twogether

Paper Technology Journal

6

Hans Müller,
President and CEO
Voith Sulzer Papiertechnik

Dear customers, dear readers,

We have now put the first six months of the 1997/98 fiscal year successfully behind us and exceeded our own ambitious targets. This is surely reason enough to cast a brief glance back.

Asia has been one of the major markets since the formation of Voith Sulzer Paper Technology, contributing more than 30% of the overall bookings of DM 2.2 billion for the 1996/97 fiscal year. And this in spite of the ongoing economic turmoil in an area which, with the exception of China, cannot be expected – even in the most optimistic of views – to undergo any decisive upturn before the start of the next century.

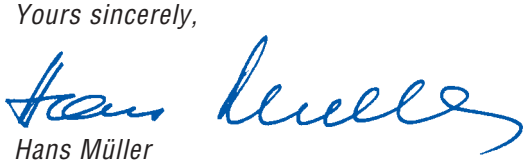
The European market and the North-American free-trade association, NAFTA, including South America, made contributions of 40% and 25% respectively to our order book and are developing during the current fiscal year much better than anticipated during the planning stage. Even if the markets in Eastern Europe and South America only show slight signs of improvement, the major projects under consideration in South America in particular are closer to being realised than ever before.

Altogether, new orders received in the current fiscal year have reached the same level as the comparable of last year, with an ongoing upward trend in evidence.

You can see which developments, innovations and records are primarily responsible for this optimistic outlook in this sixth issue of the "twogether" magazine. In particular, it is our innovative concept solutions which have served to improve quality and productivity, impressed our customers and helped to set new standards.

Without an active dialogue with you, our customers, this would not have been possible. I would therefore like to take this opportunity of thanking you for your cooperation and hope you enjoy reading the interesting articles in this issue.

Yours sincerely,



Hans Müller

The managers of Voith Sulzer Papiertechnik on the current situation

For the Stock Preparation Division, this year will be marked by the market launch of our new screening machine series. For the reycling of secondary fibres, a major task in stock preparation, this screening technology has a decisive part to play.
The new series represents the result of some years of research and development on the processes that take place at the screen and between screen and rotor. With the aid of complex computer simulation and advanced ultra-sound measurement technology we have obtained essential knowledge on the actual flows in the screening zone. This has led to the development of new casing geometry and rotor design concepts. With the launch of this new screen generation we expect to boost our business in the updating and improvement of existing plants.
Of course, Stock Preparation is also affected by the current crisis in Asia , since this region has become one of our most important markets in the past few years. However, we are relying on long-term dynamics and on the potential of this economic region. For this reason we recently acquired a majority stake in R. Dan, Manila, a partner of ours for many years, in order to secure a strong foothold for our future in Asia.

Dr. Lothar Pfalzer
Stock Preparation Division

Despite the crisis that is currently shaking Asian markets, the Paper Machine Division Graphic has continued to make progress. Investment activity within the European and American paper industries has gone up substantially. In addition to the purchase of some new machinery, the industry is concentrating its efforts on the extensive updating and improvement of existing plants. Innovative concept solutions aimed at boosting productivity and improving quality have given us a satisfactory starting basis. The excellent results achieved with innovations ranging from ModuleJet to Sirius, including our new DuoFormer TQ former concept in Jämsänkoski, all launched within the past few years, have helped us to convince many customers to place their investments with us.
As far as investments in new plant are concerned, two specific orders deserve attention: a new newsprint machine featuring trend-setting press technology which is bound to evoke great interest in the entire paper industry, and one of the world's most advanced machines for online calendered SC papers.

The tissue business in North and South America also developed satisfactorily. Investment here was concentrated on new plant, enabling us to book in several worthwhile orders.

Dr. Hans-Peter Sollinger
Paper Machine Division Graphic

The Board and Packaging Division is the youngest operating division within Voith Sulzer Paper Technology: we have just celebrated our third birthday.

Our mission is simple: to be the best in our field! Best in operating performance of our machines, best in serving our customers. Our team is knowledgeable, we are there when our customers expect us.

The narrow focus on folding boxboard, containerboard and packaging papers, with a dedicated Research and Development Center, allows rapid product development and high efficiency during customer trials. To date we can show two new machine concepts and two new gap formers – all for the never ending quest of achieving better paper quality at higher machine speeds. And, of course, lower cost per ton too!

Containerboard machine speeds are approaching newsprint levels of only five years ago, resulting in tremendous productivity gains and lower capital cost. This should provide the impetus needed for replacement of older, less efficient production lines.

Our customers seem to agree with us, booked orders are at record levels for our division.

Otto L. Heissenberger
Paper Machine Division
Board and Packaging

When the Finishing Division introduced its new calendering technologies to the expert world – key words: Janus and Ecosoft – the opinion was unanimous: a highly innovative approach.

The only question that remained was whether it would genuinely be possible to translate the benefits of the new concepts – solidly founded in theory – into practice according to a "one-to-one" ratio?

The first reassuring answer came from tests carried out with our customers' papers at the Janus Technology Centre in Krefeld, Germany. Of course, final proof could only be obtained in continuous operation.

In the meantime the new solutions have proved their worth:

In addition to the world's first on-line Janus at the Lang company in Ettringen, Germany, various off-line Janus calendering machines are running at the Maastricht and Gratkorn mills of KNP LEYKAM, while at Oji in Yonago the first Janus is running in an off-line coater.

With these installations we are now able to present – only two years after introduction of the innovative Satinage concept – examples of successful practical applications.

But finishing is more than just producing satisfactory surfaces. It also encompasses the cutting and packaging of rolls. Economical, high-quality roll packaging was obtained by using the flexible, space-saving Twister. More than ten plants, some already in production, have confirmed this concept too.

The Toro roll cutting machine is our latest product. Not only the name but also the entire winding concept is new. The first orders confirm that customers greatly appreciate the Finishing Division's innovative power. With Janus, Ecosoft, Twister and Toro, the Finishing Division can offer the paper industry "systematic finishing": complete, made-to-measure solutions based on the use of advanced modular technology.

Our declared target is to convince users with our performance in the future as in the past – and we certainly have enough good ideas in reserve to achieve this aim! The Finishing Division still has one or the other surprise or secret "in stock". And in due time we will unveil them – maybe in one of the next "twogether" magazines. It's worth keeping an eye on the latest news from the Finishing Division!

Dr. Dieter Kurth
Finishing Division

The "Status-Quo" for the paper industry today is one of change. The dynamics of the current situation for the papermaker and the supplier base require all of us to maintain stable operations while meeting new challenges.

The Service Division of Voith Sulzer Paper Technology today is concentrating on maintaining a solid, stable base of local Service Centers nearby our customers/ partners so that we can provide the best in support services.

As we strive to deliver maximum value, return and dependability, we realize that our main objective must be service that yields top quality and the lowest possible cost per ton.

While we maintain this focus on stability, we are also concentrating on strengthening our market presence with new products, services and locations. In this issue you will read about our partnership with RIF Roll Covers in Italy. We have recently approved the expansion of our West Monroe, LA (USA) Service Center to begin offering rubber and polyurethane roll covers.

We will open our newest Service Center in Farmington, NH (USA) in July and we have recently approved the acquisition of a first class roll grinding supplier in Sweden which will be expanded to a full line Voith Sulzer Paper Technology Service Center for the regional area.

Additional plans are in progress for expansion of Service Centers into Asia, additional Scandinavian locations and also in South America.

So, we are on the move, in an ever changing environment. Our goal is to continue to be a trusted partner, around the world, in assisting our customer in achieving maximum optimization of their activities and investments.

R. Ray Hall
Service Division

Thanks to consistent, intensive effort we have succeeded in supplying our customers continuously with further developed plants that have improved productivity and quality still more for a wide range of paper and cardboard grades.

The vast, constantly growing capital requirement needed for the operation of a new complete or technically modified production unit is also a reason why efficiency must be boosted still further.

In this context, plant machinery is an essential element from the technical and technological point of view, but once the investment has been made, efficiency depends solely on the degree of production plant optimisation.

Providing our customers with process support in a manner as consistent as possible with the joint aim of achieving a highly efficient production process is – along with the further development of plant technology – an increasingly vital task to which we are willing to devote all our efforts.

Dr. Hermann Jung
Finance and Controlling

twogether

Do you remember? Three years ago Voith and Sulzer merged their paper technology product sectors in order to go forward jointly into the future. They summed this merger up by coining the phrase “twogether”. This was well received. For two traditional paper technology companies, whose production locations were not at all far away from each other, to combine their experience, production and research potential was well received in this age of globalisation. “We need powerful, internationally competitive partners”. This was the accurate, majority view within the paper and board manufacturing industry, which is undertaking its own consolidation process for similar reasons.

The marriage has been celebrated. The house has been set up and areas of responsibility defined. Joint business activities have proved to be highly successful. The two previous companies have merged successfully into one. Voith Sulzer Paper Technology has won recognition as a company. Should the “twogether” company now break away from its highly original logo? Yes and no! In terms of the consolidation of the two areas of paper technology into one individually responsible company, the term “twogether” has indeed served its purpose. As a vision for an even better level of cooperation between Voith Sulzer on the one hand and the paper and board manufacturing industry on the other, this applies just as much as it ever did. It is precisely this common bond, this customer loyalty, that we have been aiming for on that distant horizon.

Therefore we shall now desist from using the term ”twogether” in as far as it relates to Voith und Sulzer. As a term for co-operative processes and handling, for constantly improving products, for the bond between Voith Sulzer and the paper and board manufacturing industry, we will continue to use it. As a result, our customer magazine will continue to bear the title “twogether”, which has become a worldwide recognised link and a communication tool between the paper industry and our company. I hope that you too will concur with the sentiments expressed by the term “twogether”.

Yours sincerely,

Wolfgang Möhle

Dr. Wolfgang Möhle, Corporate Marketing

Stock Preparation Division:

New process technology for high quality deinked pulp

The author: Harald Selder, Stock Preparation Division

Following comprehensive trials carried out in the pilot plant of the Voith Sulzer Stock Preparation Division in Ravensburg, Germany, UK Paper, a paper mill located in Kemsley, Great Britain, and belonging to the Fletcher Challenge Group, placed an order for the supply of a turn-key deinking plant for the preparation of recovered mixed office papers. The following is a report on the process installed at Kemsley.

The report comprises the following sections:

- Procedure in developing the system
- Pilot plant trials
- Project realization based on the results of the pilot plant trials.

Procedure in developing the system

Factors influencing the design of the plant

Fig. 1 shows the factors of particular importance to the customer in designing his deinking plant. The two most important factors are the type of raw materials and the requirements for the finished stock. Other factors are fresh water consumption, the amount of rejects material and personnel as well as control and instrumentation costs. Combining personnel and control and instrumentation costs into one block is because of the close relationship between these two parameters. Experience generally shows that where control and instrumentation costs are high, personnel costs can be reduced to a certain extent. The two most important parameters of influence, finished stock requirements and grade of raw material, are now dealt with in detail.

Finished stock requirements

In Central Europe, UK Paper is one of the leading manufacturers of high quality, wood-free business papers, including copy papers. This exacting production program thus automatically places great demands on the raw material. The following lists the most important optical, technological and colloidal-chemical criteria for enabling the use of deinked pulp in UK Paper's products:

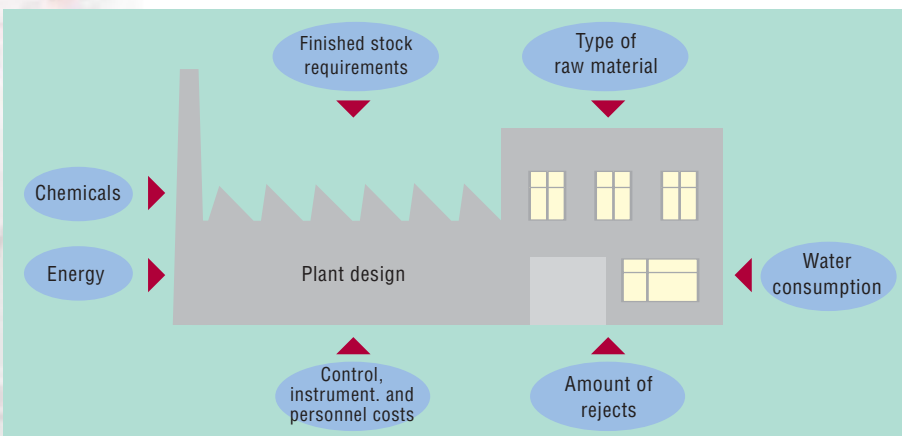


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Fig. 1: Factors influencing the design of the plant.

Fig. 2: Characterization of recovered mixed office papers (after pulping and coarse screening).

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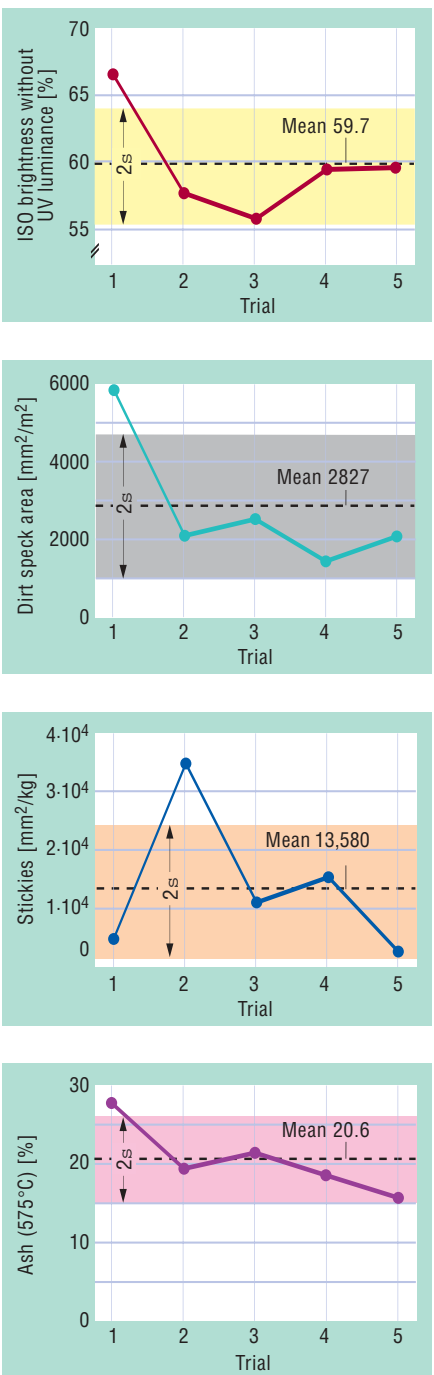

- Finished stock brightness 80-85% ISO without UV luminance
- Cleanness ✣10 ppm
- Stickies ✣150 mm²/kg
- Ash ✣5%
- Freeness 420-370 CSF
- Low/constant cationic demand
- Low COD value.

With the exception of freeness, ash and stickies content, the requirements are roughly the same as for virgin fibres.

Raw material

Following comprehensive research and studies carried out by UK Paper, the decision was made to use recovered mixed office papers from the London area. This decision was made on the basis of price, quality and availability.

Technological characterization of recovered mixed office papers

5 pilot trials, each with 3 tonnes of recovered mixed office papers from London and surrounding areas, were carried out in the pilot plant facility of Voith Sulzer's Stock Preparation Division in Ravensburg. This enabled an optical and technological characterization of this raw material to be made. In view of the large amount of recovered paper processed during these trials, the characterization results can be taken as representative. These comprise the characteristics of brightness, cleanness (expressed as the dirt speck area), stickies and ash.

The characterization results are shown in *Fig. 2.*

As regards brightness, the recovered mixed office papers have an average ISO value of 59.7% (without UV luminance). The standard deviation here is ± 5% ISO points. The average cleanness, expressed as specific dirt speck area, is 2827 mm²/m². The fluctuations in cleanness are ± 1600 mm²/m². As for stickies, the average contamination is 13,580 mm²/kg, with the values showing a standard deviation of ±11,600 mm²/kg. These large fluctuations are typical for recovered mixed office papers, and can be attributed to the varying content of self-adhesive (pressure sensitive) envelopes.

The average ash content of recovered mixed office papers is 20.6% ±5%, based on an incineration temperature of 575°C.

These average values must now be set against the requirements placed on the finished stock. From this comparison the required system efficiency as illustrated in *Fig. 3* is derived.

As regards ISO brightness (without UV luminance), an average absolute increase of 22.8% points is necessary. With stickies, the required reduction is 98.9%, while with ash it is 75.7%. The highest required system efficiency concerns stock cleanness, where the reduction is 99.65%. To achieve these objectives, the stock preparation technician can use the following system modules. The process modules have, as *Fig. 4* shows, very specific ranges in efficiency. As far as the increase in brightness is concerned, the

Fig. 3: Determining the necessary system efficiency.

Fig. 4: Efficiency ranges of the process modules.

Fig. 5: Absolute efficiency of the process modules in the preparation of recovered mixed office papers (average values from approx. 20 trials).

flotation and bleaching stages are the most effective modules. The main components for achieving a high degree of cleanness are flotation and dispersion whereas for an efficient reduction in stickies the important modules are screening and dispersion. De-ashing is most effective with the washing module. If recovered mixed office papers are to satisfy the finished stock requirements, all modules need to be installed because of their very specific ranges of efficiency.

Fig. 5 shows the absolute efficiency values of these modules which can be expected in the preparation of recovered mixed office papers. This efficiency quantification is based on approx. 20 trials with recovered mixed office papers carried out in Voith Sulzer's stock preparation pilot plant in Ravensburg.

Fig. 5 shows that it is impossible to achieve the required cleanness and reduction in stickies, even with the use of all available system modules. The dirt speck area is reduced with an efficiency of only 93.4%, resulting in a finished stock load of approx. 200 ppm.

This corresponds to the cleanness level of central European newsprint, produced from 100% recovered paper. As far as UK Paper's products are concerned, this is a completely inadequate level of cleanness.

To achieve a significant improvement in cleanness, double treatment with the

3

Technological criteria	Raw material	Finished stock requirements	Required system efficiency
Brightness without UV luminance	59.7% ISO	80-85% ISO	+22.8% points
Dirt speck area	2827 mm^2/kg	10 mm^2/m^2	99.65% reduction
Stickies	13,580 mm^2/kg	150 mm^2/kg	98.9% reduction
Ash	20.6%	5%	75.7% reduction

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Modules	**Technological parameters**	**Brightness**	**Dirt specks**	**Stickies**	**Ash**
Screening		–	○	●	–
Flotation		◑	●	○	◑
Washing		◑	–	–	●
Centrifugal cleaning	Heavy contraries	–	◑	○	–
	Light contraries	–	–	◑	–
Dispersion		–	●	●	–
Reductive bleaching		●	◑	–	–
Oxidative bleaching		●	◑	–	–

● high ◑ average ○ low – no efficiency

5

Modules	**Technological parameters**	**Absolute change in brightness** % points	**Dirt speck area reduction** %	**Stickies area reduction** %	**Ash reduction** %
Screening		0	20	80	0
Flotation		+ 3	65	30	30
Washing		+ 3	-20	0	85
Centrifugal cleaning	Heavy contraries	0	30	30	0
	Light contraries	0	0	30	0
Dispersion		- 1	65	70	0
Reductive bleaching		+ 8	10	0	0
Oxidative bleaching		+10	10	0	0
Overall efficiency		+23	93.4	97.9	89.5

Fig. 6: Improvement in cleanness through additional modules.

- ❍ *Basic modules, ❋ = 93.4%;*
- ❍ *+ 1 additional flotation, ❋ = 97.6%;*
- ❍ *+ 1 additional flotation + 1 dispersion, ❋ = 99.15%;*
- ❍ *+ 2 additional flotations + 1 dispersion, ❋ = 99.7%.*

Fig. 7: Improvement in Flotation II efficiency with a preceding dispersion stage.

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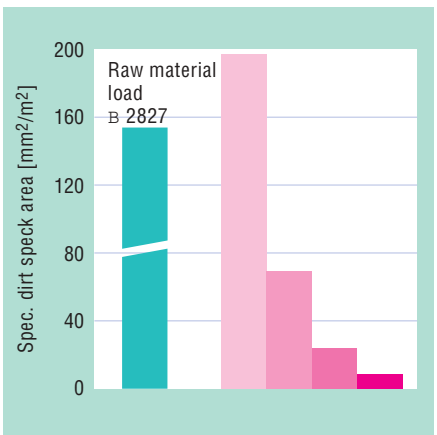

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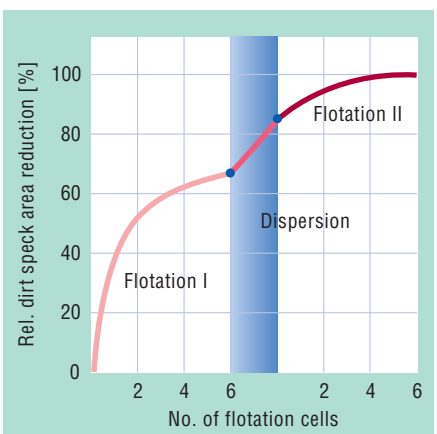

most effective modules, i.e. with flotation and dispersion, is required. With a residual load of 200 ppm and a cleanness target of 10 ppm, the efficiency must be increased by an additional 95%. This corresponds to three additional modules with an individual efficiency of 65% each.

To avoid mechanical overstressing of the fibres, the number of dispersion stages within a system should be limited to two. The remaining increment in cleanness must be achieved using two additional flotation modules. This method of extrapolating the results is illustrated in *Fig. 6*.

Prerequisite for achieving the required efficiency with the additional modules is a correct system integration. The trials showed that the additional flotation stages will only achieve the required efficiency when preceded by intensive mechanical treatment of the stock. This mechanical intermediate treatment on the one hand achieves a further loosening of remaining ink particles from the fibres and on the other hand produces a geometric reshaping of disturbing toner particles.

The flat-shaped toner particles are compacted in hot dispersion and become cubic in shape. The results in better floatability. The synergy relationship between flotation and dispersion modules is graphically illustrated in *Fig. 7.*

It can be seen that no worthwhile dirt speck area reduction takes place after six flotation cells. An increase in the number of cells in Flotation I would therefore not achieve any further improvement in cleanness. Only after an intermediate dispersion stage is it possible to achieve a further improvement in cleanness with the help of flotation technology. In summary, one can say that, to achieve the required characteristics as regards cleanness, brightness, stickies and ash contents, the papermaker needs to install all available system modules as well as two additional flotation stages and one further dispersion module.

Pilot plant trials and project realization

The machine sequence for the pilot trials was determined based on extrapolated results and the synergy relationship between the flotation and dispersion modules. *Fig. 8* shows the process arrangement used for the pilot trials in the form of a simplified block diagram.

The system diagram shows that all available process modules are involved, and that the required additional modules have also been integrated. It also shows that the synergy advantages between the flotation and dispersion modules have been fully exploited. In other words, mechanical treatment in the form of a dispersion stage takes place between each flotation stage.

This arrangement was used in Voith Sulzer's Stock Preparation pilot plant facility in Ravensburg for a total of five trials. In four trials the finished stock requirements were fully met. The required cleanness was not however fully achieved in one trial. The reason for this was a change in the additives used in the flotation stages.

In general, however, the trial results showed good correlation with the extrapolated results. The reduction in dirt speck area in the process stages is used to illustrate the efficiency of the system.

Fig. 8: Process arrangement used for the pilot trials.

Fig. 9: Reduction in specific dirt speck area through the individual process stages.

Fig. 10: Simplified block diagram of UK Paper's RCF (Recycled Fibre) plant.

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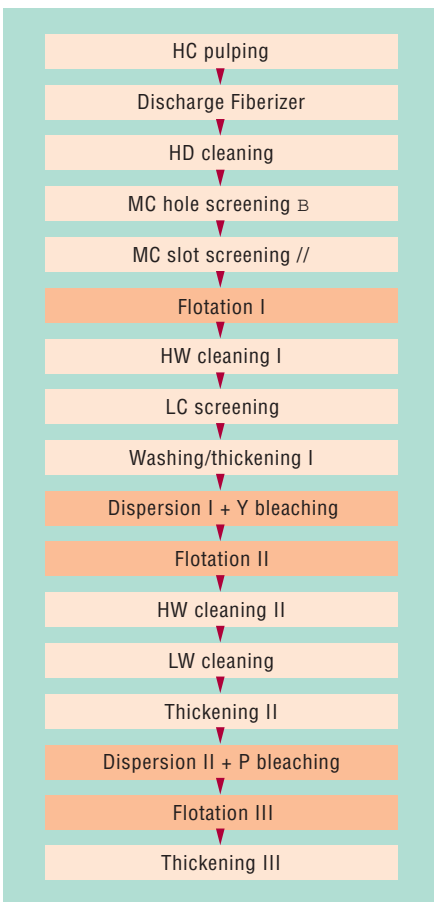

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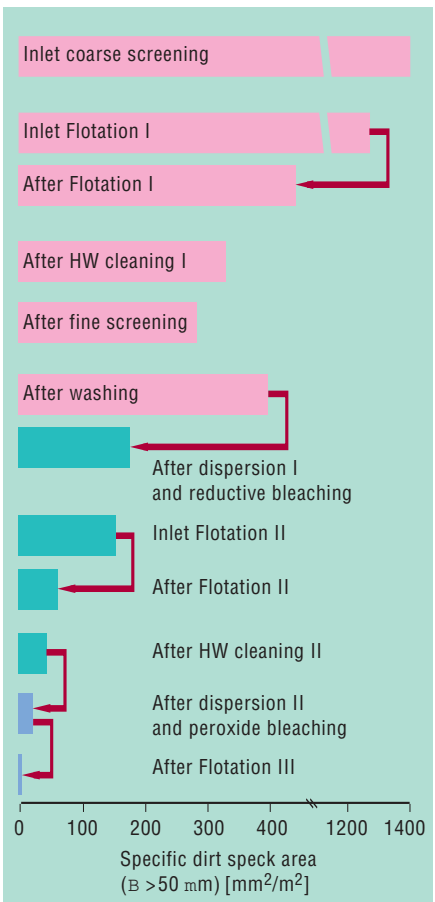

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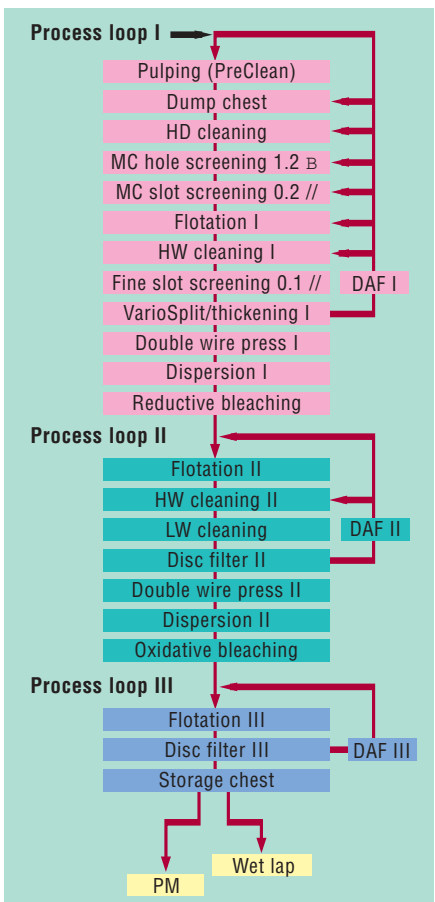

The initial dirt load in *Fig. 9* was 1400 ppm. The first significant increase in cleanness is obtained with Flotation I, whilst the second increase is with Dispersion I including reductive bleaching. Then follow noticeable reductions after Flotation II and Dispersion II.

