995 and in fact the first reel produced was of commercial quality. With the help of highly experienced papermakers of TNPL, Voith Sulzer Paper Technology was able to fulfil the first

Here too the use of alternative raw materials pays off



quality targets easily. It was one of the smoothest start-ups of a machine of this size and kind. History was made when 100% bagasse furnish was used for the first time in the world to produce quality newsprint in TNPL PM2.

The performance guarantee run was a run-away success with fulfilment of target figures with respect to production, machine efficiency, furnish, percentage ash, moisture and paper properties eg. caliper profile, porosity, roughness etc. The steam consumption achieved was an incredible 1.33 kg steam/kg of paper and power consumption was 498 kWh/ton of saleable paper.

When the country was looking for alternative raw materials to save its forest – TNPL has come out with an *answer*. The countries with abundance of sugarcane must be looking at TNPL with gratitude. But TNPL – does not want to stop and bask in its glory. It has already set its sights on building a bigger plant at another site.

More and more countries with a growing demand for paper, but limited timber resources, are using alternative furnishes instead of this classical raw material. Thanks to comprehensive experience, Voith Sulzer Paper Technology is a welcome partner in this sector.

Complete paper mill for Egypt

Early in 1998 Voith Sulzer Paper Technology received an order from Quena Newsprint Company for a complete newsprint and printing/writing paper machine line in Kous, Egypt. This order was won against extremely tough global competition following an international tender invitation. Decisive grounds for awarding the contract to Voith Sulzer Paper Technology included outstanding references in newsprint and printing/writing paper machinery using bagasse, a difficult furnish. All the most advanced Voith Sulzer Paper Technology components will be used in this new Quena plant. For example, the latest version of the ModuleJet headbox will ensure an extremely good basis weight cross-profile with independently controllable fibre orientation profile. The state-of-the-art DuoFormer CFD gapformer enables active control of ash and fillers distribution in the Z-direction, and guarantees optimal formation and runnability. The machine will also be equipped with modern NipcoFlex press technology and TopDuoRun dryer section. Perfect paper quality will furthermore be ensured by a Speedsizer and tandem softcalender.

This paper machine, with daily capacity 400 tonnes, will thus be equipped with the most advanced technology available on the market at the present time.

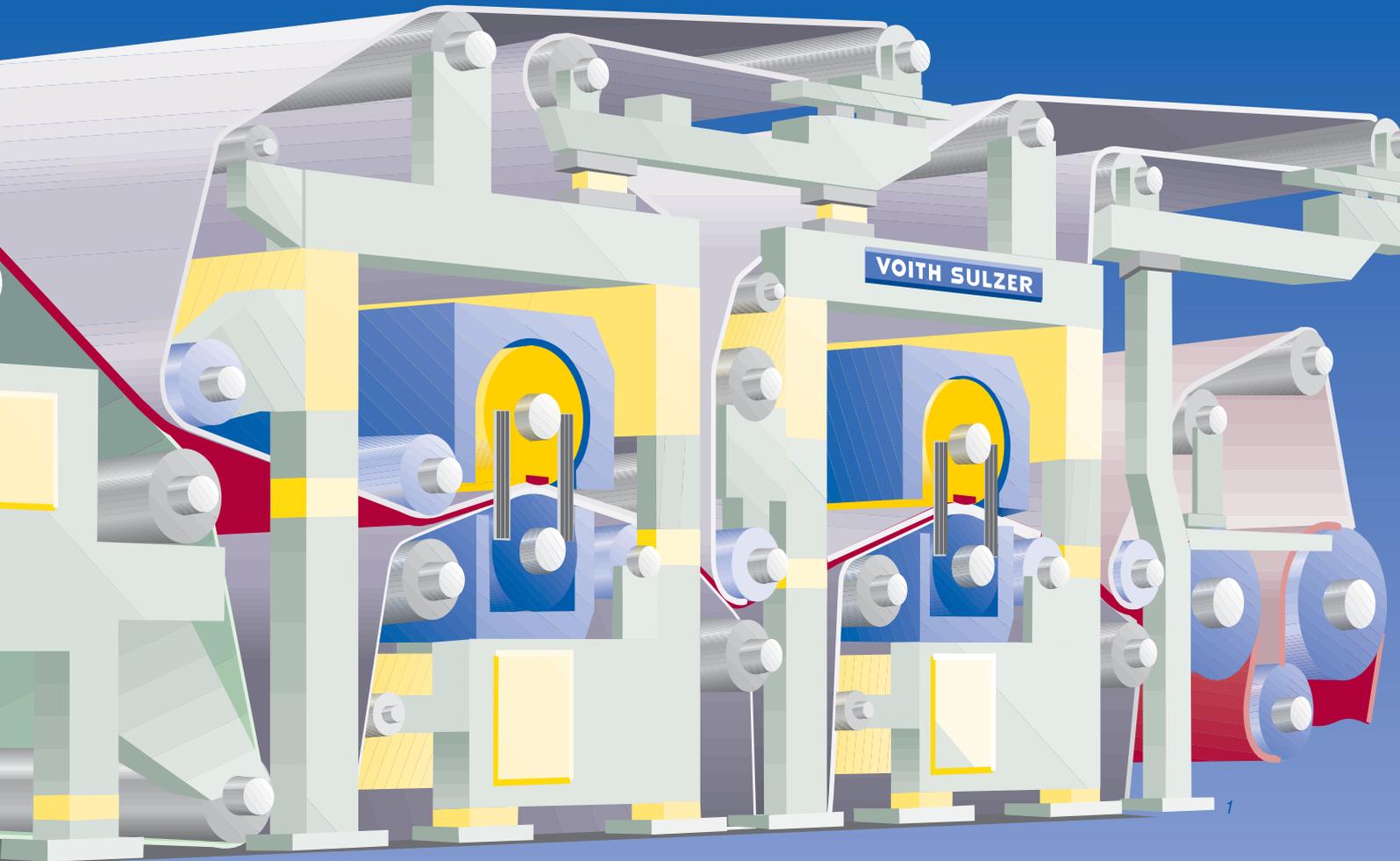
Apart from the paper machine, the Voith Sulzer Paper Technology scope of supply includes the stock preparation line, approach flow section, whitewater system, rejects handling, reel trimming, transport and packaging machinery. Chemicals processing, piping and containers are also included, together with process control systems, all drive gear and electrical components. Start-up is scheduled for early 1999.

First shoe press for graphical papers using 100% Eucalyptus furnish

Voith Sulzer Paper Technology is also delivering the first NipcoFlex press for papers made of 100% eucalyptus furnish. Customer is the Luis Antonio paper mill in Sao Paulo, Brazil, a member of the Votorantim group.

Purpose of this rebuild is to raise the operating speed of paper machine 1 (rotogravure and offset printing paper) from 980 to 1200 m/min. Paper quality will also be improved substantially with regard to basis weight, moisture content and fibre orientation, together with better formation and higher output.

Installation of the new NipcoFlex press will include conversion of the former and dry section, and a Speedsizer will also be installed. Commissioning is scheduled for July 1999.



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Paper Machinery Division Graphic*

Paper Machinery Divisions:

The new Tandem NipcoFlex Press for optimum paper properties

Until some years ago press sections for fast graphical paper machines did not use shoe press technology. Since the first installation on PM5 in Perlen, Switzerland in September 1994, there is a growing demand for this technology. A further step towards high speed and high efficiency was the DuoCentri NipcoFlex Press (a 3-nip press with a shoe press in the third nip) on PM 53 at Braviken, Sweden, now the fastest

paper machine in the world. The latest development however is the Tandem NipcoFlex Press, *Fig. 1*, which consists of two, double-felted, straight through shoe presses. It is designed for high speed machines and optimum paper properties.

The first commercial Tandem NipcoFlex Presses for highest production speeds will start in autumn 1999.

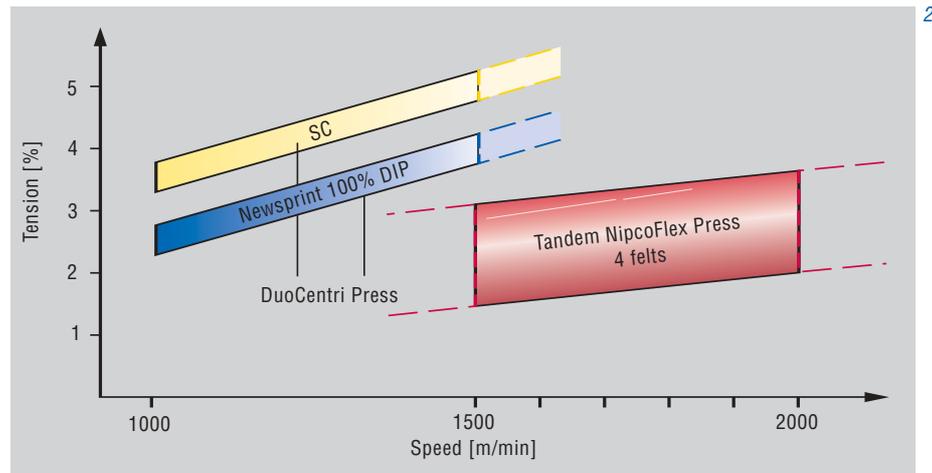
Fig. 1: Tandem NipcoFlex Press.

Fig. 2: Draw between press and dryer section for newsprint and SC paper.

Fig. 3: Tandem NipcoFlex Press with steam box, splash guards and exhaust points.

What were the driving forces for this development ?

The demand for faster machines with higher efficiency and improved paper properties were the driving forces for this development. With higher speeds, the draw between press and dryer section and, therefore, the tension in the paper is getting higher. However, reducing the safety margin between the wet strength of the paper and the sheet tension, the risk of breaks and their number increases. Until recently, this was the major obstacle towards higher machine speeds. Since the Tandem NipcoFlex Press is a configuration without smooth roll surfaces, it overcomes this bottleneck. During pilot trials it was found that the Tandem NipcoFlex Press with four felts (no open draw) could be operated – due to the dryer section – using a draw between press and dryer section of 1.5% to 3.5%. In comparison, conventional



press sections need approx. 1.5% higher draw, Fig. 2. As further advantages of the closed draw configuration we expect less paper breaks, fast paper threading, no doctoring at center roll and high speed potential.

What are the key components ?

Characteristic of this press section are

two straight through shoe presses, Fig. 3. Threading will be done machine-wide from the wire section to the dryer section using suction rolls, without open draw in the press. The NipcoFlex roll (shoe) is in top position while the heavier Nipco P roll (backing roll) is located in bottom position. In front of the two presses the DuoSteam blow box for

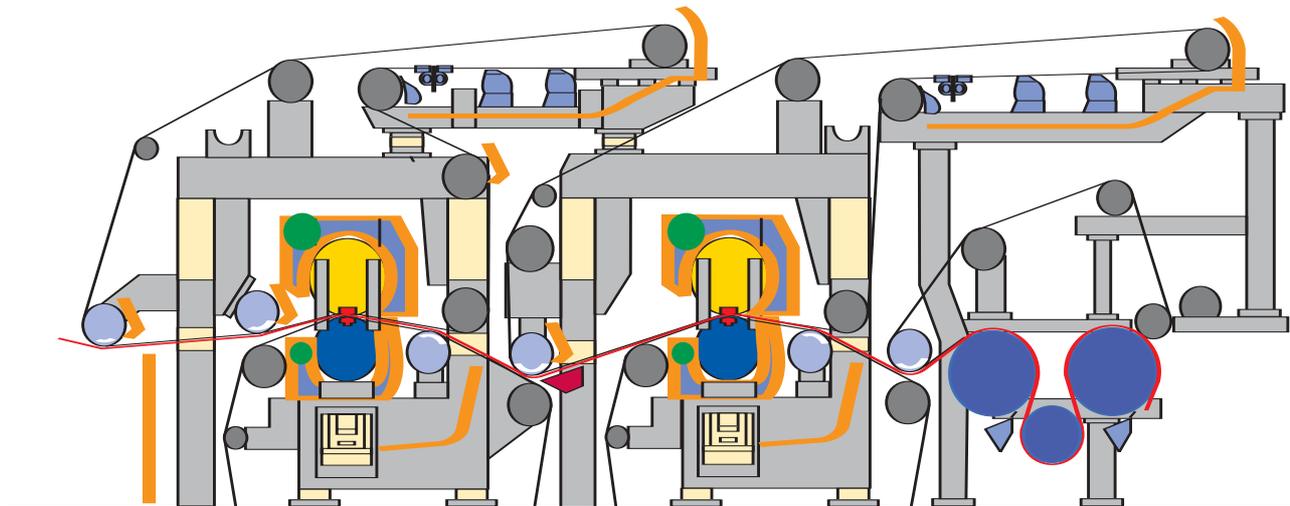
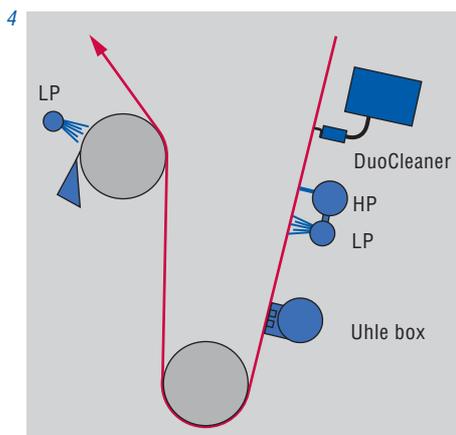


Fig. 4: Felt conditioning.

Fig. 5: Dryness after press for different paper grades

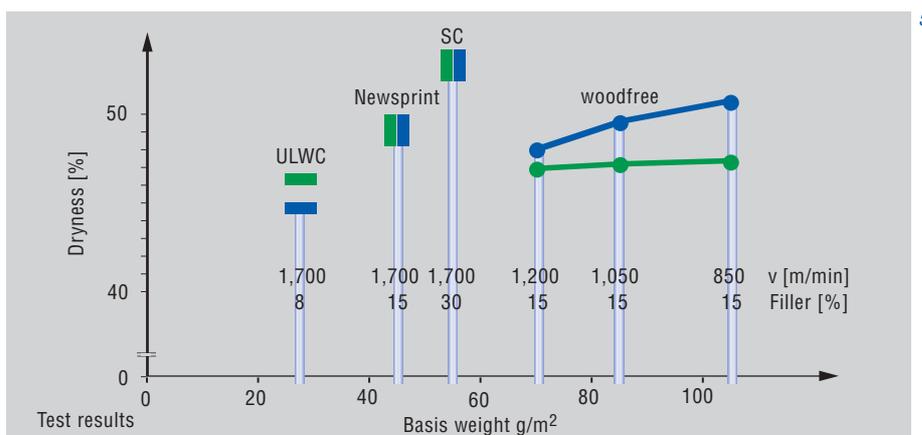
■ DuoCentri NipcoFlex
■ Tandem NipcoFlex



moisture profiling and increasing dryness can be located. The boxes are swiveled away during web threading.

