A Royal Event for Board and Packaging Papers

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Paper Machines
Board and Packaging

In early May 2001, under the motto "ahead, Voith Paper invited the manufacturers of board and packaging papers to Vienna to exchange their experiences and opinions.

The list of the more than 400 participants reads like the 'Who's Who' of the board and packaging paper industry: Over 250 top international managers from the board and packaging paper sector, as well as representatives of institutes, technical universities and representatives from the media had accepted the invitation to come to Vienna. A total of 40 countries were represented – from Australia to Canada, from Japan to Chile.

Lunch was served in the newly renovated roof foyer of Vienna's Hofburg Palace.

Otto Heissenberger, President of the Board and Packaging Paper Machine Division, and Dr. Hermut Kormann, President of J.M. Voith Aktiengesellschaft, Heidenheim.

Vienna's Hofburg Palace provided a royal setting for the conference. In former times, the Hofburg Palace was the emperors' winter residence. Today it houses the offices of the Austrian Federal President, the Spanish Riding School, the National Library, several museums and a modern conference centre. More than 350 guests from 40 countries attended the conference held in the 'Großer Redoutensaal'.




On the evening before the conference, Otto Heissenberger, President of the Board and Packaging Paper Machine Division, welcomed the guests at a reception held at the Ferstel Palace.

A 'gemutlich' evening at a 'Heuriger' with typical 'Schrammel' folk music is an absolute must in Vienna.

The evening's entertainment was an experience enjoyed by everyone. In the relaxing atmosphere, many attendees also found the time to discuss future plans and projects.

The spouses' programme included a visit to the imperial apartments in the Hofburg and the Porcelain Manufactory Augarten.




Three years had passed since the last **"ahead** Customer Conference was held in 1998, focusing for the first time on the topic of board and packaging papers – and it was time for an update.

Many investments were made by Voith Paper during these three years, mainly to strengthen its process competence. Today, papermakers have to re-think and optimize their complete production process to assure that their products are geared to market requirements at optimum cost effectiveness.

Some changes were clearly visible, such as the acquisition of the Scapa group, which considerably strengthened the Voith Paper Service Division and made Voith Fabrics one of the major manufacturers of paper machine clothing.

In other areas, such as research and development, Voith Paper has also focused on strengthening its process competence. The following topics were interlinked throughout each paper being presented at the **"ahead** 2001 Conference:

- How do the raw materials used, the stock preparation equipment, the paper machine components and following process stages interact with one another during operation of a board or packaging paper production line and how can such interaction be utilized to achieve an optimum product?
- What are the possibilities of multi-ply and multi-layer concepts, when are such concepts used today and what advantages do they offer for the production of certain board or packaging paper grades?
- What can be done to follow the trend towards higher speeds and lower basis weights of packaging papers? What are the possibilities to boost production while enhancing quality when producing board?
- How do investment cost and operating cost correlate, and how can a machine's total cost be minimized?

The papers focused both on concepts for new production lines and on possible upgrading through rebuilds. Moreover, several "smart solutions" were presented, allowing the papermaker to achieve lasting improvements in machine performance with small investment budgets and minimum amortization times.

Highlighted on the agenda were the papers on new reference plants. During **"ahead** 1998, several new components and machine concepts specifically developed for board and packaging papers had been presented, such as the gap formers, DuoFormer™ Base and DuoFormer™ Top. This time, five customers demonstrated how these concepts had successfully been put into practice, giving current figures to substantiate their reports.

Some of the production lines discussed have revolutionized the industry: PM 9 at SAICA 3 in Spain, the fastest paper machine for corrugating medium, constantly reports new speed world records. The new production line for gypsum-grade paperboard, Lawton, Oklahoma, USA, is the world's first paper machine fitted with two gap formers. The fact that the shoe press technology has also gained a firm foothold in the production of board was demonstrated by a report on the BM 3 rebuild at Mayr-Melnhof, Frohnleiten, Austria.

The guests' expectations were high, and the participants this year were twice as many as during the **"ahead** 1998 Conference. The numerous positive reactions, the pleasant atmosphere during the conference and the fact that the large conference room was packed full until the last paper was read, showed that the Vienna conference was worth visiting.

In closing, a small, but unique, thank-you gift was presented. Each participant received a 'take-away' paper machine. The simple design, absolutely maintenance-free and environmentally friendly, was received with great enthusiasm.

"ahead on the Internet:
*All papers and the best photos of the conference can be found on the **"ahead** homepage:*
Simply download at: www.ahead.voithpaper.com
The papers presented at the conference can also be requested from:
Ms Sigrid Hrebacka, Fax: +43 27 42 8 06 25 48
E-mail: sigrid.hrebacka@voith.com

Our guests' opinions

Ing.
Henk Lingbeek
SCA Packaging De Hoop, Netherlands

It was an excellent conference, and what I liked especially – I also attended the conference three years ago – was the combination of topics: not only technical issues, but also some dealing with marketing, final products, Voith Paper's philosophy and organization.

Dipl. Ing. (FH)
Manfred Stemmer
Cascades Arnsberg GmbH, Germany

My general impression is a very positive one, we gained new ideas and thoughts, and moreover, it was a good opportunity to talk with many colleagues.

What impressed me most was the professionalism of the presentations.

...An important thing is that people with practical experience were present, reporting about their experiences...

...What I also liked very much, as I come from the folding boxboard sector myself, was the first paper giving entirely new aspects of the publicity value of our product. It was a highlight for me not only in technical respects, but also because it focused on the tasks of our product.

... Whether I will come again? Yes, of course, we already agreed yesterday that, if things go on like this, Voith can hold such a meeting every week!

Peter Reichler
Amcor Australasia, Australia

I think it was a very impressive conference, you have picked a beautiful location, even the weather is impressive. What pleased me more than anything else was the quality of the presentation and the information provided...

... It was very pleasing that the information was prepared in a way that even the non-technical people, such as myself, could understand...

... The paper on investment and operating cost yesterday and of course the two presentations of the new mills in Turkey and SAICA were most interesting!...

...I do have to express my appreciation of the Voith team – they have done a fabulous job!

Pekka Mauranen
KCL, Finland

I come from the Finnish research institute KCL and have to admire your team. Listening to all of the papers about the different products, I realize how deep their expertise is in this field.

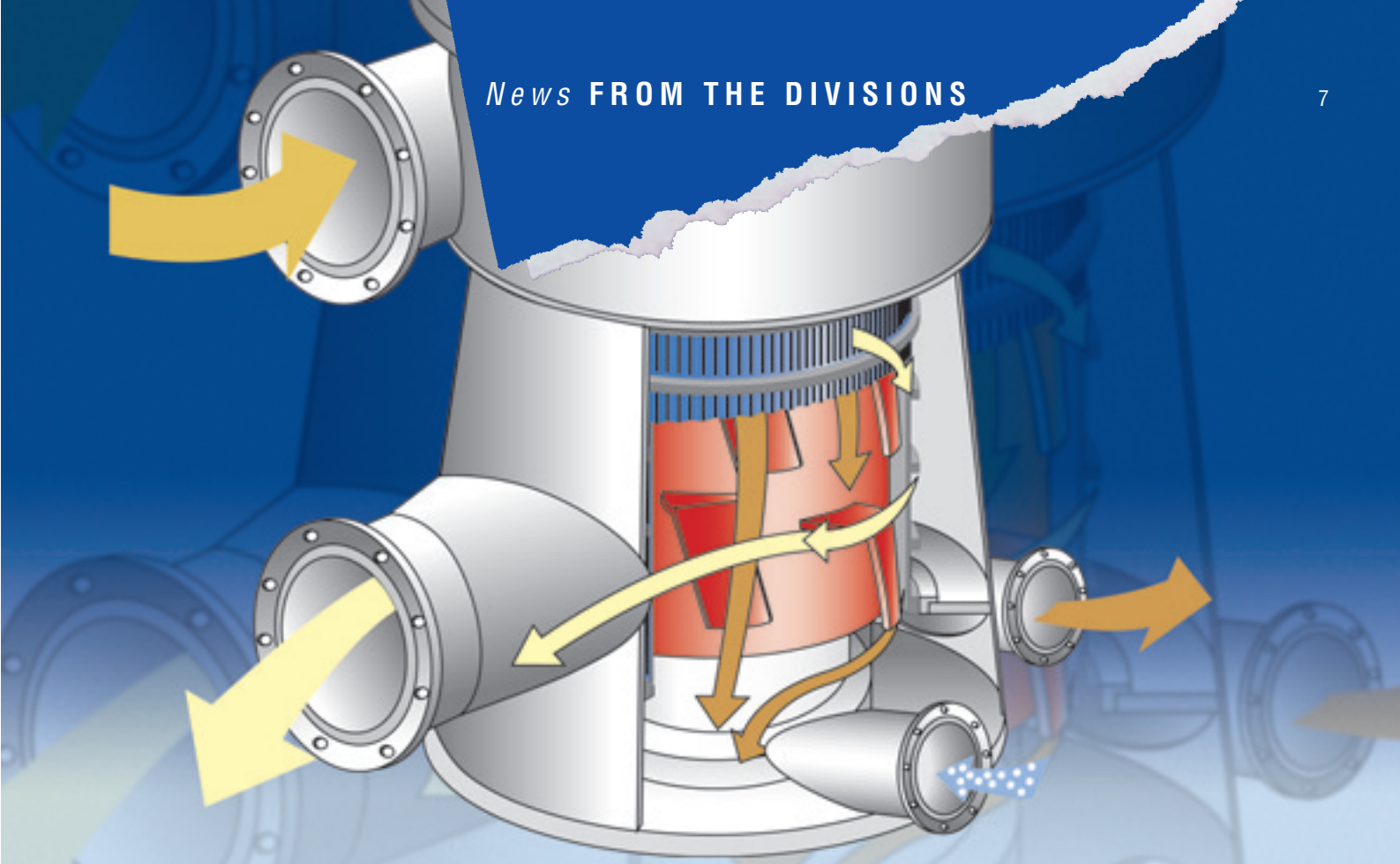
I think Voith has done extensive theoretical research and development work and has applied the results in practice on the pilot machine and in customers' mills...

...Of course, the location is very impressive, this imperial palace...

...I think it's a world-class conference!

T.S. Ong
Genting Sanyen, Malaysia

The conference was well organized, and I think the topics were well chosen, particularly on the first day. The quality of the papers, in general, was good – 'they were presented by many of the young people. I think there is a bright future ahead because Voith is capable of renewing itself with these young specialists...



Stock preparation – the key to ensure the productivity of newsprint and SC paper machines

The author:
Harald Selder,
Fiber Systems

The Federal Republic of Germany holds a top position in Europe with regard to the use of secondary fibers for the manufacture of paper and board products. The rate of utilisation of recovered paper is presently 62%. For Germany, this ratio is expected to be increased further, which will lead to a further reduction in fresh fiber usage.

It is known that the largest quantities of recovered paper are used in the field of packaging papers. In this product sector, signs of maximization have already become apparent, so that in this sector no increase in the use of recovered paper is to be expected. A higher percentage can therefore only be achieved by raising the secondary fiber usage for graphical papers.

What is the present situation in the use of recovered papers in the field of graphical papers?