In Flotation III cleanness is improved from approx. 20 ppm to under approx. 5 ppm. Overall the dirt speck area is reduced in this system from 1400 ppm to 5 ppm, which represents a system efficiency of 99.65%. The process arrangement, as simulated in the Voith Sulzer's trials, was exactly taken over for UK Paper's project. The result is the new RCF (RCF = Recycled Fibre) plant in Kemsley as illustrated in *Fig. 10*. The following report by Peter Christmas, Operations Manager of UK Paper, Kemsley, describes the plant in detail.

Summary

The special features of the Voith Sulzer system are summarized as follows:

- 3 separate process loops with 3 flotation stages, 2 dispersion stages, 3 separate water loops, including 3 water treatment stages
- Combined MC hole and slot screening and additional LC screening with a slot width of 0.1 mm
- 2 bleaching stages in Y-P sequence
- In-line brightness and dirt speck measurement
- No intermediate chests, with the exception of the pulper dump chest and finished stock storage chest.

The author:
Peter Christmas
UK Paper, Kemsley,
Great Britain

As already described in the previous report by Harald Selder, UK Paper had, after a number of comprehensive trials and studies, decided to realize the deinking project using the system design developed by Voith Sulzer Paper Technology. We also decided to transfer total responsibility for process engineering, control and instrumentation technology and commissioning to Voith Sulzer. The reason was that we did not want to start such a project without an experienced and competent complete systems partner. Voith Sulzer has considerable specialist knowledge and was also able to provide suitable plant references. The following report describes the Kemsley RCF (Recycled Fibre) plant in detail, dealing with the following areas:

- Chronology of plant construction and process description
- Quality development during the optimization phase
- Cost structure and comparison with other market DIP plants.

The Kemsley RCF plant

General details

The overall site on which the Kemsley RCF plant was built covers 54,000 m^2. The site includes two building complexes, – the warehouse for recovered paper and the machine building.

Fig. 1: View of the RCF plant buildings in Kemsley.

The recovered paper warehouse can store up to 15,000 tonnes. All main stock preparation machines as well as the water treatment equipment are located in the machine building, with a floor area of 7600 m^2. *Fig. 1* shows the machine building with the adjacent warehouse for recovered paper.

In the surrounding industrial zone, two large paper mills are located quite nearby. This enabled us to enter into an appropriate service contract with the service organization already supplying the two paper mills with power and steam and also taking care of effluent and waste material disposal. Total investment for the deinking plant was 43 million pounds Sterling. Plant capacity is 110,000 tonnes per year finished stock. This requires processing approx. 180,000 tonnes of recovered paper per year. The recovered paper consists of unsorted, mixed office papers. To achieve the necessary tonnage, the plant must operate 363 days per year.

Table 1: Process data

Pulping consistency	18 - 22%
Specific pulping energy	28 - 30 kWh/t
Reductive bleaching	0.65% stabilized dithionite (Hy-Brite)
Oxidative bleaching	1.3% peroxide (H_2O_2, 100%)
Flotation additives	1% soap + 0.01% synthetic foaming agent
Overall specific dispersion energy	160 - 180 kWh/t

Table 2: Quality comparison

Parameters	Unit	UKP DIP	100% SF chem. pulp	50% SF chem. pulp 50% LF chem. pulp	100% LF chem. pulp	100% SF/CTMP (bleached)
Brightness	% ISO with UV % ISO w/out UV	100 86.5	91 91	90 90	90 90	85 85
Dirt speck area	mm^2/m^2 (ppm)	4-6	1-5	1-5	1-4	1-6
Stickies	mm^2/kg	< 80	< 20	< 20	< 20	< 40
Freeness	CSF	400	460	420	500	470
Tensile index	N · m/g	50	49	66	81	41
Tear index	mN · m^2/g	10.8	7.1	10.9	11.1	9.3
Burst index	kPa · m^2/g	3.3	3.8	5.8	7.8	2.9

(SF = short fibre, LF = long fibre)

Chronology of the plant construction

Construction work started in September 1994 with the demolition of unused buildings, and the foundations were laid in October 1994. The first machines were installed in March 1995 and installation of the plant was completed by September 1995. The first phases in commissioning the plant then began, and production of deinked pulp started on the 11th of November 1995. At the end of January 1996 optimization work commenced. The amount of sludge "produced" annually in the RCF plant is 70,000 tonnes. It comes out of the system with a dry content of 60% and is used to improve neighbouring agricultural land. This form of sludge utilization is carried out under the supervision of the government authority ADAS (Agricultural Development and Advisory Service). The average content of inorganic components (ash) in the sludge is around 70%. Apart from sludge, some 3% of plastic and metal waste is removed and then disposed of on the communal rubbish dump.

Finished stock production was 73,000 tonnes in 1996, the first year of operation, and production for 1997 was set at

Fig. 2: Development in deinked pulp cleanness
Still acceptable
Target

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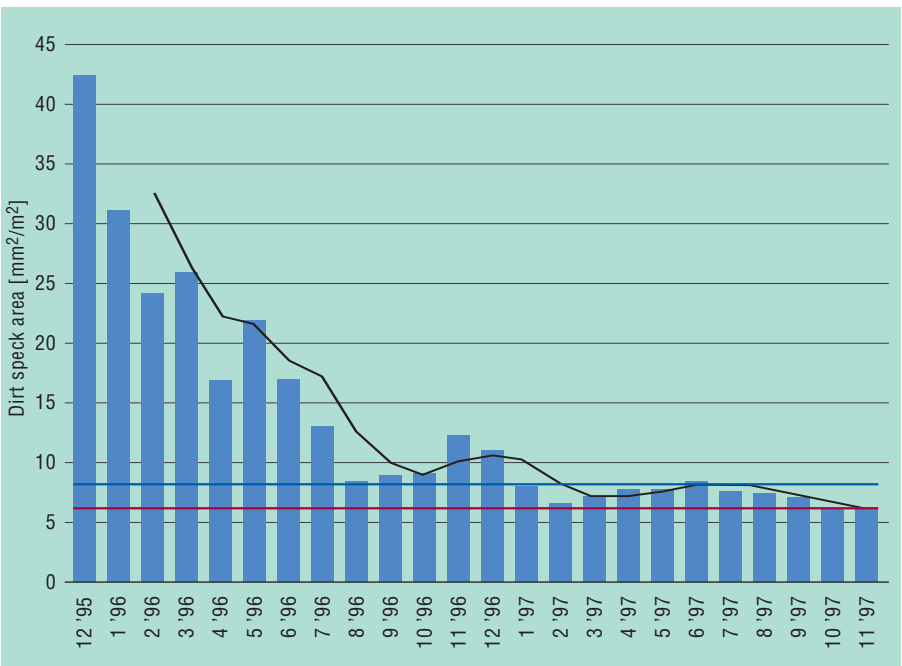


96,000 tonnes. The utilization rate of the deinking plant depends primarily on the amount of deinked pulp used in the paper mill. It requires a considerable learning process for the stock preparation technician and, in particular, for the papermakers, to be able to use a high proportion of deinked pulp without detracting from paper machine efficiency and product quality.

At present UK Paper produces copy paper grades on a 7500 mm wide fourdrinier machine at 950 m/min using 100% deinked pulp. The papers are surface treated using a film press.

The sales and marketing personnel also have to go through a learning process similar to that of the stock preparation technicians and papermakers. They have to learn how these recycling products can be marketed most effectively as regards pricing and sales markets.

Process description

The process realized in Kemsley is illustrated in Harald Selder's article, Fig. 10, page 9.

The special features of the Kemsley system are the 3 process loops with 3 separate water circuits, with each circuit having its own water treatment. The system was installed according to Voith Sulzer Paper Technology's recommendations. Up to now the only change has been the installation of an additional disc filter before the VarioSplit. The filter is used only when required. It is thus possible to vary yield and finished stock quality over a wider range. *Table 1* shows some typical process data.

Plant efficiency and results

The quality requirements can be divided into two areas:

- Visual/physical requirements
- Colloidal-chemical requirements

The visual/physical requirements comprise the following quality parameters:

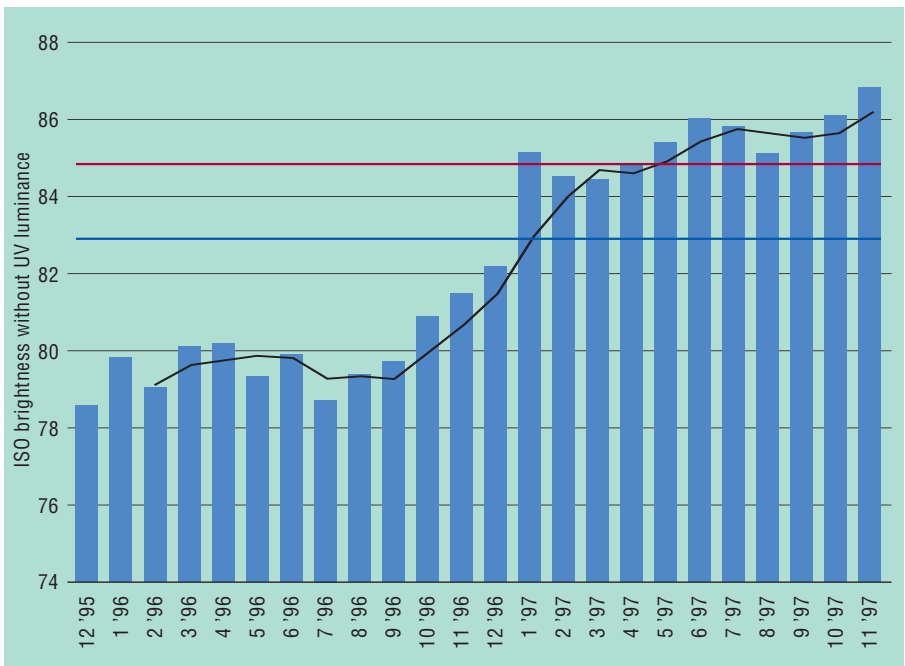
- Brightness
- Cleanness
- Stickies
- Freeness
- Stiffness
- Strength characteristics

Table 2 shows a quality comparison between Kemsley DIP and various virgin fibre pulps. The most important quality parameters of wood-free deinked pulp are without doubt cleanness, brightness and stickies content. These parameters are dealt with in greater detail in the following.

Cleanness

Fig. 2 shows our successful optimization as regards cleanness. For a greater proportion of deinked pulp in the existing production lines of our main customers,

Fig. 3: Development in deinked pulp brightness
Still acceptable
Target



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we had to reduce the originally specified dirt speck area from 10 to under 6 mm^2/m^2 for uncoated grades and to under 4 mm^2/m^2 for coated grades. These revised levels of cleanness allow up to 35% of the previously used hardwood chemical pulp to be substituted by deinked pulp. A further increase in the DIP portion is foreseen for the near future. It has been noted that coated papers calendered in a supercalender react very sensitively to residual dirt specks. Under compression in the supercalender, even the smallest of dirt specks show up again.

The new recycling grades produced from 100% deinked pulp have excellent cleanness and their visual qualities are very convincing. Customer acceptance and sales of this product are consistently increasing.

Brightness

Today, the original target for brightness, 85% ISO without UV luminance, is, in fact, being exceeded. As shown in *Fig. 3,* in November 1997 brightness was 86.5%.

Based on brightness with UV luminance, values of approx. 100% ISO are achieved. This high value is due to optical brighteners in the recovered paper. Since copy papers generally have a high content of optical brighteners, their use can be reduced considerably when using deinked pulp. By using alternative bleaching agents, such as ozone, for instance, a greater fibre brightness is possible, but there is the danger of destroying the effect of the optical brighteners.

Stickies

The deinked pulp produced in the Kemsley plant has never yet been the subject of any complaints about stickies. The wide range of process principles is the main reason for an effective stickies reduction. Particularly important here is the 4-stage fine slot screening with 0.1 mm slot width and the two dispersion stages, with their high specific dispersion energy.

Colloidal-chemical cleanness

Colloidal-chemical disturbances when using a high percentage of deinked pulp are connected with

- Conductivity
- Cationic demand and
- pH value.

To solve the colloidal-chemical problems, individual solutions in the retention systems of the paper machines and in the deinking processes need to be found. These solutions can differ greatly. What is important is whether the paper mill is producing coated or uncoated papers. Experience has shown that it is the broke systems that set off the colloidal-chemical disturbances.

Fig. 4: Cost structure.

Table 3: Applications for the deinked pulp

Qualitatively high-grade, wood-free writing and printing papers	45%
Qualitatively high-grade, coated writing and printing papers	30%
Wallpaper and standard writing and printing papers	10%
Tissue products	15%

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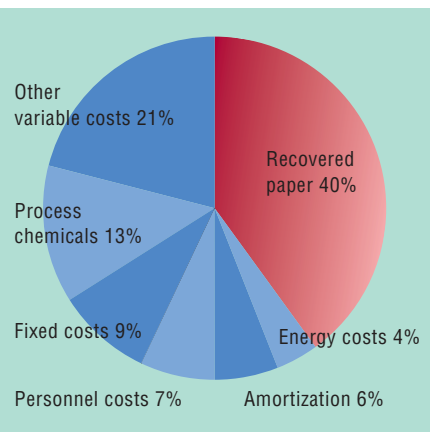


Applications for deinked pulp

Table 3 shows the applications for deinked pulp produced in the Kemsley plant.

Cost structure and cost comparison with different market DIP plants

The main reasons for the economic success of a deinked pulp plant are listed as follows:

Geographic location

- The deinked pulp plant must be near to the source of the recovered paper.

Transport costs for recovered paper are an important cost factor, and it is therefore vital to be as near as possible to its source. In the case of Kemsley, the London business centres supply the RCF plant with the necessary recovered paper.

- The deinked pulp plant must be near to the buyer of the deinked pulp.

Major cost reductions not only in capital expenditure, but also in operating costs, can be secured if the deinked pulp can be delivered in wet form. A drying plant for deinked pulp is extremely capital- and operating cost-intensive. Approx. 75% of the deinked pulp currently produced at Kemsley is delivered to customers located within 3 miles of the RCF plant.

- A suitable infrastructure must be available for the deinked pulp plant.

If the deinked pulp plant can make use of existing power, steam and waste disposal services, the capital and operating costs can be drastically reduced. A neighbouring paper mill with sufficient utility reserves represents the ideal location. The RCF plant of UK Paper is located between two large paper mills.

Recovered paper

According to *Fig. 4,* the cost of the recovered paper represents 40% of deinked pulp costs. To keep this very important cost factor as low as possible, the cheapest grade of recovered paper which still produces the required quality as well as an acceptable yield, must be used. The Kemsley RCF plant uses only recovered mixed office paper from London and the surrounding areas. The efficiency of the chosen system with its 3 process loops was calculated such that printing inks coming from different printing processes can be removed.

Another line of strategy would be to process qualitatively higher-grade recovered paper with a low process expenditure. This strategy failed because of difficulties in the availability of the higher qualities and because of the uncertain price development for these types.

- Yield is primarily a function of the recovered paper.

European office papers (recovered mixed office grades) have an ash content of between 22% and 26%. The ash content of American grades, on the other hand, is in the region of 12% to 15%. This difference is due to the higher share of coated products in the European material. The two qualities also differ greatly in the proportion of wood-containing fibres. Because of a higher CTMP content in European wood-free grades, the proportion of wood-containing fibres is around 10% to 15%, while the American equivalent, on the other hand, has a proportion

of < 5%. Through washing, some clear differences in substance losses can be seen. The differences in yield can represent 8 percentage points or more. A representative yield value for the RCF plant is 58% to 60%.

Personnel costs

Personnel costs are determined by the following parameters:

- Plant design
- Ratio of employees with fixed job specifications to employees with variable job specifications
- Wet lap plant/drying
- Power and steam generation
- Effluent treatment.

Energy costs

Energy costs are mainly determined by:

- Plant design
- Availability of a drying plant for the deinked pulp and
- Availability of an existing power station.

Chemical costs

The chemical costs depend on plant design and finished stock requirements.

Disposal costs

The disposal costs for the sludge "produced" depend on the one hand on the disposal possibilities and costs and, on the other hand, on the possibilities for local re-utilization.

Freight costs

Freight costs for the deinked pulp are determined by the distance from the mill using it and by its dry content.

Fixed costs

Due to the low land requirements and lower infrastructural needs, these costs are below those of a pulp mill. The maintenance and material costs are about the same as those for a pulp mill.

Capital costs

Since most plants for producing market deinked pulp (MDIP) have only recently started up and have been financed with public money, the amount of capital expenditure is known. A recent comparison produced the following specific capital costs:

- 800 US dollars per annual tonne (design capacity) for a deinked pulp plant with wet lap plant.
- 1400 US dollars per annual tonne (design capacity) for a deinked pulp plant with drying plant.

Sales price

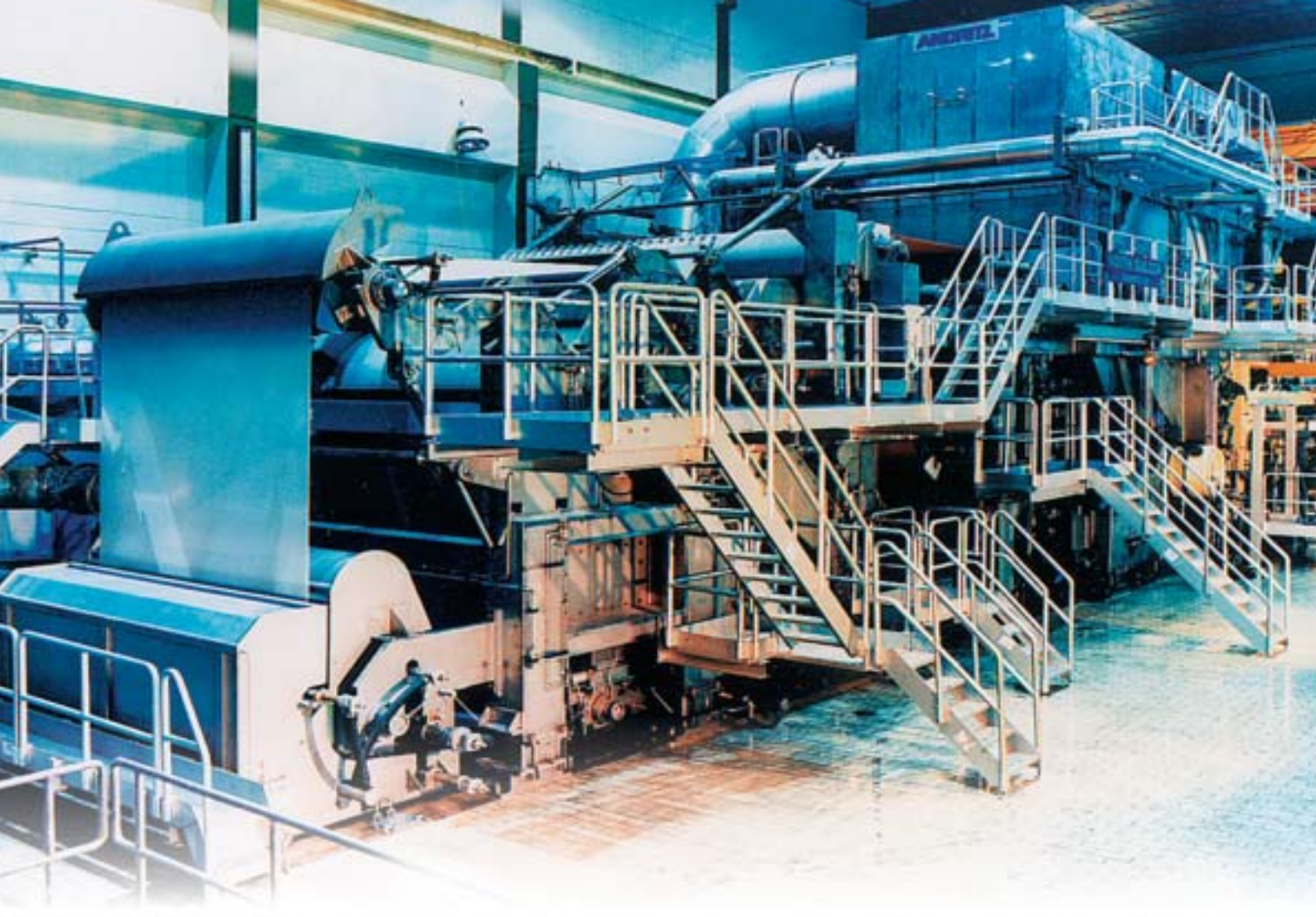
It is extremely difficult to give the latest representative sales prices for deinked pulps, the reason for this being the drop in prices for virgin fibres. The market price for wood-free deinked pulp is generally oriented on southern hardwood chemical pulps. Due to over-capacity in the USA during 1995, 1996 and the beginning of 1997, deinked pulps had to be sold at considerably less than the price for short fibre virgin chemical pulps. Following stabilization of chemical pulp prices, it is expected that deinked pulp prices will stabilize, too. In the long-term, UK Paper expects the DIP price to stabilize around 100 US dollars under the average price for northern long fibre chemical pulps. An additional price reduction can be expected for wet lap pulp.

Cost comparison for various MDIP plants

A recent study in which an independent institute compared 17 wood-free deinked pulp plants showed the RCF plant of UK Paper to be the plant with the most favourable cost structure.

The advantages of the Kemsley plant lie in the low freight costs due to the ideal local situation as well as in the low personnel and disposal costs. Yield is comparable with that of other similar plants. The costs for process chemicals, fixed costs and personnel costs are comparable with those of other wet lap plants.

The more recent, large deinked pulp plants with drying plants are very cost-intensive as regards operation and capital investment. Financial difficulties are therefore to be expected during phases of over-capacity. Provided the smaller, less capital intensive deinked pulp systems with wet lap plant can satisfy the demands of the writing and printing paper manufacturers and freight charges can be kept within limits, operation in the profit zone can be expected.



translating practical experience into system design in a tissue mill

The author:
Helmut Berger,
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This report is about the further upgrading of a plant for preparing recovered papers for tissue production. The results of analyses in the plant, experience from another preparation plant in the same mill and trials carried out in the machine supplier's pilot plant were used successfully for upgrading the plant to tackle the main problem of stickies.

The company

Wepa Papierfabrik P. Krengel GmbH & Co. KG was founded in 1948 by Paul Krengel senior as a paper wholesale company and has grown to become a leading manufacturer of hygiene papers in Europe. Today, the company is managed by the founder's four sons.

At its two locations in Müschede and Giershagen, Wepa manufactures around 125,000 tonnes of paper a year on five paper machines. The production programme ranges from multi-ply toilet papers, kitchen rolls, paper handkerchiefs and cosmetic tissues to single-ply products such as towels and toilet paper *(Fig. 2)*.

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Fig. 1: The new crescent former at the Müschede mill.

Fig. 2: Wepa´s product range.

Fig. 3: Recycled paper with 100% closed loop.

Fig. 4: Aerial view of the Wepa mill at Giershagen.

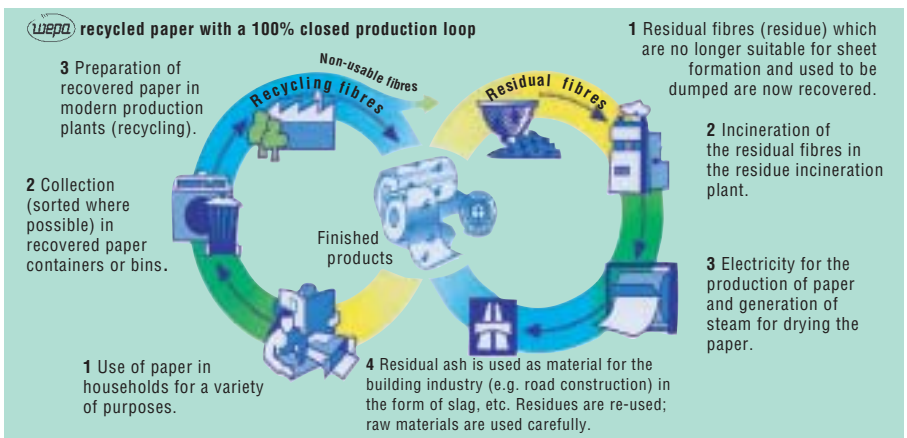
Wepa is a company with a clear commitment to the environmentally correct use of recovered paper as a raw material for the manufacture of hygiene papers. 85% of Wepa's production is based on recovered paper as raw material. In the environmental segment of hygiene papers made from 100% recycled paper, Wepa is market leader for paper handkerchiefs in Germany with its brand name "Mach mit".

A further major step towards the consistent use of available resources was the installation of an industrial power station at the Marsberg-Giershagen location. Here, the residues left over after recycling the reusable fibre content are converted into energy by incineration.

The resulting steam and power are used in the production process. In this way, Wepa manufactures recycling papers using a 100% closed production loop *(Fig. 3)*.

80% of Wepa's sales are domestic with the remaining 20% in neighbouring European countries. With a total of around 700 employees, the family-run company sells to all major food store chains in Germany. Wepa is one of the few medium-sized suppliers in Europe and customers profit from this. The advantages are nearness to customers, fast decision-making and the resulting high degree of flexibility.

Toilet and kitchen papers are manufactured on two tissue machines at the Müschede mill. Cosmetic tissues are produced on the newest machine *(Fig. 1)* which started up in December 1996. This machine, a crescent former, is designed



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for a speed of 2200 m/min. At the Giershagen mill *(Fig. 4)* there are two tissue machines and a fourdrinier machine on which towels and crêped papers are manufactured. While the fourdrinier machine has a maximum speed of 920 m/min, speeds of 1600 to 1900 m/min are normal on the tissue machines.

With the installation of a new twin wire machine from Escher Wyss in 1983, Wepa took the plunge into the (at that time) difficult era of recovered paper recycling. Problems with stickies, shutting down the machine for cleaning – sometimes once a day – were commonplace in those early days and still "stick" in the memory of all tissue-makers who began using recovered paper at that time. Yet it is worth remembering that our new machine already had a production speed of 1500 to 1600 m/min.

Use of recovered paper and problems with stickies

Stickies which are not eliminated during

Fig. 5: Stickies area in the finished stock.

Fig. 6: Ash content in the raw material (wood-free recovered paper).

Fig. 7: Brightness of the raw material (wood-free recovered paper).

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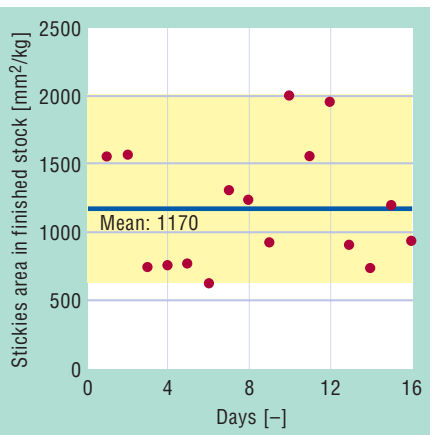

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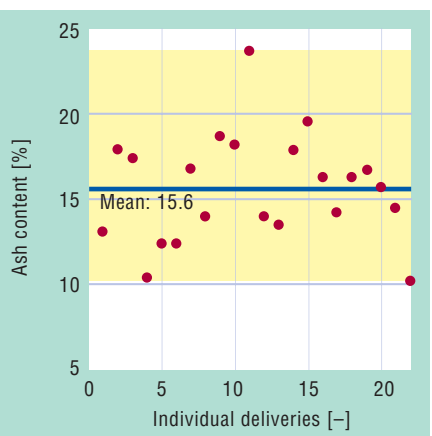

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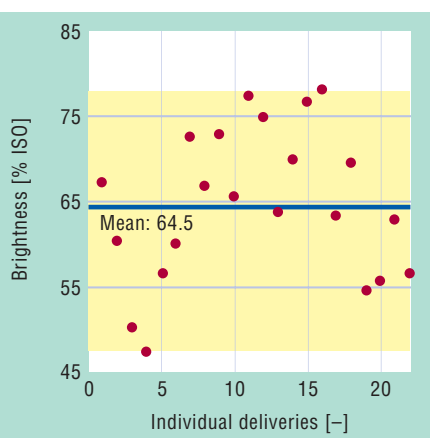


stock preparation – and are therefore still in the stock going to the paper machine – have three possibilities of causing trouble:

- They form deposits on the wires or Yankee dryer felt – thus causing holes in the web – or they collect on the outer guide rolls, are flushed into the sewers and end up in the effluent treatment plant.
- They go through the machine with the paper web and are reeled up with the parent roll. In subsequent converting operations, the danger is that on rewinding the layers of paper stick together, causing sheet breaks.
- They get into the paper machine whitewater loops from where they can be discharged through dissolved air flotation (DAF).