Are there any special features for high speed applications ?

Yes: As mentioned, there are suction rolls for a controlled and safe paper run. This is of extreme importance after the nip, where top and bottom felts separate. After each shoe press we provide at this point of separation a suction roll. Sheet stabilizers support the sheet run if necessary. Another feature are the splash guards that completely enclose the press rolls (NipcoFlex and Nipco P). In addition, low pressure exhaust systems are installed to prevent mist and dust. Of extreme importance is a maximum dewatering in the nip. The water passes from the paper through the felt and is slung off by centrifugal forces into splash guards. Felt conditioning is a further important topic. It is significant for a long felt life as for excellent moisture



cross profiles. Besides the Uhle boxes and water showers the successful DuoCleaner is integral part of every felt run to keep the felt open and improve overall efficiency, Fig. 4. The traversing rotor nozzle – using only 2 liters of water per minute – already in the first production machine proved that it has great advantages.

What are the test results and where can it be applied to ?

Important requirements on a press section are a high bulk paper at highest possible dryness with no twosidedness. Two shoe presses in a row, both double felted, obviously have the potential to fulfil these requirements. We have tested different paper grades. In some cases highest possible dryness, in others highest possible bulk was the target. The achieved dryness as a function of basis weight is shown in Fig. 5. The corresponding filler content and speed are also listed.

For newsprint and SC grades the Tandem NipcoFlex Press reaches the same dryness level as the well known DuoCentri NipcoFlex Press. A minor rewetting however is inevitable at double felted nips. Therefore, the DuoCentri NipcoFlex Press reaches the highest dryness for ULWC with the extreme low basis weight of 26 g/m². Since the maximum allowable draw of this light paper grade is the bottle neck in press sections with a center roll, we expect that the DuoCentri NipcoFlex Press will not reach the high production speeds of a Tandem NipcoFlex Press. For basis weights exceeding 60 g/m² the Tandem NipcoFlex press opens up all its advantages. In addition, the difference in dryness after the press between the two configurations is becoming more pronounced with increasing basis weight. For a woodfree 85 g/m² coating base paper the Tandem NipcoFlex Press reaches already 2% more dryness than the DuoCentri NipcoFlex Press.

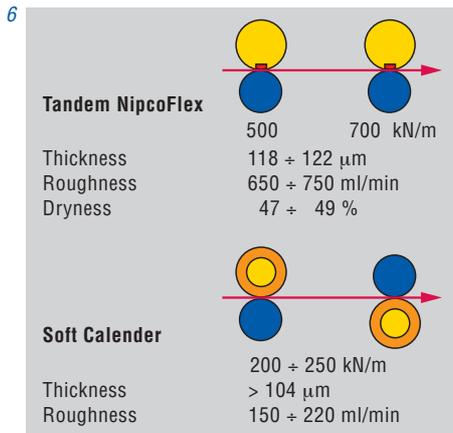
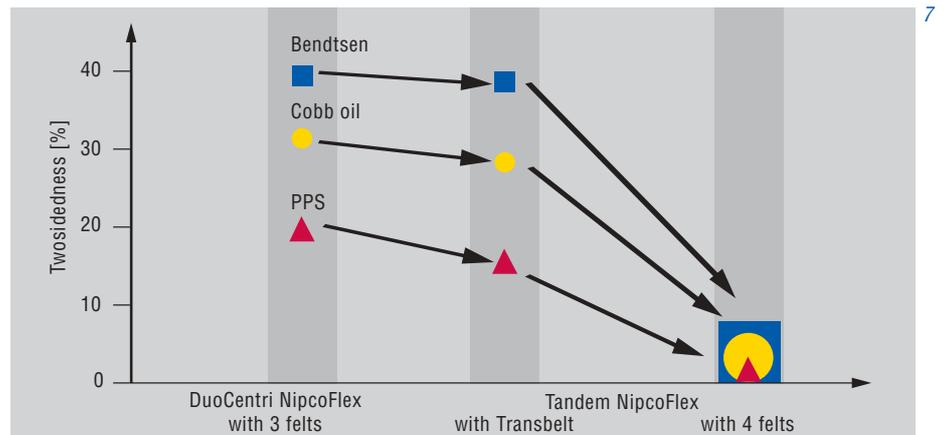


Fig. 6 shows in more detail the inter-relationship between the press and the calender work for a bulk sensitive wood-free copy paper (80 g/m²). The market often requires a specific bulk of 1.3 (thickness 104 micron) at a Bendtsen roughness in the range of 150 to 220 ml/min. The required specific bulk was achieved by the Tandem NipcoFlex Press of the pilot installation with linear loads of 500 to 700 kN/m. Since both paper sides have the same roughness after the press, the two soft calenders can both be loaded with approx. 200 to 250 kN/m at 150°C.

Considering the entire production process, the optimum combination, for this specific furnish, was a paper thickness of 120 micron with 700 ml/min Bendtsen at high dryness after press that was calendered to the target of 150 to 220 ml/min at 104 micron. Generally, a lower nipload of the Tandem NipcoFlex Press has the advantage of higher bulk



and yields higher smoothness of the paper surface.

The two double felted shoe presses are dewatering nearly symmetrically to top and bottom side. After extensive trials with various felt suppliers and a further development of the felt design the twosidedness in Bendtsen, PPS and oil absorption were seen to be plus minus some percent and confirm the expectations, Fig. 7. The application of a transfer belt instead of a bottom felt in the second press results as expected in a distinct deterioration with respect to twosidedness due to the different surfaces and dewatering in one direction only.

Conclusion

The Tandem NipcoFlex Press is part of many linerboard machines since years. In the meantime, this concept was developed further for printing & writing grades. The drawless sheet run is a big

Fig. 6: Inter-relationship of press and calender work.

Fig. 7: Twosidedness.

advantage, especially for low basis weights (ULWC), despite a minor rewetting. At medium basis weights (newsprint, SC), the low twosidedness, reduced number of breaks and the speed potential are very advantageous. At high basis weights the Tandem NipcoFlex Press allows, aside from the already mentioned benefits, much higher dryness. In summary, the Tandem NipcoFlex Press, with four felts and two shoe presses, is, because of all the mentioned advantages, in many applications the most desirable and most economical solution:

- high dry content and high specific bulk with two NipcoFlex presses
- four felts for minimal twosidedness
- low paper expansion
- suction rolls for controlled and safe web run, short threading time.

With the new Tandem NipcoFlex Press Voith Sulzer will set new benchmarks in speed, efficiency and paper quality.

Paper Machinery Divisions:

The packaging paper machine beyond 2000



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Board and Packaging

New trends in the corrugating business were driving forces to develop a liner and medium paper machine concept for the future. The trend towards lighter paper grades will allow to overcome the 1000 m/min limit without restraints in quality.

Well known limits of today will be described and solutions will be discussed to increase machine speed at of higher productivity and better quality.

Current Situation

Corrugated board has a respectable market share of more than 70% of all transport packaging. The market can be divided into recycling papers, such as testliner and medium (70%), and virgin fiber based kraftliner and fluting (30%).

A shift towards recycling paper can be noticed. Both, recycling paper and virgin fiber containing papers with huge forests as renewable resources perfectly meet the concept of sustainable economy.

In recent years dramatic developments have taken place in the packaging industry. Apart from economic aspects, ecological considerations have become a major driving force. The opening of several borders in Europe permitted a concentration of smaller companies to form large enterprises. As a result, there was a shift from a regional to an international approach, which had a strong impact on

the company policy of these enterprises. This development brought about several trends in the corrugating business.

Tendency

In order to find a concept for the future we think we have to look over the edge of Voith Sulzer Paper Technology delivery. We have to study the main trends in the corrugating business, which will affect the paper machine concept for the near future. The most significant ones are:

- reduction of costs
- reduction of weight
- supply chain management
- development of logistic concepts
- more technology in corrugating process.

New Flute Types

Taking a closer look at corrugated medium, one can see a new generation of flute profiles coming-up. Nowadays, the majority of profiles produced on the corrugators are of the A, C, B and D type. These profiles are well known and used for boxes with high strength potential. Besides the conventional profiles there already now is a small market for a new generation: the E, F and N profiles, which are much smaller in height and used for low basis weight paper (*Fig. 1*). If you compare the height of the flute type A with N, you can see that there is a factor of 9-10 between. The market for these low grammage papers is expected to grow fast in the next years.

New Flute Design

A few years ago, a new flute design was created on the Japanese market: the so called wave flute. It has a corrugated structure like the conventional flute. But, what is new, there is a second wave across the whole surface. The result is a two-dimensional wave design which is shown in Fig. 3.

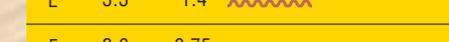
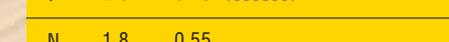
It is produced on a single facer corrugating machine so that you can see the interesting wave design. This design allows a reduction of basis weight. There are 14 corrugators in operation in Japan and in the US. The next start-up will be in Europe.

Due to environmental regulations, the restrictions imposed by them and costs, the average basis weight of corrugated board and thus of liner and medium grades has been reduced. This trend will continue in the future and will be supported by technical and technological developments in the paper and corrugating industry.

Lower Basis Weight

The main reasons for the production of lighter paper are:

- strong market demand
- new life cycles
- progress in flexo-print technology
- new flute types and designs.

code	average spacing (mm)	average height (mm)	shape
A	8.7	4.7	
C	7.3	3.8	
B	6.0	2.8	
D	4.5	2.1	
E	3.3	1.4	
F	2.6	0.75	
N	1.8	0.55	

This short study of the trends in the corrugating business shows that one important trend will significantly influence paper production in future: the reduction of the basis weight (Fig. 5).

Trend of basis weight for light weight paper...

yesterday	127-140 g/m ²
today	90-115 g/m ²
tomorrow	60- 90 g/m ²

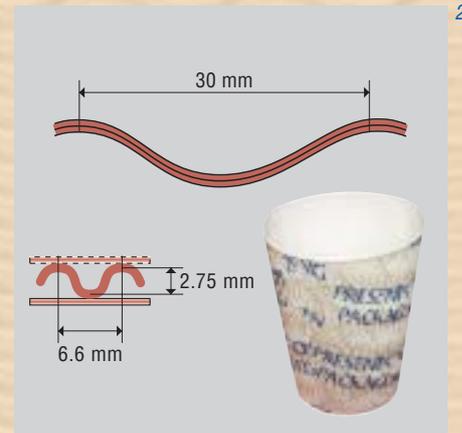
...and the effect on PM productivity

1000 m/min x 100 g/m ²	= 144 t/day·m
1000 m/min x 70 g/m ²	= 101 t/day·m
1500 m/min x 70 g/m ²	= 151 t/day·m

Yesterday, the industry still talked about 127 g/m². Today, Voith Sulzer Paper Technology gap formers produce 90 g/m² packaging grades and this development will go on. Tomorrow 60 g/m² paper will be produced and the market for this grammage will grow.

Fig. 1: A new generation of flute profiles.

Fig. 2: A new generation of flute design – Wave Flute: Isowell-B
 – eye catching effect
 – higher compression strength
 – better scoring characteristics.



Limits today

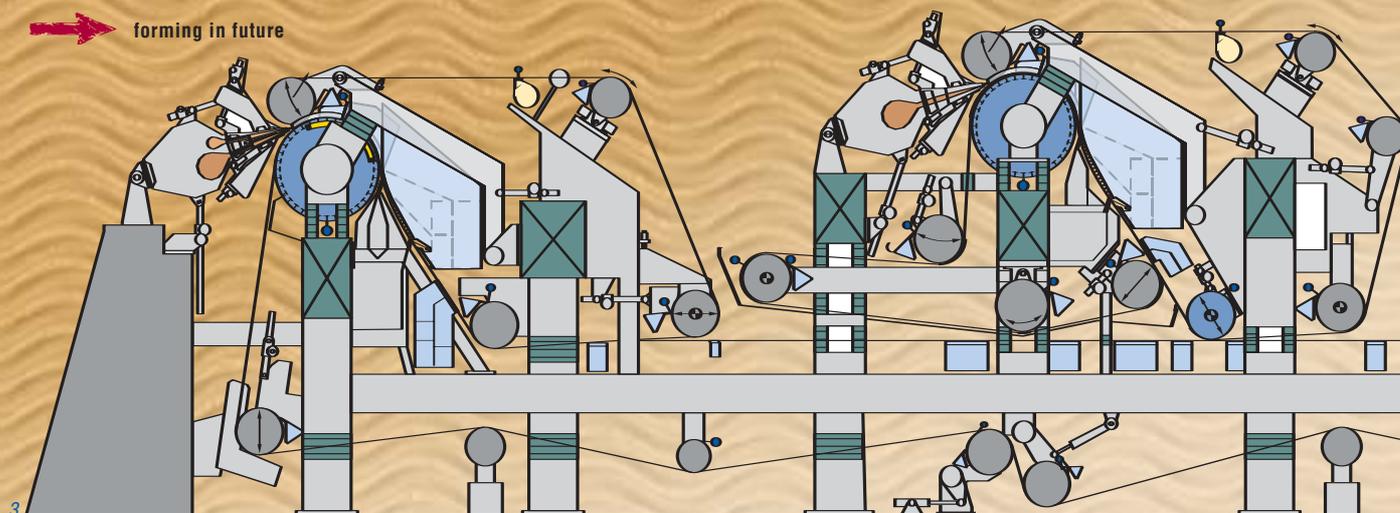
If we look at the packaging paper machines of today, most of the machines are limited in speed: The main limiting factors are sheet forming on fourdriniers and sizing with pond type size presses, especially for testliner and medium.

Tomorrow's concept

The year when 70 g/m² paper has to be produced is coming up faster than everybody wants to believe. The effect on paper machine productivity is obvious.

Today, a PM produces 100 g/m² and is limited to 1000 m/min, that is a specific production of 144 t/min·m. Tomorrow, one will have to produce 70 g/m² – the specific production will thus be 30% lower, but fixed costs will remain the same.

The only way out is to increase the production speed. 1500 m/min will bring



back the productivity level of today. Voith Sulzer Paper Technology gives you the technology to reach this goal.