Fig. 1 shows the relative recovered paper contents for the most important graphical, wood-containing paper grades. The abscissa in this diagram represents the quality whereas the ordinate stands for the price achieved with these products. The red field describes the average, relative recovered paper content used in these products.

Today, the standard newsprint paper is usually made from 100% deinked pulp (DIP). The same applies for upgraded newsprint. In the SC paper sector, 40% of secondary fibers are used on average, and for LWC papers, approximately 25%. A similar percentage is also used for the high-grade coated papers.

Fig. 1: Content of deinked pulp in wood-containing printing papers.

Fig. 2: Number and relative weight of advertising inserts in newspapers.

$$*\text{Relative weight} = \frac{\text{Weight of inserts}}{\text{Overall weight (newspaper + inserts)}} \times 100$$

Fig. 3: Trend in paper grades used for magazines and change in inorganic content of DIP. German deinking furnish: 50% ONP, 50% OMG.

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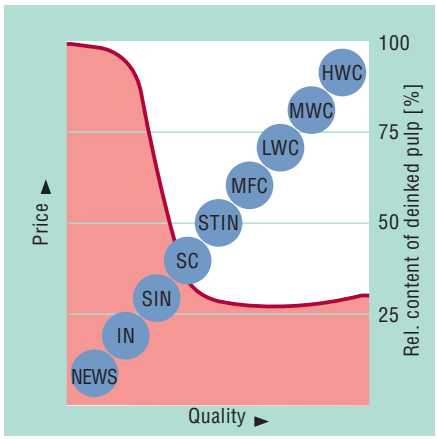

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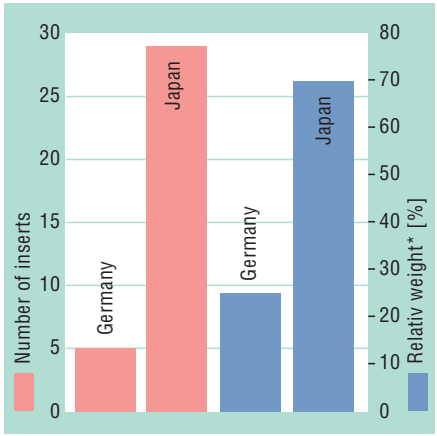

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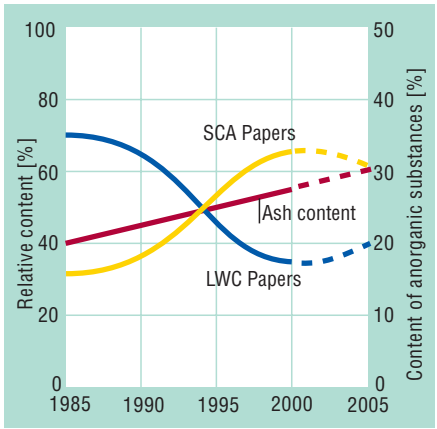

Recovered paper: quality and availability

The recovered paper grade, which is available in sufficient quantities in Germany and of satisfactory quality uniformity, suitable for the higher-quality, graphical papers, is the deinking furnish.

This deinking furnish is collected in the form of a household collection grade by the recovered paper trade, and it's then separated into brown and white paper fractions in sorting plants.

The resulting white paper fraction consists of approximately 50% old newspapers and 50% magazines and is supplied to the paper mills as deinking furnish. The paper composition of this deinking furnish is subject to continuous change, which the stock preparation engineers have to take into consideration. In this article, we will point out the most essential changes in the deinking furnish composition, which have an influence on the deinkability and the DIP quality.

Today, the daily newspapers include approximately 2-5 advertising inserts per paper. These inserts are in most cases printed on SC and LWC papers. The printing process is mostly sheet-fed offset with integrated heat-set drying. Due to this heat-set treatment, many problems have to be reckoned with when it comes to deinking. The quantitative share of these inserts is approximately 10-20% of each newspaper, as shown in *Fig. 2*.

In Japanese daily newspapers up to 30 inserts per distributed paper can be found. In this case, the inserts have a share of 70%. In Japan, statutory regulations limit the advertising space in daily newspapers, which explains this high percentage of inserts.

Such a high share of inserts is not to be expected in Europe. However, a further increase in the number of advertising inserts in daily papers is to be reckoned with. Local and regional advertising is not of interest as yet for the electronic media, and it will remain a domain of print advertising for now and the near future.

Another change can be noted for the magazine paper grade. Approximately 15 years ago, the principal paper grade for magazine production was LWC paper. Today, the predominant paper grades used for magazines in Germany are the SC paper grades suitable for roto-gravure printing, as can be seen from *Fig. 3*. About 70% of the magazines published in Germany are presently printed on SC papers.

This situation must be expected to change again. The reason is the new generation LWC papers. These papers are coated and calendered in an online process. In this way, production costs can considerably be reduced. In addition, the quality of these papers is equivalent or even superior to that of the corresponding SC papers. Consequently, there will be more LWC papers in the deinking furnish in the future.

From *Fig. 3*, it is also obvious that a constant rise in ash content can be noted in the deinking furnish. This rise is the result of continuously increasing ash contents in LWC and SC papers, and on

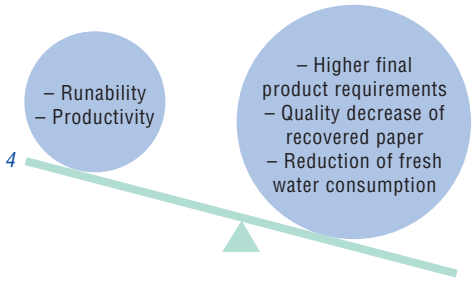

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Fig. 4: Runnability- and productivity-related variables.

Fig. 5: Simplified block diagramm of analyzed system.

the other hand of rising ash contents in standard newsprint papers.

Along with the higher percentage of magazines in the deinking furnish, more adhesive glue and more hotmelts are automatically fed into the stock preparation systems. These substances are the sources of the macro stickies, which will cause many upsets on the paper machine if not sufficiently removed. In addition, large quantities of coating binders and coating additives are included in the coated papers. It is from these substances that the micro stickies originate resulting in serious runnability and availability problems on the paper machines if their removal is not satisfactory. This situation will require systematic countermeasures in the future *(Fig. 4)*.

In addition to the usual targets of optical brightness and cleanliness, which are aimed at in the stock preparation process, the separation of detrimental substances in the recovered paper must also be increasingly considered in the future. As fresh water usage in paper production is reduced, this subject becomes even more important. The remainder of this article describes solutions for the control of detrimental substances in the stock preparation system. The control strategies are integrated with plans for optimizing paper machine operation.

Process modules for controlling detrimental substances

In order to be able to fight detrimental substances effectively, it is necessary to define those modules integrated in stock preparation systems with regard to the separation of detrimental substances. For this reason, the results of a detrimental substances analysis will first of all be presented.

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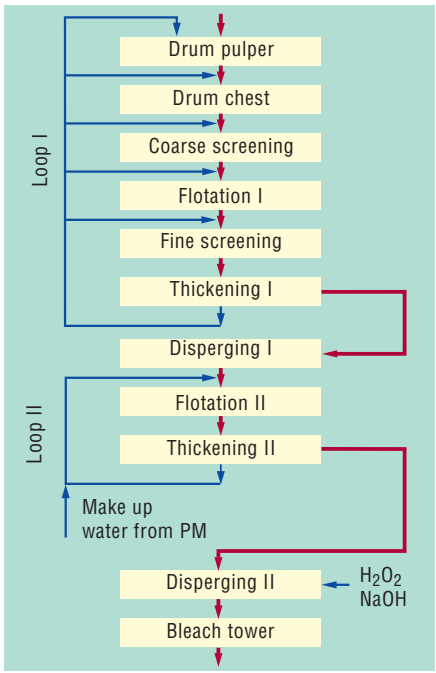

The system chosen for the analysis *(Fig. 5)* consists of a 2-loop process for the production of DIP for SCB papers. The first process loop includes the drum pulper, coarse screening, flotation I, fine screening, thickening and disperging I. The second process loop contains flotation II, thickening and disperging II. Disperging II is combined with peroxide bleaching. No process water cleaning is connected, neither in the first nor in the second process loop. Only the make-up water from the paper machine, which is carried over to the stock preparation, is run through a microflotation. The system analysis focused on establishing the change in the macro and micro stickies area. For reasons of completeness, the development of the chemical oxygen demand and the anion-charged substances was also established.

For the macro stickies determination, the pick-up method, developed by Voith Sulzer was used. And, the micro stickies were determined with the laser optical particle counting method developed by BASF.

In the following section, a thorough description is given of the results obtained regarding the macro and micro sticky behaviour.

Results

Macro stickies

The first reduction in macro stickies worth mentioning occurs in coarse screening, as shown in figure 6. In flotation I, no macro stickies are removed. With 85% removal efficiency, fine screening is by far the most effective process module. A further reduction in macro stickies can be noted in both disperging systems.

The total sticky loading was reduced from 11510 mm^2/kg b.d. to 192 mm^2/kg b.d. which corresponds to a total reduction of 98.3%.

Micro stickies

The change in micro stickies area in each process step presents a completely different picture from that of the macro stickies. The screens do practically noth-

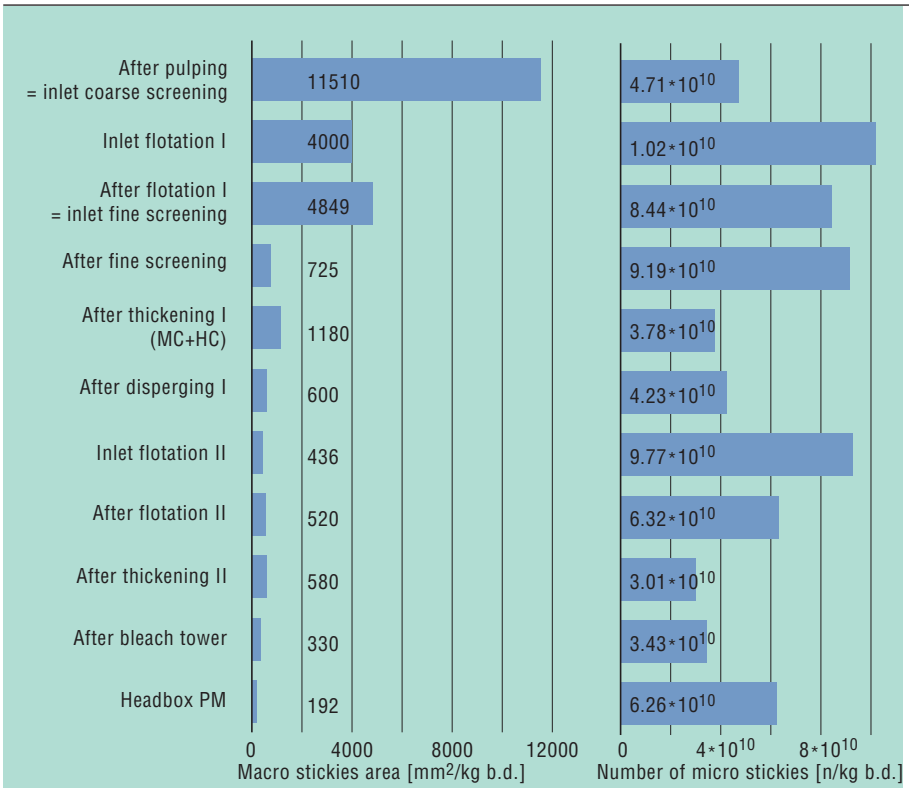

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Fig. 6: Change in macro stickies area in the analyzed deinking system.