Analyses in stock preparation and observations on the paper machines PM 4 and PM 7 at the Giershagen mill showed the following:

The stickies area in the finished stock ranged between 600 and 2000 mm^2/kg *(Fig. 5)*. The mean value was about 1200 mm^2/kg. Generally, no production problems were experienced on the paper machines within this range. On the other hand, in individual cases there were production problems on the paper machines with a very low stickies area in the finished stock of under 1000 mm^2/kg.

The conclusion is that it is not possible to deduce any clear relationship between measured stickies area and production problems on the paper machines. In other words, there is no limit for the measured stickies area beneath which one can guarantee there will be no production problems.

Experience with other paper machines has shown that the stickies area, however, has to be reduced as far as possible. This saves frequent flushing, i.e. intermittent cleaning of wires and felts with the paper machine running or, in extreme cases, the machine having to be shut down completely for cleaning. Normally, the wires and felts are sprayed continuously with a detergent which also avoids problems in converting.

Two demands are made on the ideal stock:

- First, there must be no problems with the runnability of the paper machine and converting plant, e.g. due to holes and tears.
- Even more important, however, is that the stock has the properties that the end product must have later. These include optical characteristics such as brightness and dirt speck levels as well as mechanical properties such as strength, bulk, wet tensile strength etc.

Recovered paper as raw material is one of the decisive factors influencing the quality of the finished stock. *Figs. 6 and 7* show the quality characteristics of a typical grade of recovered paper – in this case wood-free office papers. The ash content and brightness of 22 deliveries of recovered paper were analysed over a

Fig. 8: The stock preparation plant of PM 4/7 prior to upgrading.

Fig. 9: VarioSplit for removal of ash and fines.

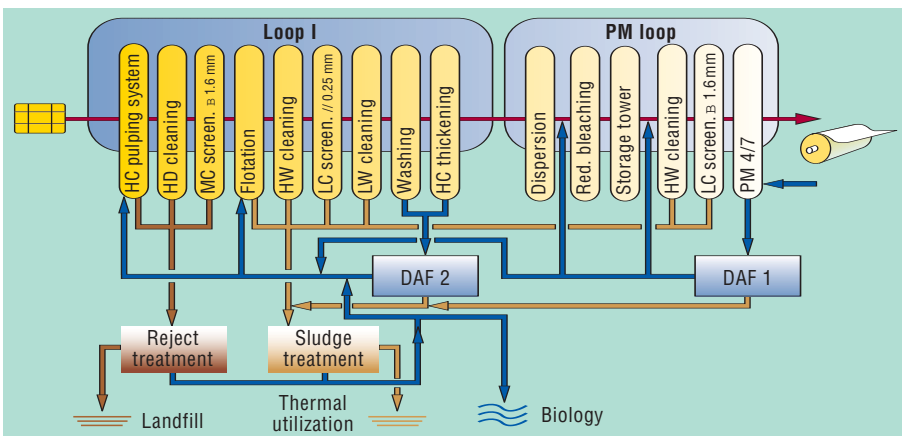
period of 12 days. An enormous spread was found within these deliveries. The ash content varied from 10.2% to 23.7%. Brightness fluctuated by more than 30 points from 47.3% ISO to a maximum of 77.9% ISO.

What configuration of stock preparation is installed that on the one hand reliably achieves the required end-product quality while at the same time more or less balances out the enormous fluctuations?

Stock preparation plant of PM 4/7

A high consistency pulping system pulps down the paper and ensures early removal of disturbing components without reduction in size *(Fig. 8)*. This is followed by high density cleaning and hole screening with 1.6 mm perforation. After this is a flotation stage with six cells, operated without secondary stage and in the neutral pH range, without chemicals. Then comes cleaning of heavyweight particles, followed by low consistency screening with a slot width of 0.25 mm. Lightweight cleaning is followed by washing. High-consistency thickening is necessary for the dispersion stage. Reductive bleaching is then carried out after which the stock is pumped to storage.

The approach flow systems of PM 4 and PM 7 include a further heavyweight cleaning system as well as hole screening as a policing function. Tissue products with approx. 1% ash content are manufactured with this plant using various grades of recovered wood-free office papers. A brightness from 74 to 84% ISO is achieved, depending on the raw material and end product. The stock preparation yield is about 70% and the specific effluent volume is about 7 l/kg of paper. With this low volume of effluent and the already mentioned problems with stickies, the water systems are of decisive importance. Process water is circulated on the counter-current principle. Fresh water is supplemented on the paper machine. Excess water from the PM loop is sent to stock preparation. The system is opened to biological treatment at the point where the water is most contaminated and this is the filtrate from sludge treatment.



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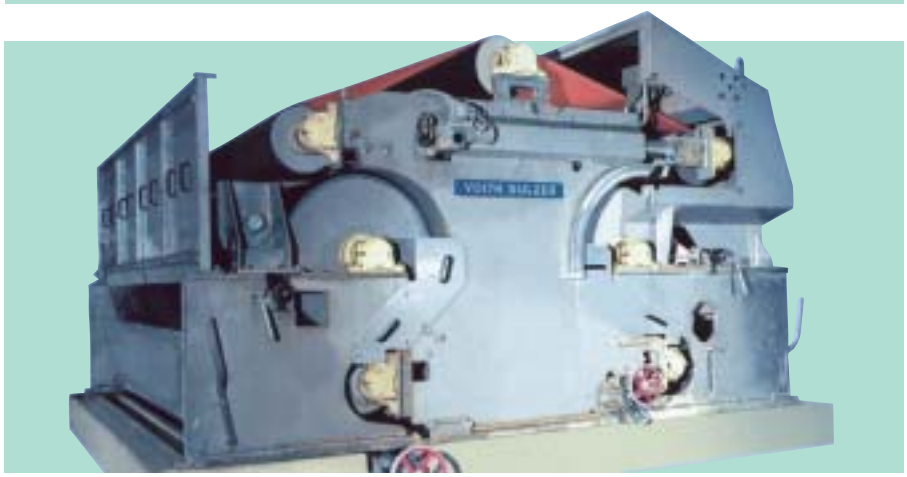

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The high ash content of the raw material must be reduced to about 1%. This is mainly undertaken in stock preparation by the washer *(Fig. 9)*. Unwanted fines are also removed at the same time as the ash.

Ash and fines carried out in the filtrate during washing have to be removed from the water by microflotation. Any disturbing components not yet removed, such as residual ash, fines and ink particles separated by dispersion, are washed out by the paper machine. Here, too, the

Fig. 10: Reduction in dirt speck and stickies area in the stock preparation plant of PM 4/7.

Fig. 11: Reduction in stickies area during system trials in the Voith Sulzer stock preparation pilot plant.

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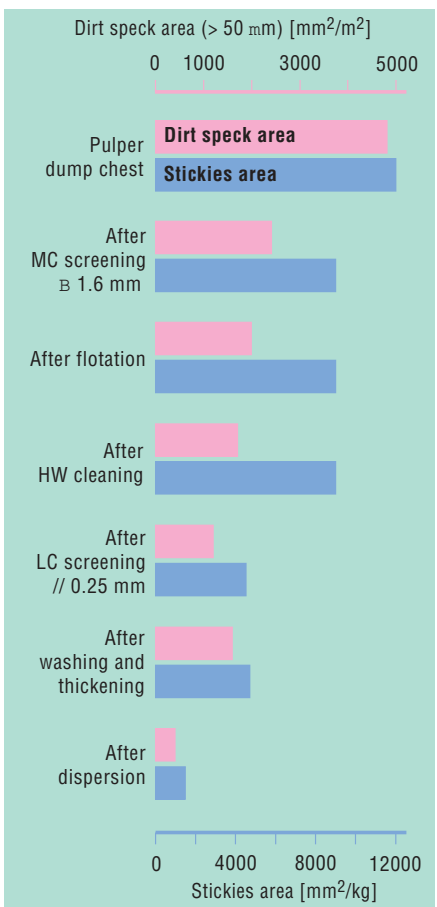

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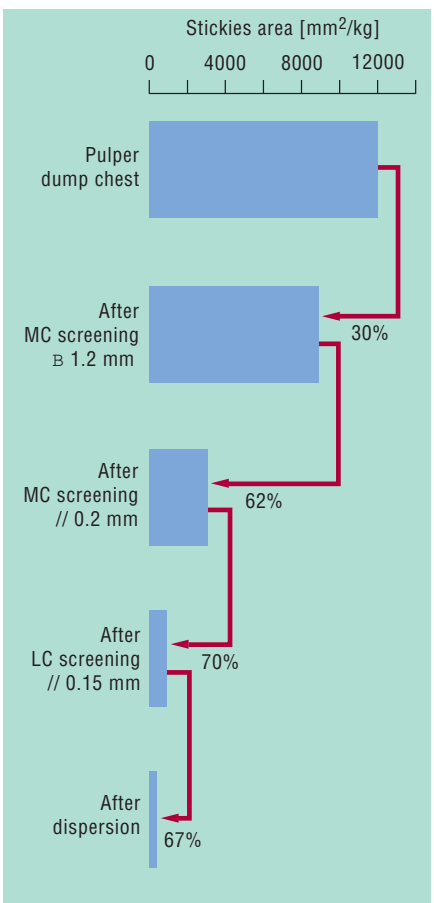


filtrate is also cleaned by microflotation. The sludge from water treatment and rejects from flotation as well as from all following process stages are dewatered to 60% dry content and then incinerated in the mill's own power plant.

The rejects from pulping, high-density cleaning and hole screening are dewatered and go to landfill.

And what does the mean dirt speck and stickies reduction look like for the PM 4/7 stock preparation plant?

Fig. 10 shows mean values from seven measurement series. The dirt speck area is examined in mm^2/m^2 for particles with a diameter of greater than 50 µm. The main reduction in dirt speck area is achieved by

- high density screening by 50% and
- dispersion by 75%.

The reduction in dirt speck area throughout the complete process amounts to 92%.

The stickies area in mm^2/kg is also shown in *Fig. 10.* Measurement of the stickies area was carried out based on the Haindl-Escher Wyss method. Three process stages are of particular importance for the reduction in stickies area:

- MC hole screening reduces the stickies area by 25 %,
- LC slot screening by 50% and
- dispersion by 68%.

Spread over the complete process, a reduction of 88% is obtained. Can these figures be improved still further? And if so, how?

Further development and the 1997 upgrade

To answer these questions, we can use the experience gathered from another plant, – PM 5 stock preparation. Mainly towelling is manufactured on PM 5. With "cold towel rolls", i.e. towel rolls coming from intermediate storage, there were often problems in converting due to layers of paper sticking together, caused by stickies.

This was the reason why the MC screening was renewed on this stock preparation plant in 1994.

A reduction in stickies area of 76% was achieved with a perforation of 1.2 mm and a slot width of 0.25 mm.

The installation of the new MC screening stages solved all production problems and, in particular, all converting headaches.

Experience with PM 5 led to the decision to carry out trials in the Voith Sulzer Paper Technology pilot plant facilities in Ravensburg in order to improve stock quality for the tissue machines PM 4 and PM 7 as well. The basis for this was the existing stock preparation plant PM 4/7, but with the following changes:

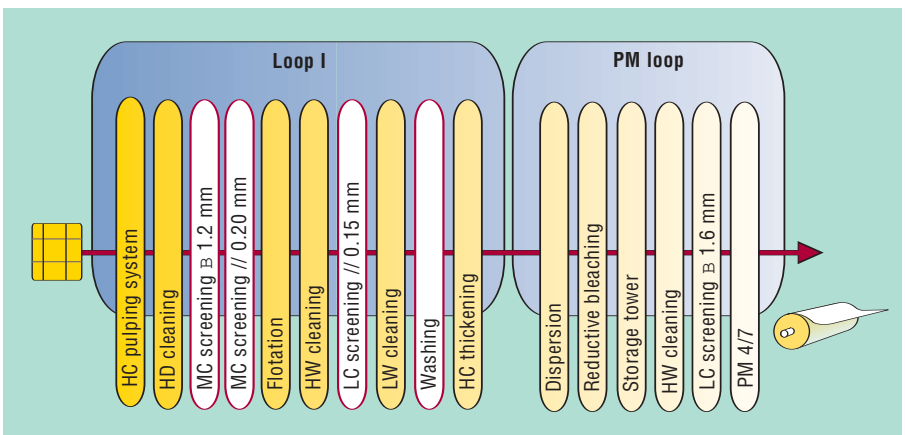
- The perforation of the hole screen stage was reduced from 1.6 mm to 1.2 mm.
- A complete new MC slot screening stage was installed.
- The slot width of the LC slot screening stage was reduced from 0.25 mm to 0.15 mm.

It was gratifying to have the results obtained with PM 5 confirmed by these trials. A reduction in stickies area of 74% was achieved in Voith Sulzer's pilot plant with the MC screening stages *(Fig. 11)*.

Further considerable reductions of 70% and 67% respectively were achieved with the low-consistency screening and dispersion stages, the latter with a specific energy consumption of approx. 90 kWh/t. In all, a stickies area reduction of 97.5% was achieved, compared with 88% with the PM 4/7 plant.

The decision to change the plant concept was made on the basis of these trial results *(Fig. 12)*. The upgrade has since been completed and put into operation. The detailed changes were:

Fig. 12: PM 4/7 stock preparation plant following upgrading.



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- The perforation of the hole screening stage was reduced from 1.6 mm to 1.2 mm.
- A complete new MC slot screening stage with a slot width of 0.20 mm was installed.
- The slot width of the LC slot screening stage was reduced from 0.25 mm to 0.15 mm.
- A new washer was installed for improved reduction of ash and fines.

Latest measurements from the PM 4/7 plant confirm the expectations:

- The MC screening stages reduce the stickies area by 70%,
- LC slot screening by a further 70% and
- dispersion by 67%.

In all, a reduction in stickies area of 97% was achieved.

Conclusions

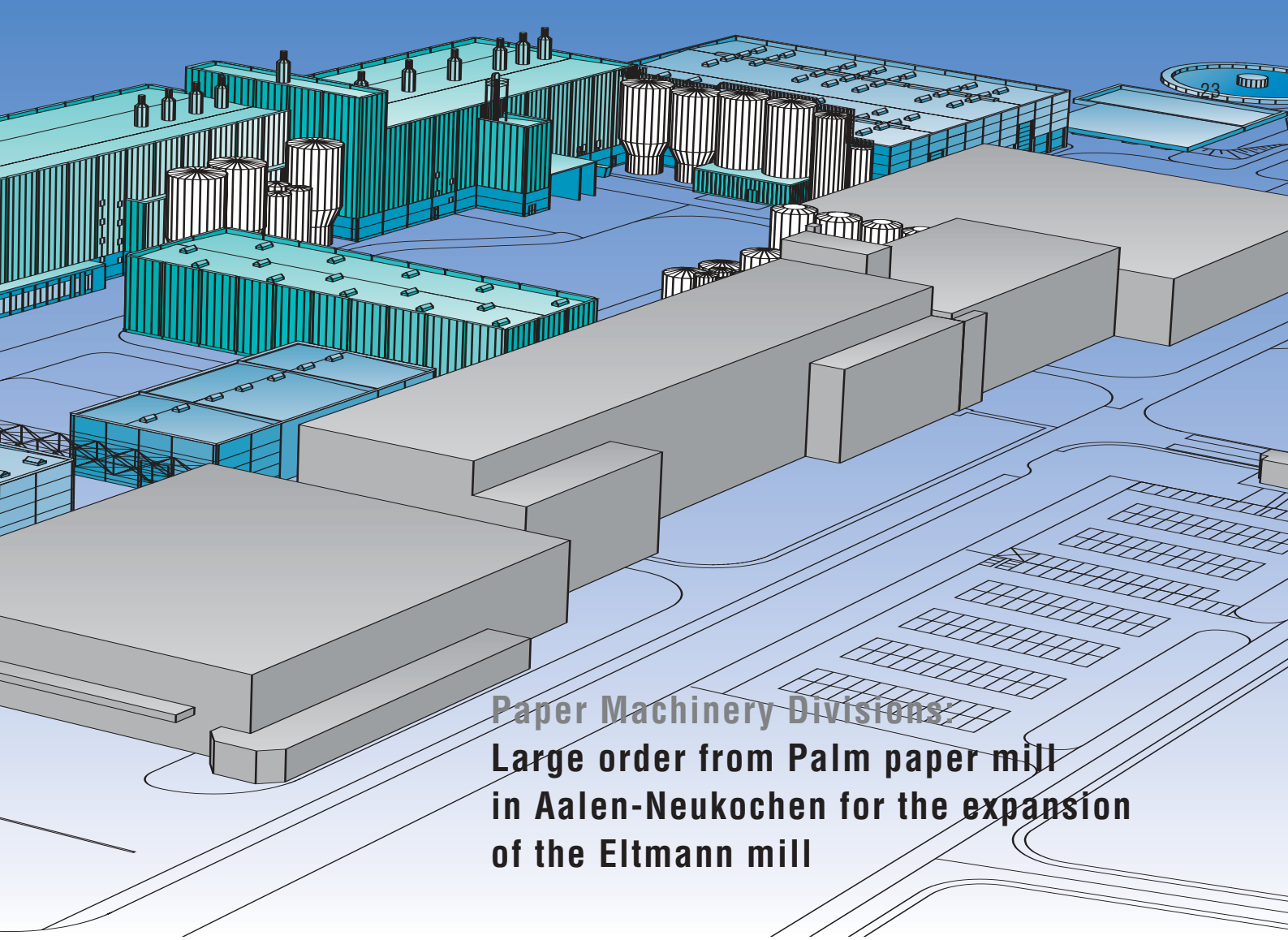
Analyses of the stock preparation under investigation, experience from another plant in the mill and trials in the machine supplier's pilot plant led to an upgrade of the stock preparation plant.

The objective was an improvement in product quality, advantages in converting and a reduction in cleaning work on the paper machines. To achieve this, the perforation of the hole screening stage and the slot width of the LC screening stage were reduced, an MC slot screening stage was installed and the washer was replaced by a new one.

The stickies problem was significantly reduced by these measures. The reduction in stickies increased from 88% to 97% and, consequently, the stickies content in the finished stock was reduced by 75%.

Our expectations for the upgrade have been completely fulfilled.

The Eltmann mill of the Palm paper producers as it is today (lower photograph). The project drawing (top) gives an impression of the size of the planned expansion. Parallel to the present machine room for PM I is the building for the new PM III.



Paper Machinery Divisions:

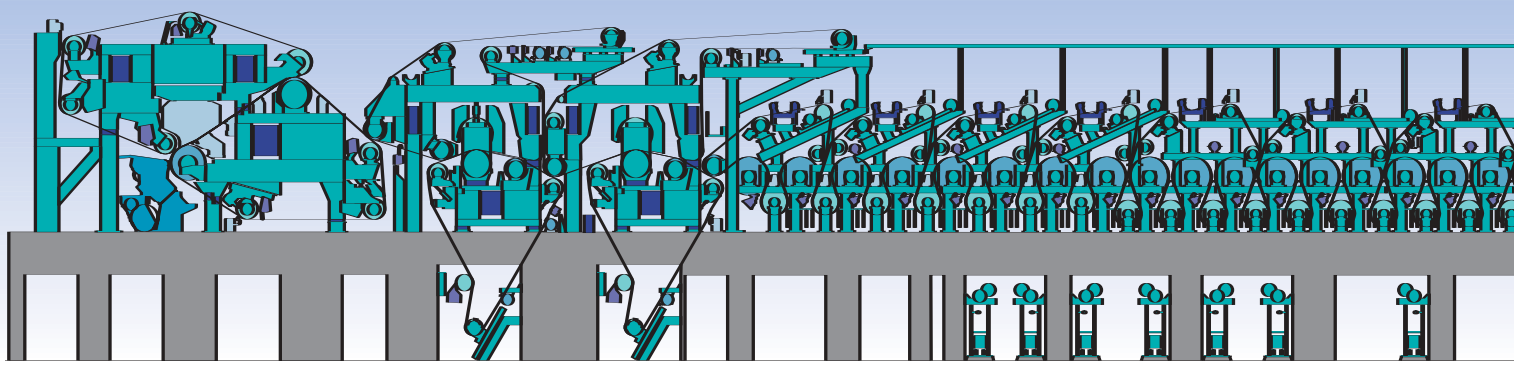
Large order from Palm paper mill in Aalen-Neukochen for the expansion of the Eltmann mill

The paper mill Palm GmbH & Co, Aalen-Neukochen, has placed an order with Voith Sulzer Papiermaschinen GmbH, Heidenheim, and Voith Sulzer Stoffaufbereitung, Ravensburg, for the expansion of their production facilities in Eltmann am Main near Bamberg. The centerpiece of this project is the new PM III, another machine for Palm's very successful production of newsprint paper made from 100% waste paper.

Since its foundation more than 125 years ago, this enterprise, which has been kept in the family for four generations without interruption, has worked exclusively with secondary fibres. Thanks to its wealth of experience in waste preparation and deinking, the organization without doubt occupies a special position within the paper industry. Palm was the first paper mill in Germany to make a success of the production of good newsprint paper exclusively from waste paper.

During the course of its expansion and with its consistent secondary fibre strategy, the company has repeatedly had to explore new territory with regard to both process and machinery. However, courage is always ultimately rewarded by success. With its three paper mills, Palm is now one of the leading producers of newsprint and packaging paper in Germany. A large part of the packaging paper production is further processed in the 8 mills which produce corrugated board and finished packaging and also belong to the group of companies.

Palm and Voith Sulzer Paper Technology are joined together by more than just geographical proximity of the corporate headquarters in Aalen, Heidenheim and Ravensburg! Many progressive ideas, from the first paper machine to the present-day dimension of production facilities, have been implemented and tested jointly.



With a considerable total investment of around DM 500 million for the whole of the Eltmann mill expansion, a considerable part of which is directed towards the new pulp preparation system and PM III, this innovative and cooperative joint venture is being continued.

Apart from proven and successful system components, the *PM III Eltmann* will also receive some new features, which both Palm and Voith Sulzer Paper Technology are convinced will write a new chapter in the future of newsprint production purely from waste paper.

Pride of place here must go to the new press, the Tandem-NipcoFlex, which has two shoe presses, one behind the other, for optimum gentle dewatering at low specific pressures. The Tandem NipcoFlex press is being used in this form for the very first time for a newsprint machine at unprecedented production speeds exceeding the 1800 m/min mark, and for which the PM III Eltmann has been designed. A further plus of the new press configuration lies in the improved quality. As there is no separation pull from the last press, the stretchability of the paper is increased.

Here is the main data for Eltmann PM III: Production capacity 250,000 t per annum, speed more than 1800 m/min and a trim width up to 8050 mm.

The technical design is as follows: ModuleJet headbox with zone-controlled water injection for optimum CD profile; DuoFormer TQ for optimum sheet forming; the new Tandem NipcoFlex press; then the TopDuoRun, a single-tier dryer section with 38 dryers for very gentle drying; HardNip calender as optimized calender and finally Sirius, the new economic winding concept for large dimensional, smooth winding up.

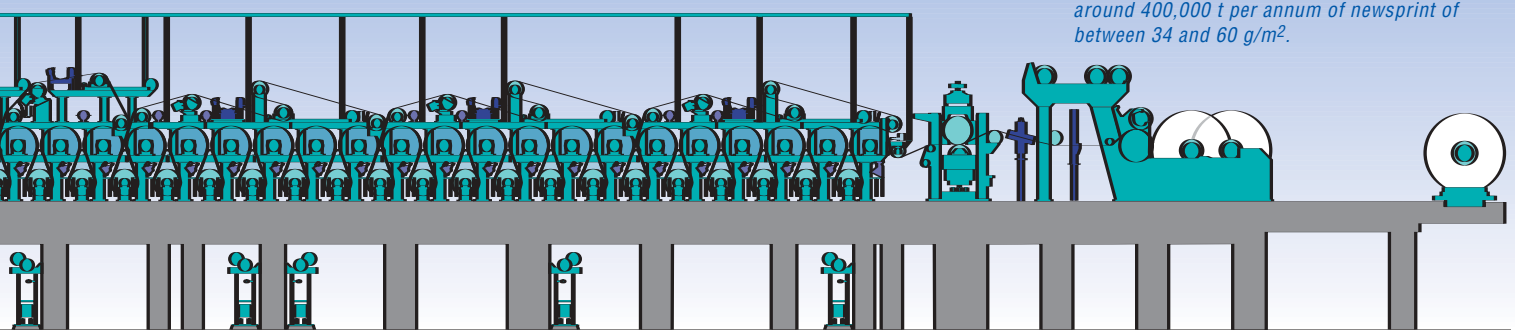
With regard to *stock preparation*, Voith Sulzer Paper Technology received an order for the delivery of two complete stock preparation lines, each with a capacity of 600 t/24 hours. Both stock preparation lines are laid out identically, each consisting of a conveyor system supplied by the Voith Sulzer Group member B + G in Euskirchen, a high-consistency pulper with suitable waste disposal facility and downstream protector system. A highly efficient screening system, together with hole and screening and partially equipped with C-bar technology (0.15 mm slotted screen baskets), completes the line-up.

At the heart of the plant is the Flotation with the latest EcoCells. Thanks to their high efficiency, these cells are now market leaders in flotation of printing inks and other contaminants. A special feature of the system is the kneading dispergers with double-acting kneading zones, with which Eltmann have already recorded some excellent results.

Other machines and assemblies, such as the cleaner system, the agitating propellers and reject compactors as well as total responsibility for the process technology are also included in the scope of supply. In addition, Voith Sulzer Paper Technology supplies the basic as well as the detailed engineering know-how for this part of the plant, including the C & I technology, erection and start-up supervision.

Together with the new stock preparation system, Voith Sulzer Paper Technology also received an order for the expansion of the deinking plant. This rebuild includes the expansion of the existing Flotation system with EcoCells.