Maximum Strength

Unfortunately the quality of secondary fibers will not become better in future. A maximum gain in strength therefore has to be an important goal in the wet end.

Today an average corrugated medium machine has a fourdrinier – tomorrow, an average machine will have a gap former. Especially for liner burst is very important, that is why today a configuration using two fourdriniers is given preference over single ply forming.

The reasons for higher burst are:

- more perfect sheet forming: 50 g/m² more perfect than 100 g/m²
- lower z-orientation
- in addition, the consistency can be reduced.

With two ply concepts a 10-20% higher burst can be achieved.

In order not to lose this advantage in the future, Voith Sulzer Paper Technology has been concentrating on research and development for a new two ply forming concept which allows production far beyond 1000 m/min.

Forming in Future

With the new gap former generation for board and packaging papers – the DuoFormer Base and DuoFormer Top – the Paper Machine Division Board and Packaging has developed units that are excellently suited to meet the demands of the future (Fig. 3).

These units are the standard concept for liner and medium grades: For medium grades the DuoFormer Base with a one-layer headbox, for liner grades the DuoFormer Base with a two-layer headbox is

the optimal solution. For White Top Liner the DuoFormer Top gives optimum results. For liner the DuoFormer Top together with the DuoFormer Base offer the advantage of two ply forming. This is the first time in the history of Voith Sulzer Paper Technology that a two-gap former concept is offered for producing both the base and the top ply for packaging grades.

Pressing in Future

After the revolution of the shoe-press technology in the last 15 years we still need evolution: If the speed for packaging paper machines will come up to 1500 m/min then we need:

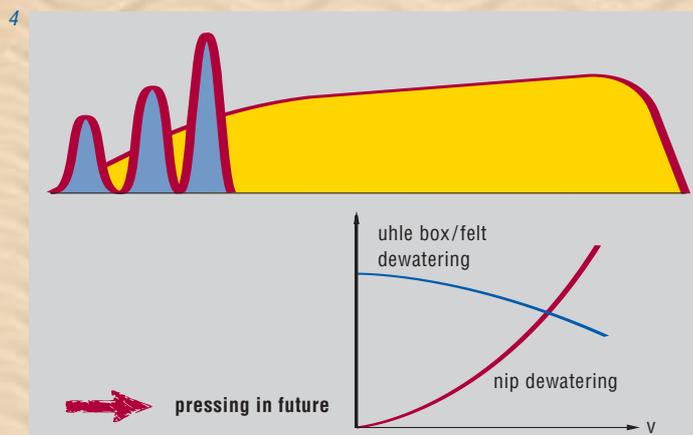
- a higher press impulse to get
- maximum dry content
- a uniform densification in z-direction is the key for highest strength values.

These are the reasons why the pressure

Fig. 3: A forming concept for the future ... available today.

Fig. 4: Evolution of shoe press technology
 – higher press impuls
 – maximum dry content
 – uniform densification in z-direction
 – higher strength improvements
 – lower risk of crushing
 – higher life time of felts and sleeve.

Fig. 5: How to overcome the 1000 m/min speed limit?



curve should be like the one shown in Fig. 4 for the entire press section:

- higher strength improvement
- lower risk of crushing
- and higher life time of felt and sleeve.

Roll presses, with their sharp pressure curves and high maximum pressures, have major disadvantages. The Tandem NipcoFlex is a step in the right direction.

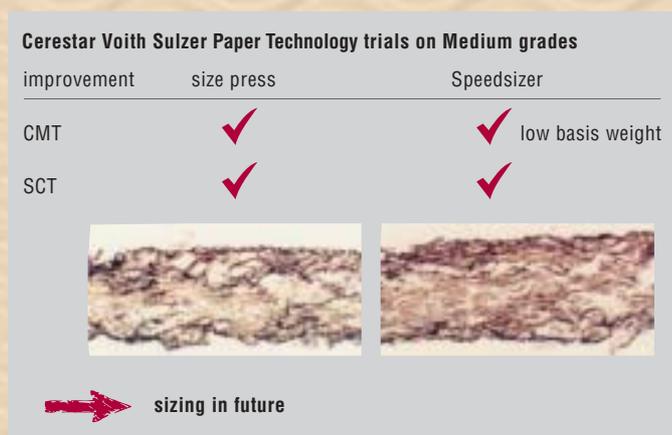
Sizing in Future

But, there another limiting factor for high speed production – the size press. Voith Sulzer Paper Technology has put a focus on this topic and entered into a strategic co-operation with Cerestar. The goal of research & development was to find out more about Speedsizer performance. Where are its limits? And what is the effect on burst, SCT and CMT? It is no secret that the Speedsizer can run faster than 1000 m/min. The question is

whether enough starch can be introduced into the paper with the same results as with a size press. Tests were performed on liner grades: furnish was 100% secondary fiber. The most important quality test criteria for liner are burst and SCT.

The results clearly show that with the Speedsizer you can get the same burst and SCT performance as with a conventional pond type size press when using light weight paper. For high speed testliner machines the Speedsizer will be used for sizing in future.

In the case of corrugated medium, the situation is somewhat more complicated corrugated medium. For good CMT values full penetration to the middle of the paper is a must, otherwise the paper will split up into two layers. With the size press CMT and SCT improvement is no question. Tests performed with the



Speedsizer gave some very promising results. With basis weights up to 120-130 g/m² full penetration can also be achieved with a Speedsizer and CMT improvement is as good as with a size press (Fig. 5). With very low viscosity starch it might be possible to get full penetration with higher basis weights, as well. This means that for high speed production of corrugated medium grades the Speedsizer is the solution for: sizing in future. Two references with Speedsizer in operation for testliner and corrugated medium underline this trend.

Conclusions

New concepts in the wet end and the trend towards lighter paper grades will allow to overcome the 1000 m/min without restraints in quality. Voith Sulzer offers a concept for a high output/efficiency/quality paper machine and opens the door for competitive production of packaging grades beyond 2000!

Paper Machinery Divisions:

The board machine beyond 2000



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Board and Packaging

Board machines for high capacity production are today limited by design. These well known limits are being described and solutions are brought forward to increase machine speed under aspects of higher productivity and better quality.

Introduction

Regional differences in market requirements influence strategic decisions of board producers. Disregarding this diversity we can find general trends which are not only true in the board- but throughout the paper industry (Fig. 1).

These trends can be summarised as follows:

- Reduce Production Costs
- Increase Production
- Increase Product Quality.

Reducing the production costs is only possible by effectively controlling:

- Raw Materials
- Utilities (Steam, Electricity and Water)
- Mill Productivity.

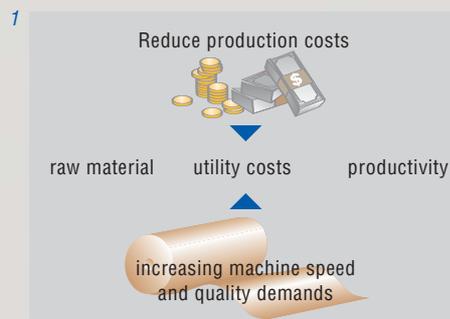
Increased production and product quality influence these factors in the opposite direction. For a machine supplier it is therefore necessary to help our customers keep a balance between the trend factors.

Voith Sulzer Paper Technology is constantly developing new and adapted machine concepts with higher production output per meter width of machine. This paper focuses on the possibilities of designing a board machine in respect to high output, high efficiency and high quality.

The requirements can be derived from two basic functions (Fig. 2) which are:

- Transportation of Goods
- Transportation of Information.

On the one hand stiffness in CD direction is required which depends mainly on the bulk or density of the product. This is mainly influenced by raw material choice and machine concept. On the other hand the surface needs to be smooth and glossy for best printing results. In this

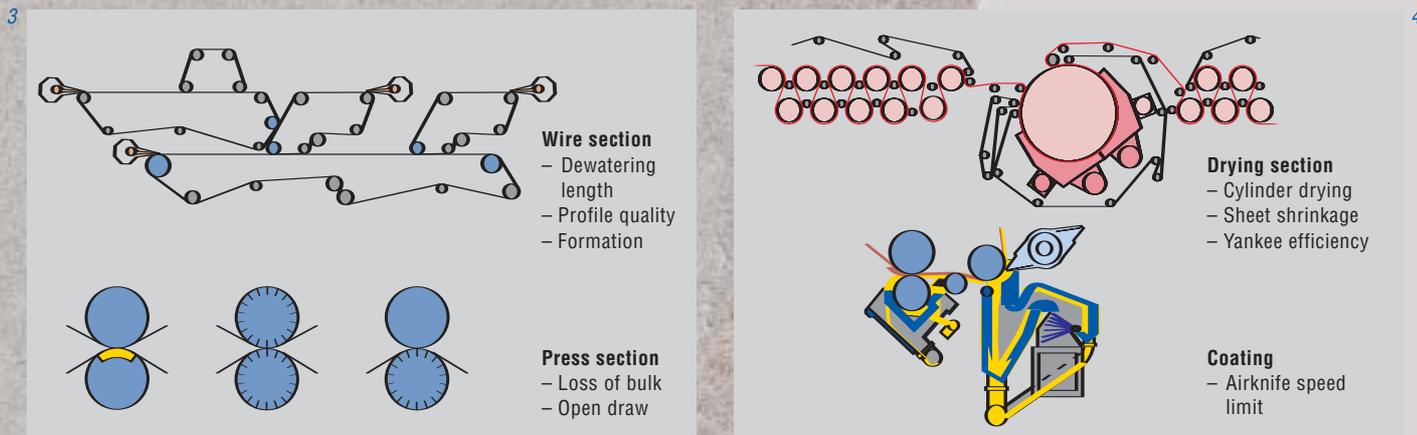


function	requirements	dependency	parameter
transport of goods	stiffness	bulk	▶ raw materials machine concept
transport of information	printability	smoothness gloss	▶ coating calendering

Fig. 1: Trends in board production.

Fig. 2: Folding boxboard – functional requirements.

Figs. 3 and 4: State of the art board machine and its limitations.



case coating and calendering are the dominating parameters to achieve the desired results.

Limits today

Considering waste paper as furnish we are experiencing throughout all markets decreasing fibre quality which leads to reduced strength properties such as stiffness for example. Virgin fibre costs are considerably higher than for waste paper and naturally the board producers for Folding Box Board seek new technologies for reducing basis weight at equal stiffness values.

Wire Section

To reach the desired stiffness targets it is necessary to use several plies in the forming area to structure the sheet according to the specific advantages of different raw materials on strength properties. Multi-fourdrinier forming technology is state of the art, however limits can be seen at higher speeds: Drainage length

will increase considerably and huge wire sections will be necessary. Good and stable profiles will be more difficult to achieve on fourdriniers. The basis weight of the individual plies needs to be reduced to reach the necessary good formation (Fig. 3).

Press Section

In the press most board machines today still use straight through roll presses in most positions. The nips can be double or single felted, suction presses are also common. The mayor drawback of such a press is however the loss of bulk when several roll presses follow each other. Also open draws lead to increased MD/CD stiffness ratio or in other words lower CD stiffness which is not acceptable (Fig. 3).

Drying Section

The board machine of today is easily recognised by its already extensive drying sections which are necessary due to

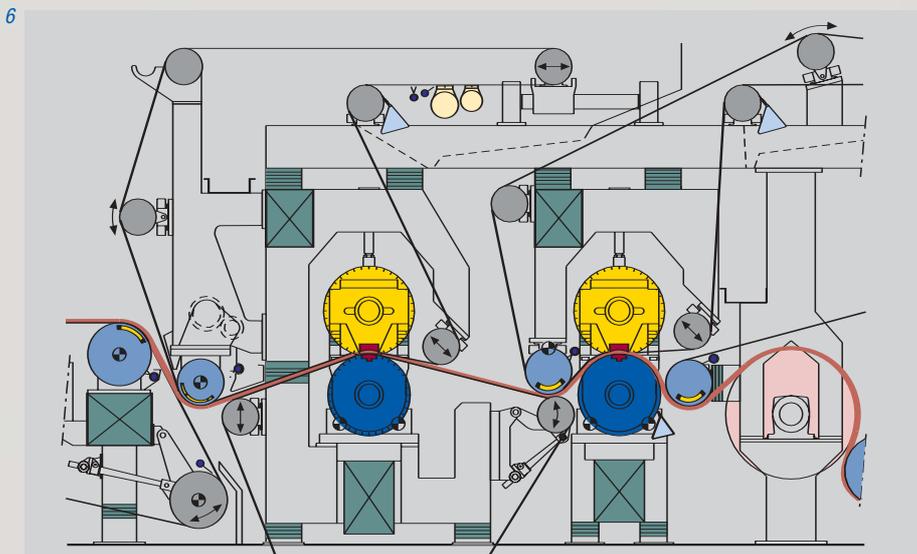
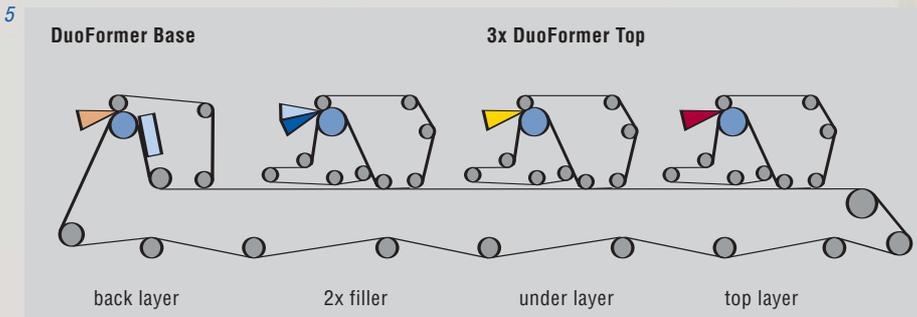
comparable lower evaporation rates as in other paper grades. Although new concepts are being developed to reduce the building length as well as the required energy input, it is still matter of fact that drying cylinder sections will be the major drying method well beyond the turn of the century (Fig. 4).

Double-tier drying sections have the disadvantage of non restraint drying which leads to shrinkage effects such as roughness increase or MD tensile decrease at the web edges.

The replacement of the nowadays especially in Europe successful Yankee cylinder will be a priority task. The benefits of the "M.G." are still eminent where high board surface quality requirements and low raw material characteristics demand for a gentle smoothing equipment. Increasing machine speeds will reduce the advantages and runnability problems will make a substitute necessary.

Fig. 5: Modern concept for multiply board machine.

Fig. 6: Tandem NipcoFlex press for board machine.



Coating Section

In the coating section the airknife is well known for its excellent covering abilities however it is limited in speed (Fig. 4).