Fig. 7: Change in number of micro stickies in the analyzed deinking system.

Fig. 8: Effectiveness of stock prep process units in removing substances detrimental to runnability and productivity.

Fig. 9: MultiScreen fine screen optimized for macro stickies removal.
Rotor
– Multiple blades
– Adequate pressure pulses
Screen basket
– C-bar™ technology
– High precision of slot width
Housing
– Conical design
– Fishmouth accept discharge

8

Process blocks	Macro stickies	Micro stickies	COD	Cationic demand
Coarse screening	● ●	—	—	—
Flotation I	—	● ●	—	—
Fine screening	● ● ●	—	—	—
Thickening I	—	● ● ●	● ● ●	● ● ●
Disperging I	● ●	—	—	—
Flotation II	●	● ●	—	—
Thickening II	—	● ● ●	● ● ●	● ● ●
Disperging II	● ●	—	—	—

— No influence ● Low improvement ● ● Medium improvem. ● ● ● High improvem.

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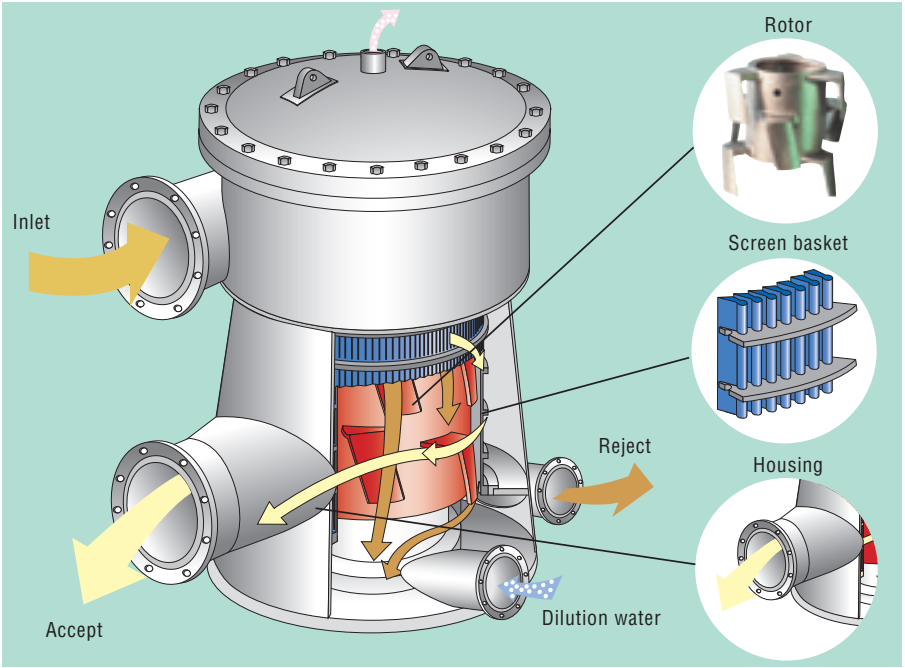

ing in terms of micro sticky removal. Whereas the flotation blocks possess a considerable separation ability. A high removal efficiency is produced in the thickening stages. But, the low micro sticky level after the thickening processes cannot be maintained due to the highly contaminated process water that is subsequently used for dilution. At this point it becomes noticeable that microflotation is needed for cleaning the process water *(Fig. 7)*.

Fig. 8 summarizes the efficiency of the individual process modules used in the stock preparation system with regard to the separation of the investigated group of detrimental substances.

The most effective process module with regard to macro sticky separation is fine screening. Voith Paper Fiber Systems recognized the importance of fine screening for the macro sticky removal at an early stage and now offers a most effective machine – the MultiScreen. This screen *(Fig. 9)* is completely optimized from “head to foot”.

Micro sticky control is most effective in the flotation blocks and in microflotation used for water cleaning. However, there will always be some residual micro sticky load carried over to the paper machine.

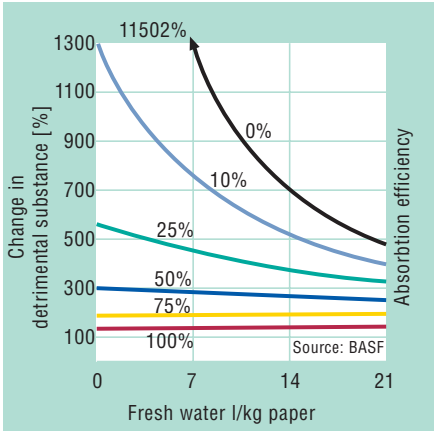

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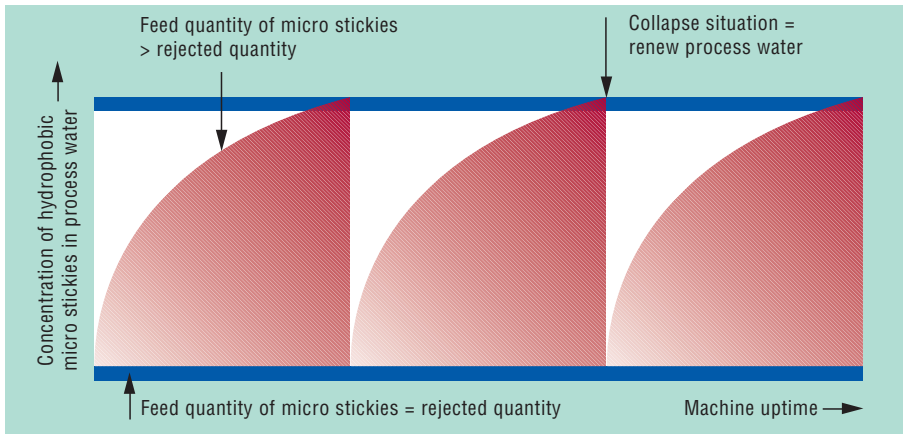
Fig. 10: Correlation between build up of detrimental substances in the PM white water. absorption efficiency and fresh water usage.

Fig. 11: Effect of hydrophobic micro stickies concentration in the process water loop on paper machine availability.

Fig. 12: Strategy for control of detrimental substances.
- *Process units relevant to macro stickies*
- *Process units relevant to micro stickies*
- *Process units relevant to COD*
- *Process units relevant to cat. demand.*

In this case, the carried over micro sticky load is to be bound to the fibers by means of fixing agents so that the left-over microstickies go out with the finished paper. The correlation between absorption efficiency and changes in concentration dependent upon fresh water usage is shown in *Fig. 10*. It can be noted that a 50% absorption efficiency is required for maintaining a stable micro sticky concentration in the white water circuit *(Fig. 10)*.

If more micro stickies are fed to the paper machine than can be absorbed by the fiber material, the concentration in the white water circuit will continuously rise. Eventually, a critical concentration is reached where slight changes in temperature and pH-value will induce the formation of macro stickies due to displacements in solubility. With a further increase in concentration, a collapse situation will be evoked. The paper machine must be shut down and the process water exchanged. This kind of situation will considerably impair paper machine availability *(Fig. 11)*.



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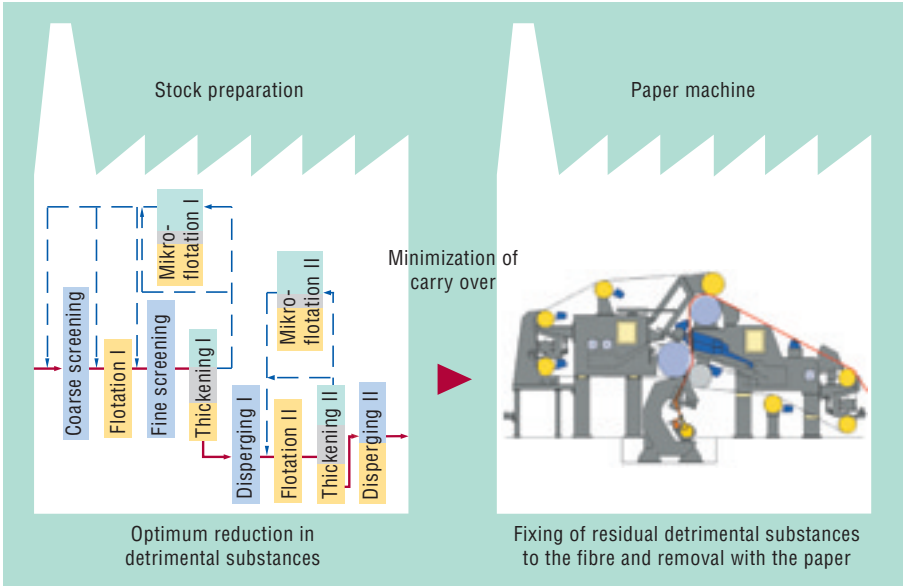

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Summary and recommendations

In order to ensure the runnability and availability of high-speed newsprint and SC paper machines, it is absolutely necessary to control the level of detrimental substances. There is a continuously increasing load of detrimental substances, and countermeasures must be taken to fight this. Detrimental substances are combatted most efficiently in the stock preparation systems. The system supplier can decisively help to reduce the load of detrimental substances by a corresponding module arrangement and by optimized process water management and cleaning. The aim should always be to keep the carry over of detrimental substances to the paper machine as low as possible *(Fig. 12)*. This way, high concentrations of detrimental substances in paper machine circuits can be avoided. Consequently, deposits and contaminations of felts and screens can be eliminated. Another advantage of this control strategy is the much reduced usage of process chemicals during the manufacturing process. Fixing agents should only be used after the reduction in detrimental substances in the stock preparation system has been optimized.

New Product

EcoMizer™ –
A new cleaner concept establishes itself

The author:
Wolfgang Mannes
Fiber Systems

Hydrocyclones for the separation of specifically heavy and/or light contaminants have been used in the paper industry for about 50 years. After some significant innovations in the first decades, the development of hydrocyclones came to a relative standstill in the recent past. Consequently, the difficulties with these machines have remained the same. The new EcoMizer development now offers a solution to many of these problems.

Fig. 1: Distribution of axial velocities in a hydrocyclone (result of numerical simulation using the finite volume method).

Fig. 2: Backflow of thickened, contaminated suspension in the vortex center.

Fig. 3: EcoMizer™-Cleaner – Flow conditions at the rejects outlet.

Thickening behavior as a basic problem

Most problems with hydrocyclones can be contributed to an elementary cause – the tendency of the fibres suspension to thicken in the rejects. If this tendency is not correctly assessed when designing a cleaner plant, stock consistency increases in the final stages of a cleaner plant will lead to operating problems and/or excessive fibre losses.

However, apart from the uncertainty in the design of cleaner plants, fibre thickening also limits the possible operating conditions. A hydrocyclone only functions with the use of fibres while their fluidation caused by rotation is guaranteed. If the rotation in the cone comes to a standstill, the cleaner becomes clogged. The restriction at the cone nozzle or a re-routing of the rejects on the cone end to a radial or tangential outlet, will not allow any "pressing through" of the fibres.

This phenomena of rotation failure actually is the most common cause for operating problems on the hydrocyclone, whereas clogging due to individual, large-size contaminants is rather an exception in the low consistency range.