According to Dr. Wolfgang Palm, *"The expansion of our Eltmann mill is designed to meet demand and ensure successful sales of our newsprint grades made from secondary fibres. But we want more! It is our opinion that the*

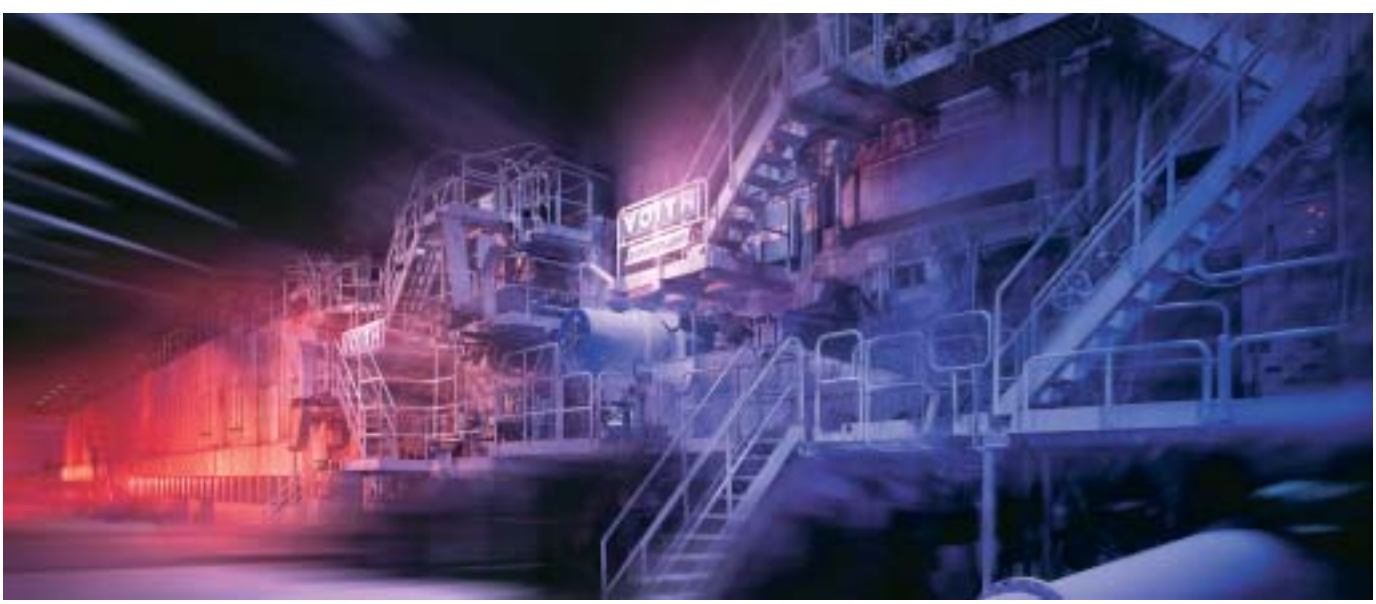


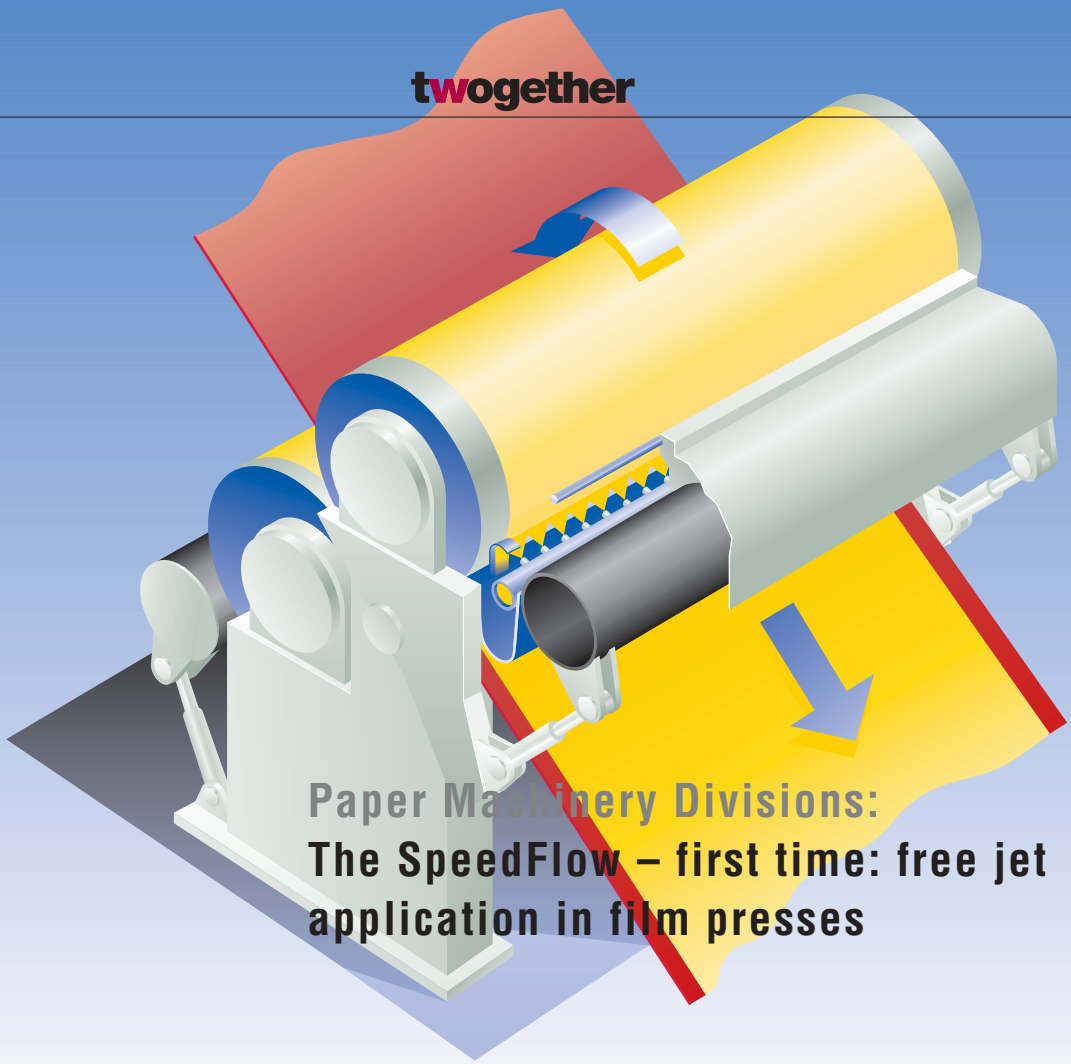
The project drawing of the new PM III. Together with PM I (see photograph below) the Eltmann mill will have a production capacity of around 400,000 t per annum of newsprint of between 34 and 60 g/m².

Federal Republic of Germany has one of the most modern and comprehensive recycling systems in the world. We are on our way to exemplary recycling management, but only on our way – we are not there yet! The outstanding collective results achieved in just a few years cannot yet be compared with the corresponding processing capacities. At present some 3 million tonnes of waste paper are exported every year. What appears economically and ecologically sensible to us represents only medium to long-term processing in the respective country of origin, and not an export-orientated, export-dependent waste disposal industry. Only well-balanced cycles, with short paths between the paper industry, the media, print and packaging producers and the end users, makes any sense. In our corporate and product strategy we see a good opportunity to contribute to such a well-balanced cycle system. We are optimistic and convinced that looking after your resources has a future, and we therefore invest and take chances in the pursuit of testing innovative technology".

This point of view is also confirmed at Eltmann by the application and testing of a new sludge process for waste water processing by means of additional nano-filtration with concentrate treatment, something not yet in major industrial use anywhere else. New routes are also being opened up with the introduction of new energy technology.

The first technical equipment will be in use at Eltmann in late autumn 1999. Official start-up is planned for November 1999.





Paper Machinery Divisions:

The SpeedFlow – first time: free jet application in film presses

The author:
Bernhard Kohl,
Paper Machinery Division
Graphic

The Voith Sulzer Paper Technology Organisation is true to its precept: "Innovation in paper technology, Innovation in the coating technology".

Voith Sulzer Paper Technology were the first to develop the Speedsizer. Since the introduction of this equipment the combination of nozzle application and metering bar has dominated the market. 84 Speedsizers and/or Speedcoaters in 25 countries speak for themselves.

1998 promises to be the year when Voith Sulzer Paper Technology will write a new chapter in the annals of coating technology.

The new Idea

A new revolutionary idea was transformed into the technical solution of the SpeedFlow, proven in practice and all within 12 months! The coating colour is now applied to the rolls in the form of a free jet which means, that the pre-metering is carried out via a number of special MultiJet nozzles, which apply a thin and uniform film onto the rolls. Subsequent equalization can, as previously, be carried out with the proven metering elements.

The new design

Within the field of metering beams, new compound materials, designed to meet specific requirements, enable a completely new design, optimally adapted to the operation.

New advantages

Min. quantity of colour in circulation

The MultiJet nozzles guarantee very thin and uniform film application, which reduces the amount of colour in circulation to a minimum. In addition the applied film is perfect pre-metered.

Edge deckle adjustment at its simplest

The MultiJet nozzles apply the colour without contact onto the rolls. Edge deckle adjustment is possible by means of specific jet deflection in the area of the edges. The expensive, closed nozzle

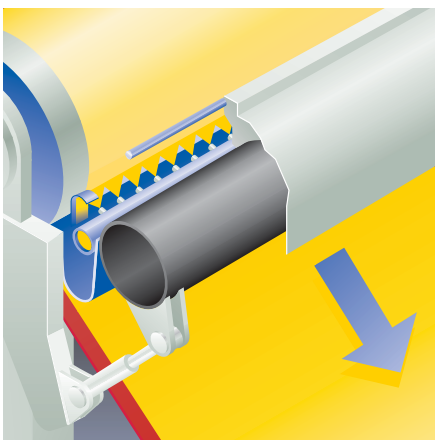
Fig. 1: SpeedFlow.

Fig. 2: Application principle.

Fig. 3: Field of film coating applications.

Fig. 4: Web run from top to bottom.

2



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		Coating weight [g/m^2] per page	Solids content [%]	Viscosity Brookfield$_{100}$ [mPas]
Starch application	Max. penetration	0,15 - 4	5 - 18	10 - 60
		Target: improved Strength characteristics		
Pigmenting		2 - 6	10 - 50	50 - 350
		Target: improved Whiteness and Smothness		
Coating	Min. penetration	5 - 15	50 - 65	300 - 1600
		Target: Best Coverage, Smoothness and Gloss		

chamber over the whole width of the machine as well as the edge deckle adjustment device inside the nozzle are no longer required.

Good profiles

Pre-metering and levelling with the metering element are thermally disengaged. This guarantees stable operating conditions and good profiles from the very beginning and throughout operation.

Simple adjustment

Pre-metering and levelling with the metering element are mechanically disengaged. This avoids any complicated adjustments during roll and metering element change.

Field of application

Like using Speedsizer and Speedcoater the whole range of film coating applications can be covered. From low viscosity starch solutions to pigment suspensions and up to high viscosity coatings, all state-of-the-art formulations can be metered onto the rolls.

The Technology

Optimum web run

The paper industry needs optimum solutions for its individual requirements. Maximum coat weights or starch application with minimum installation length are "normal" requirements, to which is also added the best runnability with greatest flexibility.

The SpeedFlow permits all proven roll allocation, but practice has shown that two typical construction forms can cover all applications with the greatest productivity.

Concept 1: For new paper machines or rebuilds with sufficient space:

- Inclined web run
- Sheet run from top to bottom
- Airturn, infrared
- Air drying (when necessary).

Advantages:

- Excellent sheet run
- Short free draws
- Best runnability.

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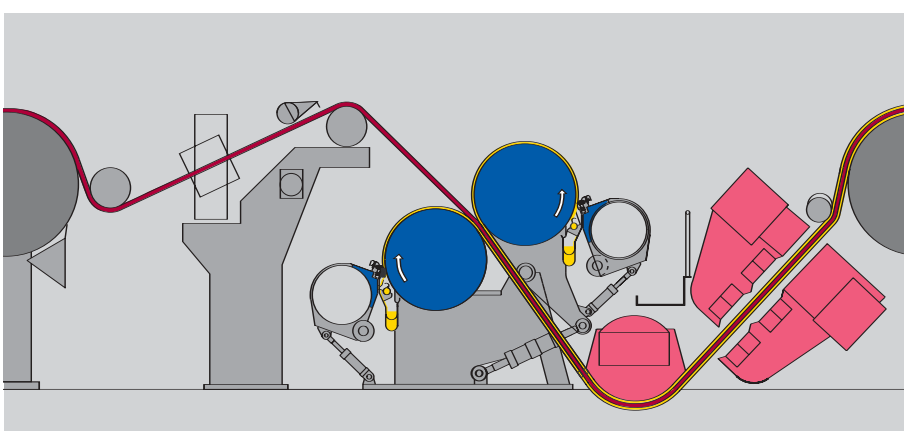

Fig. 5: Web run from bottom to top.

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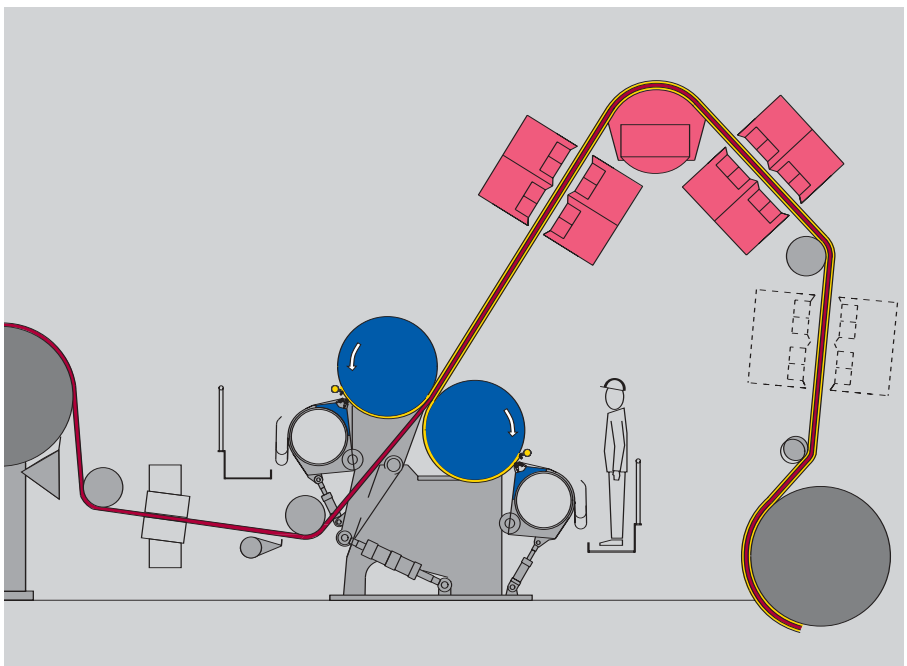


Concept 2: For installation into existing paper machines with restricted space conditions:

- Steep web run
- Sheet run from bottom to top
- Airturn, infrared
- Air drying (when necessary)

Advantages:
- Short installation length
- For max. drying installation
- Drying facility on top.

Less quantities of colour in circulation
The paper maker demands a film coating unit with minimum amounts of colour in circulation. Smaller quantities of colour in the system also save time (when changing the type) and money (less loss).

The SpeedFlow satisfies both demands. The SpeedFlow is operated with approx. 40% less colour in circulation than standard systems. At the same time there will be approx. 70% less coating colour in the coating system.

Optimum cross distribution
Coating colour or starch is only fed through a small colour distribution pipe with MultiJet nozzles. Allocation and dimensions guarantee optimum cross distribution for high and low viscosity media. The flow system is clean and simple.

A sealing blade is not needed any longer, so that one of the most sensible parts disappears.

Simple edge deckle adjustment
With paper machines the SpeedFlow must be capable to adjust different working widths. Coated or uncoated edges can be adjusted easily and in a reproducible manner.

The MultiJet nozzles of the SpeedFlow are simply covered by a guide plate in the edge areas, which ensures contact- and wearless format adjustment.

The metering system
Papermakers today use metering bars with varying diameters and in smooth or profiled form. Surfaces are either uncoated or coated (chrome, ceramic).

With the SpeedFlow the pre-metering facility is separated by the free jet and the final metering facility by the metering bar. This makes it much simpler to install metering bars of different diameters or to change the rod beds.

Disengaged system – application/metering beam
Operating personnel constantly demand good coat weight profiles right from the start. The metering beam must therefore be stable, mechanically and thermally.

With the SpeedFlow the metering beams and application unit are disengaged. Manufacturing the metering beam from the most modern thermal and mechanically stable compound material makes a weight reduction of up to 80% possible for wide machines. The heating system required earlier is no longer necessary.

Push-button operation
A modern coating unit must of course satisfy the requirements of extensive automation, something the SpeedFlow does

admirably. Operation via a touch-screen display is standard. The integration into a process control system is possible without any problems. In both cases the steps

- Tail transfer
- Starting
- Metering element change
- Stop sequence and
- Break sequence

in functional as well as time sequence are optimally initiated.

Practical experience

In January 1998 the SpeedFlow pre-metering unit was installed for the first time into a production machine. In an existing Speedsizer the nozzle application devices were closed and replaced with the colour distribution pipes fitted with MultiJet nozzles. Immediately after installation it was possible to re-start production unhindered and of high quality. In comparison with the conventional system all expectations were fully satisfied.

It was also possible to drastically reduce the quantities of colour in circulation, which also reduces the size of the colour pumps considerably.

The starch coating profiles are much more uniform than before. Especially during the starting process (with "cold" beam) the SpeedFlow demonstrates good and stable profiles.

Plugging and wear are issues of the past, thanks to the tested and proven nozzle construction of the individual nozzles, neither are deposits to be found in the distributing pipe.

Although in this case the old metering beams were retained, a clear reduction in the beam temperature could be noted, thanks to mechanical disengagement with the coating system. Despite a starch temperature of more than 50°C the beam only will only accept the ambient temperature.

The customer evaluated the new edge deckle adjustment and the low quantity of colour in circulation within the system as especially positive and operator-friendly.

Market introduction

Orders for three new SpeedFlows were already received between January and April 1998. The first start-up of a completely new SpeedFlow will take place during this year. With this Voith Sulzer Paper Technology will again demonstrate successful and fast realizations of future-orientated innovations.

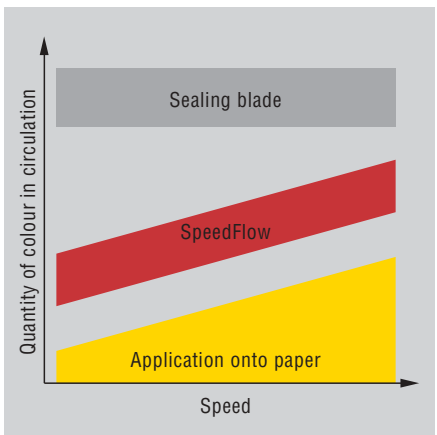
Fig. 6: Quantities of colour in circulation.

Fig. 7: Edge deckle adjustment.

Fig. 8: Application unit and metering beam.

Fig. 9: Start-up
Pigmenting/Coating
Starch applications

6



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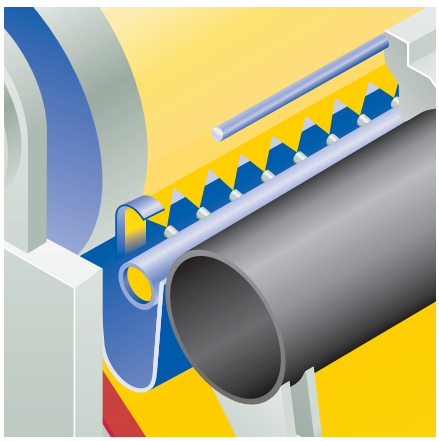

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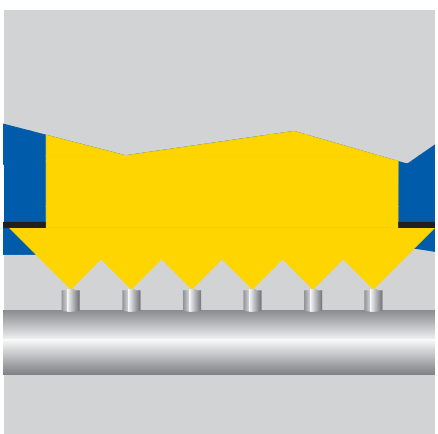

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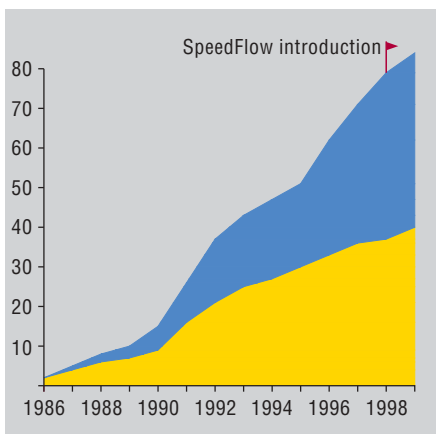

Paper Machinery Divisions:

The Ningbo model mill in China – an enormous step forward

The author:
Harald Weigant,
Andritz AG, Graz

Carton for China

China's economy has developed astonishingly fast over the last few years, with proud 2-digit growth rates likewise in the paper industry.

To meet this steep rise in demand, domestic production capacities are being increased accordingly.

Foreign investors such as the Indonesian Sinar Mas Group predicted this trend years ago and took action in good time. Ningbo is only the first link in a whole chain of new paper mills and machinery for supplying China with high-grade products – starting with the Shanghai area.

Hardly five years ago, only very few paper mills in China could produce more than about 100,000 tonnes per annum. Less than 30 mills had a capacity of 25,000 t.p.a., and just about 100 mills could handle up to 5000 t.p.a.

On the other hand, there were thousands of small mills turning out anything from a few kilograms to a few tonnes per day.

Ningbo is an excellent example of how this situation has changed in the meantime. At a plant on the outskirts of this one-million town south of Shanghai, a board machine for 34,000 t.p.a. had been installed during the first construction phase ten years ago. The manufacturing know-how thus gained, together with the existing infrastructure and adequate land facilities, offered ideal conditions for subsequent expansion.

After founding a joint venture with Sinar Mas, phase II of the expansion project went ahead in 1994. Several alternatives were studied, and the final choice was for a capacity of 400,000 t.p.a. This is shared between two almost identical board machines in parallel, each with a width of 4.2 m and capacity of 200,000 t.p.a. Right

1

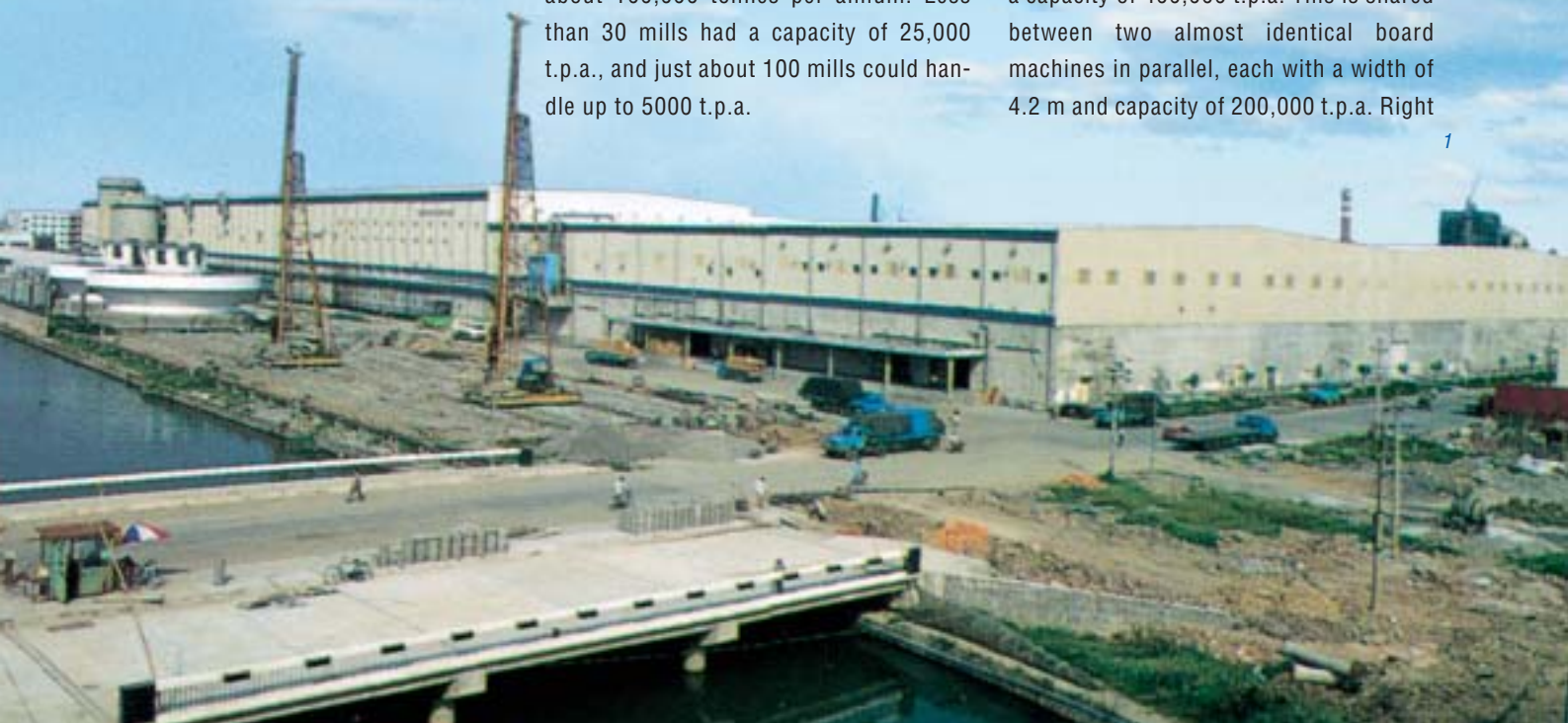

Fig. 1: Ningbo paper mill south of Shanghai.

Fig. 2: The new KM3 board machine.

2

from the beginning, it was clear that this will be China's biggest paper mill by far – covering almost 50% of domestic demand for coated board.

Even if more paper will soon be produced at other sites, Ningbo will still remain the highest output mill if things go the way Sinar Mas are planning them. In expansion phase III, four more machines are to be installed for liquid packaging board, ivory board, kraft liner and corrugated medium. This will increase total capacity to nearly 1.5 million t.p.a., thus making Ningbo one of the world's largest mills.

Concept

As a basic principle, Sinar Mas always selects new plants according to the latest state of technology. The order in 1994 was therefore placed with an Austrian/German consortium comprising Andritz, Voith Sulzer Paper Technology, Jagenberg and Siemens. This was the team which installed a sister machine in Serang, Indonesia, where Voith Sulzer Paper Technology took over the technical management as against Andritz in Ningbo.

Another Sinar Mas principle is to assign the consortium with overall delivery responsibility. Practically all the mill machinery is included in scope of supply, from the first conveyor belt in the stock preparation line to the paper machine pope roll.

Fig. 3: Waste water processing.

Fig. 4: Stock preparation.

3

4

As a general concept for these board machines, recycled paper is used as low-cost furnish for the 4-layer sheet lining, the top layer being made of chemical pulp produced in-house, and the under and back layers of deinked waste paper. An on-line coater gives the board an optically appealing surface finish.

Stock preparation

The stock preparation line is designed for supplying both board machines at the same time, with a total capacity of nearly 2000 tonnes/day. It comprises the following sections:

- For the top layer: a 60 t/d NBKP line and 230 t/d LBKP line
- For the under layer: a 260 t/d DIP line for both ONP and OMP
- For the liner: two 340 t/d mixed waste paper lines
- For the back layer: two 135 t/d lines for ONP.

Also included in the scope of supply are four rejects lines of 130 t/d each for dry and wet rejects as addition to the board liner lines. On one of these lines CTMP or light coloured waste paper can also be used, while one of the back layer lines uses LBKP and BCTMP. This layer separation arrangement gives the operator plenty of flexibility for optimally combining chemical and recycled furnish into various types of end product.

Board machines

After careful comparison, Sinar Mas

Fig. 5: The new KM2 board machine.