Tomorrow's concept

Wire Section

The new generation of Voith Sulzer Paper Technology formers for Board and Packaging grades – the DuoFormer Base and the DuoFormer Top – can be combined in

a multiply/multilayer wetend of a board machine (Fig. 5).

A combination of a DuoFormer Base as the back ply and three DuoFormer Top for the filler ply the under ply and the top ply is a flexible solution for multiply grades such as GD or GC and of course liquid packaging.

The design can be adapted for various raw materials and dewatering capacities.

The top ply can be produced on the last DuoFormer Top as shown in this design in case of “top on top” or on the DuoFormer Base in case of a “top on bottom” configuration.

A two layer headbox in the filler ply gives flexibility in furnish distribution when producing white back triplex grades.

This concept eliminates speed barriers and preserves the flexibility of today's multi-foudrinier layouts. The good formation capabilities of the Voith Sulzer Paper Technology gapformer family introduces two immediate benefits:

In the outer plies better furnish quality and lower concentration gives higher tensile strength. In the middle plies it is possible to run at higher concentrations than today and still reach the required formation levels. This produces a bulkier sheet.

Both benefits together result in increased stiffness properties or at same stiffness levels in a reduced basis weight of the product.

The second feature is the two sided dewatering which gives

- controllable fines and ash distribution in z-direction
- short forming length and
- with different wrap angles any furnish and consistency requirements can be met.

Fig. 7: Dryer section for fast running board machines.

Press Section

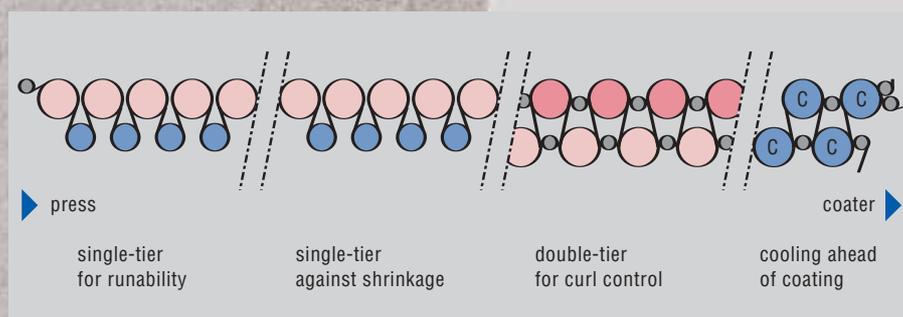
Depending on maximum basis weights run on the board machine it will be possible to reduce the amount of press felts to three from today usually five to six when using a Tandem NipcoFlex Press as shown in Fig. 6. This concept can handle high amounts of water, has low peak nip pressures which eliminate the danger of web crushing and retain bulk.

A smooth roll cover against a felted NipcoFlex shoe press in last position ensures the required smoothness of the baseboard on top side. As the dwell time is longer in a NipcoFlex nip the smoothness can be assured even at higher machine speeds. However depending on furnish and maximum basis weight, a roll press needs to be installed ahead of the shoe presses.

Drying Section, Coating and Calendering

As already mentioned cylinder drying will still be up to date for the next decade, especially considering the low energy costs of steam as energy source. At increased machine speeds it will be important to stabilise the web as it is known from fast running paper machines for graphical papers.

In a board machine curl tendencies need to be controlled which is achieved by separating the heating circuits for top and bottom cylinder groups in the main evaporation zone. This leads to a design as shown in Fig. 7.



Single-tier groups are introduced for runnability and shrinkage reduction. Double-tier groups control curl tendencies. Cooling cylinders ahead of coating reduce web temperature. Surface sizing is sometimes an issue in board production depending on fibre quality and specific surface strength properties required. A film application of starch with a speedsizer ensures an even sizing profile and reduces the amount of water brought into the sheet. This shortens the length of the afterdryer section. An additional benefit is the low nip load in speedsizers which retains bulk levels better than pond type size presses.

Surface smoothness is achieved in a combination of hardnip and softnip calendering using the effects of temperature and moisture gradients. This technology has already proven that it is possible to achieve the expected smoothness and gloss at bulk levels comparable to those of Yankee cylinder machines.

The online coater section will be equipped with JetFlow F coating applica-

tion systems and a combination of rod and blade metering elements. Important for outstanding coating results is the reduction of the sheet temperature ahead of the coating stations and the reel. This ensures low coating colour temperature and eliminates stress induction into the sheet due to temperature gradients in the rolls.

Conclusions

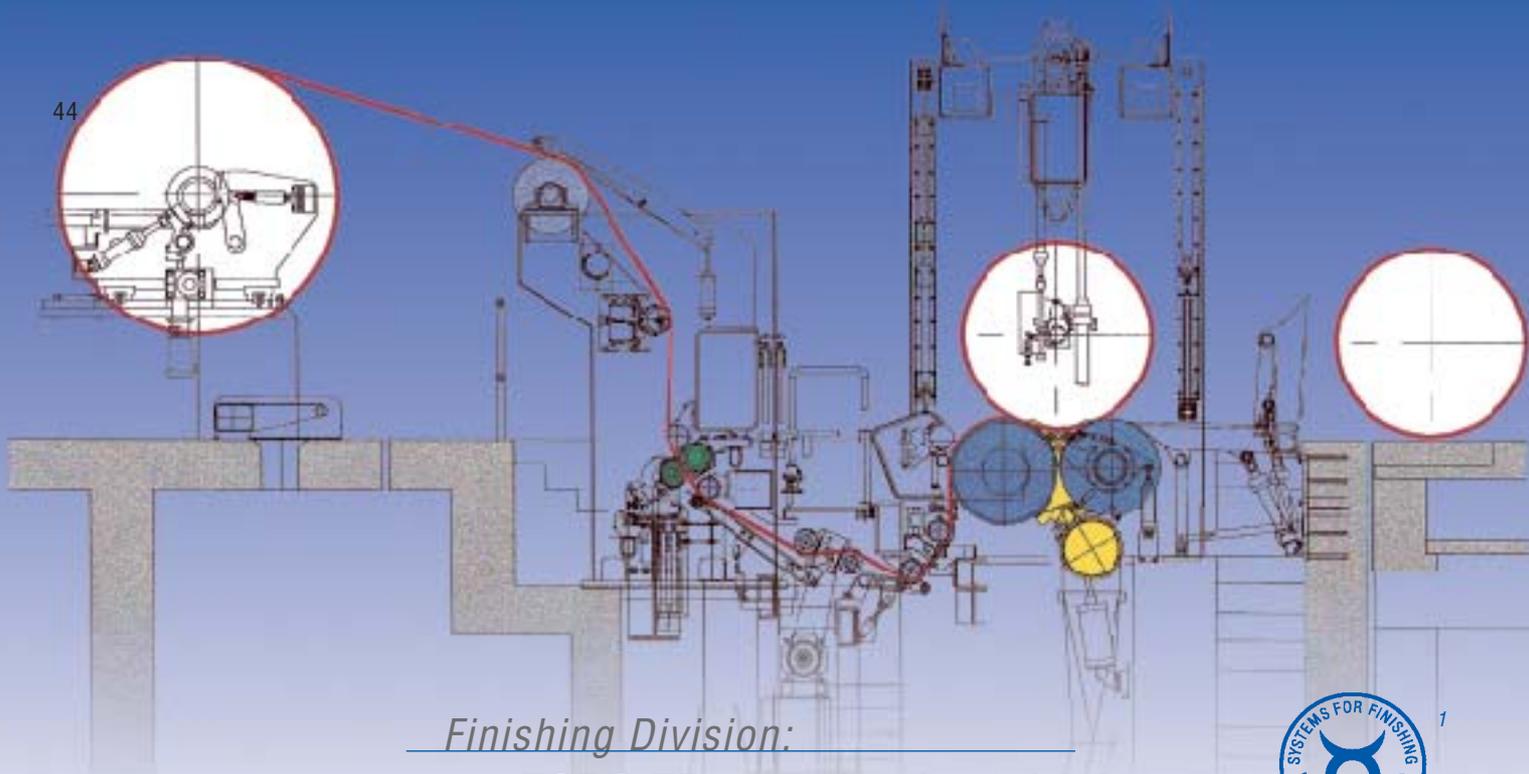
This short description of the board machine beyond 2000 shows possible solutions in a combination of proven machinery elements. It leads to a Voith Sulzer Paper Technology vision for future production plants as summarised:

The high capacity boardmachine

basis weight range	160-400 g/m ²
wire width	≤10.5 m
operating speed	600-1000 m/min
max. production	≤ 3000 t/d

Products: Coated Multiply Board

- Duplex-, Triplex-Board
- Liquid Packaging and Folding Box Board
- Gypsum Board.



Finishing Division:

TORO TD – graduation with honours



1



*The author:
Dirk Cramer,
Finishing Division*

As already reported in *Twogether*, the Voith Sulzer Finishing Division has developed a new winder concept known as TORO TD. *Fig. 1* shows the layout of this machine.

An air relief system is used in the TORO TD concept for keeping nip loads within permissible limits to prevent damage. Air entrainment during winding – a technological drawback of conventional winders with air relief – is eliminated by the innovative web travel layout.

The main features of this machine are that both nips can be relieved and that the well proven two-drum winder principle is retained. *Fig. 2* explains the operating principle of the TORO TD with air relief system.

With a rewind diameter of 1500 mm, the nip loads developed in a conventional cutter would reach about 11.5 kN/m. Depending on paper grade, this would cause crepe wrinkles or shiner zones due to longitudinal displacement and unfavourable hardness distribution as a function of winding diameter.

Thanks to the T-Air relief system, the desired nip load variation over the diameter range can be preselected. For example

3.5 kN/m at the core, then slightly reducing until the diameter reaches 500 mm, afterwards rising to 5 kN/m at the periphery. To comply with these settings, the T-Air system comes into play after the winding diameter reaches about 700 mm. This means that nip loads can be adjusted precisely to suit paper quality requirements.

As a comparison, *Fig. 3* shows the situation with a two drum winder where only the second drum is rubber covered. Although this ensures that with equal loading the effective nip force on drum 2 remains within acceptable limits, the force on drum 1 is still over 11 kN/m. Another drawback is that relieving the second nip also applies during winding, whereas nip loading should be higher in order to generate the necessary winding hardness in the core area. This shows one of the main advantages of the Toro concept: nip relief does not come into play until actually needed.

What is the effect of air relief on winding hardness? To answer this question, tests were conducted on the Krefeld laboratory test rig.

In *Fig. 4* the Smith hardness characteristics with and without air relief are plotted over winding diameter.

Fig. 1: Toro TD with air relief system.

Fig. 2: Nip loads at two drum winder.
 — theoretical nip load
 — nip load by rider roll
 — air relief system
 — resulting nip load.

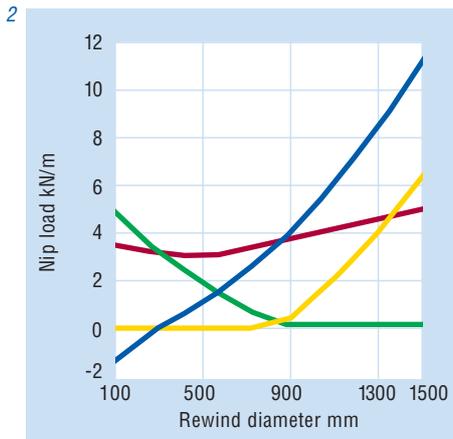
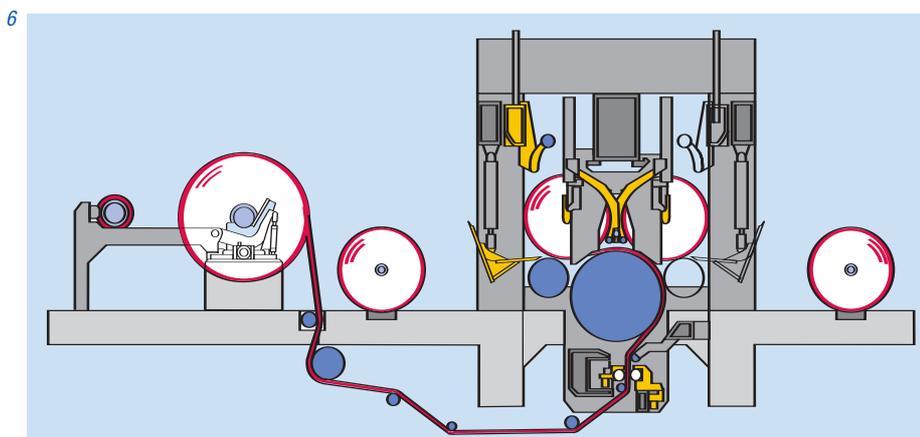
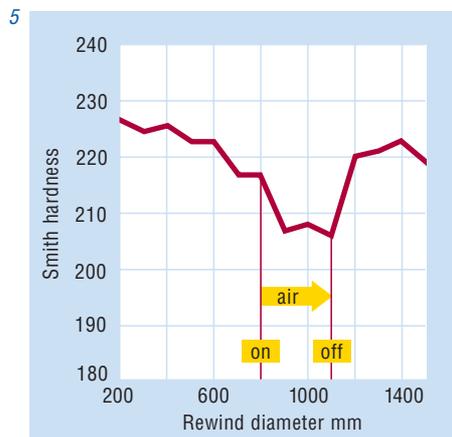
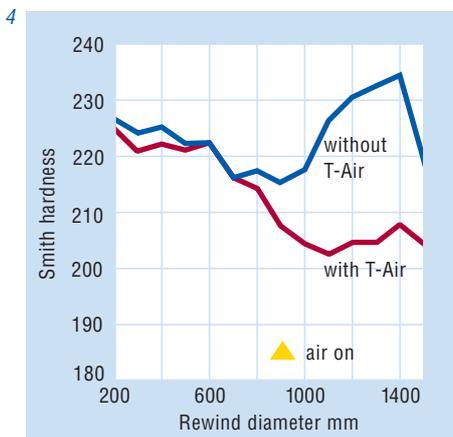
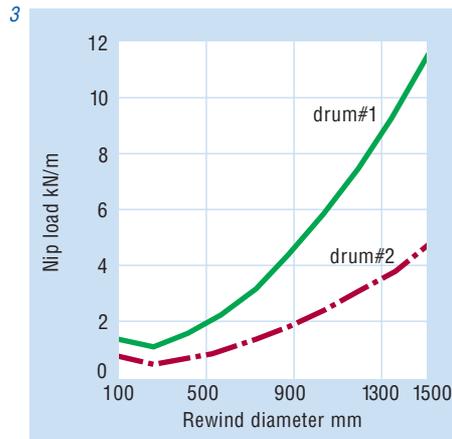


Fig. 3: Nip loads at two drum winder with soft covered drum #2.