Break-down of rotation and return flows

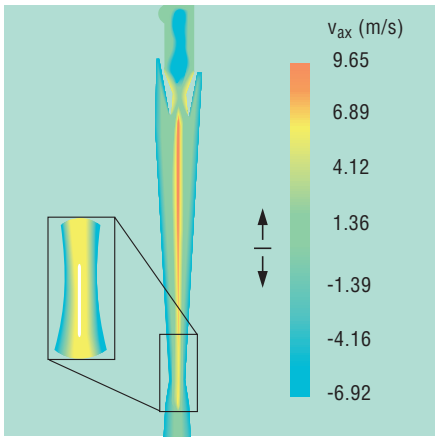
What causes the rotation in a hydrocyclone to break down? Since a fibre suspension is a viscous medium, it must be constantly fed with energy in order to maintain the rotation in the cleaner. The more viscous the medium – as is known, the stock consistency of fibres has a very large influence on the viscosity – the more energy is required for this.

In the hydrocyclone, energy is fed in with the incoming suspension only and distributed downwards in the hydrocyclone by the axial flow running along the cylinder and cone walls *(Fig. 1)*. This energy distribution depends on the volumetric distribution of the inlet flow into the accept and reject flows.

The lower the volumetric reject discharge, the less energy reaches the bottom cone area. At the same time, the stock consistency, and thus the viscosity of the suspension, are at its highest in the bottom cone area due to the thickening effect of the hydrocyclone. Therefore, with low reject rates, failure of the referred to rotary motion may occur and consequently lead to clogging of the cleaner.

The consumption of the kinetic energy in the cone area is further intensified by an additional phenomenon. As can be seen in *Fig. 2*, the basic pattern of a downward flow along the cone wall and an upward or back-flow in the vortex centre is also present at the reject outlet.

With this backflow, the thickened reject stock is returned to the cone where it further increases the consumption of kinetic energy. In addition, contaminants, which were already separated, are once more entrained upwards and in the worst case, may even reach the accepts.



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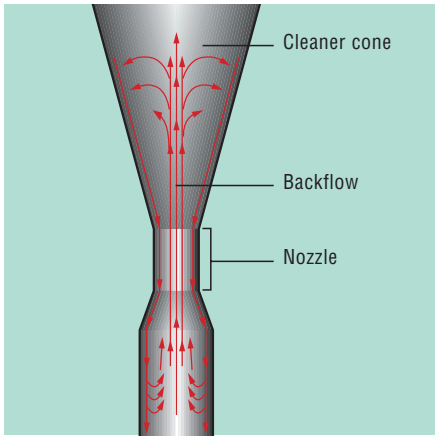

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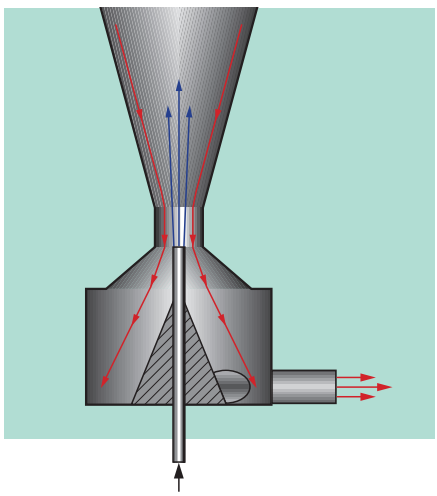
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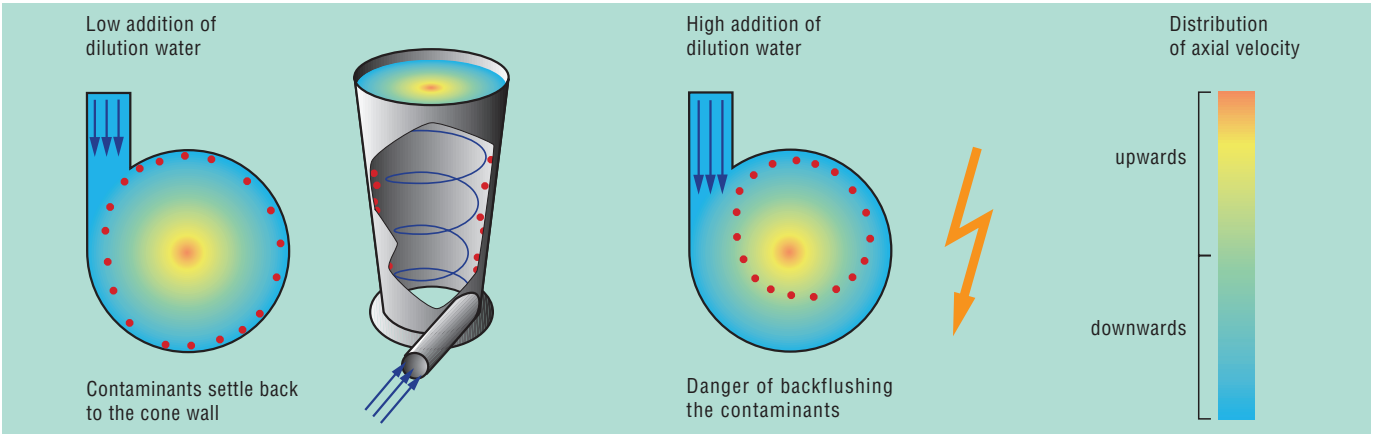
Fig. 4: Problems with classical concepts for rejects dilution.



The EcoMizer™ concept

The newly developed EcoMizer concept offers a solution for these two problem areas. The concept was derived from the fact that the basic flow pattern in the hydro-cyclone cannot be influenced. This is a consequence of the geometry and the usual distribution of the volumetric inlet flow in a hydrocyclone. However, the decisive idea is to "replace" the thickened reject stock in the central return flow in the lower cone by a clean filtrate or white water added from the outside *(Fig. 3)*. Thus, on the one hand, dirt is prevented from being sucked upwards once again. On the other hand, the injected filtrate will mix in the cone with the surrounding suspension, so that the stock consistency of the surrounding suspension will also be decreased.

Comparison with traditional concepts

This type of dilution water addition has several advantages compared to previous concepts.

In conventional concepts to decrease the reject stock consistency, the filtrate is usually added tangentially in the lower cone area *(Fig. 4)*. Although fibre recovery is thus fundamentally possible, with an excessive dosage of filtrate there is a great risk that contaminants, already concentrated in the cone wall area, will be diverted to the vortex center at the point where the filtrate is fed in. If these contaminants reach an area with an upward directed axial speed, flushing back of contaminants into the accepts may occur. This risk particularly exists for contaminants which are difficult to separate, such as dirt specks, since their specific weight differs only slightly from that of fibres.

With the EcoMizer concept, however, the addition of the filtrate is distributed over a comparatively large volume, actually the entire lower cone area. Thus, it can be dosed much better.

Furthermore, addition of filtrate is started in the centre of the cleaner and from there continues outwards. The layers near the cone wall, where the contaminants are concentrated, are not affected at all by to the addition of dilution water, which also facilitates the dosage of the water quantity.

Finally, the energy demand for adding the filtrate is considerably lower than when it is carried out via the cone wall. Depending on the pressure ratios in the hydrocyclone, even a vacuum may exist in the vortex centre, so that the flushing water is sucked in from the outside without any pressure.

In conclusion, it is possible with the EcoMizer concept to decrease the stock consistencies in the reject outlet area without any negative effect on separation efficiency. On the contrary, due to the fact that the thickened reject stock is prevented from flowing back in the vortex centre, and because of the lower stock consistencies, the rotational speeds in the lower cone remain high and the tractive forces acting on contaminants remain low. This means efficiency may even be improved in certain cases.

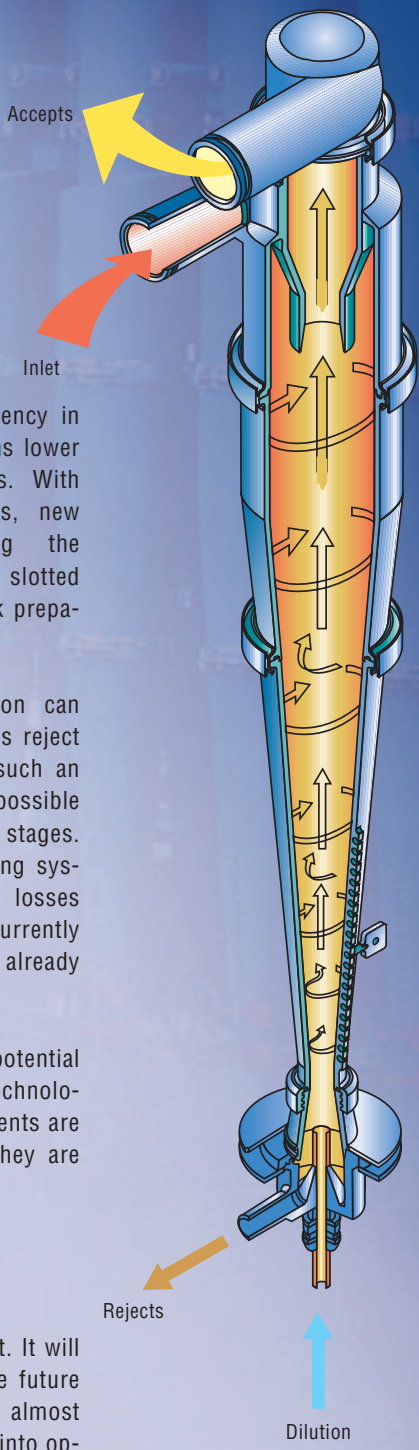


Fig. 5: Advantages of the new EcoMizer cleaner concept.

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- Higher operational reliability at lower reject rates
- Reduced number of cleaning stages (2-3 in stock preparation, max. 4 in the approach flow)
- Savings with respect to space requirements and additional investment costs for pumps and drives, piping and control equipment
- Reduced energy consumption for pumping
- Improved dirt speck removal
- Efficient sand removal at considerably higher consistencies than previously possible
- New possibilities in the process design
- Reduced fiber losses through higher contaminant concentration in the rejects

What advantages result? *(Fig. 5)*

The operating reliability of cleaner plants is always increased by lowering the stock consistencies in the lower cone area. In addition, back flushing allows operation of a cleaner with lower volumetric reject rates and lower reject stock consistencies. It is thus possible to design the following stages considerably smaller than before. Consequently, the required number of cleaner stages is substantially reduced, providing large savings, both in the overall infrastructure required for operating a cleaner system, as well as in pumping energy.

Higher separation efficiencies for contaminants, which are difficult to remove, like dirt specks, have already been mentioned. Alternatively, the cleaners can be operated with higher inlet stock consistencies than before, while maintaining the previous efficiencies. Due to the dilution of the rejects, the stock consistency in the bottom cone area still remains lower than with conventional cleaners. With higher inlet stock consistencies, new possibilities result concerning the arrangement of fine cleaning and slotted screening in recycled paper stock preparation systems.

Finally, contaminant concentration can now be increased with continuous reject discharge in the final stage to such an extent as was previously only possible with periodically rejecting final stages. Through minor changes to existing systems, considerable reductions in losses and thus a lot of savings in the currently incurred disposal costs have already been achieved.