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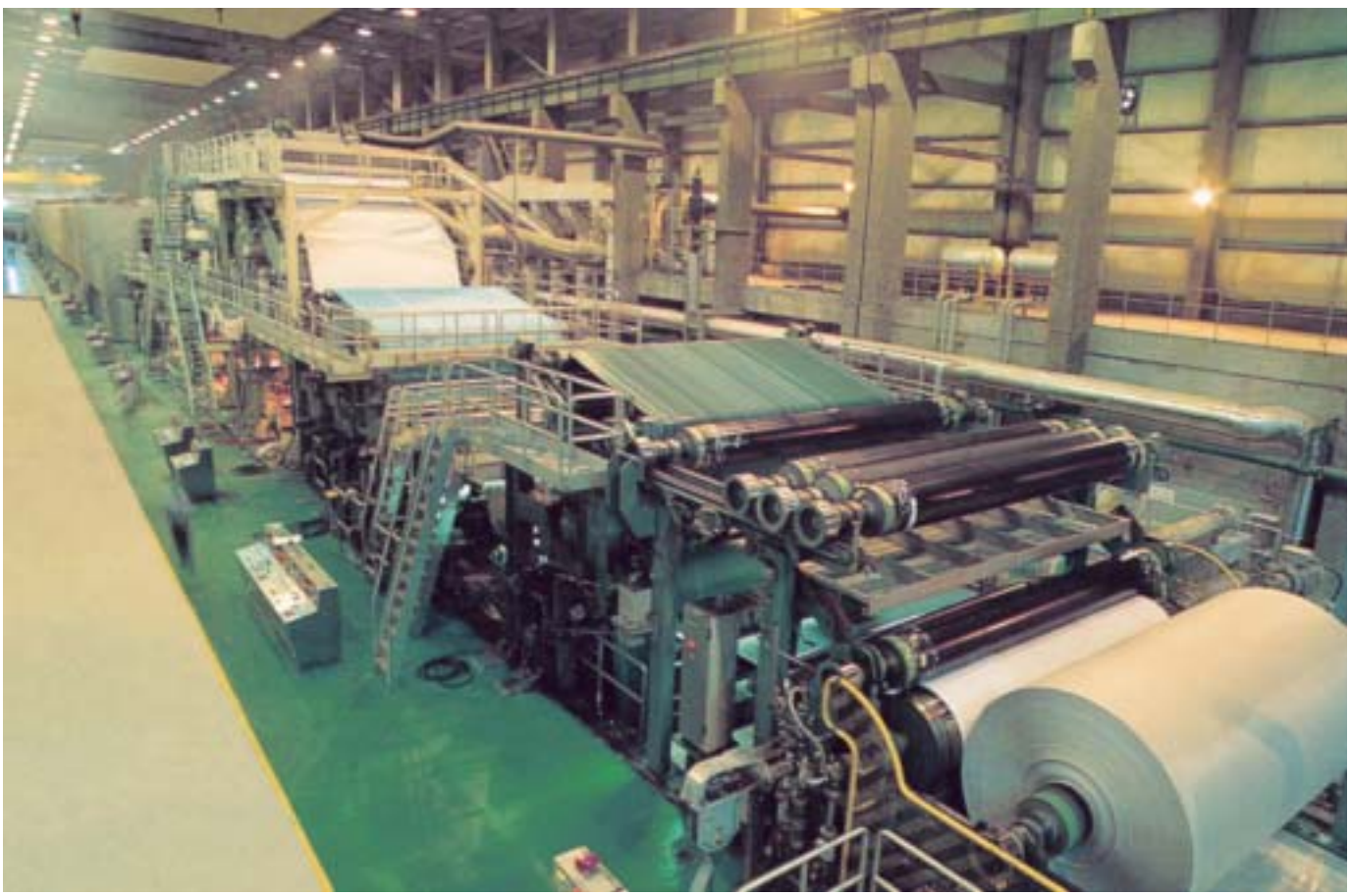


decided for the modern and already well-tried multi-fourdrinier formation concept. This enables greater flexibility for optimally adjusting board quality.

The heart of the wet section in these board machines comprises four high-turbulence headboxes, one for each layer. Adequate drainage and optimal formation on the filler wire is ensured by an additional SP TopFormer. The wires themselves are fitted with enough drainage elements to enable a production capacity up to about 200 tonnes of board per metre working width. To reach this capacity, however, the machines have to operate at speeds up to 500 m/min.

The top layer wire is fitted with a dandy roll, so that formation can be optimized in the same way as on a fine-grade paper machine. A double-felted vacuum press followed by two high-pressure presses increase the dry content of the web to a cost-effective degree without excessive loss of volume. One machine includes an offset press in order to improve smoothness on the wire side. After passing a total of 69 drying rolls 1.8 m in diameter, the web goes through a FilmSize press. This in turn is followed by 12 drying rolls in the first afterdryer section. Andritz hoods ensure optimal temperature and humidity conditions in the dry section.

Finally the web passes through a hard-roll calender prior to the coating line. To ensure optimal effectiveness, the calender

Fig. 6: The control room.

6

is preceded by an Andritz steam blow box for surface moistening.

Paper machine No. 2 has three coating heads, two of which for precoating and cover layer coating. The third head is either used for coating the backing layer if it is white grade, or for sizing if the backing layer is grey. Paper machine No. 3 is equipped with four coating heads, allowing dual coating on both sides. A central mixing unit supplies both machines.
The coating aggregate is followed by two calenders, both with hard heated roll and soft-covered floating roll. Since the hard rolls can be used on the top side and the back side as well, both sides can be calendered simultaneously. An operating mode is also possible, however, for calendering only one side at a time. The customer is convinced that with a total of three calenders, similar results can be achieved to a Yankee roll but with significantly better runability. Thanks to easier optimization and more user-friendly operation, much steeper startup performance curves are possible.

Project handling

Another record-breaking aspect of this project was the incredibly short completion time. Although the final go-ahead was not given until the end of 1994, the first machine went on line less than two years later in November 1996, followed by its sister machine in May 1997. This achievement is all the more astonishing in view of the traditionally simple Chinese construction methods used for the enormous site buildings.

Perhaps not so astonishing after all – much more important than big earthmoving machinery for large civil engineering works is organizational talent. The rest is simply a matter of experience with local methods, and sheer hard work.

The entire erection phase was a model of international teamwork between various nations. A good deal of understanding was necessary to overcome initial differences of opinion, but in the end perfect coordination between East and West enabled punctual completion.

Shortly after commissioning the two machines, the operations tests were successfully completed. Today, with one year and six months of operation behind them respectively, the predicted startup curves of these machines have not only been reached but exceeded. This applies both to production output and to quality.

And as anyone who knows China will confirm, nothing could be more important here than keeping promises to the full. How could it have been otherwise? Meeting ambitious customer targets is matter of course to Andritz and the Voith Sulzer Paper Technology – Jagenberg – Siemens team.

1

Paper Machinery Divisions:

“ahead – Together with our customers towards superior solutions for board and packaging papers

The author:
Nicole Kreitmayer, Marketing,
Paper Machine Division
Board and Packaging

“ahead – Under this motto, experts of the European board and packaging paper industry met in Vienna from 26 to 28 April 1998 at the Customer Information Meeting of the Paper Machine Division Board and Packaging.

For one and a half days, the European board and packaging paper industry focused its attention on the event taking place at the Austria Center Vienna, Austria´s largest conference center. At this meeting, not only the most recent Voith Sulzer Paper Technology developments on this sector were presented but also noted guest speakers held papers in particular on important market developments affecting board and packaging papers. Additionally, four customers offered us an interesting insight into the technological and economic results of Voith Sulzer Paper Technology rebuilds and the startup of PM6 at Zülpich Papier.

With “ahead, a discussion forum was created, thus fulfilling an important aim of Voith Sulzer Paper Technology: Together with our customers, we want to move on – “ahead – towards innovative and flexible solutions. To realize this aim, we closely observe the markets of our customers and the requirements placed on board and packaging papers. The conference was organized by the international Center of Competence of the Paper Machine Division Board and Packaging in St. Pölten, Austria. Large sections of the European market have only been served from St. Pölten for a short time and therefore in particular European customers were invited to inform themselves about the know-how and commitment of the “Board and Packaging” team of Voith Sulzer Paper Technology. The conference also offered the opportunity to meet the members of the sales and technology team in a relaxed atmosphere.

2

The Paper Machine Division Board and Packaging

The conference programme of 29 April was opened by division manager Otto Heissenberger, who gave a short description of the activities of the division. For Voith Sulzer Paper Technology, board and packaging paper machines have always been an important field. The establishment of a separate division now permits putting even more attention on the special requirements placed on board and packaging papers. The contract awards speak for themselves: From 1995 to 1999 alone, 13 complete board machines and 12 new packaging paper machines have been (or will be) started up by customers of Voith Sulzer Paper Technology, and the current volume of incoming orders of the division is at a record level.

Focusing on board and packaging paper requirements permits fast, innovative product development and highly efficient customer trials on the pilot paper machine. On the one hand, this approach continuously improves the quality of board and packaging papers and, on the other hand, has significantly increased machine speeds. Combined with the high runability of Voith Sulzer machines, these new concepts deliver enormous productivity increases on the customers' machines and reduced capital investment.

The division is represented by locations worldwide: The major parts of Europe, Asia, Africa and Australia are served from St.Pölten, the location of Tolosa is responsible for the markets of Spain and Portugal, the location at Schio handles business in Italy, Greece and Israel. Customers in North America are served from Middletown, Ohio, and the South American market is handled by the location at Sao Paulo by Brazil. In addition, there is a licensee in Japan, three joint ventures – one in Russia and two in China – and a number of representative offices and agents. Wherever you need a specialist for board and packaging papers, competent contact partners will be at your service.

Market and raw material trends for board and packaging papers

These aspects were highlighted especially in the papers held by the guest speakers. So, for example, Dr. Helmut Stark, head of the Institute for Paper and Pulp Technology of the Technical University of Graz, presented a paper on the selection of raw materials for board production.

3

The paper of Thomas Reiner, managing director of Berndt und Partner, the Institute for Packaging Technology of the Technical University (Fachhochschule) Berlin, dealt with general packaging trends on the European market. The special chances and risks for board and packaging papers were discussed by the two representatives of the associations of ProBox and Pro Carton, Guy Standaert and Franz Rappold. Michael Gröller, Chief Executive Officer of Mayr-Melnhof Karton AG, described the concentration tendencies in the European board industry and their impact on the industry.

Dr. Hermann Bernard, head of the Voith Sulzer Regional Representative Office in Jakarta, Indonesia, made an interesting excursion to Southeast Asia. He reported on the real scale of the economic crisis in Asia and explained what problems but also what chances this situation creates for the Asian and European paper industry.

Innovative product developement for board and packaging papers

The second major topic at the conference dealt with the most recent Voith Sulzer

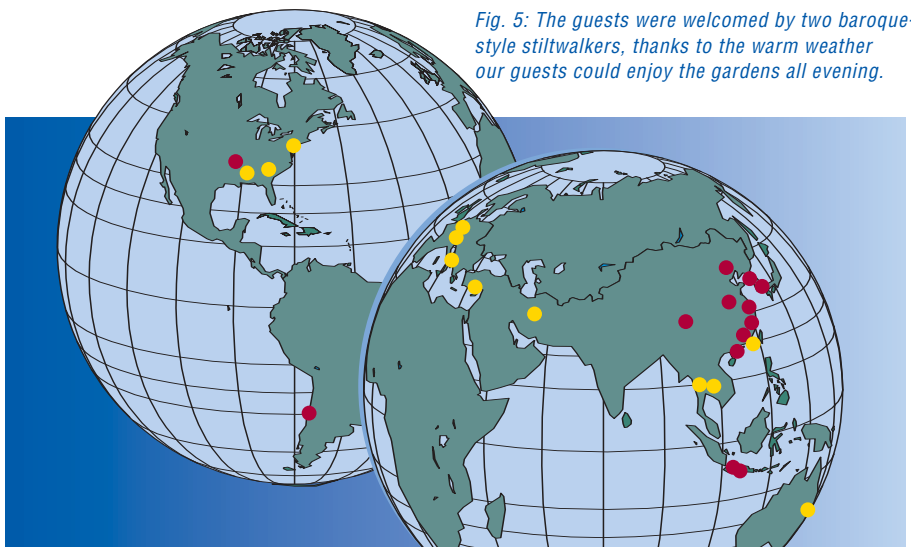
Figs. 1: The conference hall at the Austria Center in Vienna.

Fig. 2: An imperial reception at the Orangerie of Schönbrunn Castle – Emperor Francis Joseph I held his celebrations here.

Fig. 3: Executive Vice President, Otto Heissenberger, holding his welcome address.

Fig. 4: 25 completely new board and packaging paper machines between 1995 and 1999.

Fig. 5: The guests were welcomed by two baroque-style stiltwalkers, thanks to the warm weather our guests could enjoy the gardens all evening.



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Paper Technology product innovations for board and packaging papers.

A new generation of gap formers – the DuoFormer Base and the DuoFormer Top – sets new standards both for packaging papers and board. Thus, the first new board machine fitted with a gap former will come on stream in 1999. The shoe press technology, which continues to deliver excellent results in the production of packaging papers, is now successfully used also for coated folding boxboard. In addition, the JetFlow F, a new, highly efficient coating unit, is available for coated folding boxboard.

Papers held on the calendering of board and packaging papers and the spectrum of services offered by the pilot paper machine of the division rounded off the programme.

A particularly impressive presentation of the possibilities of web transfer on board and packaging paper machines was given by Ken Rooney, Vice President of Fibron Machine Corporation, a new member of the Voith Sulzer Paper Technology group of companies. Modern presentation techniques via computer and video beamer permitted illustrating the transfer procedures in short video sequences.

On the second day, the programme focused on the reports of customers. Jean François Geleleens, Director of Technical Affairs Paper and Board of KNP BT Packaging, started out by reporting on the technological and economic results achieved with the new PM6 at Zülpich Papier. This paper was followed by reports on two rebuilds of sack paper machines – at AssiDomän Skärblacka in Sweden and at Zaklady Celulozy i Papieru w Swieciu in Poland. The speakers, Håkan Krantz (Production Manager AssiDomän Skärblacka) and Tadeusz Koszur (Technical Director at Swiecie), focused on improvements of paper quality and productivity increases achieved by the installation of an Extensible Unit and the novel use of the shoe press technology for sack papers. The last speaker was Lars-Erik Mellgren, Mill Manager at AssiDomän Frövi, Sweden, who talked about their experience with the rebuild of BM 5. Frövi was the first to install a JetFLow F for liquid board, and the board quality at the mill was significantly increased by the installation of a new DuoFormer D.

5

Following these reports, the audience was given the opportunity to take a look into the future. The two product technologists of the Voith Sulzer Paper Technology team, Alexander Wassermann (board product line) and Erich Brunnauer (packaging paper product line) talked about the demands which will be made on the

Fig. 6: The blue Pullman car.

Fig. 7: The "ahead steam train.

producers of board and packaging papers in the next decade and the machine concepts of the future. Maximum production capacities at continuously increasing product quality were the key words also here. The volume of incoming orders of spring 1998 and talks with customers in the past few months showed that the smart solutions worked out by Voith Sulzer Paper Technology meet with extraordinary response from our customers even now.

6

The "ahead rail tour – social highlight of a successful meeting

For the evening of the first day of the conference the board and packaging team came up with a special treat for their guests. It was to be an evening spent among friends, full of adventure, entertainment and Austrian "Gemütlichkeit" – something to choose for every individual guest.

7

At 19:00 hrs, the trip started with a welcome cocktail at Wien Südbahnhof Railway Station, where a historical train with a gigantic steam engine was waiting for departure. Each car had its own atmosphere – there was the club car, for example, with live piano music or the elegant Pullman cars. After the hours d'oeuvres had been served, the train stopped for a while, during which the locomotive was put before the other end of the train. During this stop, artists, actors and jugglers took everyone in with their lively performance.

When the journey continued, the main courses and desserts were served and almost every passenger took the opportunity to have a drink in the various cars and meet many different people.

Twelve of the guests were in for a special adventure. They were lucky and had won a ride on the steam engine. This involved a lot of work, of course, but despite the noise, steam and shovelling of coal all of them had a lot of fun.

When the train pulled into Wien Südbahnhof Station again just before midnight, time had passed much too fast and many a passenger only reluctantly parted with their favourite car.

We, the Voith Sulzer Paper Technology "Board and Packaging" team, would like to thank all our guests for taking such a great interest in "ahead. We will continue to take care that the dialogue with our customers goes on and we can work together to find superior solutions on the board and packaging paper sector.

Since there has been great interest in the "ahead papers, more copies can be ordered, as long as they are available, from:

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Concentration of the Carton Board Industry
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Finishing Division:

New from old – upgrading of existing supercalenders

The authors:
Franz Kayser,
Michael Gwosdz-Kaupmann,
Finishing Division

As in 1995/1996 the Voith Sulzer Finishing Division presented the calenders with the Janus Concept, even the greatest optimist could not have foreseen that this new technology would not only replace the traditional and well-known supercalender in such a short time, but that it would set a new standard and clear the long-standing boundaries associated with this product.

Now more than a dozen Janus calenders are in operation processing the most diverse types of paper, wood containing and woodfree paper, coated and uncoated, offset and gravure paper and last, but not least, off-line and on-line. The potential of the Janus Technology has, for instance, contributed to the fact that a wastepaper containing uncoated paper which in former times would have been similar to newsprint only can nowadays be finished to a degree comparable with classic supercalendered gravure papers.

The advantage of the Janus Concept is, among others, in the fact that the modular design system permits optimum adaptation to a variety of different tasks, with the result that a 6 roll Janus calender processes gravure papers at the end of a paper machine and another Janus, based on two 5 roll stacks, does the same to woodfree qualities in a coating machine. Several 2 x 7 roll Janus calenders are processing woodfree special paper in the USA and last, but not least, several 11 roll Janus calenders are producing a quality spectrum from matte finish to average gloss or even to high gloss *(Fig. 1)*.

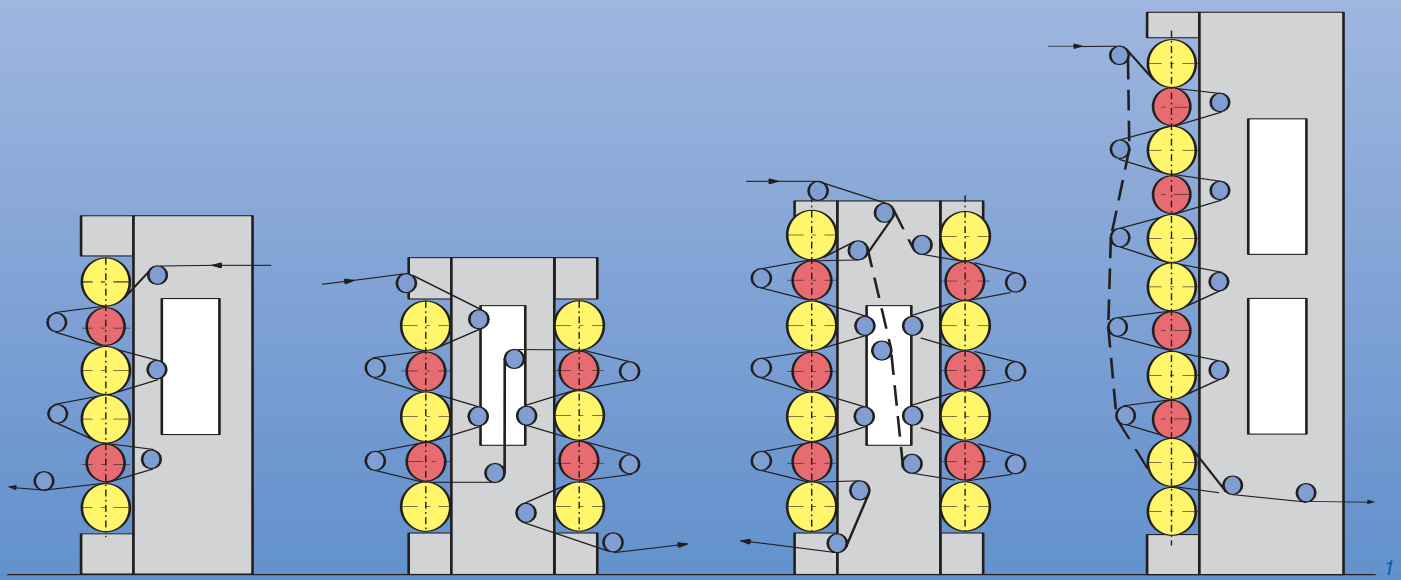

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Fig. 1: Different Janus calender lay-outs, 1 x 6 rolls, 2 x 5 rolls, 2 x 7 rolls, 1 x 11 rolls.

Fig. 2: Modifications to a Janus calender with a heating roll surface temperature of 100°C.

Fig. 3: Quality target values.

It is exactly this wealth of variation and the adaptability within the Janus Concept which offers a particular opportunity to upgrade existing calenders using the potential of the Janus Technology.

Two recent examples can be used to provide food for thought for others running existing plants.

In a Finnish paper mill for uncoated gravure paper it was decided to modify the more than 25 years old Eck supercalenders to such a state that, together with modernisation measures to the paper machine itself, natural gravure paper could be produced which would satisfy the highest quality standards applicable in today's industry.

The elements, which are necessary to convert this customer's supercalender into a Janus, are illustrated in colour in *Fig. 2*. Compensation of the overhanging loads form the basis for this, creating a geometrically straight nip.

This means, that the previously sliding calender bearing housings are now mounted on swivel levers, which are fitted with hydraulic cylinders and used to eliminate the detrimental effect from the overhanging loads.

The existing antifriction bearings and bearing housings of the supercalender are re-used.

The extremely complicated mechanical and electric/electronic means that were necessary when changing filled rolls with different diameters have become obsolete now. This facility provides the basis for

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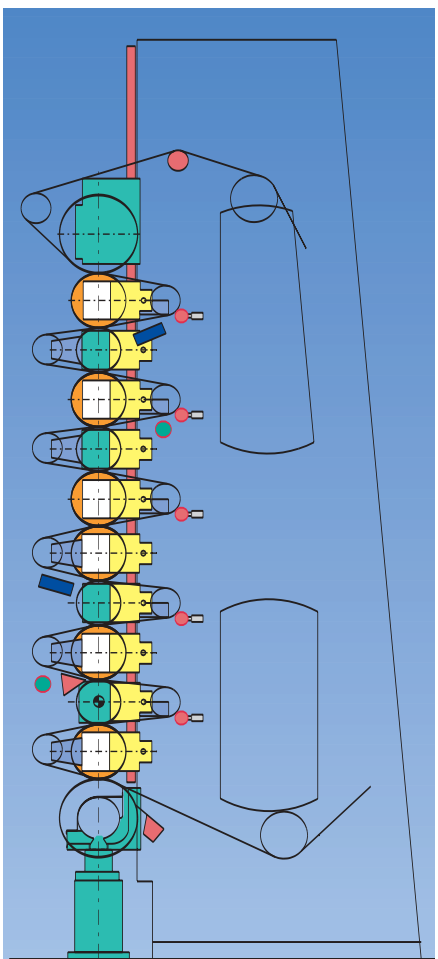

New

- Lever position with OLC cylinders
- Marun air stream rolls with JanuTec coating
- Water heating/cooling system
- Rotary joints for heating rolls
- MicroFlow steam moisturizers
- Bearing housing for top and bottom S roll
- Bottom hydraulic cylinder
- Auxiliary drives for guide rolls

3

Gloss Tappi 75° Hunter	⇑ 50%
Roughness PPS-10 S	✜ 1,0❍m
Blackening index	✜ 45
Loss of luminescence (ISO)	✜ 4,5%
Opacity reduction	✜ 3,5%

replacing the filled rolls with plastic rolls. The filled roll shafts, however, will be converted into a MARUN roll provided with a JANUTec cover and continue to be used.

So as to provide the necessary process heat within the Janus Technology, the next logical step must be pursued on the heating side. In this particular case, extensive laboratory tests in conjunction with the paper makers and calender manufacturers enabled a process to be worked out where 100°C of surface temperature of the heating roll proved to be sufficient.

In this project the restriction of surface temperature to 100°C has the advantage that the old heating rolls of the supercalender need not be changed, leaving only the procurement of a more effective and new heating installation.

The surface moistening necessary for natural paper by means of steam is being modified to the latest state-of-the-art as well as to future use by the addition of new micro-steam moisturizers. The result of this is illustrated in *Fig. 3*. As can be

Fig. 4: Comparison of the blackening.
Top: supercalender; Bottom: Janus calender.

Fig. 5: Comparison of the production speed with 3 Supercalenders and 2 Janus calenders;
Type of paper: SC paper, base weight: 48-60 g/m²
Main type: 52 g/m²; Web width: 7300 mm;
Roll diameter : 2800 mm;
Reel drum diameter: 700 mm.

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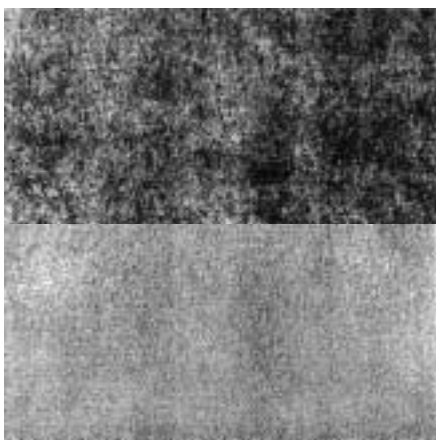

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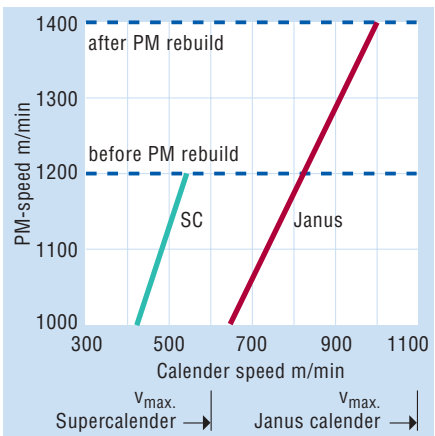


seen, very ambitious quality targets can be realized with the application of the Janus Technology, even with a modified supercalender.

Apart from the elements which have a direct influence on the paper quality, well-known problem areas are eradicated during this modification.

The integration of a rope feed system not only simplifies the threading itself to a considerable degree, thus avoiding frequent complaints, namely marking of rolls during threading, but it also eliminates the problematic nip guards.

Apart from the traditional surface parameters of gloss and smoothness, *Fig. 3* also shows that a so-called blackening index is defined as quality target. This really is a fault which to date appears and does not seem to be controllable in any way by the classic calendering process.

Blackening or black calendering means that pulp fibres collapse locally at crossover points, thus becoming transparent and, with regard to this calendered paper, appear to have been blackened.

Before Janus this knowledge was at best shady and has only been researched during the development stage of this new calendering technology to the extent that a blackening index of 45 can be promised. However, this number is quite meaningless to most people. The higher the index, the “blacker” appears to be the paper surface, with a supercalendered paper having a normal index value of 55 and more.

In direct comparison of two paper samples, a trained eye can detect an increased blackening of two index points. On a purely subjective point, all paper with an index number of below 48 is classified as being free of any blackening. To emphasize this, *Fig. 4* shows in bold markings the degree of blackening of a natural paper processed on a supercalender and on a Janus calender. The difference speaks for itself.

This so positive influence of the Janus Technology on even the optical characteristics of a calendered paper can always be observed, whereby the absolute values of the improvements achieved are influenced considerably by the stock composition of the individual paper.

This leads us directly to the second example, where the tests carried out with the sample papers having been processed with Janus laboratory calender show a considerable improvement in the blackening, but not a the lower level of comparable gravure paper produced by other manufacturers.

In this case the combined know-how of the Voith Sulzer Paper stock preparation specialist together with his paper machine colleagues and that of the calendering specialist and supported by really in-depth basic position investigations led us not only to be able to provide a recommendation for optimization of the existing calendering installations, but also to clear and specific instructions regarding the effective relations in the paper composition and manufacture.