Fig. 4: Smith hardness without/with air relief system.

Fig. 5: Smith hardness with/without air.

Fig. 6: Paper web travel at DuoRoller side #2.



This clearly shows that with conventional winders, hardness rises after the diameter reaches about 900 mm. The T-Air relief system prevents this undesirable effect, as demonstrated by the interesting test shown in Fig. 5.

In this case air relief was activated at a winding diameter of 800 mm and shut down again when the diameter reached 1100 mm. Clearly discernible is the resultant winding hardness trough – an eminent demonstration of how effective the T-Air relief system is.

During market introduction of the TORO TD, the question was often asked whether the new web travel layout raised any drive problems compared with conventional systems. Without going into details, the answer is very clearly no. Fig. 6 shows the second side of a DuoRoller – a type which has been used very successfully for several years now. As in the TORO TD system, the web runs over both drums, and no drive regulation or winding hardness control problems have ever arisen with any DuoRollers.

Another feature of the TORO TD system is the rubber covered drum No. 1 (Fig. 7). The purpose of this relatively hard rubber cover (65-70 Shore A) is not to reduce the specific nip load – that is the task of the air relief system. With impermeable paper grades (high-gloss and coated papers), the boundary air must be prevented from being entrained into the roll and from building-up in front of nip No. 2.

That is why the first drum is rubber covered, thus mating the surface profile with that of the paper rolls and closing nip

Fig. 7: Influence of rubber cover at drum #1.

Fig. 8: Peripheral forces at TORO TD.

Fig. 9: Rubber cover of rider roll.

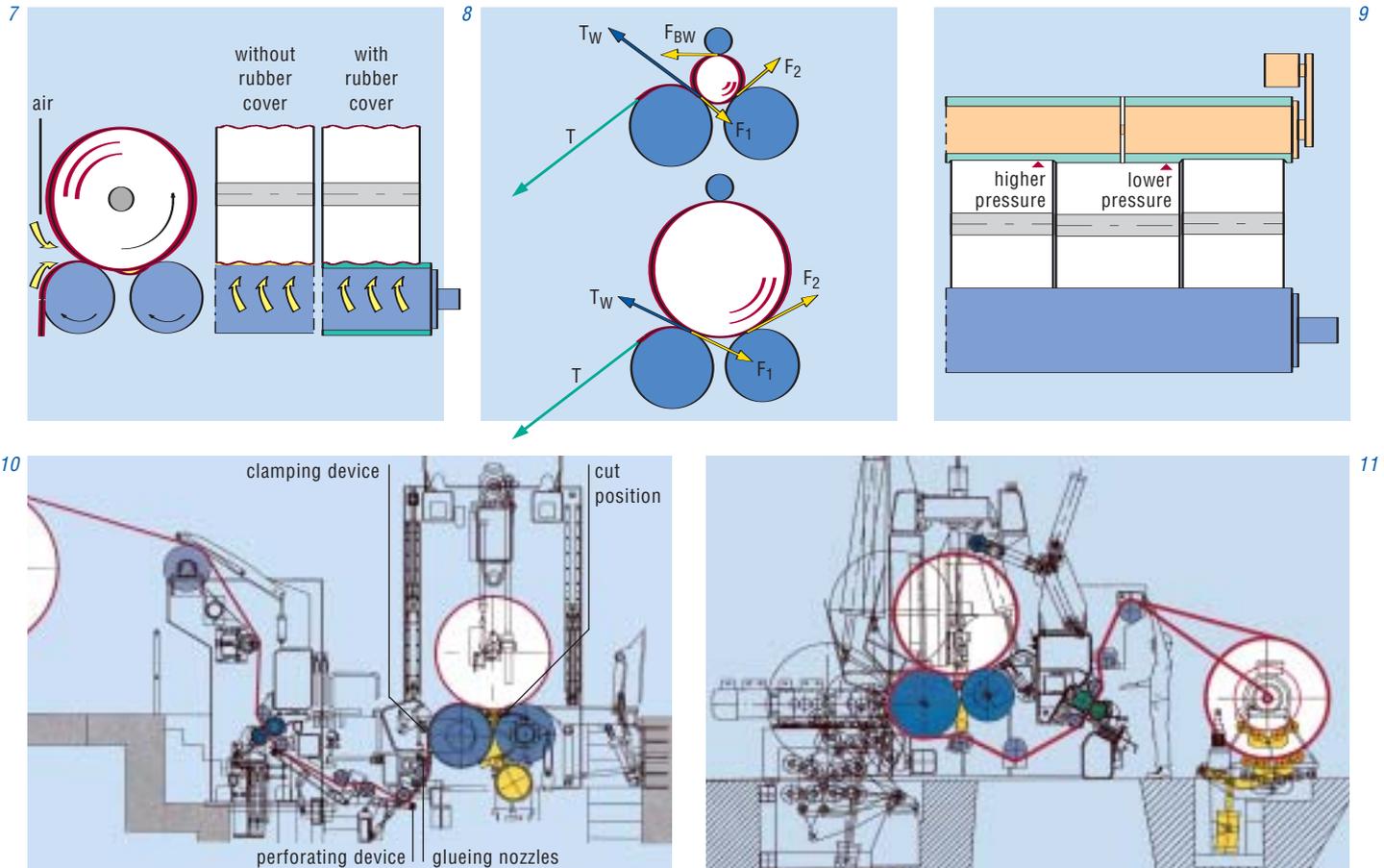
Fig. 10: TORO TD, automatical roll set change.

Fig. 11: TORO Combi for Lang Papier, two drum mode.

Fig. 12: TORO Combi for Lang Papier.

Fig. 13: TORO Combi for Lang Papier, Smith hardness with air relief system.

Fig. 14: Control system TORO Tronic.



No. 1 to prevent air entrainment almost completely.

This technique is also used successfully in the Sirius winding system.

With high-gloss or coated papers – particularly for rotogravure printing – it is very important to ensure adequate hard winding in the core area during winding. This prevents damage occurring near the core – so called core bursts – during unwinding on the printing press. So far single drum winders with center drives

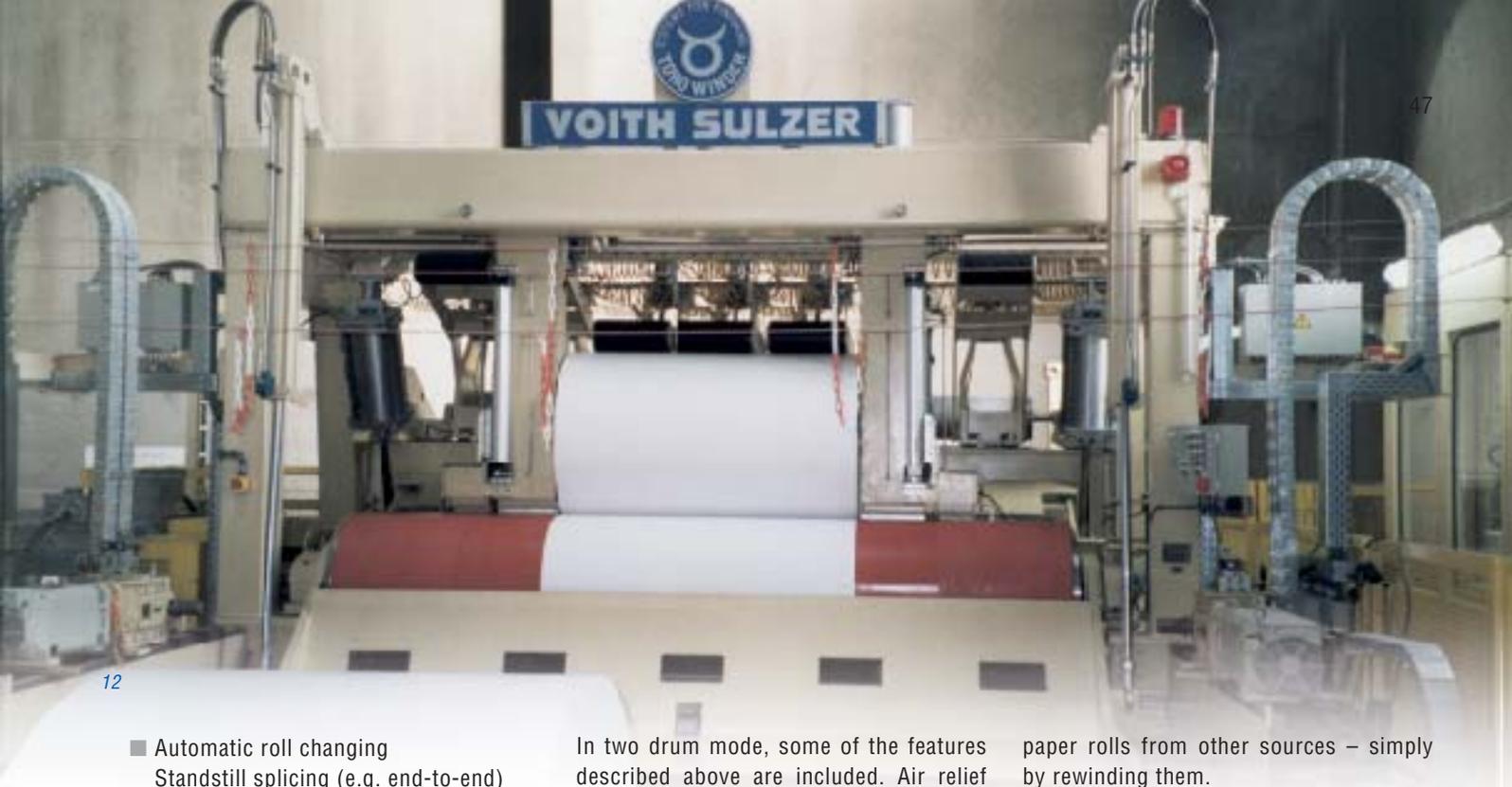
on each station have been used for this purpose. With the TORO TD system a driven rider/loading roll ensures optimum winding hardness. The loading roll is working as follows:

- The high initial press force of the loading roll is used for diverting peripheral forces into the paper reel (Fig. 8).
- With increasing reel diameter, the loading roll pressure decreases and the drive power is reduced accordingly.

■ The loading roll is rubber cover, which brings two advantages:

- better diversion of peripheral forces into the paper roll
- the rubber cover of the loading roll allows to an appropriate extent for changes in winding reel diameter (Fig. 9).

Apart from good winding quality, optimal productivity is of course an absolute must. To this purpose the following automation possibilities are available:



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- Automatic roll changing
- Standstill splicing (e.g. end-to-end)
- Low speed flying splice
- Automatic slitter positioning
- Automatic roll set change
- Web end glueing.

Fig. 10 shows the TORO TD components required for automatic roll set change with web end glueing.

The well-tried perforation system is taken over here from the DuoRollers.

So much for design aspects, but what about practical experience? Since August 1998, rolls have been wound at Lang Papier using the new TORO Combi system in two drum mode (Figs. 11 and 12).

The support roll system went into service at the end of November 1998.

In two drum mode, some of the features described above are included. Air relief ensures that the SC grade paper (Janus calendered) is wound perfectly without any faults. The rubber covered rider roll prevents any air entrainment, and the soft covered drums ensure well-dosed application of pressing forces. The technological results with regard to product quality meet expectations in full.

Fig. 13 shows the Smith hardness of roto-gravure printing paper as a function of winding diameter.

As desired, the hardness decreases slightly as winding diameter increases. The wound-in stretch rate is 1.9% at the core and 1.5% at the periphery, which is ideal for this grade of paper.

Another advantage is how the TORO winder characteristics correct faulty

paper rolls from other sources – simply by rewinding them.

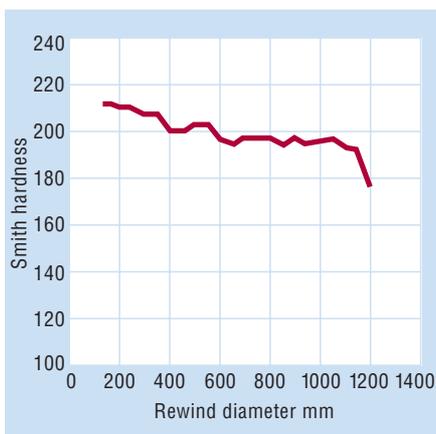
The TORO TD system is controlled by the newly developed TORO Tronic software. This was developed according to the well-proven principle “as little as possible is enough” – and the result is an uncomplicated, user-friendly control system.

Summary

This technical development by the Voith Sulzer Finishing Division has proved itself outstandingly at Lang Papier. Admittedly there were teething troubles – but with such an innovative design and control concept, this is hardly surprising.

As mentioned above, the support roll system went into service at the end of November 1998, and we look forward to publishing an equally gratifying operating report in due course.

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Research and Development:

Image analysis in headbox development



The authors:
Wolfgang Ruf,
Hans Loser,
Paper Machinery Division
Graphic

One of the most critical tasks in headbox development is flow configuration analysis. This particularly applies to surface analysis of the headbox jet flow, which in fast-running paper machines can reach speeds of 100 km/h or more.

We have developed measuring techniques and analysis software enabling precise flow assessment at such velocities. As a result, this process know-how is available for advanced headbox development.

Digital photography has made enormous progress in recent years, and powerful software is now available for image analysis. This technology is particularly suitable for processing large quantities of digital data, such as from modern high-speed video cameras at up to 2000 images per second.

Voith Sulzer Paper Technology's R&D division in Heidenheim makes intensive use of this technology among others for headbox development. The complex task of adapting it to meet our specific needs has been solved by a team of headbox development engineers, measuring system specialists and software programmers. As a result, data from various digital image sources (see Fig. 1) can now be computer-analyzed and evaluated in various ways.

Optical methods without physical contact give superior results and are much easier to handle than if flow sensors are used. The main advantage lies in better quantification and more reliable results.

Furthermore, contactless measurement can also be used for stock suspensions where sensors would be unsuitable.

Flow mechanisms significantly affect technological characteristics and product quality, particularly during sheet formation in the GapFormer. Taken together with other data, they give a comprehensive picture of hydraulic mechanisms within the headbox. By combining and correlating this flow data with sheet formation results both in pilot tests and during production, a better and more rapid insight is gained into process mechanisms as a whole. This is indispensable for:

- Optimal adaptation to specific customer needs
- Efficient customer service and support
- Development of new headbox concepts.