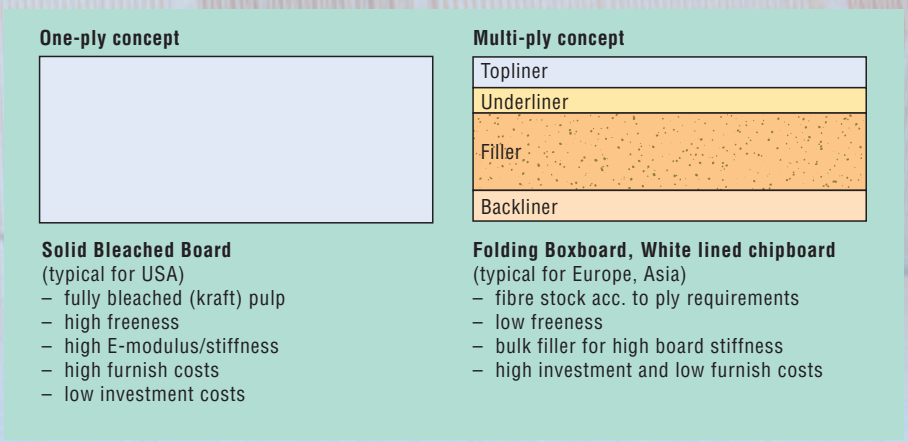
This list gives a first idea of the potential inherent in the newly developed technology presented here. The improvements are not just a small step forward, they are more like a quantum leap.

Where are the limits?

To be honest, we do not know yet. It will surely be an exciting task for the future to answer this question. In the almost 20 installations, which have gone into operation since the first application in a plant approx. 1 1/2 years ago, the limits have not yet become evident. In most cases, start-up caused no problems whatsoever, enabling the customers to profit immediately from the significant advantages of a higher operating reliability with simultaneously improved accept quality and/or reduced fibre losses by up to 70 %.

Get the most out of your fibre

The author:
Dietmar Borschke,
Fiber Systems



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Multi-ply sheet formation allows the board to be provided with a great number of special features by selecting special fibres and mixtures for the individual plies of the base board. The type and intensity of fibre treatment of the raw materials used, for instance by refining, dispersion or by washing also help to optimize the base board quality. Finally, the basic processes of each individual paper machine influence properties such as sheet formation, fibre orientation, sheet compaction and surface quality. The characteristics of the finished board are additionally specified by surface treatment processes such as sizing, coating colour application and calendering.

For illustrating different board production strategies, *Fig. 1* compares the classic single-ply sheet forming concept with multi-ply sheet formation on a four-ply board machine.

Solid bleached board – typical for production in the USA – consists of a single ply and is usually produced from bleached kraft pulp. This simple sheet formation is compensated by the excellent fibre properties of this long fibre pulp, such as a high CSF freeness, the high E-modulus and the resulting high bending stiffness. In connection with a double coating on the top side of the sheet, the requirements of surface properties and cleanliness can be fulfilled with a simple paper machine concept. Relatively low investment costs are involved vis-à-vis relatively high fibre costs.

Especially in Europe and Asia, multi-ply sheet forming concepts are used to produce folding boxboard on the basis of virgin fibres or secondary fibres (white lined chipboard). The specific stock requirements with multi-ply board vary depending on the ply; for the concept shown, a distinction between topliner, underliner, filler and backliner is made. Simply speaking, for the two outer plies special surface and strength properties are required, which can be achieved with bleached hardwood pulp or high-quality deinking grades. The underliner prevents shining through, striking through or pressing through of the filler material. For the filler ply, stock mixtures of high bulk are required for a good board stiffness. Two to three top coats are usually applied. The production of such a board is connected with high investment costs due to the sophisticated overall system and paper machine configuration. The economy in production is here decisively determined by the selection of low-cost raw materials for all plies.

Current virgin and recycled fibre potential

How can the development of bending stiffness of the total base board be controlled by the characteristics of the filler material? The technological comparison can be limited to the presentation of freeness, bulk (specific volume) and elasticity modulus (E-modulus) in order to evaluate the possible suitability of the three mean fibre stock groups mechanical pulp, chemical pulp and secondary fibre grades.

Fig. 1: Example for baseboard forming concepts.

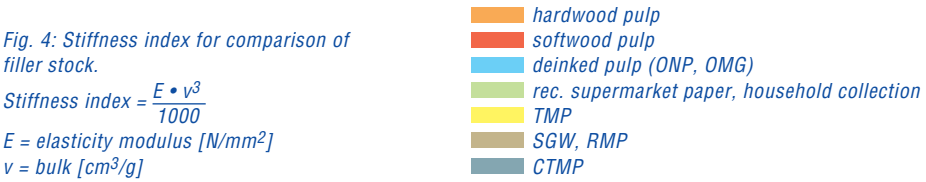
Fig. 2: Bulk versus freeness.

Fig. 3: Elasticity modulus versus freeness.

Fig. 4: Stiffness index for comparison of filler stock.

Stiffness index $= \frac{E \cdot v^3}{1000}$

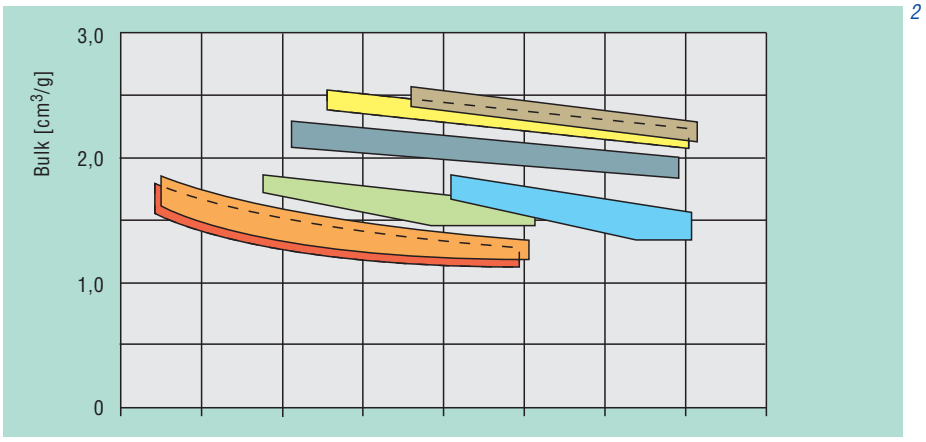
E = elasticity modulus [N/mm²]
v = bulk [cm³/g]

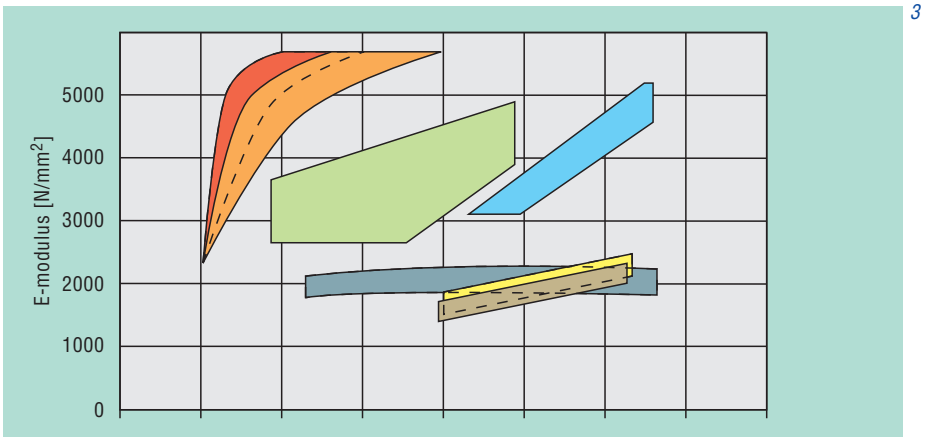


The bending stiffness of a single-ply paper sheet is experimentally established in practice with a two-point bending stiffness tester by bending a clamped paper strip in the elastic range (DIN standard). The established bending moment usually agrees well with the mathematically established bending stiffness (S), which is the arithmetical product of the E-modulus (E) and the third power of the caliber (d) of a single-ply material divided by 12. If the bending stiffness of multi-ply boards is calculated, the Steiner formula is used.

Bending stiffness: $S = E \cdot d^3/12$ [mNm]

In *Fig. 2*, the bulk of different fibre stocks is plotted against freeness (all following data is taken from Voith Paper's data base). The freeness serves as an auxiliary quantity to describe type and pre-treatment of the fibre stock. The areas marked in colour of the mechanical pulp types TMP, SGW and RMP cover a wide range of freeness with a high bulk of up to 2.5 cm³/g. The bulk range will of course be extended downwards by refining. CTMP is probably the most versatile fibre stock, the properties of which can be varied by changing the process conditions, such as chemical chip impregnation and the intensity of refining. With high specific refining work, i.e. with decreasing freeness, the high bulk level decreases. Hardwood and softwood pulps with excellent strength properties only have a low bulk, which decreases further with more intensive refining. Secondary fibres, which originally always consisted of a mixture of wood-containing and wood-free recovered papers, usually show mean specific volumes from 1.3 to 1.8 cm³/g. Deinking grades from newspapers and magazines





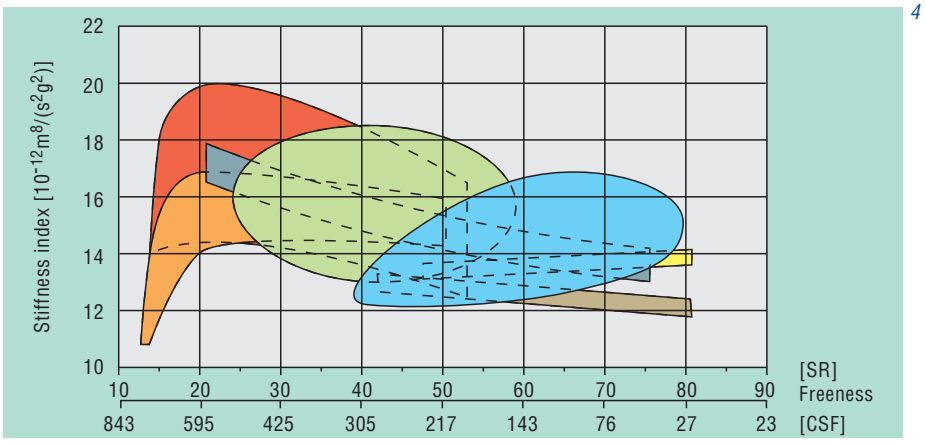


Fig. 5: Basic data for technological comparison of folding boxboard – White lined chipboard.

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			Folding boxboard	White lined chipboard
Board	Bending stiffness	mNm	**70**	**70**
	Basis weight	g/m²	**300**	**390**
Topliner	Fibre material		Bleached softwood pulp	White shavings
	Bulk	cm³/g	1.4	1.6
	Elasticity modulus	N/mm²	5500	3500
	Basis weight	g/m²	60	60
Filler	Fibre material		Groundwood	Household collection
	Bulk	cm³/g	2.2	1.7
	Elasticity modulus	N/mm²	1500	2500
	Basis weight	g/m²	180	270
Back-liner	Fibre material		Bleached softwood pulp	DIP
	Bulk	cm³/g	1.4	1.6
	Elasticity modulus	N/mm²	5500	3000
	Basis weight	g/m²	60	60

and a prepared mixture of supermarket waste and household collections are shown here as an example.