The example of a calender rebuild, of which we will now report, has completely different project aims to those realized at present. This customer in Germany calenders his natural gravure paper on three Wärtsilä supercalenders supplied in 1987 which, at a specified paper machine speed of 1200 m/min were just about

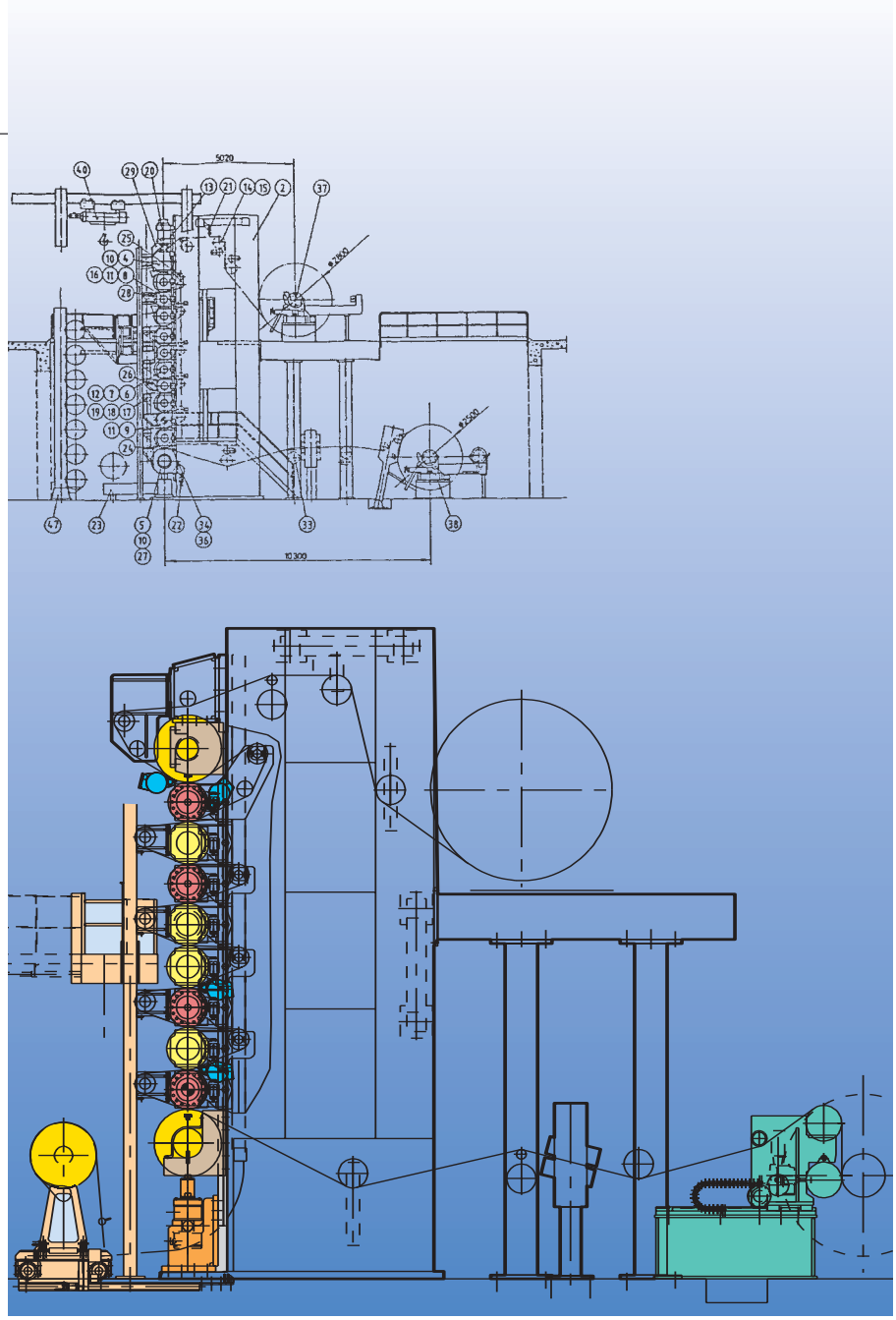


Fig. 6: Existing supercalender for SC paper before the rebuild to the Janus Technology.

Fig. 7: Calender after rebuild to the Janus Technology.

capable of processing the production quantity.

In order to provide a degree of reserves on the part of the calender, also with a view to an increase of the PM speed to 1400 m/min., this customer considered to fit the three calenders with a zero speed flying splice system at the unwind.

The result of discussions during the project phase was that one of these calenders could be taken out of operation once the two remaining ones would have been rebuild to the Janus Concept.

Fig. 5 shows that the two remaining calenders, after the rebuild to the Janus Technology, without the originally planned Flying splice retrofit, have a speed reserve of 100 m/min, even if the unrealistically high availability of the PM is based on 100%.

In order to achieve this great potential and apart from all changes carried out during the above described example, the heating rolls are also changed. Apart from the higher calendering temperature of 140°C, these new rolls are also provided with smoothness and gloss promoting SUME* *CAL* surface plating.

As, with a calendering speed of almost 1000 m/min, also high technical demands are placed on the reel, Sensomat Plus-E-units in the winding up system are used with this project.

Fig. 6 shows the original situation and *Fig. 7* the final condition of the calenders.

Although the drives of the supercalenders supplied in 1987 were not designed for the data normally applicable with the Janus Technology performance or speed, they need not be exchanged, as the power requirement of the JanuTec plastic rolls in comparison with the old filled is so much lower and as the speed ratio could be adapted by modifying the diameter of the new drive roll.

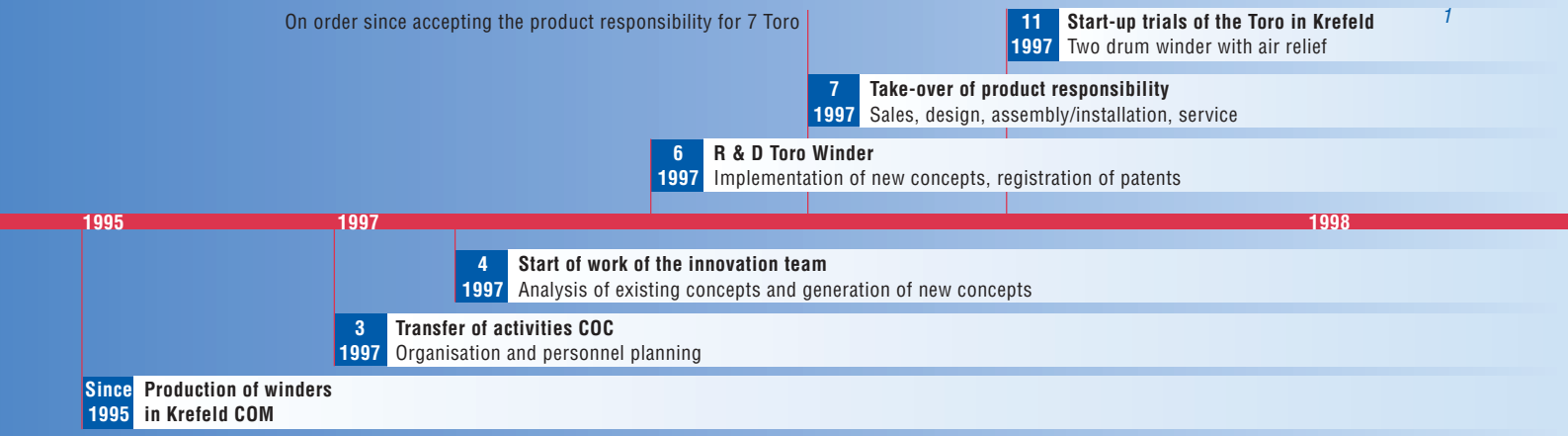
With both projects, the Janus Technology and clever selection of the elements from the Janus modular design system enabled not only the set target to be reached, it is also possible to plan for future expansion and, and this is of special importance, any of the newly installed elements can be used again.

In the case of our Finnish customer, the potential for a further substantial qualitative and quantitative increase in performance lies in the heating rolls and their SUME* *CAL* plating additionally promoting gloss and smoothness.

As far as our German customer is concerned, the automation of the winding (flying splice) process originally requested, in addition to the already existing speed reserve, creates a potential for every possible increase in the paper machine speed.

Finishing Division:

Toro – a breath of fresh air with the winder



The author:
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Finishing Division

On the 1.7.1997 the responsibility for winders within the Voith Sulzer Paper Technology was transferred to the Finishing Division in Krefeld. This was not a precipitate decision, as winders had been manufactured and pre-assembled in Krefeld since 1995, among them the orders for Halla, Selangor, Skolvin and Dagang.

As it became clear in the Spring of 1997 that the total responsibility for the winders would be transferred from Heidenheim to Krefeld, comprehensive measures were taken to meet this demanding task *(Fig. 1)*.

Apart from the necessary know-how transfer it was also essential to enable sales and design/planning to elaborate customer specific quotations. Apart from the existing software, new programs were introduced to support these activities. As far as the design activities were concerned, all documentation was transferred to Krefeld. At the same time and with the help of the Heidenheim staff, the newly formed Winder Group was prepared specifically for their future work. As important as these transfer measures were and apart from the basic idea of creating integrated finishing solutions ("all-in-one-solution") the moving of the winder activities to Krefeld also included particularly the requirement to force the development activities into a situation to change the image of the Voith Sulzer Paper Technology winder. For this purpose a team was assembled, whose job it was to analyze the existing systems critically as well as to develop new concepts. The composition of the team from experienced specialists and "new blood" proved to be most successful.

TORO TD

It was one of the most important tasks to fill the gap between the standard two drum winder and the single drum winder. The situation before the transfer activities is illustrated in *Fig. 2*.

It can be seen that, from a certain roll weight per m onwards, (depending on roll diameter and specific paper weight),

Fig. 1: Time table for taking over the responsibility for winders.

Fig. 2: Field of activities for standard two drum winders and single drum winders.

Fig. 3: Nip forces at two drum winders.

Fig. 4: Conventional two drum winder roll with compressed air load relief.

Fig. 5: TORO TD with compressed air load relief.

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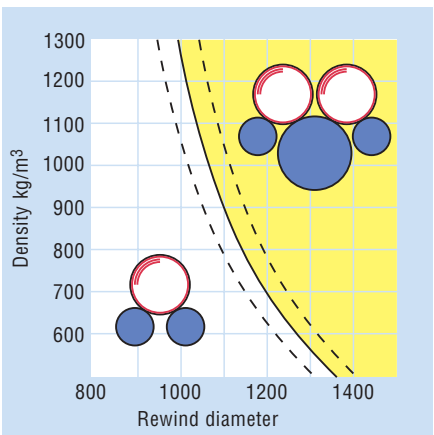

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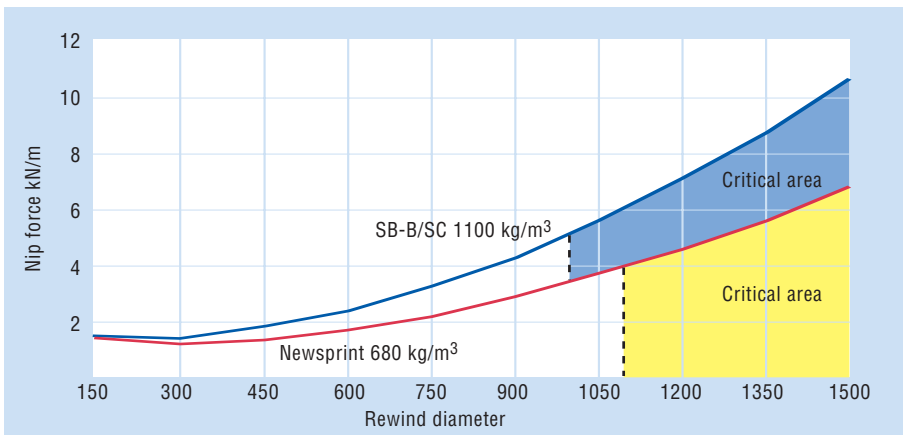

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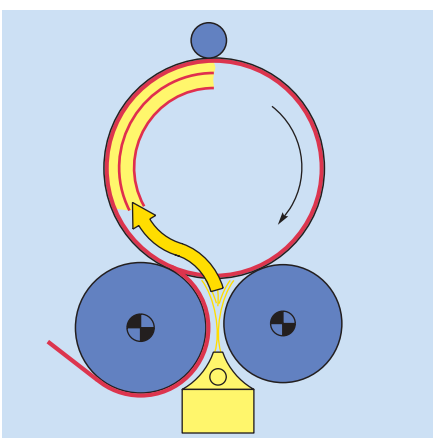

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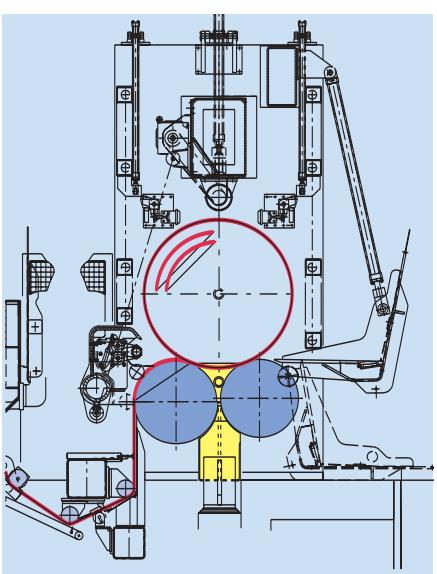

a single drum winder had to be used. The reason for this were the nip forces resulting from the great roll weights which, with the two drum winder, could lead to winding faults, such as crepe wrinkles, breakages, excessive stretch etc. *Fig. 3* shows an example of 2 types of paper on this subject.

Assuming therefore, that nip forces of 4 or 5 kN/m are critical for the paper selected, a roll diameter of approx. 1070 mm would be required for newsprint. This roll diameter would be considerably smaller for SC paper (approx. 980 mm). A standard two drum winder could therefore not be used with present-day typical rewind diameters of 1100-1250 mm – and particularly not for the diameters of 1500 mm required in the future. It was for this reason that in the past compressed air systems *(Fig. 4)* were used with two drum winders, so that the depositing forces resulting from the roll weight could be reduced.

These requirements have been fully satisfied by the compressed air systems provided that the paper was air-permeable. However, as shown in *Fig. 4*, these standard installations have a technological disadvantage: The relieving air gets wound into the paper roll. With more dense types of paper, such as, for instance, improved newsprint and/or SC-B paper, the wound-in air causes layer displacements leading to crepe wrinkles even if the paper roll weights and the nip forces are low. The situation is still worse with high-finished or coated papers, as these types are almost impermeable to air, e.g. the included air really has no chance to escape.

This, of course, leads to the question as to which modified winder concept we should adopt in the future. With this in mind, solutions such as belt supports and application of a soft cover on the winder drum etc. were discussed. It became clear, however, that these ideas were linked in part with other disadvantages. The best concept, in our opinion, is illustrated in *Fig. 5.*

The solution is characterized by the following features:

Fig. 6: TORO TD for Stora Grycksbo.

Fig. 7: Trial winder TORO TD in Krefeld.

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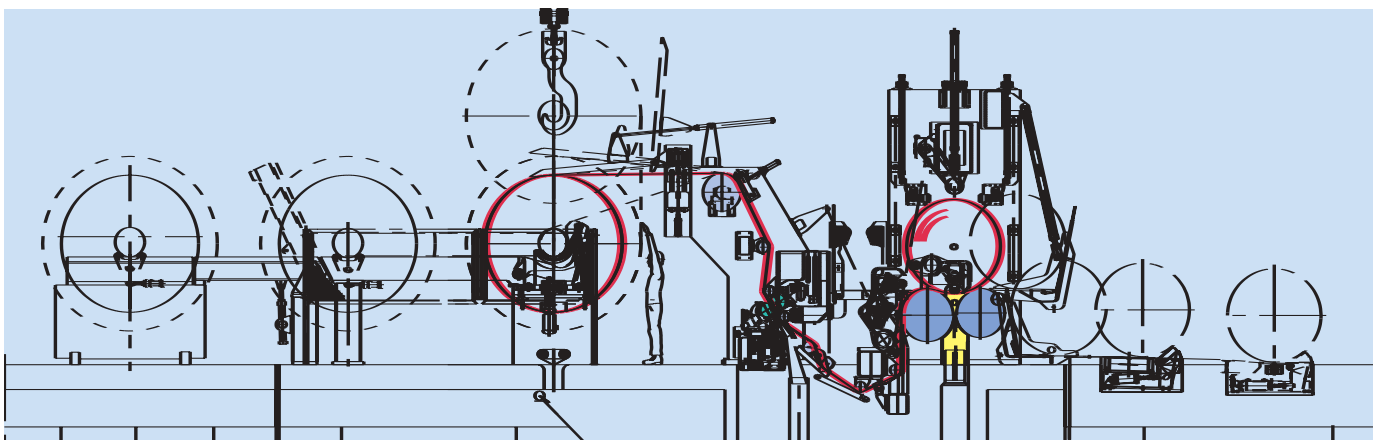

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- The basic two drum winder concept remains unchanged.
- The web run is modified in such a way that the proven air load relief can be used without technological disadvantages.
- Both nips are relieved.
- The air relief can be used as additional winding parameter.
- With air-impermeable, smooth paper the first drum is rubber coated. This ensures that the drum adapts to the profile variations of the paper roll thus preventing that boundary air is wound into the roll.
- The rider roll is rubber covered and therefore suitable to contribute to a good build up of the paper roll hardness.
- The rider roll is driven and, up to a roll diameter of approx. 800 mm, participates actively with the introduction of the circumferential forces.

Fig. 6 shows the first TORO TD ordered for Stora Grycksbo in Sweden.

During the project discussions as well as during the trials carried out the customer has been able to convince himself of the advantages of the TORO winders for processing of his sophisticated paper and hence he decided in favour of Voith Sulzer Paper Finishing. Start of production is envisaged for February 1999.

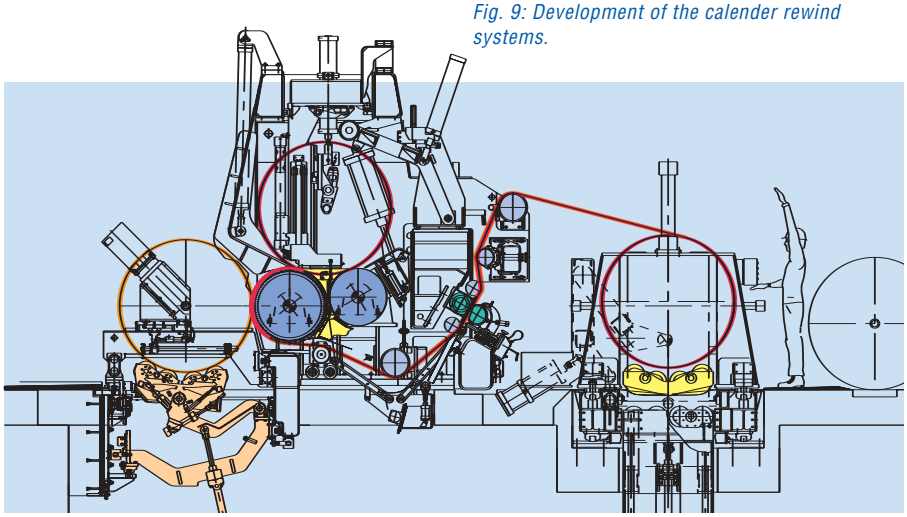
Trial winder

The above mentioned trials were carried out in the test centre in Krefeld. We decided at an early stage to install a winder in Krefeld for testing purposes. *(Fig. 7)*.

Here the basic functions as well as new ideas are tested. When putting the JANUS calender on the marked in 1995/96, we immediately provided for a JANUS trial calender in our Technology Center so as to be able to run realistic trials with customers paper rolls. Naturally, we wanted to do the same with respect to the new TORO winder. Yet, the large dimensions of gravure paper rolls (W = 3.6 m with a tendency towards 4 m, Dia. = 1.5 m, roll weight approx. 8 t) made this impossible,

Fig. 8: Winder TORO Combi for Lang Papier, machine width 4200 mm, max. speed 2500 m/min., roll width 800-4000 mm, roll diameter 1500 mm.

Fig. 9: Development of the calender rewind systems.



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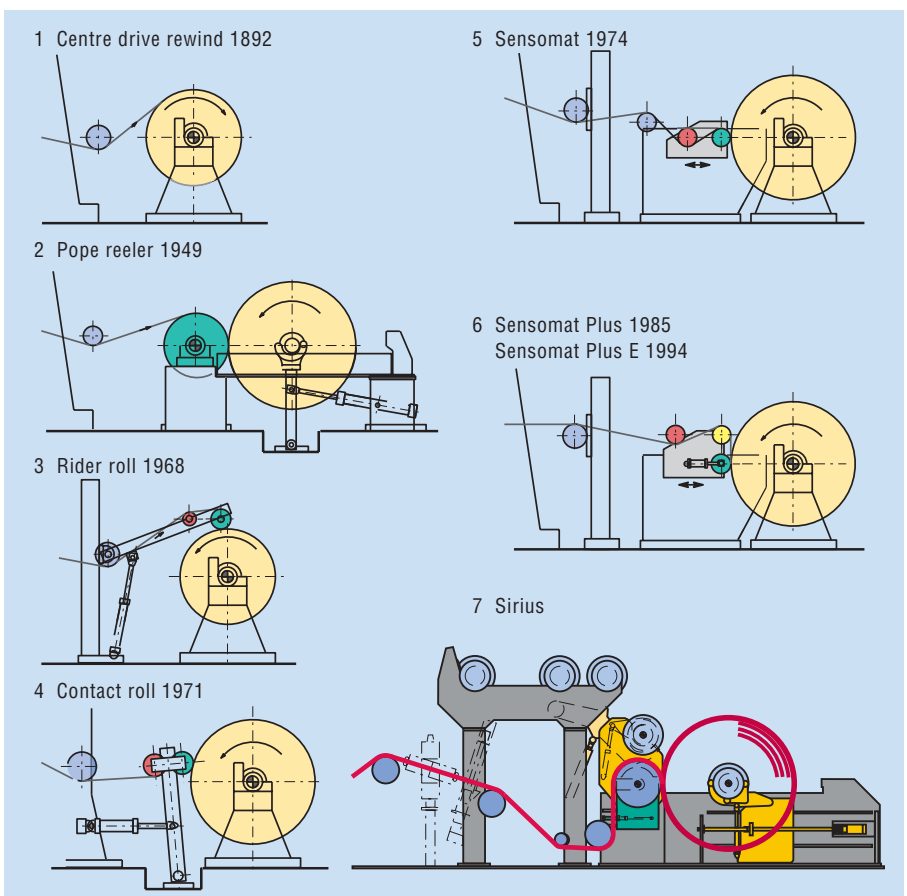

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at least for the time being. Therefore it was necessary to look for a partner in the paper industry.

Winder TORO Combi

Fig. 8 shows the winder for Lang Papier in Ettringen. With this machine it was possible to combine the wish of Lang Papier to obtain an efficient winder for SC papers and our desire to use this extremely flexible installation for carrying out trial runs with paper rolls from our other clients.

The new type of Combi concept is capable of winding up rolls in the winder roll bed with air load relief. For rewinding of large gravure paper rolls, where it is important to achieve a hard core winding, the single drum winder with centre drive will be used. With effect of the 9th June 1998 we will be able to use this plant to carry out customer tests in the two drum as well as the single drum mode the max. width and the max. diameter of the rolls being 4000 mm and 1500 mm.

TORO SD

The features of the winder roll have already been discussed, let us now move on to the single drum machines. Here also is the question as to which of the concepts we should adopt for the future. Apart from the critical analysis of existing systems, our experience, gained over decades in the fields of calender as well as the paper machine and coater rewinds, were also utilized.

Fig. 9 shows the history of calender rewinds as well as PM/Coater rewinds from the Pope reeler right up to our modern and very successful Sensomat Plus E

Fig.10: TORO SD.

Fig. 11: T-LIFT system.

Fig. 12: TORO Combi.

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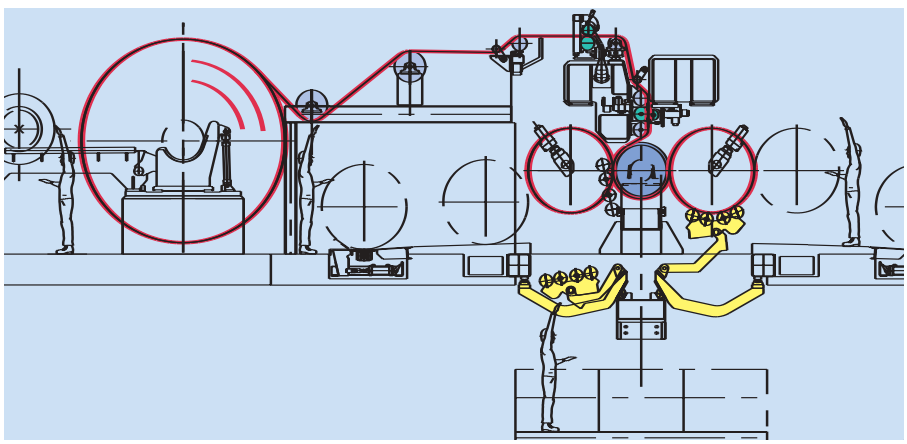

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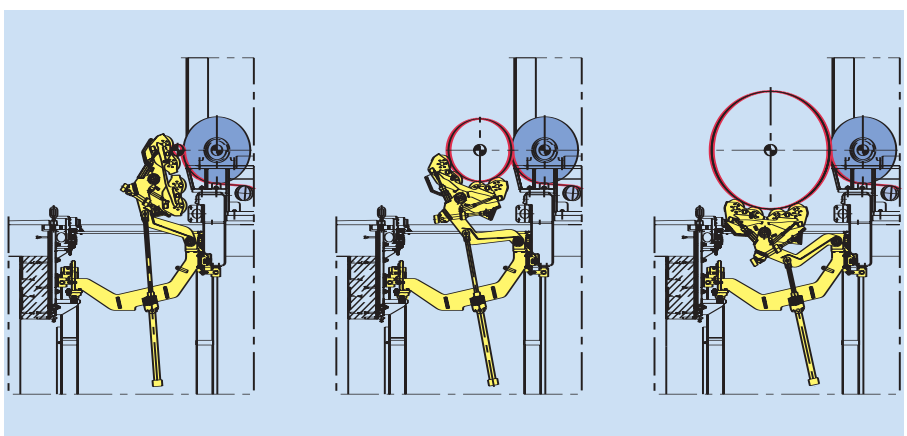

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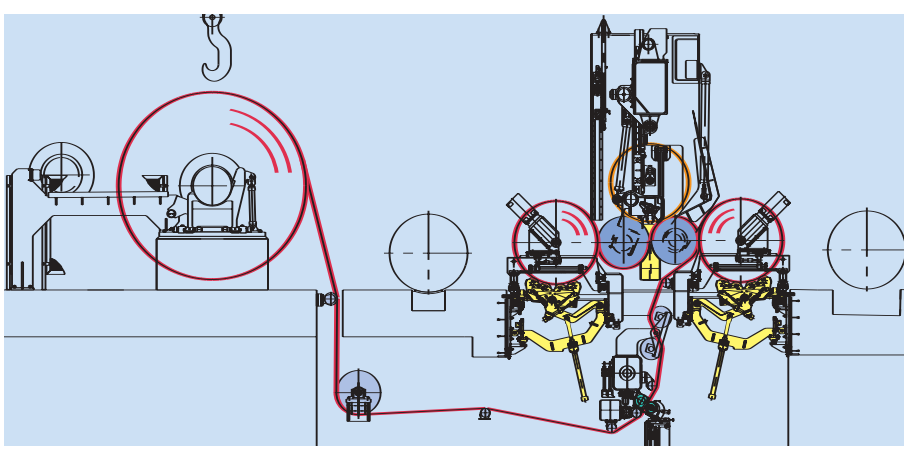

system and/or the Sirius. The resume of this experience is as follows:

- The greatest influence in the roll hardness, particularly in the core area, is derived from centre drives.
- The optimum roll build-up is achieved through separate influencing of web tension, torque and nip force, e.g. horizontal winding and, therefore, adjustment of the nip force independent of the roll weight.
- Control of the roll weight forces is the key to a perfectly wound roll.

Fig. 10 shows our single drum concept TORO SD together with the main components.