The two image analysis methods mainly used are as follows:

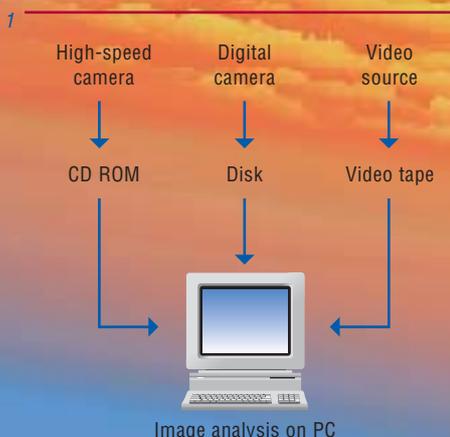


Fig. 1: Image recording systems.

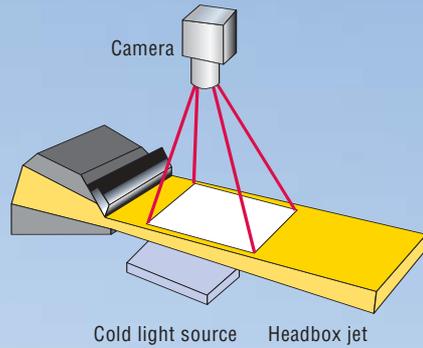
Fig. 2: Backlighting method.

Fig. 3: Laser intersection method.

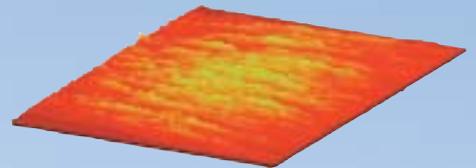
Backlighting method

In this case the headbox jet is illuminated from below and photographed from above. The result is individual or series shots of the jet surface which are suitable both for qualitative and quantitative analysis.

This method can be used for example to analyze microturbulence on the jet surface, and with suitable image processing, longitudinal structures can also be revealed and analyzed.



Macroturbulence image analysis



Jet photograph



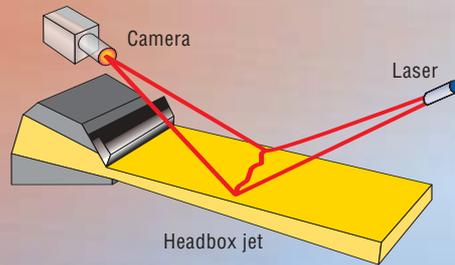
Microturbulence image analysis



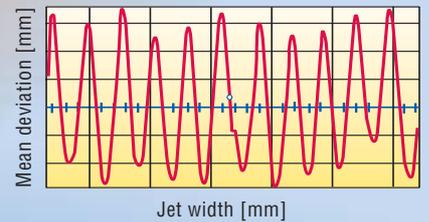
Laser intersection method

Here the jet is intersected by laser beam to give a precise image of the surface profile. This profile is recorded by high-speed camera, and the images are then analyzed. Each individual image is processed into metric data readings, which are evaluated statistically.

Jet irregularities, for example, can be identified with high precision by averaging out the 2000 images per second and carrying out frequency/wavelength analysis. In many cases this also allows their origin to be determined.



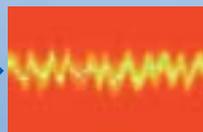
Averaged surface profile



Original image



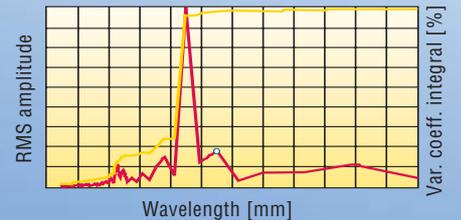
Image processing



By comparison:
jet photograph



Wavelength analysis





“Impact Systems, Welcome Aboard!”



*The authors:
Janine Nagel, Impact Systems,
Germany;
Barclay Wallace,
Impact Systems, USA*

Impact Systems joins Voith Sulzer Paper Technology: bringing papermakers a new level of manufacturing capability.

On January 21, 1998 Voith Sulzer Paper Technology acquired Impact Systems, Inc., and raised the potential performance of papermakers worldwide. The unique combination of papermaking, measurement and machine actuator experience offered by this new team will provide paper mills with quality, efficiency and customer service opportunities not previously available.

Impact pioneered electric infrared (IR) moisture profiling, and is a leading supplier of profile control actuators. These are all part of Impact's complete family of on-line paper Quality Control Systems (QCS). Impact's innovations fit hand-in-glove with VSPT's great strengths in the papermaking processes and machinery. The result is a combination of technology, industry knowhow, expertise and resources that are already bringing new and exciting offerings to the papermakers.

In the words of Hans Müller, President and CEO of Voith Sulzer Paper Technology, *“With the acquisition of Impact Systems, we are significantly enhancing our technology offering. Many of our future developments of sophisticated paper machinery require the full integration of advanced sensors, actuators and controls to achieve their full potential.*

By combining papermaking and control technologies, we can substantially enhance the performance of many of our new developments and improve the results for our customers.”

Kenneth P. Ostrow, President and CEO of Impact Systems, adds *“I am excited about our new opportunities to bring papermakers a higher level of manufacturing capability. We will start by combining our existing products with those of VSPT to provide the broadest range of paper machine control solutions. For the future, we are working together on innovative new products shaped by Voith Sulzer's deep knowledge of papermaking and Impact's leading expertise in on-line quality sensors and paper machine profiling actuators. We are going to show paper mills some amazing opportunities to improve product quality, manufacturing efficiency, and customer service.”*

The team got its start at consolidated

The potential of the Voith Sulzer Paper Technology/Impact team became clear when together we achieved great results on PM 35 at Consolidated Papers' mill in Stevens Point, Wisconsin. This new, high-speed Voith Sulzer specialty machine includes the ModuleJet headbox with advanced CD weight control using Impact's fast, high-precision weight sensor. Five Impact Advantage Plus scanners with 11 paper quality sensors support the latest in supervisory control, while their ThermaJet CD caliper and

Fig. 1: Impact Systems is located in Los Gatos, California – the heart of Silicon Valley.

Fig. 2: Impact scanner with sensors on Consolidated Papers machine.

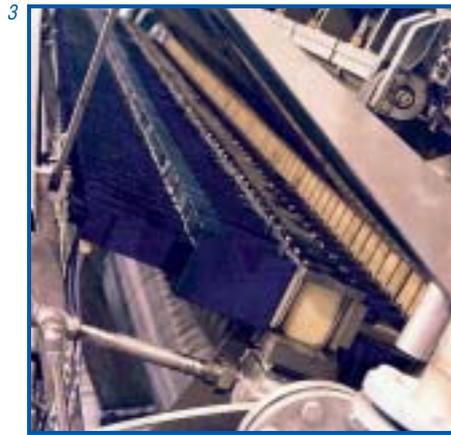
Fig. 3 and 4: ModuleJet headbox.

Fig. 5: Spectrum IR Gas system.

Fig. 6: Millennium System in Crown Vantage, Parchment, Michigan Yankee 1.

Fig. 7: InfraPac Electric.

Fig. 8: ThermaJet.



InfraPac electric IR moisture actuators yield superior caliper and moisture profile control. The smooth integration of the ModuleJet, DCS (Distributed Control System), and the Impact products was largely attributed to Impact's "totally-open", distributed sub-systems plus Ethernet and TCP/IP (network protocol) communications directly from the scanners and actuators. Wolfgang Griech, Manager Development Controls for Voith Sulzer Paper Technology, "In working with various QCS (Quality Control System) suppliers, we found the Impact system far more open, which allowed us to easily access the information we need for optimum results."

Although many system elements contributed to the results at Consolidated Papers, the three most notable were as follows:

- The combination of the ModuleJet headbox and Impact's weight sensor – yielded excellent basis weight profiles.

- The InfraPac moisture profiling system – achieved amazingly good CD moisture control.
- The direct Ethernet communications from the Impact scanners to the mill's DCS and to the VSPT Profilmatic CD weight controller allowed easy, fast access to sensor information for operator interface and control.

This successful effort demonstrated the exciting potential created by the two organizations.

The Millennium family from Impact

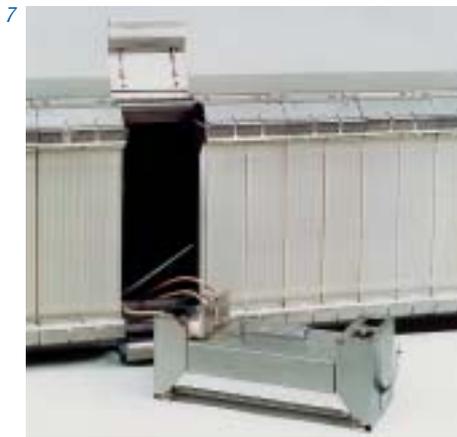
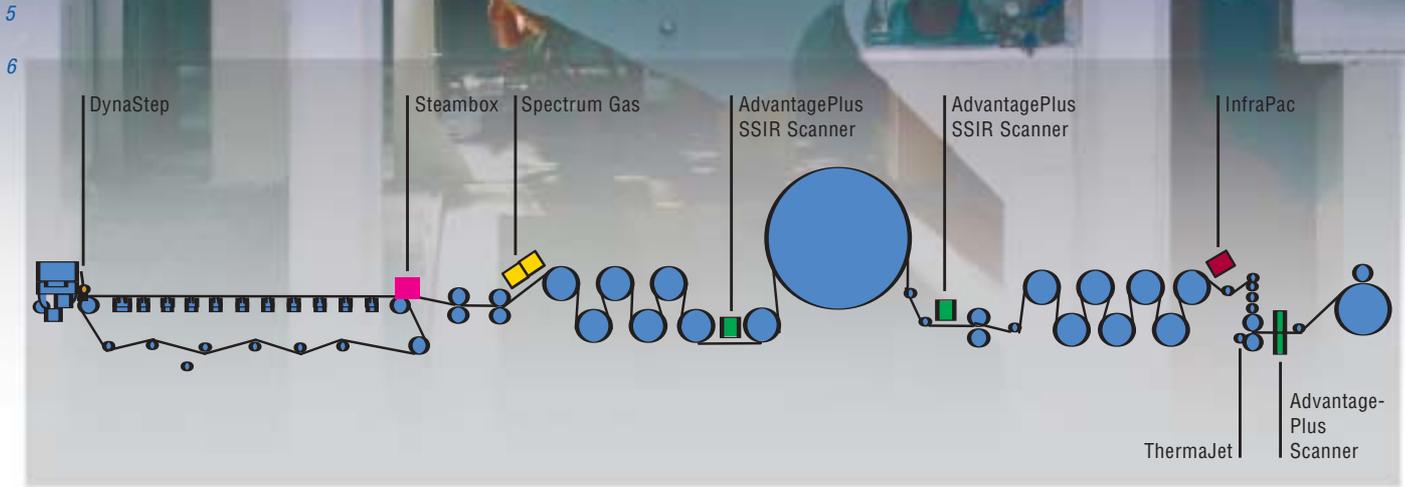
Impact's recently-introduced Millennium family surely competes for "best of breed" in papermaking measurement, control and information-management. Millennium introduces a new generation of open system architecture that will support development and growth well into the next century. Millennium is already proven, with eleven systems installed. Customer-reported highlights

include:

- An ultra-stable scanner and high-precision weight sensor tripling the profile measurement precision of other gauges. Of course, this yields better profiles. In the words of Rudolf Münch, Manager of Process Controls for Voith Sulzer Paper Technology, "The Impact unfiltered basis weight profile has better precision than the filtered basis weight profiles from other QCS systems. High precision profiles are required to achieve the full performance potential of ModuleJet."

- The broadest family of proven profiling actuators and advanced CD controls in the industry. The gas and electric IR profiling/drying systems are especially noteworthy in their ability to address moisture streaks and drying problems, and boost productivity.

- Distributed "totally open" sub-systems, using Ethernet TCP/IP, and oth-



er open standards, offer open connectivity to other control and information systems. This design removes the connectivity roadblocks presented in other allegedly “open” systems.

- Full system robustness maximizes reliable operation in the harsh paper machine environment. In addition, Millennium is designed with advanced diagnostics, remote support, and Internet troubleshooting aids, to allow mills to assume any degree of maintenance responsibility.

Millennium also offers some new and innovative technologies, including:

- Ethernet/DDS (Data Distribution System) communications networking, which delivers a highly efficient and reliable control network and allows easy future expansion. Voith Sulzer Paper Technology and Impact jointly developed this technology, for use in the future control systems of both

companies.

- InfoPac Paper Machine Information System continuously monitors and stores the real-time paper machine data, allowing mill personnel to recall it on-demand, to improve quality, efficiency and customer service. InfoPac uses standard Microsoft programs and an ODBC (Open DataBase Connectivity) compliant database, for user-friendly Windows-based operation. This product, under development at Impact for over one and a half years, has already assisted the Voith Sulzer Paper Technology automation group in optimizing applications.