An almost contrary picture is obtained from plotting the E-modulus against freeness in *Fig. 3*. With increased refining, chemically pulped fibres show an impressive increase in fibre bondage capability, which leads to high strength values at low elongation, i.e. to a high E-modulus of 5000 N/mm² and more, with softwood pulps showing higher values due to their higher long fibre content. In comparison, the mechanically pulped fibres show an extremely poor result with low E-modulus values. The great advantage of secondary fibres becomes evident here. They cannot only be produced at a more favourable price, but often have technological advantages concerning the E-modulus and other strength properties in comparison with mechanical pulp.

The actual stiffness potential of fibres used as a filler material referred to in this paper can be determined with a stiffness index *(Fig. 4)*. The chosen stiffness index depends on the bending stiffness calculation and is independent of the basis weight. The application of the stiffness index is limited to the filler ply or single-ply paper sheet.

It is noticed that in particular softwood pulps can have the highest bending stiffness values, although their bulk is comparatively low. The bending stiffness of single-ply papers from mechanical pulps is extremely low. Secondary fibre stocks cover a wide spectrum in the centre-field. This diagram clearly shows why it is possible even today for so different sheet forming concepts and their especially tailor-made fibre recipes to co-exist in the board sector.

Folding boxboard versus white lined chipboard

Why it was even possible for secondary fibres of a quite different type to substitute primary fibres in board manufacturing. An economical advantage is the low production costs of secondary fibres due to low waste paper prices and comparatively low energy inputs for their preparation. Recycled stocks of analoguous primary fibres rank technologically only a little behind (for example when comparing market pulp and hardwood pulp).

An interesting technological and economical comparison offers the comparison with the board grades of folding boxboard on virgin fibre basis and white lined chipboard on secondary fibre basis *(Fig. 5)*. The reference value defined here is the bending stiffness, which is also used as one of the most important sales factors. It is specified as 70 mNm.

Here, folding boxboard consists of three virgin fibre plies. The topliner consists of 60 g/m² bleached softwood pulp, the filler of 180 g/m² mechanical pulp and the backliner again of 60 g/m² softwood pulp. The basis weight of the folding boxboard is thus 300 g/m².

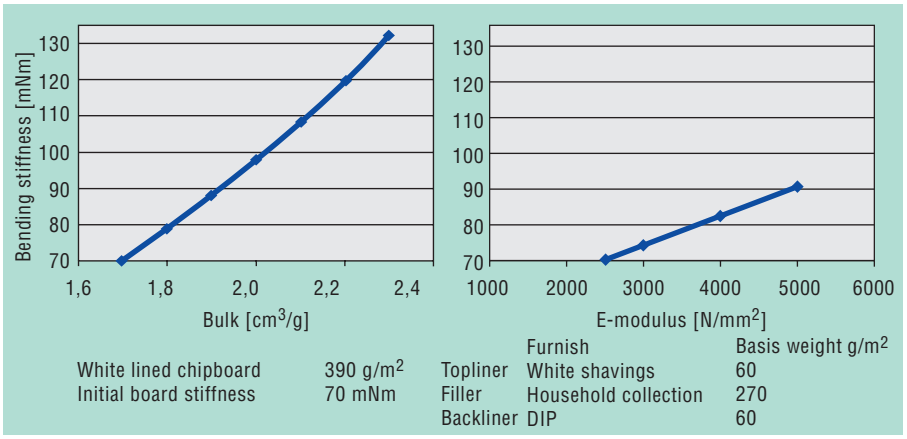
In order to achieve a comparable stiffness level for a three-ply white lined chipboard with recovered fibres, the following model set-up can be used. In the

Fig. 6: Total board stiffness – Influence on bulk and elasticity modulus of the filler.

Fig. 7: Total board stiffness – Optimization of the filler ply through remixing.

topliner, pulp is replaced by prepared white shavings of a high brightness. The most favourable raw material, i.e. household collection, is chosen for the filler ply. Deinking stock is used in the backliner. The assigned stiffness-relevant characteristics are given in *Fig. 5*. The basis weights for topliner and backliner remained to be 60 g/m^2. The model calculation for board stiffness shows that the basis weight of the filler had to be increased by 90 g/m^2 to 270 g/m^2 in order to reach the stiffness value of the virgin fibre board. The increased basis weight of the white lined chipboard with cost-wise much more favourable fibre components reduces the cost advantage of the recycled board. In fact, the costs for a ton of finished stock (bone dry) for the white lined chipboard mentioned are only half the costs for folding boxboard.

A major reason for the increased material weight of the white lined chipboard is to be found in the significantly low bulk of the prepared household collection compared to the mechanical pulp integrated in the virgin fibre board.



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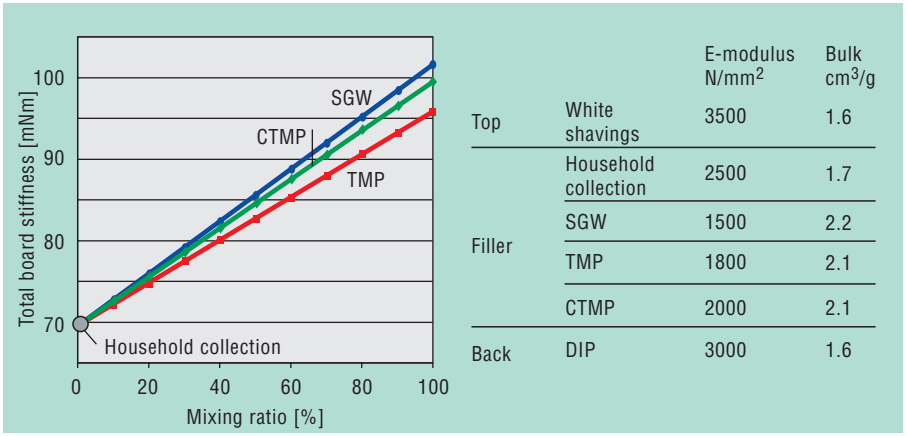

		E-modulus N/mm^2	Bulk cm^3/g
Top	White shavings	3500	1.6
Filler	Household collection	2500	1.7
	SGW	1500	2.2
	TMP	1800	2.1
	CTMP	2000	2.1
Back	DIP	3000	1.6

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By which measures can the technological properties of the filler stock, which are so relevant for board stiffness, be improved? *Fig. 6* shows the ideal properties that the filler should have. The increase in board stiffness, on the one hand by increasing the specific volume of a fictitious filler stock and on the other hand, by increasing the E-modulus in the filler, is shown in two diagrams. It becomes evident that for this board model, voluminous fibres for the filler ply are given clear preference to a fibre material with high E-modulus.

Based on the experience that all mechanically produced fibres such as TMP, RMP, SGW and CTMP are destined for this application, *Fig. 7* shows the possibility of loosening the compact fibre structure of the prepared household collection by adding mechanical pulp to increase the volume of the filler ply mixture. The aim is to increase the bending stiffness of the previously defined white lined chipboard. The starting point (grey point on the left of the diagram) is the board model white lined chipboard with approx. 70 mNm total board stiffness. If increasing percentages of SGW, TMP or CTMP up to a mixing percentage of 100 % are added to the household collection, decisively higher board stiffness values will be the result. This method is used in some board mills, and no significant technological differences can be observed for the three evaluated mechanical wood pulps.

Fig. 8 shows the cost side of such a filler ply optimization. The raw material costs for the entire three-ply board described are presented based on the average market prices of the year 2000. Adding the

Fig. 8: Total board stiffness – Furnish costs for optimizing the filler ply through remixing.

Fig. 9: Influence of machine type on bulk increase of recovered fibres.

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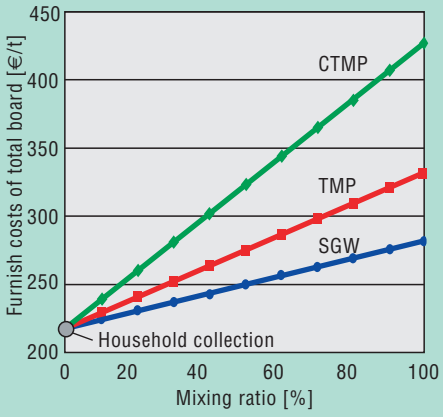

White lined chipboard	Furnish costs €/t
White shavings	460
Household collection	155
SGW	245
TMP	320
CTMP	460
DIP (ONP, OMG)	260

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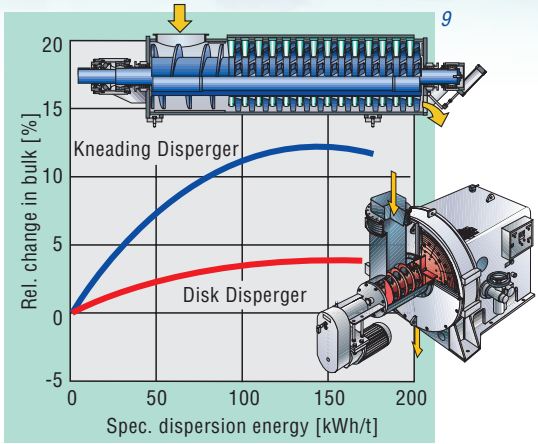

most expensive filler stock CTMP will result in highest finished stock costs for the base board. In this example, the technological/economical optimum is found by adding low-cost SGW or RMP. Therefore, these mechanical pulps are widely used as filler material or as addition in multi-ply board production.

Processes for enhancement of bending stiffness

In addition to the raw material selection, an appropriate process technology represents a further tool to develop specific fibre properties and to optimize the board product. Refining with proper stock-specific refining parameters may lead to a desirable strength increase, such as the increase in plybond and the increase of the E-modulus. It is, however, connected with a reduction in bulk of all fibre types. The decrease in air permeability is more dramatic, which is of importance for certain board grades, such as for instance gypsum board. With secondary fibres, dispersion processes can influence bulk due to fibre curling. However, this is also accompanied by partially undesirable effects such as higher wet web stretch and shrinkage, higher porosity and adsorption capacity, lower static strength values and lower dewatering resistance.

The two types of Voith dispergers, (high-speed disk disperger HTD and low-speed kneading disperger KD) may cause fibre curling, in spite of different operating principles *(Fig. 9)*. The volume and porosity increase after the kneading disperger is considerably higher.

Fibres also show a different tendency for fibre curling in the kneading disperger. Various examinations also revealed that wood-containing stock shows a high percentage of reversible curling (latency behaviour), whereas curling of wood-free fibres is irreversible to a great extent. Therefore, the effectiveness of the kneading process cannot be generally predicted. Pilot plant trials carried out with the kneading disperger for an individual raw material offer the board manufacturer a possible alternative.

Conclusions

The wide variety of board structuring allows free choice of fibres, either virgin or recovered. The fibre material has to be selected according to the individual ply requirements! Bulky fibre stock should be used for the filler ply to increase the total board stiffness.

The lower stiffness potential of household collection used in the filler ply of white lined chipboard must be compensated by higher grammage and/or remixing with mechanical pulp. Of course, the furnish costs for white lined chipboard from recovered fibres are significantly lower than for folding boxboard from virgin fibres.

RMP/SGW are most suitable for the filler stock. The kneading disperger helps to increase bulk where fibres show a tendency to curl.

Presented on the Voith Paper Customer Conference "ahead 2001, Vienna, May 8-10, 2001.