Centre drives: The rewinding stations are fitted out with centre drives.

Loading/relief devices T-LIFT: The loading/unloading units T-LIFT satisfy two requirements:

- Control of the roll weights.
- Rider roll function.

The T-LIFT units therefore ensure perfect fixing of the cores during winding up. The increasing weight forces of the rolls and the web tension are taken into account. With increasing weight of the rolls the T-LIFT units take over the relief of the roll weights.

Central drum: The central drum is rubber coated and perforated. Suction of the central drum provides two functions:

- Holding of the webs during introduction and changing of the rolls.
- Fixing of the webs during the winding process to the rubberized drum surface.

Fig. 13: Winding processes within the field of finishing.

Fig. 14: TORO Online.

Automation: Modern components for automation, such as core feeds, roll change, reeling drum change etc. are integrated.

Fig. 11 clarifies the function of the T-LIFT system.

TORO Combi

The principle of the Combi winder has already been introduced with the example for the Lang Papier machine. But this concept can also be of use for a winder integrated in a production line. Therefore our suggestion for a company producing offset as well as gravure paper rolls would, for instance, look like *Fig. 12*.

With this type of winder, the many narrow offset rolls could be wound in the winder roll bed, and the few wide gravure paper rolls in the single drum mode. This concept is also interesting for new paper mills which want to produce only offset after starting up, but later also want to produce gravure rolls. In this case the customer would start to run the machine in the two drum mode which is considerably simpler and more effective. Later on – the design of the winder allowing such a retrofitting – he can easily add a single drum operation at any time.

TORO On-line

A further task we have set ourselves – our experience with calenders and roll wrapping machines has certainly been of influence here – was to combine the various finishing processes.

Fig. 13 shows the multitude of winding processes at the finishing stage. By combination of the different processing stages (Janus/Toro, Toro/Twister, Janus/Toro/Twister) these winding processes can be minimized, which will have a positive effect on the quality of the end product. It would also lead to a marked reduction in investment and personnel costs. In place of the TORO on-line concept *Fig. 14* shows a Janus calender with integrated roll wrapping machine. In order to maintain the paper quality by respective adaptation of the line pressure and the roll temperature during speed alterations at the time of set changes, the thermal rolls of the calender are fitted with inductive heater bars.

So as to be able to follow a modern paper machine, the production speed of such an on-line plant should only be 5 to 10% higher than the speed of an “autarkical” JANUS calenders. With the calendering potential of the JANUS technology this should not be a problem, even with fast running paper machines.

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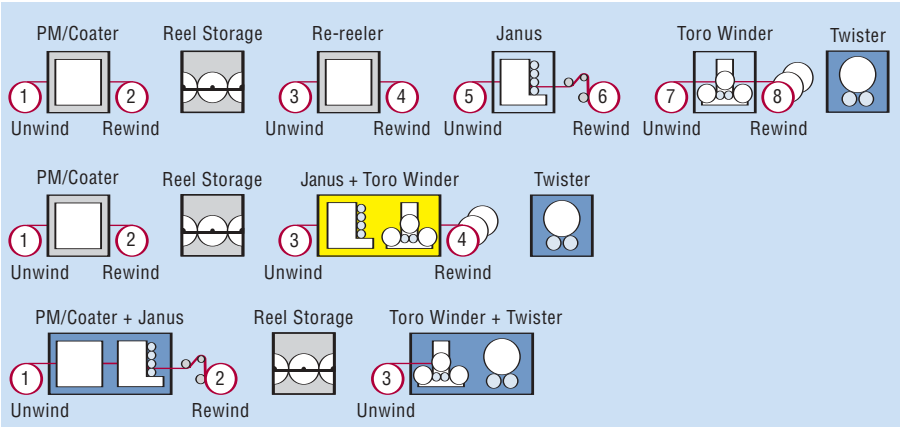

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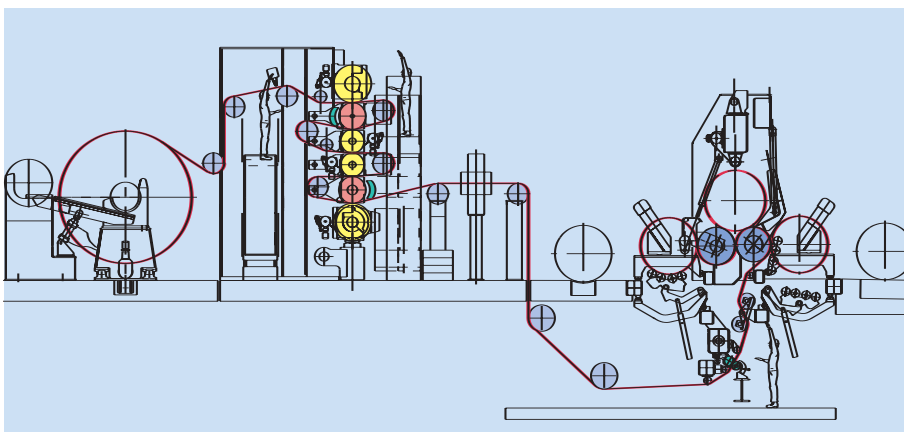

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Service Division:

The Rubber and Pu covering business through the partnership with RIF SpA

The authors:
Alessia Gasparutti, RIF SpA;
Martin Scherrer,
Voith Sulzer Service Division

Effective from January 1st 1998, Voith Sulzer Paper Technology and RIF have established the Joint Venture Company RIF Roll Cover SrL having the rubber & PU covering of rolls as scope of supply and Voith Sulzer Paper Technology as major shareholder with a 51% participation.

The first contacts between Voith Sulzer Paper Technology and RIF date back to 1989 when some preliminary investigations were conducted to find out the potential areas of cooperation in the field of roll service technology which could result of common interests for both Companies.
At that time RIF was in the process of expanding its range of services due to the ever-increasing demand of an integrated center for roll service technology and was consolidating its presence in the domestic market and breaking into the European scene.

Since that time Voith Sulzer Paper Technology and RIF have been working closely, with RIF strenghtening its good reputation as Voith Sulzer Paper Technology subsupplier mainly in the field of polymer coverings and machining and manufacturing of rolls and cylinders and Voith Sulzer Paper Technology, in its position as leading machine manufacturer, providing qualifying references for RIF.

It was only in middle 1996 that Voith Sulzer Paper Technology approached RIF with a more concrete view to proceed the negotiations focusing on the rubber & PU covering Department as prospective object of a partnership.

As one of the leading suppliers for equipment and complete production lines to the paper industry, and in a move to continue strengthening it's service support to customers, Voith Sulzer Paper Technology could not afford any longer to

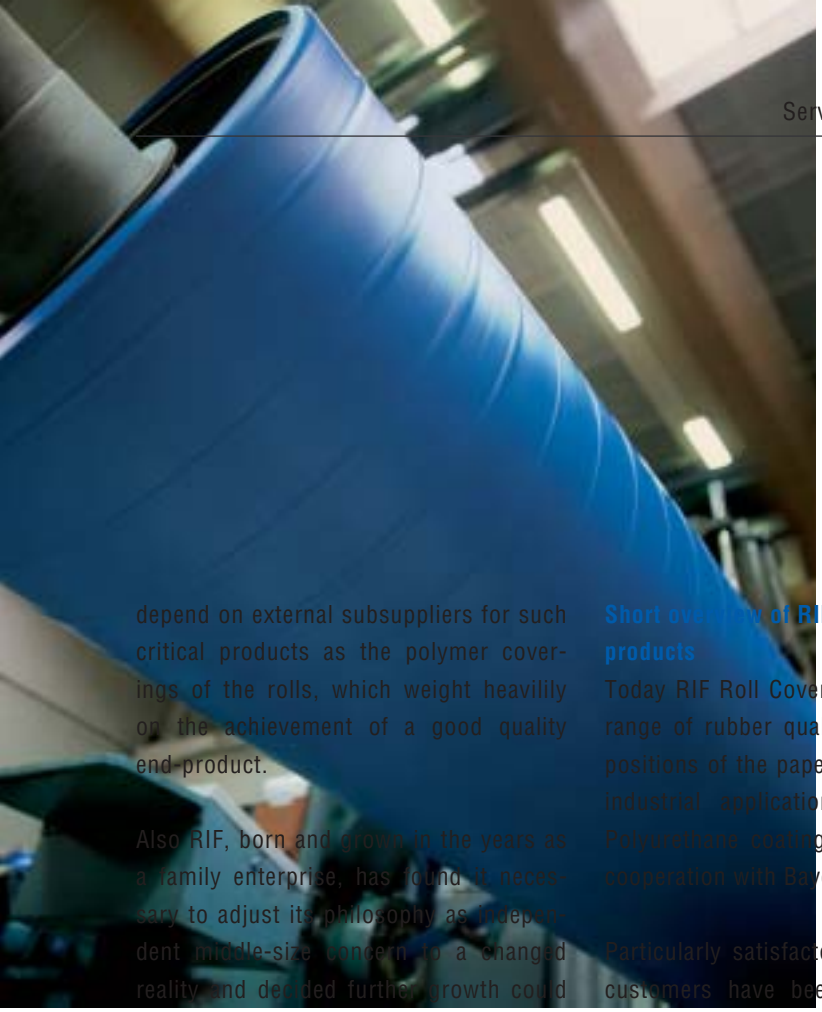


Fig. 1: View of RIF's premises from above. (Photograph authorized by the Italian Air Force.)

depend on external subsuppliers for such critical products as the polymer coverings of the rolls, which weight heavilily on the achievement of a good quality end-product.

Also RIF, born and grown in the years as a family enterprise, has found it necessary to adjust its philosophy as independent middle-size concern to a changed reality and decided further growth could come from the agreement with Voith Sulzer Paper Technology.

Organization of RIF Roll Cover

The newly-established Joint Venture Company has taken over 17 employees from RIF SpA, among which 16 are productive personnel and one is a chemical engineer responsible for the technological Lab. and R&D activities in close cooperation with Voith Sulzer Paper Technology R&D Center (see para. below).

All the other activities as management, sales, after-sales technical assistance, administration and purchasing are provided by RIF SpA and are regulated by a Service Agreement.

Together with the personnel transfer, RIF SpA has reassigned over all the machinery and equipment previously belonging to its Rubber and PU Department. RIF Roll Cover has rented the production area covering a total surface of 4125 m^2 from RIF SpA.

Short overview of RIF Roll Cover's products

Today RIF Roll Cover can provide a wide range of rubber qualities suitable for all positions of the paper machine and other industrial applications and a versatile Polyurethane coating, produced in close cooperation with Bayer.

Particularly satisfactory results from the customers have been achieved for the following applications:

Fig. 2: Backing roll covered with Bipatex on the extruder for Burgo Verzuolo PM 7, size of the roll: 645 x 696 x 4047 mm.

Yankee suction/blind drilled pressure rolls

The peculiarly long lifetime of these coverings and a well-tested bonding system are the outstanding characteristics of these coverings, appreciated to such extent as to make ourselves first-rate supplier for this particular application of some italian Papermaking group in the field of tissue production.

New steps have been taken by developing for this position of the machine an alter-

Fig. 3: Forming roll covered with Diamantite put into the curing chamber for Andritz AG, size of the roll: 1500 x 1512 x 3300 mm.

3

native compound based on a Nytrilhydrogenate polymer especially studied for those machines where the combination of high temperature and chemical inertia represent peculiarly severe running conditions.

Suction and blind drilled press rolls for the wet section

RIF Roll Cover's offer has been recently implemented by producing and marketing a new cover for heavy-duty presses (up to 300 KN/m) with encouragingly positive results. In addition, ebonite-based rubber compounds for central presses as more cost-effective and safer alternative to natural granite have been present in the market for some time and have stimulated the implementation of a new version which is now tested on the field.

Backing rolls and size-press rolls for the coating section

Excellent covering for backing rolls and size press rolls have been successfully employed in some high-demanding applications .

Rubber coverings for guide rolls (felt/wire/paper guide rolls)

A full range of coverings for guide rolls meets all the requirements of the Paper machine. In this sector RIF Roll Cover has significant references all over the world through the machine manufacturers with a considerable number of rolls over 9 meters long.

Polyurethane coverings

First applied for a large number of spools, the application of RIF Roll Cover Polyurethane has been extended to suction/blind drilled plain press rolls thanks to the implementation of an effective bonding system technology.
The follow-up of the coverings made has shown encouragingly positive results.

Research and Development

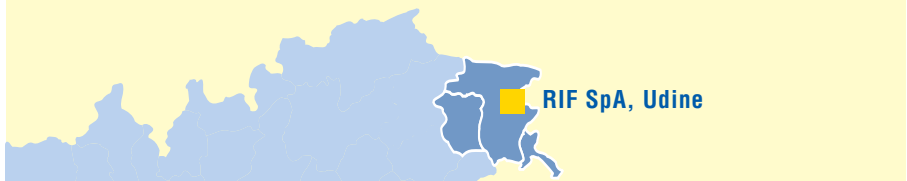
Because of the ever changing chemical environment, machine technology and sheet quality challenges faced by the paper-maker, the roll cover customer and supplier demand a strong commitment to sustain the technological edge as partners. That means Research and Development and customer support by the roll cover supplier. In order to fulfill this commitment, RIF Roll Cover will carry out its development activities as well as coordinating product development and technical customer support services with the new Voith Sulzer Paper Technology Service Division Roll Cover R&D Center located in Tucson, Arizona, USA. The R&D center, headed by internationally recognized roll cover expert, Professor Joseph F. Cheatham, will focus on new polymer development and improved roll cover systems that will enhance current state of the art technology in both rubber and polyurethane applications. The R&D center is equipped with a full range of test equipment as well as polymer chemists and technicians to carry out advanced research both on existing as well as newly developed roll cover technology. In future Twogether issues we will focus

specifically on this exciting area of technical innovation and report further on advancements in the roll cover science.

Market Growth

At the moment RIF Roll Cover is present in the national marketplace as well as in the European scene and some other countries bordering the Mediterranean Sea; moreover by covering rolls for the major machine manufacturers selling machines all over the world, it is implied that in an indirect way RIF Roll Cover is also present overseas with the coverings. Voith Sulzer Paper Technology will continue its expansion of roll cover centers beyond RIF's current location in Udine, Italy with the planned addition of new roll cover centers in Scandinavia, North and South America and Asia. Immediately, a new Service Center is being built in Farmington, New Hampshire (USA), that will coordinate single source roll service and roll cover customer support with Samco, Inc. Planned opening for this center will be July '98. We are also under construction with a new roll cover center located in West Monroe, Louisiana (USA), which will open mid '99. Other expansion activities and openings for new roll cover centers will be announced soon to the world market. Voith Sulzer Paper Technology is committed to bringing advanced roll cover solutions and competitive pricing to our customers. We are proud to be associated with a first class supplier in our new Joint Venture with RIF Roll Cover.

RIF SpA **The key dates of development**



1966 Renato Ciani sets up RIF SpA as a small mechanical workshop specialized in the regrinding of rolls over an area of 1000 Sqm. In the same year the founder starts the activity of Service on Field with mobile grinders.

1970 Beginning of the Supercalender bowl refilling business with the acquisition of hydraulic presses for small to middle-size rolls.

1982 Takeover of Pirelli's know-how and machinery for rubber covering Creation of the Lab and R&D department.

1984 Installation of twist drilling machine for the drilling of bronze and polymer suction roll shells

1988 Acquisition of one heavy-duty balancing machine for the dynamic balancing of large rolls up to a maximum length of 12 meters.

1986 Purchasing of the 1st CNC regrinder and enlargment of the existing grinding department into a climatized workshop for high precision regrindings.

1987 Acquisition of 3 new hydraulic presses for the refilling of bowls with face lenght over 9 meters.

1989 Acquisition of the gun-drilling machine and development of the activity of machining and/or manufacturing of stainless steel and bronze suction shells.

1990 Acquisition of the 2nd heavy-duty CNC regrinder for the handling of big-size rolls up to 15 mt in length and with a maximum weight of 70 tons. Beginning of the chromium plating and thermal spraying business.

1991 Starting with Polyurethane cover activity through the close cooperation with Bayer technology and facilities.

1994 Achievement of the UNI EN ISO 9002 Quality Assurance Certification.

1998 Agreement with Voith Sulzer Paper Technology and make of over of RIF's rubber and polyurethane business lines to the new joint venture RIF Roll Cover.

Service Division:
Martin Hennerici, new European and Asian manager

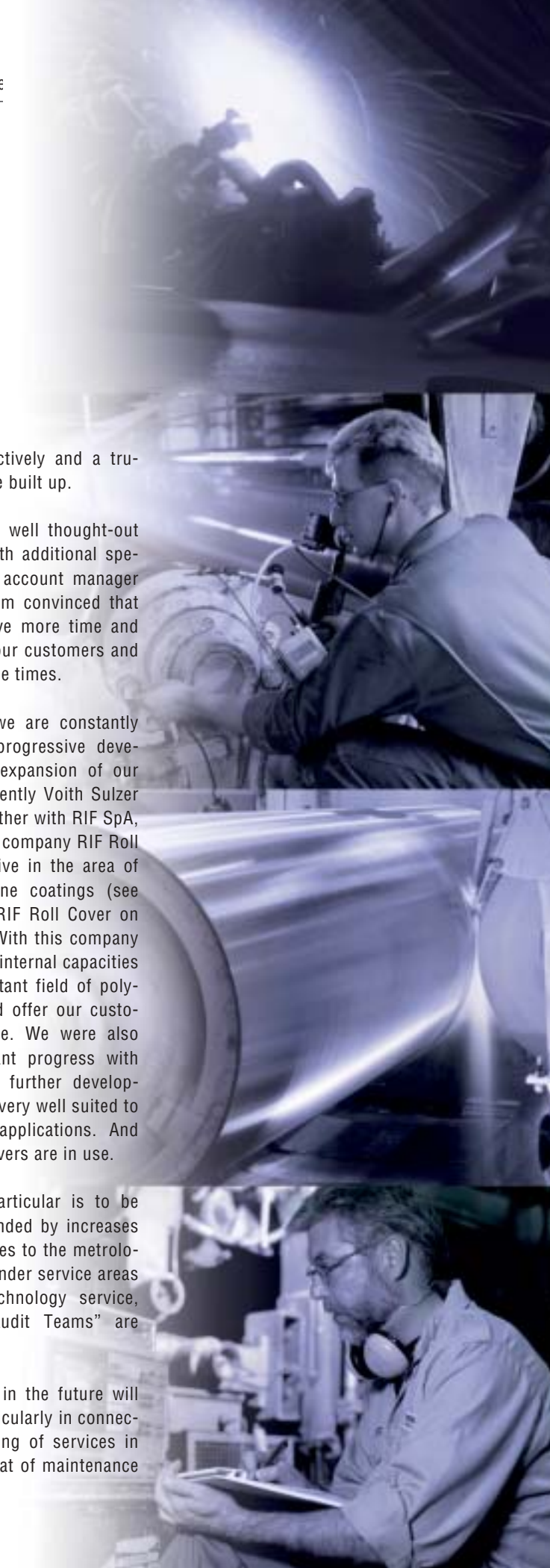
Kirsten Kolvenbach in conversation with Martin Hennerici, the manager of the Service Division in Europe and Asia

On 1 October 1997 Mr. Martin Hennerici took over the running of Voith Sulzer's European and Asian Service Division. He had previously worked at various locations for the Voith group of companies – most recently in the USA. In his new position he is responsible for the service centers in Ravensburg, Heidenheim, Düren, Weissenborn (all in Germany), Kriens (Switzerland), St. Pölten (Austria), and Udine (Italy) as well as for the setting up of other service centers in Europe and Asia.

I had the opportunity to talk to him personally about service in general and the fundamental aims and future developments at Voith Sulzer Paper Technology in this area.

Mr. Hennerici, you say that service is becoming ever more important for the customer. How do you assess this current development?

We have noticed that our customers' requirements are changing. Our customers no longer only want to be supplied with machines, but also want after-sales service. The supplier who supports the customer and provides solutions to problems will be preferred. Service is now just as crucial in the market as price and technology. Suppliers must therefore rethink their approach to the market.



What factors do you consider to be particularly important in this regard?

There are various factors which in my opinion go to make up good service. For example, to enable problems to be solved efficiently, a comprehensive service, ranging from roll service through spare parts to technology service, is certainly imperative. We have to be able to offer the customer complete solutions. It is also important that there is one person, always the same person, who the customer can contact at any time.

And as time is money for the customer, rapid solutions within the shortest possible time are required. In emergencies being able to reach the service partner at any time can mean a lot.

What is being done in order to be able to meet such customer requirements in practice?

I think that we in the service field at Voith Sulzer Paper Technology can build on the good foundation that already exists. At the same time, however, we want to acquire and form new potential for development and opportunities for improvement. Time and again, these emerge from the constantly changing market conditions and customer requirements.

What particular measures are meant here?

In future we want, for example, to provide our customers with their own account manager who is available as a contact for service and helps to find total solutions. We think that in this way the customer can be supported effectively and a trusting partnership can be built up.

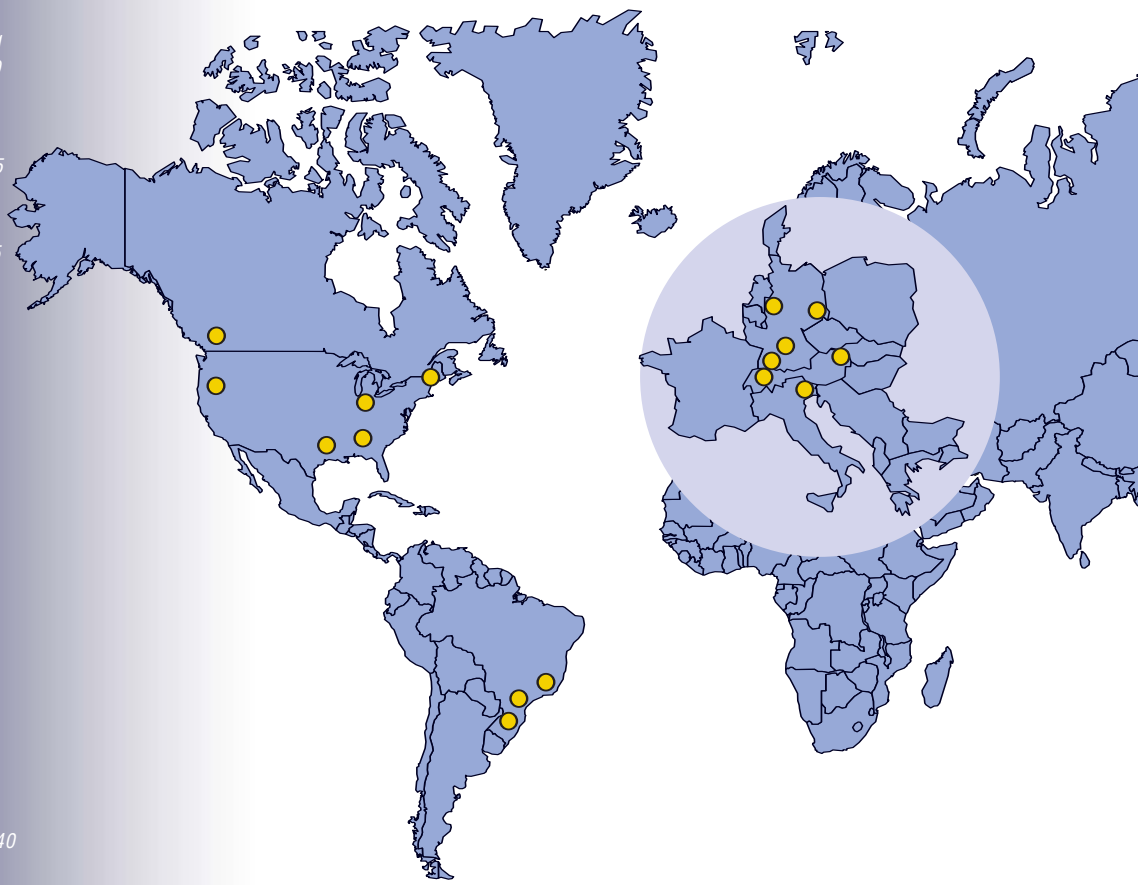
The basis for this is a well thought-out backup organization with additional specialists supporting the account manager in specific matters. I am convinced that in this way we can give more time and individual attention to our customers and achieve shorter response times.

Over and above this we are constantly working towards the progressive development and sensible expansion of our service range. Only recently Voith Sulzer Paper Technology, together with RIF SpA, set up the joint venture company RIF Roll Cover Srl which is active in the area of rubber and polyurethane coatings (see also the article about RIF Roll Cover on the preceding pages). With this company we now have access to internal capacities especially in the important field of polymer roller coatings and offer our customers a complete range. We were also able to make significant progress with the GR cover through further developments so that it is now very well suited to the most demanding applications. And already over 100 GR covers are in use.

The service field in particular is to be strengthened and expanded by increases in personnel. This applies to the metrology & diagnosis and cylinder service areas as well as to the technology service, where “Productivity Audit Teams” are being organized.

Another aspect, which in the future will gain in importance, particularly in connection with the outsourcing of services in our service range, is that of maintenance

Service Center	
Heidenheim	*Tel. ++49-(0)7321-37 6061* *Fax ++49-(0)7321-37 7889*
Ravensburg	*Tel. ++49-(0)751-83 02* *Fax ++49-(0)751-83 2999*
Düren	*Tel. ++49-(0)2421-499 205* *Fax ++49-(0)2421-423 34*
Weissenborn	*Tel. ++49-(0)3731-35 420* *Fax ++49-(0)3731-35 4215*
St. Pölten	*Tel. ++43-(0)2742-806 0* *Fax ++43-(0)2742-71772*
Kriens	*Tel. ++41-(0)41-329 5757* *Fax ++41-(0)41-329 5758*
RIF Roll Cover SrL	*Tel. ++39-(0)432-561 414* *Fax ++39-(0)432-561 600*
Middletown	*Phone ++1-513-423 9281* *Fax ++1-513-423-3256*
Portland	*Phone ++1-503-284 1440* *Fax ++1-503-288 3248*
Austell	*Phone ++1-770-948 8086* *Fax ++1-770-948 4613*
West Monroe	*Phone ++1-318-387 1801* *Fax ++1-318-322 3984*
Farmington	*Phone ++1-603-330 1088* *Fax ++1-603-330 1089*
Tristar	*Phone ++1-604-946 1631* *Fax ++1-604-946 0208*
Sao Paulo	*Phone ++55-(0)11-840 4040* *Fax ++55-(0)11-840 4841*



management as a form of contractual co-operation or partnership with the customer. This can be customized – from the maintenance of individual rolls to the whole machine.

Up to now you have talked more about organizationally and technically-oriented aspects of the plans. Do the plans also include location-related activities?

Yes, because as can be seen from my previous remarks, our concept and measures are based on a certain philosophy. Being close to the customer. This means being close technically, organizationally as well as geographically.

At the moment there are a total of seven service centers in Europe besides nine further service centers in South and North America (see drawing). We plan to set up other service centers near to our customers in Europe and Asia in order to improve the service we provide locally. In the foreseeable future we shall, for example, open service centers in Scandinavia and South-East Asia so as to be able to offer a comprehensive service in these important regions.

What do you consider to be the importance of Voith Sulzer Paper Technology's employees?

Let me tell you quite clearly. The whole concept depends on our employees. It is only through them that ideas can be converted into actual deeds. For me three components have particular importance: the right attitude concerning service, specific and effective training and motivation.

Finally I would like to stress again that our customer must always be the focal point. Our customer will reap the benefits of this, because efficient support by an experienced machine manufacturer and service provider enables him to concentrate on his core business.