Millennium boosts productivity at Crown Vantage

The Millennium family has been in development for over two and a half years, and was first offered to Crown Vantage. Robert Olah, President of Crown Vantage, notes: “Back in early 1996 Impact approached us with a whole new system

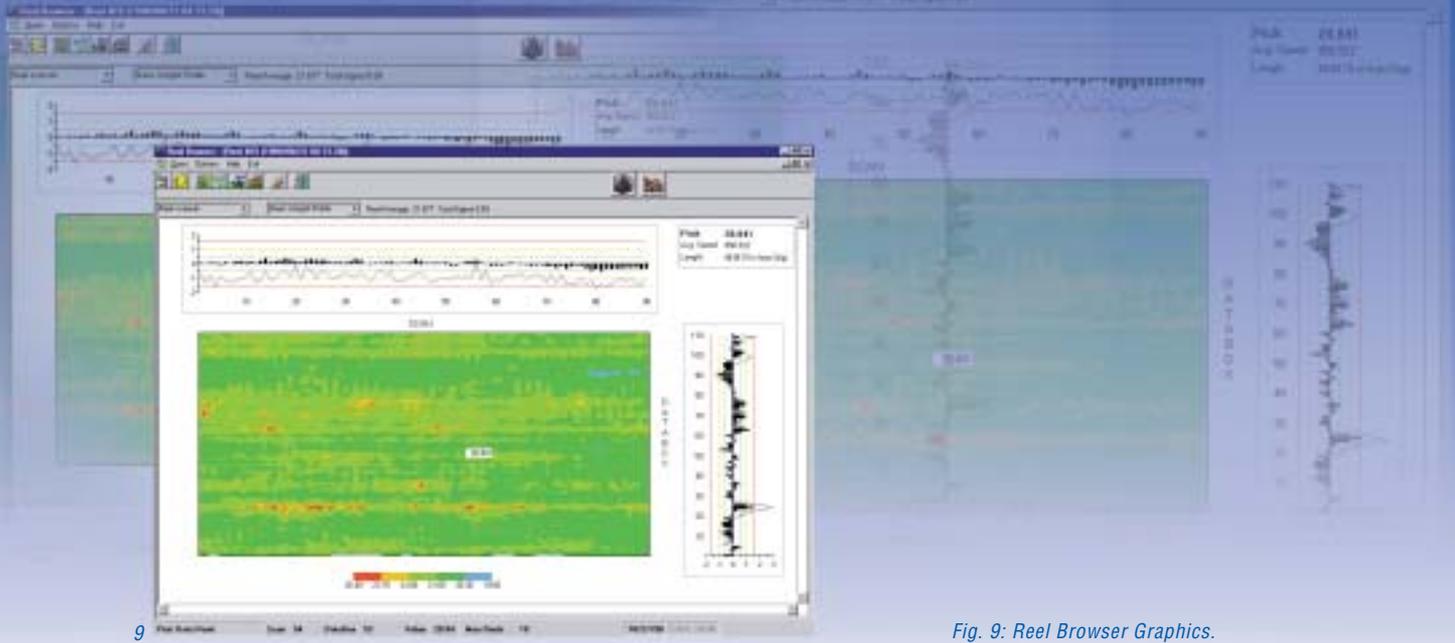


Fig. 9: Reel Browser Graphics.

concept. Our mill in Port Huron, Michigan was the very first to install the Millennium offerings, which went on two machines, Impact's unique gas and electric IR systems solved a chronic moisture problem on our Yankee, and gave us an 8 percent speed increase."

The latest Millennium installation is on the PM 1 specialty machine at the Crown Vantage Parchment, Michigan mill. "We needed to achieve a quantum leap in quality and productivity," says Karl Christianson, V.P. Operations, Specialty Papers. "When we evaluated suppliers, Impact came to us with an innovative solution, including gas and electric IR systems, which was not available from other QCS suppliers. The InfoPac Information System will provide us with detailed graphic information concerning all aspects of roll quality. Our technical and customer service department see this as a highly valuable tool when working with our customers."

Highlights of the Millennium on Crown Vantage PM 1 include:

- AdvantagePlus Measurement System with three scanners supporting six quality sensors.

- A full family of Actuator Systems, including DynaStep Weight Profiling, InfraPac Electric IR Moisture Profiling/Drying, Spectrum IR Gas Drying, SteamPac Moisture Profiling/Drying, and ThermoJet Caliper Profiling.
- InfoPac Paper Machine Information System with Reel Quality Browser and productivity tools.

This system, as installed, should reduce the MD and CD quality variations by up to 50 percent and increase machine speed by over 15 percent.

New paper machinery with integrated controls

Traditionally, major advancements in paper machine control have come from the process control companies. Today, that paradigm is shifting in favor of the new "Machine and Control" suppliers that have both the machinery and controls experience. "The ultimate performance of future papermaking equipment will strongly depend on having the right sensors, actuators and controls," says Hans Müller. "Thus we believe that the key for paper industry future advancements will come from combining making and control expertise."

The team of Voith Sulzer Paper Technology and Impact Systems will lead the way in developing and installing these new integrated machine and control technologies, and set new standards in paper mill quality, productivity and customer service in the future.

Last but not least:

Impact Systems GmbH is pleased to announce the latest Millennium System order which was finalized just before press-time. Papierfabrik Scheufelen in Oberlenningen, Germany recently ordered a Voith Sulzer ModuleJet Headbox with ProfilMatic CD control in a quality improvement project for their PM 6.

In order to optimize the performance of this investment, Scheufelen selected the Millennium QCS from Impact Systems to replace the existing measurement system. An additional important factor in Scheufelen's decision was the understanding that with Impact Systems now a member of the Voith Sulzer Paper Technology team, leading-edge paper machine and automation technology can now be provided in a comprehensive, integrated package.



Corporate News:

Mexican seminar a huge success



*The author:
Jeffrey Spielbauer,
Stock Preparation Division
North America*

The Stock Preparation Division of Voith Sulzer Paper Technology North America Inc., in conjunction with our Mexican agent, Macorvi S.A. DE C.V., recognized the importance and value of its Mexican customers by conducting two back-to-back seminars on October 13th and 15th, 1998.

The seminars, held in Mexico City and Monterrey, reached attendance levels beyond expectations with nearly 150 customers participating in the two presentations. The success can also be measured by the fact many senior management personnel attended, including mill managers and general directors.

Mario Cordoba, owner of Macorvi, opened each of the seminars with warm greetings to the participants. Presentations on Pulping, Screening, Flotation Deinking, Water Treatment & Rejects Handling Bleaching and Systems Technology as well as Mill Reviews and an After Market update followed.

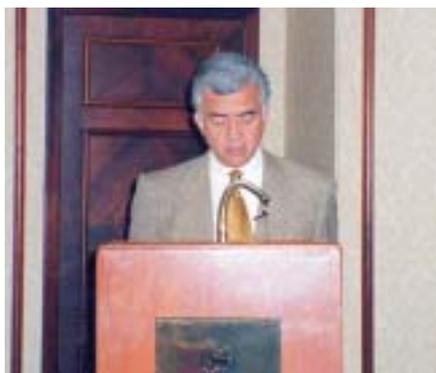
Presenters included Dave Westenberger, V.P. Sales & Marketing; Jeff Spielbauer, V.P. Applied Technology; Jerome Herro, Manager Deinking Technology; Frank Meltzer, Manager Unbleached Fiber Systems; Michael von Grumbkow, General Manager, Meri Papertec, Inc. and Patrice Barbeau, Sales Manager After Market. All presentations were greeted with atten-

tiveness and lively question and answer discussions.

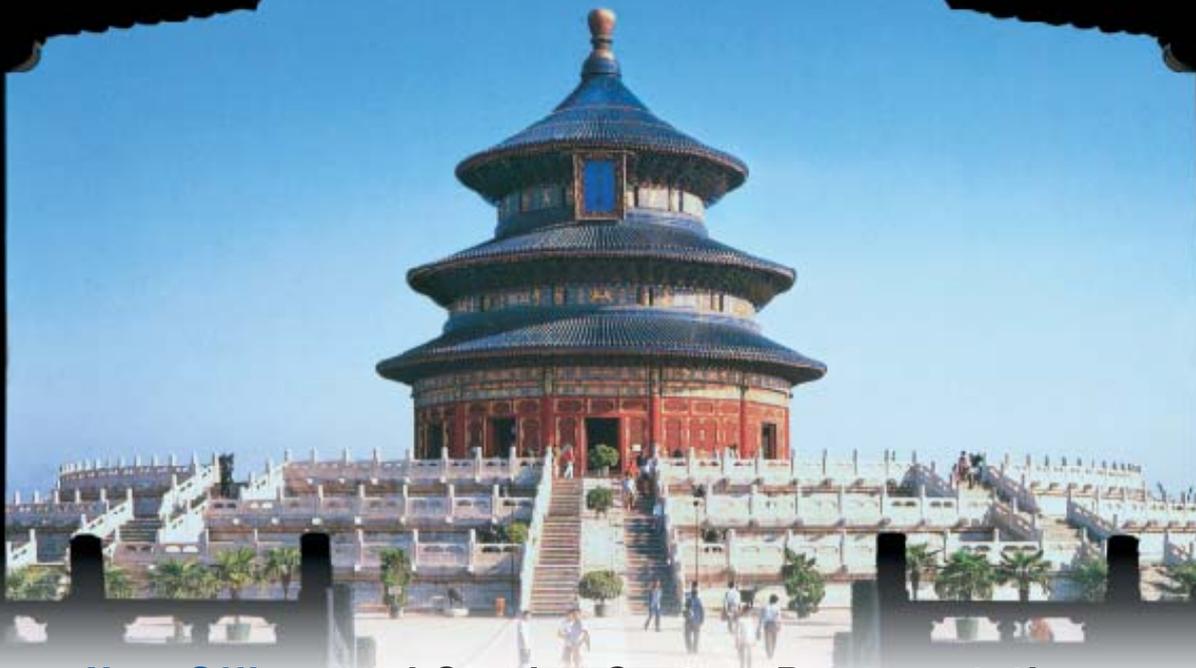
The Mexican market has long been a supporter of Voith Sulzer Paper Technology's equipment and system technology. With the help and support of Macorvi Voith Sulzer Paper Technology has secured orders for 10 of the 13 Deink Plants installed in the Mexican market and has equipment installed in 60 of the 66 mills present in Mexico. State-of-the-art technology is incorporated in many of these installations as can be seen by a recent order incorporating Voith Sulzer Paper Technology and Meri Papertec, Inc. equipment in a zero effluent discharge board mill.

Considering the attendance level, as well as positive feedback following the presentations, there is no doubt Voith Sulzer Paper Technology is considered the major Stock Preparation Equipment supplier in Mexico.

Mexico, with a population of 92 million people and the economic spark of the NAFTA agreement, is emerging as a substantial recycled paper product market. Voith Sulzer Paper Technology North America Inc. is poised to assist our valuable Mexican customers with product and systems technology as well as after-market service as they move forward to the next millennium.



*Mario Cordoba, Macorvi S.A. DE C.V.,
holding his welcome address.*



New Offices and Service Centers Representative

Competent local support and service within easy reach of all our customers. This important aspect of our image – and our market success – is now being systematically expanded.

China

China's capital is changing its face. World-famous monuments to the illustrious past (*see above*) are being joined by more and more skyscrapers as the economy expands into the third millennium. One of these modern office buildings (*foreground of picture below*) is the home of Voith Sulzer Papiertechnik Beijing Central Representative Office, founded on October 1, 1998. This replaces the China office of J. M. Voith AG, Austria, dating back to 1994. Under the newly appointed managers Ming Ming Liu and Frank Opletal, our Chinese customers are looked after by a highly experienced and well-

trained team at the Beijing office. China's paper industry is currently expanding rapidly to meet the country's enormous demand for paper and board – 33.5 million tonnes in 1997, of which 6.5 million tonnes were still imported. This already makes China the world's second largest paper consumer after the USA, and consumption is expected to double within the next decade. The Chinese paper and board industry is meeting this demand with greater production efficiency through rebuilds and new installations. Voith Sulzer Paper Technology's representative office here can therefore look forward to a full workload in future.





USA

On October 6, 1998 Voith Sulzer Paper Technology opened a new service center in *Farmington, New Hampshire*.

This modern building complex includes about 3500 m² of shop floors and offices. The entire range of services will be provided here, initially by a highly trained team of twenty. All the special machines required for roll trimming, renewal and balancing are available at this center, in which more than 7 million USA dollars have been invested.

The new Farmington service center will provide competent local support for the paper and pulp industries in the north-east USA and eastern Canada.

A public "open day" was held to celebrate the inauguration of this service center, the latest of nineteen.

Guests of honour included Jeanne Shaheen, Governor of New Hampshire. She paid tribute in her address to Voith Sulzer Papier Technology's commitment to job security and creation in this region. Chris Turner, manager of the new service cen-



Chris Turner (left) and Ray Hall (right) talking with Jeanne Shaheen, Governor of New Hampshire.

ter, pointed out how well cooperation had already started with the local paper and pulp industry. If demand continued to rise in this way, plans for plant expansion and doubling up the team would soon be put into practice.

Great attention has been paid at this new center to exemplary environmental compatibility. Clean and efficient energy utilization is just as much a part of this concept as loopwater recycling.

Sweden

Summer 1998 marked the acquisition of *Lessebo Valsliperi AB*, one of Scandinavia's leading roll trimming specialists. Founded decades ago, this company has a highly experienced team of specialists with first class equipment – including the world's largest trimming machine for rolls up to 14 m long and 2.5 m diameter.

Services here range from roll trimming and super-finishing to dynamic balancing. Activities will be expanded in future to include on-site servicing and own spare parts manufacturing facilities. Reinhard Müller, head of our European Service Division, sums up as follows: *"We now have an excellent base in Lessebo for serving not only customers in Sweden. In future, the whole of Scandinavia will benefit from the local service and support for which Voith Sulzer Paper Technology is so renowned"*.



Paper Machinery Division Graphic: International Customer Conference March 24 - 26, 1999



**PROCESS
PROGRESS**

**“Process & Progress”, integrated process concepts and progressive solutions.
It is under this central theme that we would like to provide you with detailed information –
on your future and ours in the paper world.**

What will the future bring? How will the market of tomorrow for graphic papers look? What requirements will dominate in paper production, and how has Voith Sulzer Paper Technology geared itself to this? What will ensure a competitive lead and an improved return of capital employed?

Replies to these important questions will be given in an international conference hold in Ulm and Heidenheim, Germany, from March 24 – 26, 1999. Experts from Voith Sulzer Paper Technology and guest speakers from the industry and from



Heidenheim: Hellenstein castle

market research will present development trends. A visit to our Research and Development Facility, combined with a look at future-oriented paper machines in our assembly shops, will round off the event.