Multi-Layer and Multi-Ply Concepts – Driving forces and advantages

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The discussion of multi-ply/multi-layer concepts is as old as the paper industry itself. Though the limitations of modern wet part concepts are quite different from those of the past, the basic principles are still valid. In order to minimize the total cost per net ton of paper, production and high fibre yield have been the main driving forces for the development of advanced forming concepts. This paper focuses on the reasons for multi-ply/multi-layer technology from the past until today and introduces a new multi-ply/multi-layer concept which offers additional advantages.

Paper quality and production

When installing a new paper machine, the layout has to be done in a way that the market quality demands can be fulfilled very soon after start-up *(Fig. 1)*. After optimization, a new paper machine normally exceeds the quality demands, enabling the papermakers to increase production in order to reduce the total cost per net ton. But this will also reduce the quality level.

In addition, the general furnish trend has to be considered and may change the cycle time until the market quality level is reached. At this point at the latest, the question will come up how to speed up the machine further and simultaneously maintain the quality level.

In case the machine production is limited due to the wet part, there are mainly two options: add one more ply or switch to the next forming generation.

Multi-ply cylinder mould formers

In cylinder machines, multi-ply forming was required because of the very limited production of one single former. The operating window of a recent cylinder mould former is shown in *Fig. 2*.

Production can be increased by adding additional plies, as long as the operating

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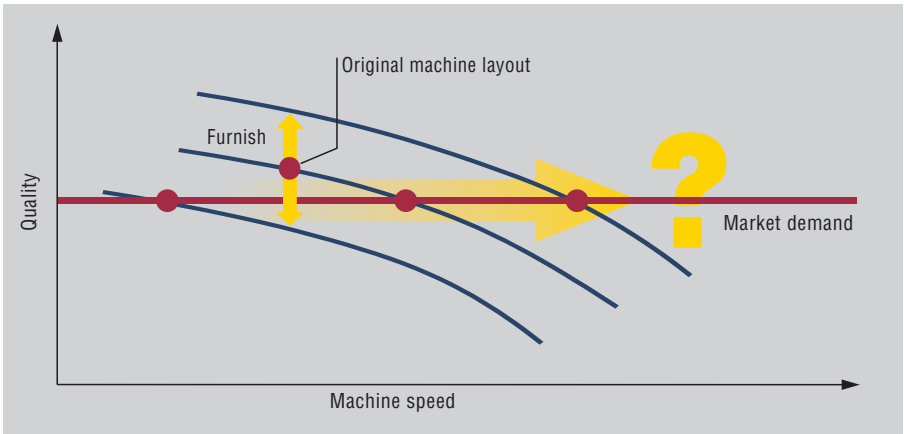

Fig. 1: Effects of machine "squeezing".

Fig. 2: Basis weight pick-up of a cylinder mould machine.

Fig. 3: Forming concepts – Design limits for board machines.

Fig. 4: Forming concepts – Design limits for packaging paper machines.

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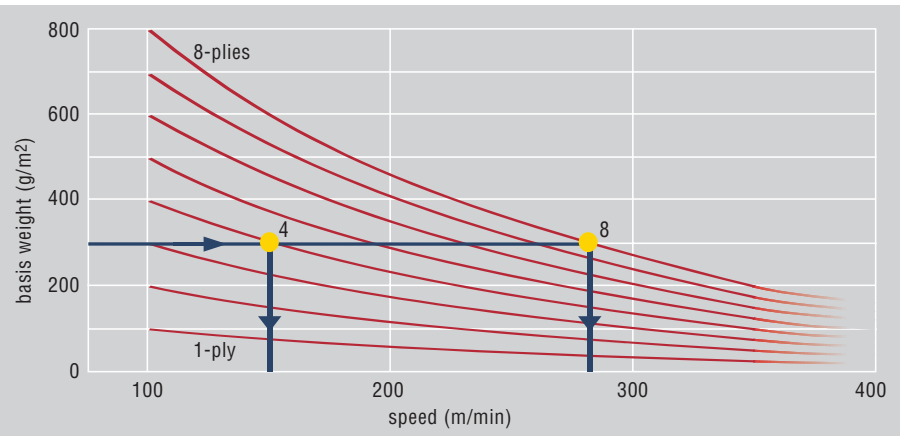

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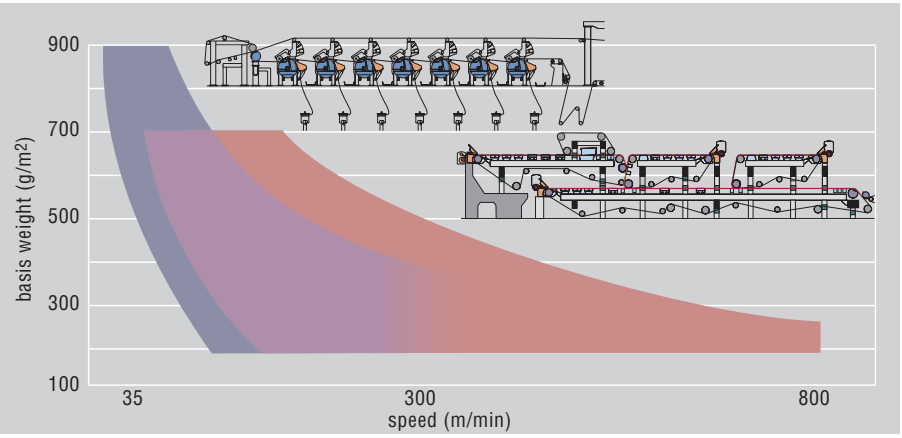

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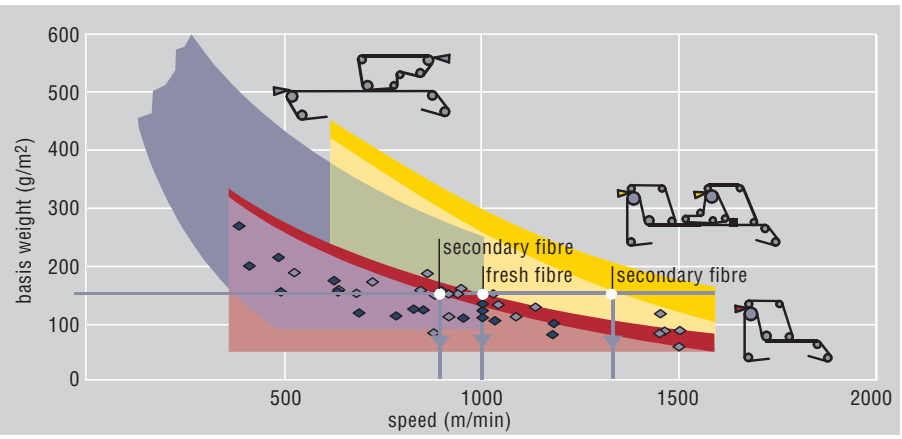

speed is not a limiting factor. To overcome the speed limitation, an upgrade to the next forming generation is required.

However, such concepts still reach reasonable production levels for board grades.

Forming concepts – design limits for board grades

Multi-ply fourdriniers combine the advantages of single fourdriniers with those of multi-ply cylinder mould formers. As shown in *Fig. 3*, the operating window of multi-ply fourdriniers is much wider compared to the cylinder mould formers.

The driving forces for multi-ply fourdriniers for the production of board have been speed, which means production, and sheet quality such as smooth formation and bending stiffness.

Forming concepts – design limits for packaging grades

The trend towards lower basis weights and, at the same time, high production levels made gap formers the state-of-the-art concept for packaging grades for new machines and rebuilds. Similarly to the cylinder mould formers discussed before, it is again the speed limit – in this case of the fourdriniers – which is the main driving force for the next forming generation.

Voith Paper introduced the gap former technology as early as in 1992. In the meantime, 14 gap formers for board and

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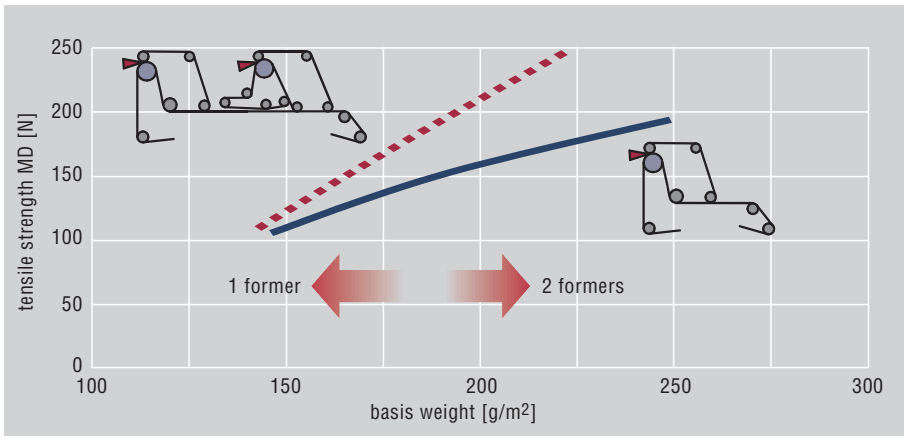

Fig. 5: Effect of multi-ply gapforming on strength.

Fig. 6: Single-ply sheet 200 g/m² (top). Double-ply sheet 200 g/m² (bottom).

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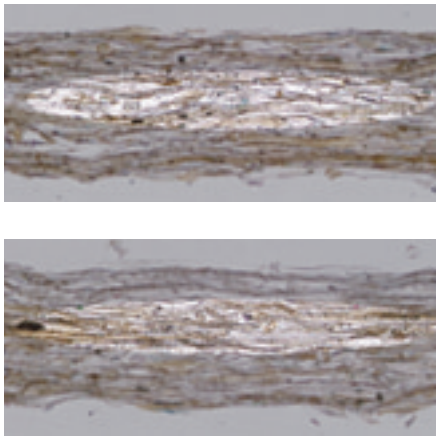


packaging grades are in operation, including the very first double gap former machine worldwide. One further top ply gap former is being delivered right now.

These gap former types have been specially developed for multi-ply board and packaging papers. The high two-side drainage capacity of the DuoFormer™ Base and DuoFormer™ Top results in very good sheets, even at highest production levels.

Fig. 4 compares the operating windows of multi-ply fourdriniers (blue area) with a single-ply gap former and a double-ply gap former. It can be seen that single-ply gap formers (red graph) are very competitive in the medium speed range. A sheet with 150 g/m² can be produced at a speed of eg. 950 m/min with one gapformer only. Nevertheless, for very high production, a second ply is required.

The yellow graph shows the operating range for a two-ply gapforming concept. Such a concept allows to produce a high grammage sheet even at high speeds.

Fig. 4 further shows operating points (dark blue) of Voith paper machines already installed as well as layout points of recent projects (light blue).

Apart from production, there are other reasons which make a multi-ply gapforming concept attractive.

Strength is one of the decisive factors for the production of linerboard. There is a significant improvement in strength when producing two plies instead of one ply. Though the strength might be different when using different forming concepts, the multi-ply technology always gives a clear advantage.

Fig. 5 shows the breaking length of a 100% OCC sheet for different basis weights, using one or two gap formers. It can be seen that the two-ply concept results in a clearly better strength at higher basis weights. Sheet forming is enhanced with better formation and lower z-orientation of the fibres, which will both help to optimally utilize the fibre potential, thus saving fibre cost.