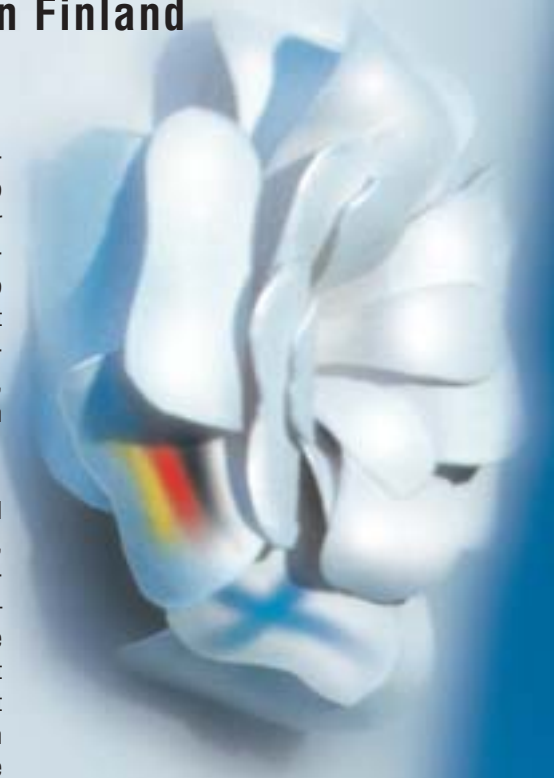
New Voith Sulzer Paper Technology Office in Finland

On March 20th our new office in Helsinki invited some 150 ladies and gentlemen from the Finnish paper industry to an evening party in the winter-garden of the "Sipuli" restaurant. It proved to be an impressive event under the floodlit roofs of Uspensky Cathedral, giving our guests an opportunity to meet the entire management of Voith Sulzer Paper Technology and to refresh old acquaintances among one other.

Although the official reason for this reception was the opening of our new office in Vantaa, we had laid on good entertainment and our guests continued dancing until well beyond midnight.

We also had every reason to be in good spirits: following the updating and improvement of PM 1 at UPM-Kymmene in Pietarsaari, we were able to secure further interesting orders from Finnish customers within the past six months. Two Janus calenders for Myllykoski, another shoe press for UPM-Kymmene in Tervasaari, a two-layer headbox for Enso board machine 1 in Kaukopää and last but not least a shoe press for the Metsä-Botnia White Top Liner machine in Kemi, representing our third NipcoFlex press in Finland.

In his address, Hans Müller, President and CEO of Voith Sulzer Paper Technology, once again emphasised the great significance of the Finnish paper industry – and promised to sit down and learn the Finnish language as soon as our market share in Finland had reached 25 %. Now it depends on our activities and our Finnish customers just how soon he has to tackle this task!



Mr. Jorma Vaajoki, President and CEO of Metsä-Serla, expressed his thanks for the invitation in perfect German and welcomed Voith Sulzer Paper Technology to Finland (above).

Hans Müller cutting the tape (left).

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Voith Sulzer Paper Technology Philippines Inc., Manila – the new joint venture in the Philippines

Robert Dan and Co.

The original company Robert Dan and Co. (RDC) was founded in 1954 by the late Robert Dan as a paper mill consulting firm. Later it expanded to become a well-known supplier to the paper industry. However, the first contact with Voith Sulzer dates back to 1929 when Robert Dan bought an Escher Wyss paper machine for his father's paper mill in Foochow, Fukian, China.

Since 1954, Robert Dan and Co. has sold six Escher Wyss paper machines in the Philippines, including the first Escher Wyss tissue machine to Kimberly-Clark in 1961. RDC has also supplied stock preparation equipment for more than 70 paper mill projects in the Asian region. Most notable are the 600 t/24 h deinking plants at Daehan Paper in Korea and at TIPCO in the Philippines, two of Voith Sulzer's finest running plants.

Aside from the paper industry, RDC is also engaged in the supply of belting and conveyor lines for other industries. For instance, the company has supplied conveyors to Changi International Airport, Singapore, rated by many as the world's best airport over the past few years. RDC is also the exclusive representative in the Philippines for Siegling Belts of Germany.

Voith Sulzer Paper Technology Philippines' current president, Raymond Dan,

Fig. 1: Aerial view of Makati City, a business district of Manila, where mainly banks and insurance companies are concentrated.

Fig. 2: Ortigas Center, a business district in Pasig, Manila, where Voith Sulzer Paper Technology Philippines Inc.'s manufacturing facilities are located.

Fig. 3: The Jeepney, – uniquely Filipino.

Fig. 4: Shaking hands after signing the Joint Venture Agreement: on left Raymond Dan, President of Voith Sulzer Paper Technology Philippines Inc. and Hans Maichel, Manager Commercial Services, Voith Sulzer Stoffaufbereitung GmbH & Co. KG, Ravensburg.

Fig. 5: The Manila offices of Voith Sulzer Paper Technology Philippines Inc., in the Malate District of Manila.

Fig. 6: Pulper in the final stages of assembly.

Fig. 7: Mill installation of a Combisorter (on left) and drum screen.

is the son of RDC's founder, Robert Dan. Raymond was educated in papermaking in the USA at the College of Forestry, Syracuse University, New York State and received his Master's Degree in Industrial Administration from Purdue University, Indiana. Before joining RDC, he acquired extensive experience in the paper industry while working in the United States for Electronics Automation Systems and Simons Eastern Consultants.

The new joint venture company Voith Sulzer Paper Technology Philippines Inc., Manila

In July 1993, RDC's initial talks with Sulzer resulted in a respective equity sharing of 75 and 25%. This partnership progressed over the following years and a joint venture, called Voith Sulzer Paper Technology Philippines Inc., was established on December 19, 1997. Voith Sulzer's Stock Preparation Division owns 51% of the new company.

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The joint venture with RDC represents a significant step by Voith Sulzer Stock Preparation in further strengthening its presence in Asia since the company is strategically positioned in the Philippines with excellent access to major Asian countries. The Philippines has a growing economy and a good supply of English-speaking personnel at attractive salary levels. Wages in the Philippines are about 6 times lower than in Germany. Highly-educated professionals for upper and middle managerial positions are available, since each year some 600,000 new college graduates are welcomed into the job market.

Plans for paper mill projects are expected to increase in the coming years as current annual per capita paper consumption in the country is only 13 kg. The market is thus ripe for rapid development. In addition, infrastructure costs are low, the democratic government is market-driven and the currency exchange system is open, paving the way for the new joint venture to be a forerunner in Asia.

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Bahia Sul – changing perceptions about Brazil and our industry

Located on the Southeastern coast of Brazil is a world class pulp and paper mill that is setting new standards for our industry and capturing the imagination of those that strive to create the ultimate model for the future. With a closer look at this pulp and paper prodution center it is easy to see not only the tremendous commitment that has been made to making this operation a model for our industry, but an example that disproves the popular belief that our industry is profiting at the expense of the environment.

Allow us to introduce you to a world class operation that is changing the perceptions of the Brazil and our industry.

The author:
Kirsten Kolvenbach, Marketing Service Division. Special thanks for their assistance: Gustavo Camargo, Bahia Sul and Ray Hall, Voith Sulzer Service Division

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Bahia Sul – more than a concept

One has to look no further than the management team to sense the leadership and the energy that is transmitted into the daily operation of Bahia Sul. They are backed by a company and a team of people that believe that it is their task to not only meet operational goals, but to do so with the highest possible standards, in fact world class standards. It only takes about ten minutes of discussion the management to not only appreciate the accomplishments of the Bahia Sul operation, but to also see how infectious their enthusiasm is to establishing and achieving even the most difficult targets.

From initial concept until today Bahia Sul has:

- Established constantly sustained fiber source from a Eucalyptus forest that is in harmony with nature and the surrounding plant an animal environment.
- Become the first pulp and paper mill in the world to be certified to the BS 7750 and ISO 14001 environmental standards.
- Developed from a green field status a world class pulp and paper mill operation including the entire supporting infrastructure of trained personnel, and the social systems for those people in terms of housing, schools and healthcare facilities.

We invite you to read on to learn more details concerning this leader in our industry.

The eucalyptus plantation

The Bahia Sul eucalyptus plantation comprises ninety million trees covering 66,000 hectares – about 90,000 football fields. Apart from the factory buildings, roads and housing, etc. the other 49,000 hectares of land (about 70,000 football fields) also belonging to Bahia Sul are planted with indigenous non-cultivated species.

Eucalyptus is one of the fastest-growing hardwood trees in the world. And the Bahia Sul regional climate is extremely favourable for this species, with heavy rainfall equally distributed throughout the year and only slight temperature variations. As a result, the eucalyptus harvesting cycle here is only seven years.

The Bahia Sul eucalyptus plantation not only covers all raw materials needs in timber and cellulose, but also makes the plant independent of outside energy supplies. Power is generated by steam turbine units fuelled with waste lignin, bark and other residues.

The high environmental standards

The company became the first organization of the American Continent and the first in the world in the pulp and paper section, to gain the BS 7750 standard certification, which establishes the requisites for the environmental management system. The BS 7750 was the base for the creation of the ISO 14001. Bahia Sul was once again recognized for its pio-

Fig. 1, (page 67): A partial view of the fiber line.

Fig. 2, (page 66): Overview of "mosaic" planting.

Fig. 3, (page 68): The nursery.

Fig. 4, (page 68): Seedling productions.

Fig. 5, (page 69): General view of the mill located in Mucuri.

Fig. 6: Paper Shipping.

6

Demands on the Environmental Management System

- Environmental policy
  Framework for action
- Planning
  - Establishing of the objectives and targets
  - and programmes for achieving them
- Implementation and operation
  - Structure and responsibility
  - Training, awareness and competence of the employees
  - Open communications (internal, external)
  - Environmental management system documentation
  - Organisation of the operations
  - Emergency preparedness and response
- Checking and corrective actions
- Environmental management system audits
- Management review
- Continual Improvement*

Environmental management systems: definition

Environmental management systems are officially defined as "that part of the overall company management system which is responsible for the organizational structures, responsibilities and behaviour rules, formal procedures, processes and resources required for establishing and implementing the environmental policy"..**

**Informations of: Norm der Umweltmanagementsysteme, Spezifikation mit Anleitung zur Anwendung, Oktober 1996.*

***Source: Integration of environmental management in quality management systems TÜV Southwest.*

neering when, in 1996, it received this certificate.

For example, to obtain certification according to ISO 14001, the requirements for establishing an environmental protection management system defined in the standard and shown in chart must have been met, where the individual modules are to be subject to a dynamic cyclic process. Improved performance with respect to the environment is the objective of this certification.

For succesful realization, the idea of protecting the environment must be taken into account in each business decision, of all levels and in all functions. All of this is based on informed and motivated employees.

In the case of Bahia Sul, the environmental protection management system is linked up with other systems, for example with the quality management system according to DIN ISO 9002, which views customer benefit as its main objective. Therefore, the environmental protection is a system modul of the holistic management system. It is the objective of such a combination of standards having different orientations to bring about a consent of customer-oriented economic efficiency as well as responsibility towards society and the environment.

Integrated cellulose and paper plant – facts and figures

The cellulose plant has been operating since March 1992, with an annual output of 500,000 tonnes bleached eucalyptus kraft pulp. Hardwoods like eucalyptus yield a short-fibred pulp ideal for producing wood-free papers which are easily printable, with smooth, bright and uniform surface qualities and high opacity.

That is why eucalyptus is used for a wide range of products such as printing and writing papers, tissue, coated papers, carton and special grades.

Since 1980 eucalyptus has played a growing role in world production of bleached hardwood kraft pulp, rising from about 28% (1.9 million tonnes) at that time to 35% (5 million tonnes) in 1995. The Bahia Sul people are convinced that „this trend will grow: the relatively low cost of eucalyptus pulp will make it more and more popular in global production of bleached kraft pulp." Some of the pulp produced – 147,000 tonnes in 1995 – is used for making uncoated wood-free printing and writing papers at Bahia Sul paper mill, which started operating in February 1993. Rated output is 250,000 tonnes p.a. (medium grade paper with a basis weight of 80 g/m^2).

Bahia Sul – a special mission

Bahia Sul not only regards itself as an employer of nearly 1500 people on the plantation and in the plant, but also takes its social responsibilities seriously – more than 80 million US dollars were invested in 1995 alone for new or improved housing, schools and medical services in the surrounding region.

Showing the way

Bahia Sul is an excellent example of how product plants should be integrated into their surroundings and the environment. And also a good example of how higher goals should be set for daily labour than output alone. To all who are inspired to follow this example, we wish you success and good luck.

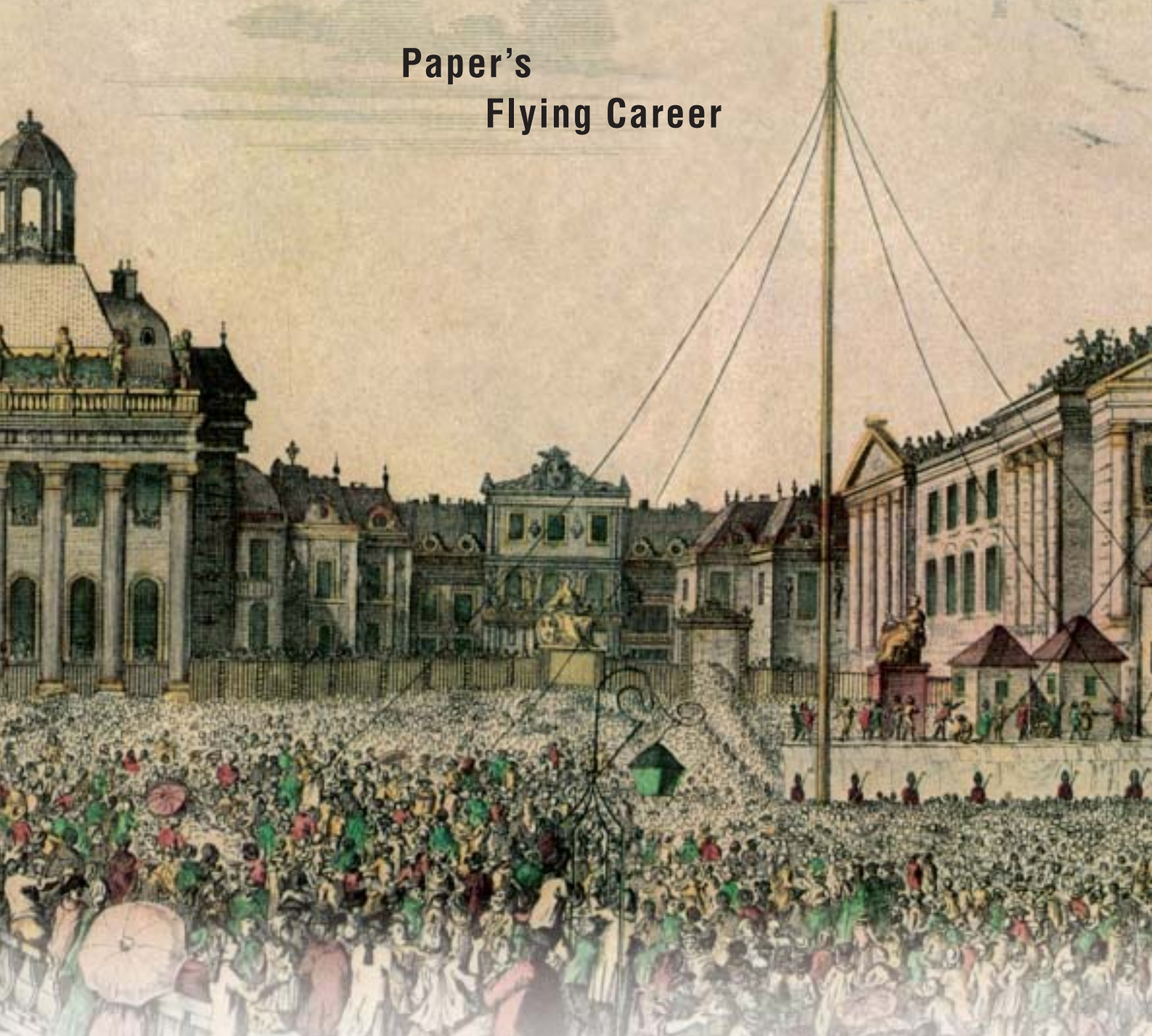
Market: Pulp
(in thousands of tons, except percentages)

	1995		1994	
Region	**Amount Sold**	**Percentage of Total**	**Amount Sold**	**Percentage of Total**
Asia	101.5	34.1%	141.6	41.7%
North America	76.0	25.5%	64.0	18.8%
Europe	60.7	20.4%	65.3	19.2%
Latin America	2.0	0.7%	14.8	4.4%
Total export sales	240.2	80.7%	285.7	84.1%
Domestic sales	57.3	19.3%	53.9	15.9%
Total sales	297.5	100.0%	339.6	100.0%

Market: Paper
(in thousands of tons, except percentages)

	1995		1994	
Region	**Amount Sold**	**Percentage of Total**	**Amount Sold**	**Percentage of Total**
North America	27.1	19.5%	43.0	23.8%
Europe	17.8	12.8%	27.4	15.1%
Latin America	10.0	7.2%	13.3	7.4%
Asia	8.8	6.3%	15.1	8.3%
Africa	3.4	2.4%	10.9	6.0%
Others	14.3	10.3%	19.6	10.8%
Total export sales	81.3	58.4%	129.2	71.4%
Domestic sales	57.8	41.6%	51.7	28.6%
Total sales	139.1	100.0%	180.9	100.0%

Paper's Flying Career



Today paper makers and paper engineers are what we generally consider as "Global Players", with the overwhelming majority of their companies active on an international basis. Their staff, whether managers or mechanical engineers, take it for granted that they will have to jet around the world in order to attend conferences, sign contracts or visit customers. Should some of our esteemed readers also belong to this modern species of occupational globe trotters, we would ask you to observe at least a few second's silence for the inventors of such flying machines during your next take-off. And not without a degree of pride, either, since it was two of your colleagues from the paper industry who turned humanity's old dream of flying into reality, going beyond all the often bold and daring but occasionally ridiculous visions developed so far. To achieve

Joseph Michel and Jacques Étienne Montgolfier

their ambition they exploited to a large extent the experience gained in their profession: paper and its characteristics.

Joseph Michel and Jacques Etienne Montgolfier, two paper makers from the Lyon region, had accumulated a substantial fortune since their paper mill close to Annonay and family-owned for four centuries was finally appointed "Royal Paper Manufactory" and official Purveyor to the Royal Household in 1782. The regular income ensured bythis honour gave Joseph, then aged 42, and his five-years younger

A bronze medal coined by King Louis XVI commemorates the aeronautic achievements of 1783 – the first manned flights in hot-air and hydrogen balloons.

The excitement that seized the entire French nation at the beginning of the balloon era inspired numerous artists and craftsmen whose works have been preserved until today and communicate a magnificent impression of the exciting events of that era (left page).

brother Etienne the financial independence needed to devote themselves fully to their life-long passion. Their fancy was definitely not sweet idleness! In the midst of the age of Enlightenment, when intelligent minds were engaged on the various kinds of scientific study and experiment that had become fashionable at the time, the Montgolfier brothers were fascinated-by "lighter than air" flying machines .

According to accounts supplied by their friends, the inspiration for constructing the first workable flying machine came one evening in front of the open fire, when Joseph threw an empty pastry bag into the flames. Instead of burning down to ashes the bag was filled and carried away up the chimney by the ascending hot air, never to be seen again. Thus the idea of the hot-air or Montgolfier balloon was born. Admittedly, some evil tongues claimed that it was not the paper bag but the clothing of the scantily-clad Madame Montgolfier which the hot air caused to rise and thus inspired the bold dreams of the master of the house while sitting up late in front of the warm fire.

An unusual, though very amusing version of the legend! And why should that world-famous movie scene featuring Marilyn Monroe's dress fluttering in the hot air above a New York subway sidewalk grid not have a real historic model? Be that as it may, from that time on the two paper makers from the South of France, convinced of the practicality of their plans, devoted all their efforts to balloon experiments. They began to construct increasingly large paper spheres and, in open-air experiments, tried to make them rise into the sky by holding them over open fires.

June 1783 saw the staging of their largest test project so far, a linen envelope lined with paper and with a circumference of 33.5 metres and a volume of 625 cubic metres. The eyes of curious spectators and representatives from the Academy of Sciences were all upon an experiment that in the event surpassed all expectations. An eyewitness noted: "…the hot smoke created by an immense fire transformed the voluminous bulk of fabric and paper into a gigantic, oscillating sphere, with eight perspiring men holding on grimly to keep it on the ground. When at Joseph Montgolfier's command the assistants were allowed to release the balloon, the huge sphere rose into the sky before the eyes of an amazed public up to a height of 2000 metres, where it hovered for about 10 minutes, before descending approximately two and half kilometers from where it had started its aerial voyage …"

It took only a few months to accomplish the leap from unmanned to manned flight experiments. On September 19th, 1783, in Versailles, watched by King Louis XVI and a large crowd of spectators, a balloon rose into the air carrying a wickerwork basket with a sheep, a chicken and a duck "on board". Two astronomers calculated the actual altitude reached as 560 metres. After this successful experiment and the safe return of the "passengers", the king beamed with satisfaction. However, when Etienne Montgolfier stated his intention to send a human being without delay on a high-altitude flight, the king proposed choosing a convict sentenced to death who as a reward could look forward to a pardon, should he survive the trip. At this stage a fierce quarrel flared up among the members of the Academy of Science, who

Between 1784 and 1790 the artist Balthasar Antoine Dunker of Bern completed this satirical painting of the "Huge Mail Air Sphere which is scheduled to fly to China on March 10, 2440" shown on the right. For its journey to the Far East the mad balloon carried "Church and Hospital" (K), "Exits" (U), "Passenger suites" (P), Inns and Coffee Shops" (X) and "Good-hearted girls including the stairs to their cage" (R).

could not decide whether or not the honour of becoming the first aviator in the history of mankind should be left to a low criminal. In the end science triumphed over the king's plea. On the morning of November 21, 1783 Monsieur Pilatre de Rozier, director of the Paris Museum, and the Marquis d'Arlandes took off in a splendidly painted aerostatic machine – as Montgolfier called his balloon – and hovered over the heads of the King and his royal household at a height of about 85 metres. After covering a distance of more than eight kilometres the two men landed safely, to tumultuous applause.

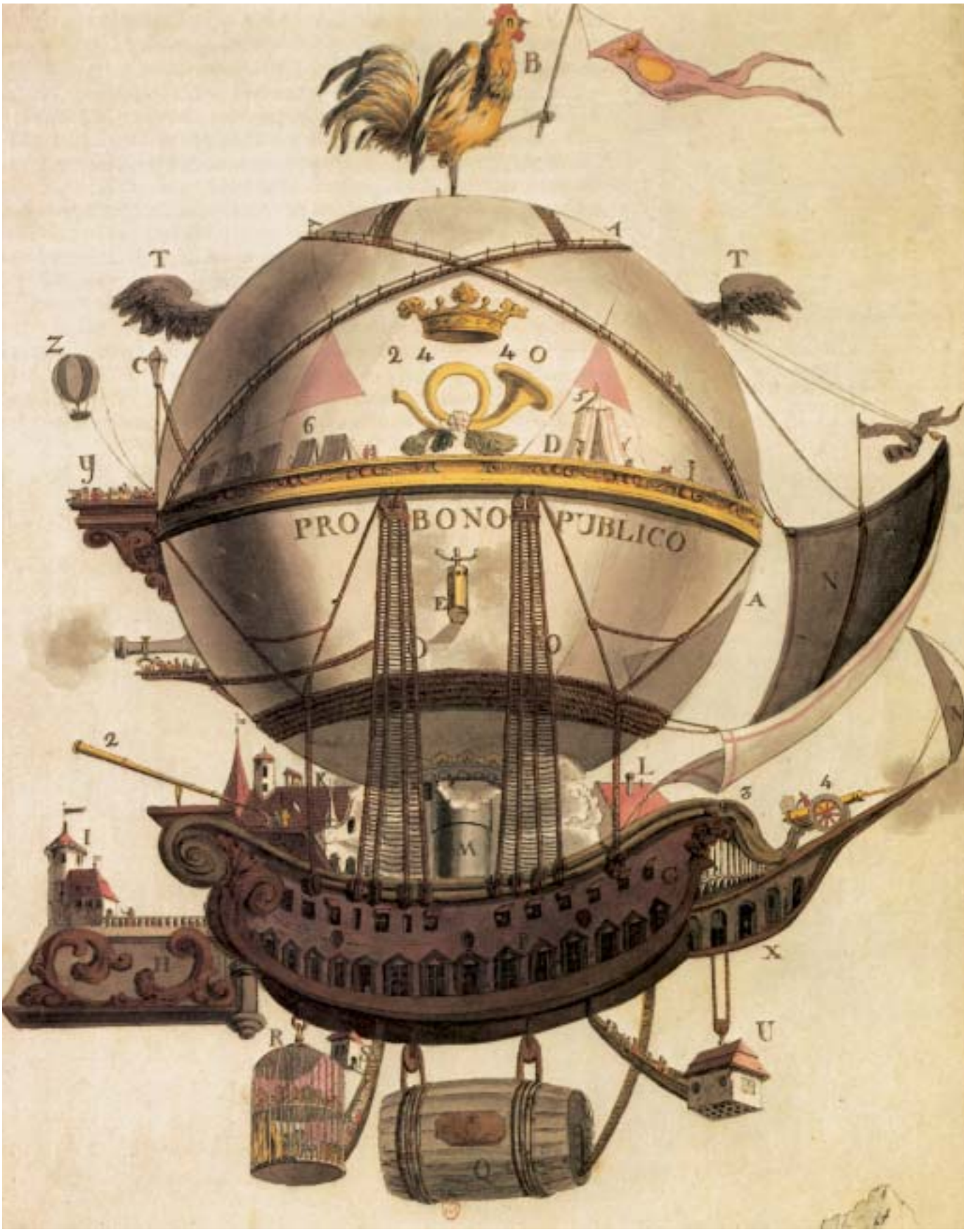
The whole of France was seized by "Montgolfier fever". And as was to be the case with many future technical developments, in 1783 people were already of two minds with regard to the new invention. Some sensed the approach of a terrible disaster, others predicted the onset of a heavenly era for mankind. Regardless of the still open end to all aeronautic adventures or their benefits, a tacky handicrafts industry exploited the forthcoming balloon era for all it was worth as Christmas approached. Nothing was spared from adornment with balloon motives or from being produced in balloon shapes. A flood of lamps, clocks, toiletries and bottles of smelling salts more or less successfully declared to be replicas of Montgolfier's balloon swamped Europe and sold like hot cakes.

Unimpressed by all the fuss and excitement, the Montgolfier brothers continued experimenting. In principle, paper remained their main material. At least as far as the lining of their balloons was concerned, they continued to pursue their profession as paper makers. It was not until some time later, when gases such as hydrogen started to replace the hot-air principle, that the balloon construction industry disassociated itself from highly sensitive paper as an envelope material. Indeed it was almost a century later, when a new generation of aviation enthusiasts started to construct elementary steerable gliders based on the ideas of Otto Lilienthal, that paper and board, known to be the lightest modelling and cover materials available, underwent a brief renaissance. However, the start of powered aviation paved the way for the use of heavier and more stable materials such as light metal alloys.

When we today take a seat in the air-conditioned, pressurised cabin of a jet airliner, we hardly give a thought to those magnificent men in their (paper-covered) flying machines or in their baskets or gondolas suspended beneath balloons or Zeppelin airships. Yet it remains an incontestable fact that two paper makers were the first people to prove that human beings can construct flying machines able to bear their own weight and more besides. Is this not something to fill paper makers with satisfaction and pride? After all, have they not always been famous for their outstanding ideas?

Manfred Schindler

Otto Lilienthal (1848-1896) and one of his gliders. He is considered the actual pioneer of aircraft construction, passing on for the first time reliable knowledge of aerodynamics and aviation engineering.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