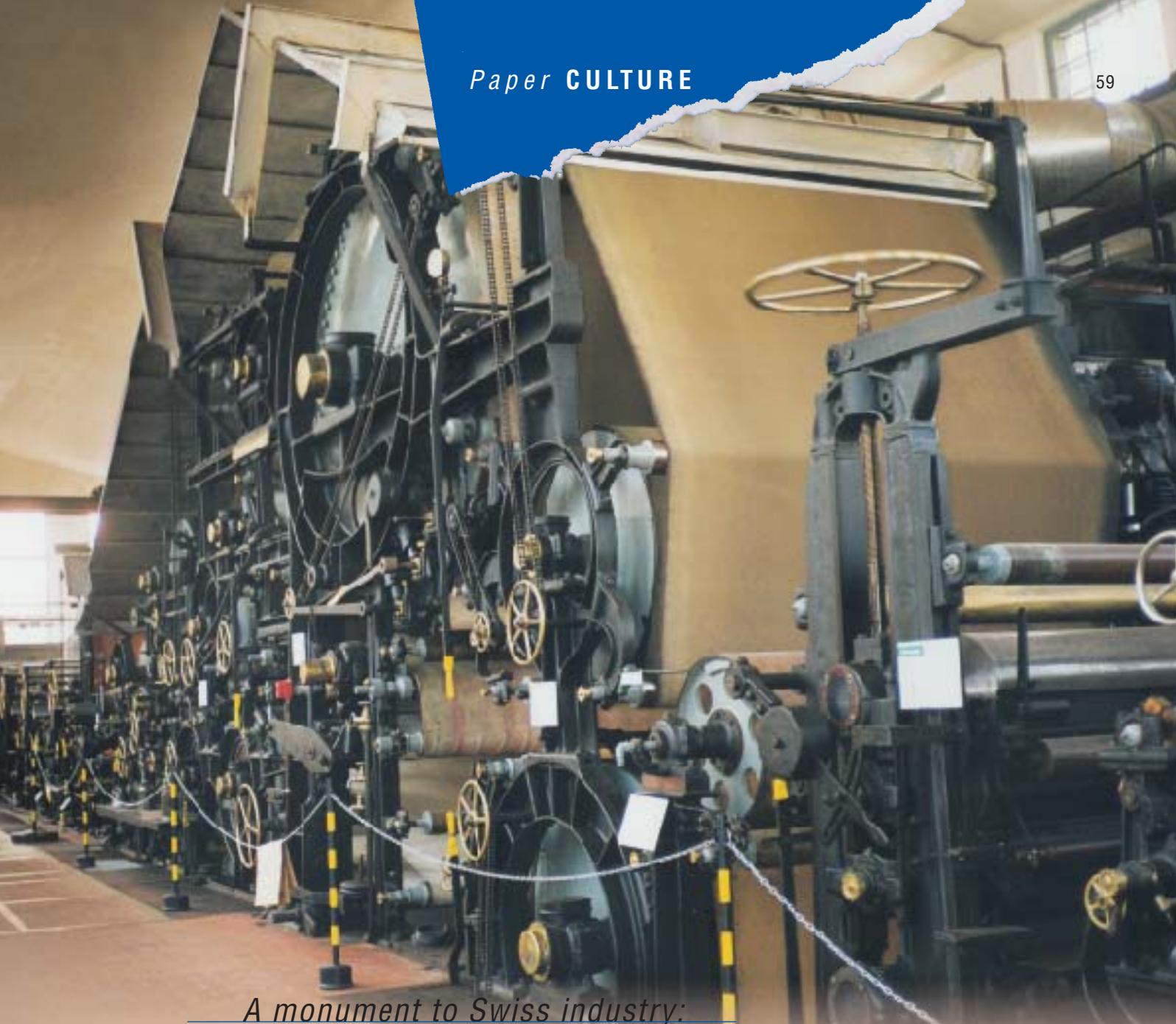
Some of the papers

Market developments and future demands on graphic papers – Voith Sulzer Paper Technology - fit for the future – Concepts for significant progress in paper technology – Greater productivity - online? – Visions for paper making – Success through partnership.

If you would like to attend this symposium but have not yet received an invitation, please fax your name and address to the editor, twogether on (+49) 73 61 94 98 94.



Historic Ulm with cathedral



A monument to Swiss industry:

Bischofszell Paper Machine Museum

Although 223 tonnes of steel thirty seven metres long are impressive enough, paper machine 1 in Bischofszell is rather modest by today's standards. When built in 1928, however, it was state-of-the-art in advanced papermaking technology. Until 1991 this Voith machine No. 353 operated day and night almost nonstop. Over more than six decades it produced countless tonnes of writing/printing and packaging papers. But in the end old age caught up, the rust started to collect, and demolition loomed – until a group of

paper technology enthusiasts decided to preserve this last surviving oldtimer of the European paper industry.

Led by Werner Seebass, they founded the Bischofszell Association for Historical Paper Machinery, and invested more than 25,000 man-hours in restoring the machine to its former glory.

Thanks to their vast experience and unbounded enthusiasm, this fully functional historical machine was ready for official

re-inauguration on August 28, 1998 – the 150th anniversary of the Swiss Federal Constitution. Since then Bischofszell Paper Machine Museum has become one of the most popular monuments to Switzerland's industrial heritage.

The little town of Bischofszell, on the river Thur not far south of Lake Constance, is protected today as part of Switzerland's history. Mills and factories were set up here along the banks of the Thur right from the beginning of the industrial revolution.

The Bischofszell "Papieri". Inside the hall in middle foreground is the Voith fourdrinier paper machine dating back to 1928.



Bischofszell's "Papieri" was originally a weaving mill. The building complex includes some interesting historical machinery, including water and steam turbines and a Diesel engine with generator supplied by Sulzer Winterthur.

Around 1887, weaving operations were replaced by carton production. Later on papermaking commenced here, and in 1927 a fourdrinier machine was ordered from Voith Heidenheim. "PM 1", which

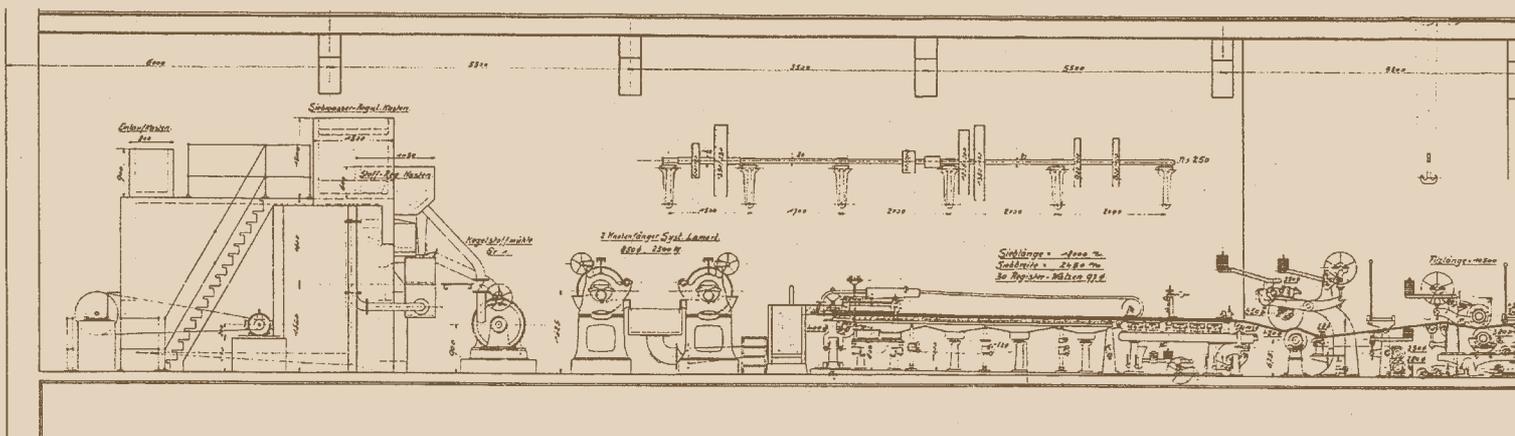
went into service at the end of 1928, was designed for an output of 10 tonnes/day with a web width of 2200 mm. This machine No. 353 was very sturdy and mature even by today's standards, fully in keeping with the high standard of Voith paper machine technology.

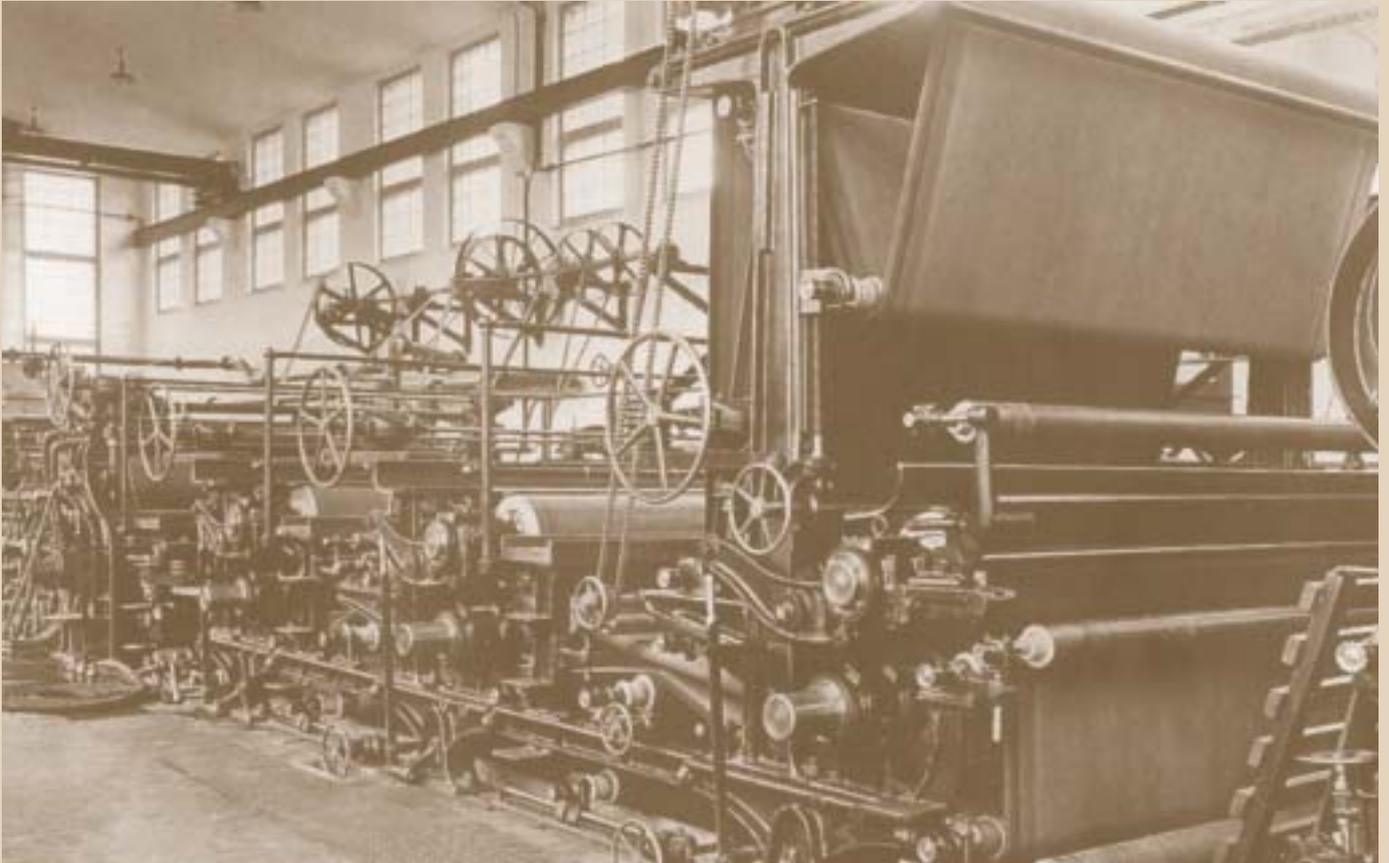
Thanks to its solid construction, the successful restoration of this machine was still possible in 1991 after more than five years of standstill and slow decay.

Werner Seebass (left) founder of the Bischofszell Association for Historical Paper Machinery, talking with Wolfgang Möhle, Corporate Marketing Voith Sulzer. Behind them can be seen some of the carefully preserved historical records on show in the Bischofszell Paper Machine Museum.



What is the spirit behind this restoration? It is more generally recognized these days that not only the fine arts are worthy of preservation for posterity, but also utilitarian things such as cars, aeroplanes – and production machinery in all its many forms. And the beauty of machinery is well demonstrated in Bischofszell: by the perfection of each individual component, and the fascinating harmony of cylinders, rollers and gears in motion – all driven by a single electric motor via





innumerable belts and pulleys. In fact one cannot help thinking here of Charley Chaplin in “Modern Times” – produced in 1938 when the machine was already ten years old.

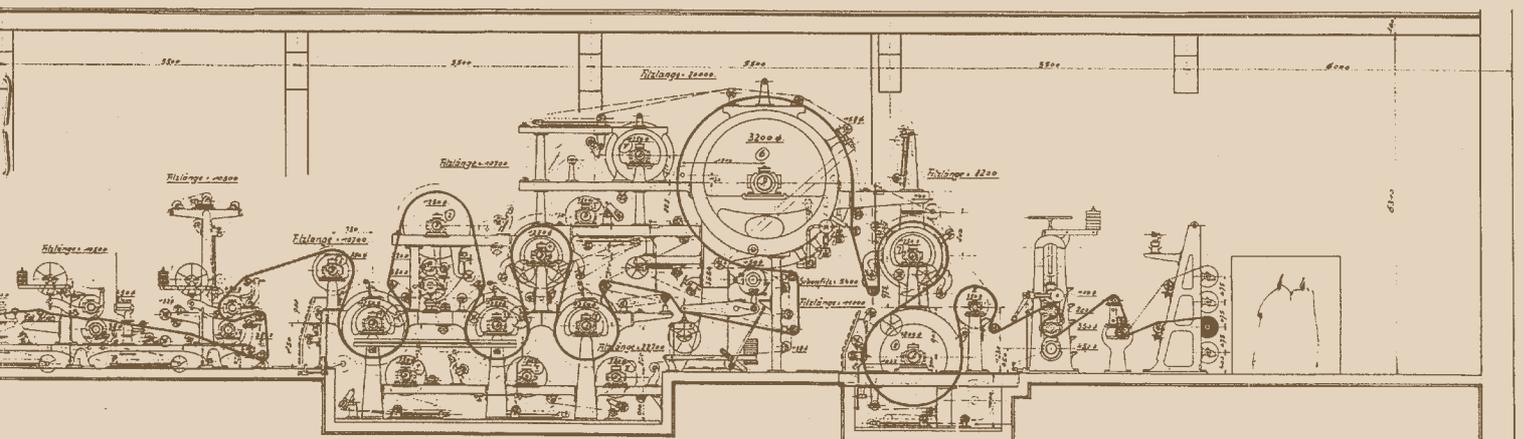
Standing inside its own specially built hall, the overall impression made by this historical paper machine together with architecture and interior fittings is remarkable. It gives us some idea of the pride and determination of our fore-

fathers – whose principals were most certainly not dictated by profit alone.

Parallels can be seen in the Bischofszell paper machine hall to epoch-making trends in industrial architecture. For example the AEG Berlin turbine hall, built by Peter Behrens about twenty years earlier. With its advanced structural design, unimpeded width and generously dimensioned window fronts, this is likewise an outstanding example of the “new think-

ing” in ergonomic industrial architecture which started to replace the old factories in the twenties.

So Bischofszell is well worth a visit, particularly for those of us who not only look to the future of our trade, but also relish the craftsmanship of the past. And it is thanks to the Bischofszell Association for Historical Paper Machinery that this is possible.



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