The crosscuts as shown in *Fig. 6* demonstrate the higher density in the centre of a multi-ply gapformer sheet.

A multi-ply gapformer concept *(Fig. 7)* ensures best formation and strength at highest production levels.

Multi-ply/multi-layer technology

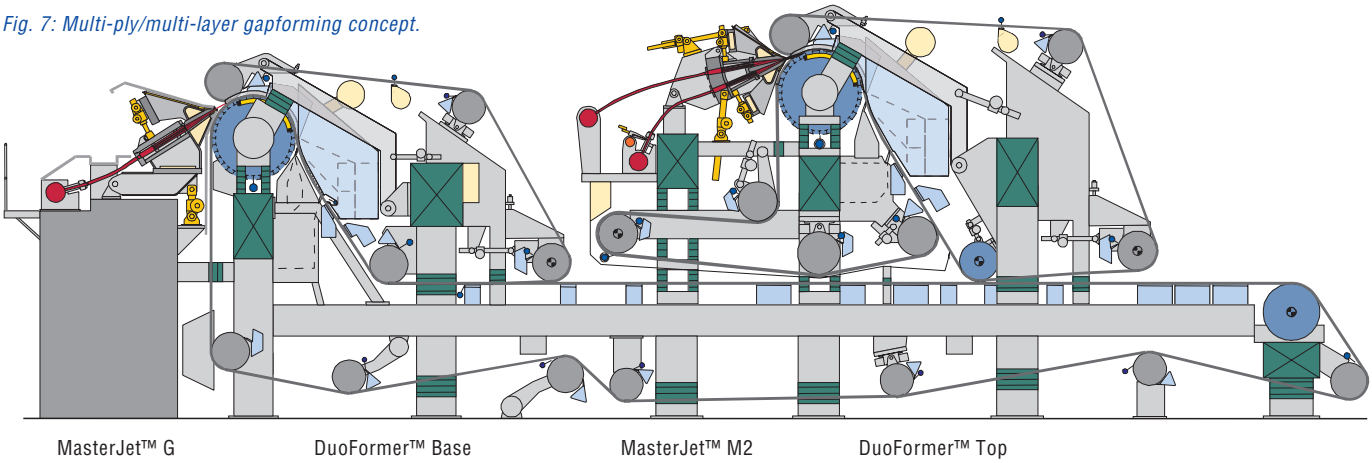
In the following, a new concept using three secondary fibre fractions will be introduced. If the multi-ply sheet is additionally stratified in the headbox, further advantages for even better machine performance can be achieved.

In such a concept, the stock is fractionated as follows:

- long fibre
- long/short fibre
- short fibre.

The long fibre fraction is fed to the DuoFormer™ Base, which produces the top ply. The long/short fibre fraction and the short fibre fraction are supplied to a

Fig. 7: Multi-ply/multi-layer gapforming concept.



multi-layer headbox in a DuoFormer™ Top, thus allowing additional sheet stratification.

Fig. 8 shows the location of the fractions during the drainage process. The long/short fibre fraction is drained through the outer wire. The short fibre fraction containing most of the fines is drained through the inner wire. Gentle drainage by the forming roll helps to keep the fines of the short fibre fraction in the sheet, which is desired for several reasons but especially for good plybond. The long/short fibre fraction on the outer wire helps to reduce washout effects.

The sheet leaving the forming section has been stratified as follows *(Fig. 9)*:

- long-fibre top ply on the base wire
- short fibre fraction with high fines content inside the sheet
- long/short fibre fraction as back ply on top side.

Effects on the press work

Figure 10 shows a schematic sketch of a press nip. As generally known, a long fibre sheet is more open and easier to drain compared to a short fibre sheet.

Since the long fibre fraction and the long/short fibre fraction are located on the outer sides of the sheet, the water can drain with less resistance. This helps to avoid sheet crushing in the press section, which is especially important for high production. Better drainage also increases wet densification, which is positive for the strength development.

Effects in the dryer section

In the dryer section, there are also advantages related to the multi-ply/multi-layer technology *(Fig. 11)*.

With such a concept, the long fibre fraction is facing the dryer cans. Due to better bonding of the longer fibres in the sheet, the dust development in the dryer section will be reduced. Less dust will result in enhanced runnability and improved converting properties.

The second advantage is that the long/short fibre fraction is facing the dryer fabric. This fraction is very clean with a low content of stickies. Therefore, the contamination of the fabrics will be reduced, which is again a plus for runnability but also for cleanliness and maintenance.

The higher surface porosity of a stratified sheet allows the steam to escape easier, which is the third advantage. Due to the fact that the sheet gets more open towards both surfaces, also the danger of blistering and delamination is reduced.

Effects in the size press/SpeedSizer™

High strength figures demand full starch penetration. At high speeds, the dwell time in the nip gets shorter and it is more difficult to achieve full starch penetration of the sheet.

In the press section, the stratified sheet structure makes drainage easier. Vice versa, the open surface of the stratified sheet allows better starch penetration *(Fig. 12)*.

Especially for high basis weights and high production, this effect is of advantage.

Fig. 8: Two-layer gapforming.
Reduction of washout effect
– higher retention.

Fig. 9: Sheet structure after couching.
Perfect location of fines
– higher ply bond.

Fig. 10: Effects of a stratified sheet on the press work.
More open sheet surface
– better drainage
– high wet densification.

Fig. 11: Effects of a stratified sheet in the pre-dryer section.
The long fibre fraction faces the dryer can surface
– reduced dusting;
The clean short/long fibre fraction faces the dryer fabric – improved runnability due to low stickies content.

Fig. 12: Effects of a stratified sheet in the size press/SpeedSizer™.
Higher porosity on outer sides
– better starch penetration (CMT, SCT)
– better ply bond in the centre.

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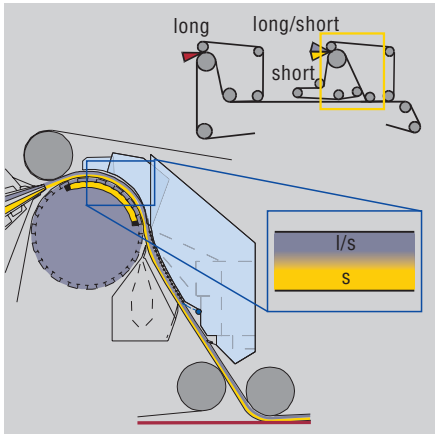

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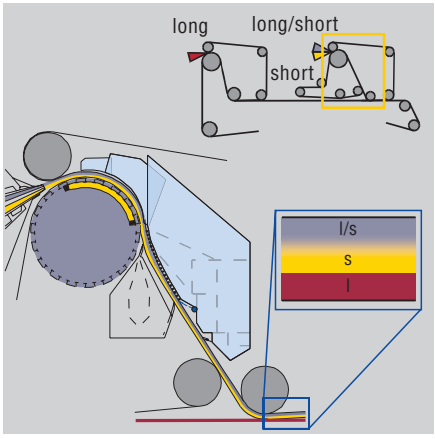

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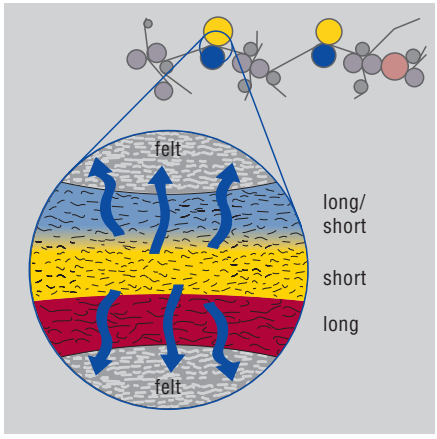

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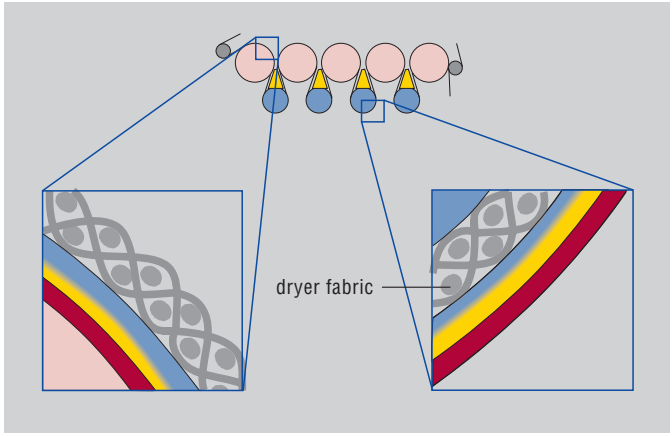

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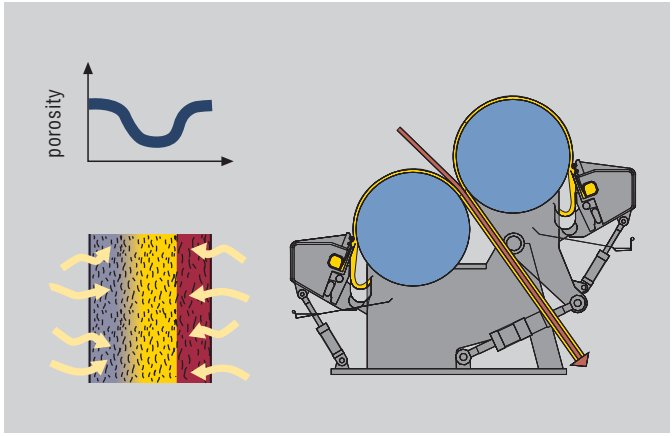


Effects on converting

The long fibre fraction on the surface maintains a certain roughness required to achieve the desired sliding angle. Further, the hot glueing properties will improve. The glue can better penetrate into the surface and develop a mechanical interlock with the sheet.

Summary

The main driving forces for the multi-ply/multi-layer technology have been speed and production, but also quality. This also applies to the latest board and packaging gapforming concepts.

Though the additional advantages of a stratified sheet are difficult to quantify, this technology will improve the machine performance and runnability as well as the sheet properties required for further converting and final usage. As a consequence, the natural resources are utilized more efficiently, which helps to protect our environment, but also the total costs per net ton of paper can be reduced, thus increasing profits.

Presented on the Voith Paper Customer Conference "ahead 2001, Vienna, May 8-10, 2001.

One Platform Concept

For years, the paper industry has generated a steady stream of numerous innovations. According to surveys, Voith Paper is the most innovative paper machine manufacturer in the world. There is no end to the creativity and drive at Voith Paper – there are plenty of ideas – but "Innovation takes methodology".

History

Voith Paper had already been building large, fast and productive paper machines in the past.

Braviken PM 53 (1996 series) was the first paper machine in the world that could exceed 1,800 m/min – thanks to the shoe press.

The author:
Bernhard Kohl,
Paper Machines Graphic

Gratkorn 11 (Triple Star) was designed in 1997 for an annual production of 470,000 t and is, therefore, still the highest-capacity fine paper machine in the world.

With *Dagang PM 1* and *PM 2* in China, 1998 saw the delivery of the widest paper machines in the world, with a wire width of 10.5 m.

These three global references document the state-of-the-art in the years 1996 to 1998. It is clear how new developments were introduced piece by piece.

Challenge

Paper manufacturing is a complex process, which must continuously meet new demands. In many regions of the world, the increased use of secondary fibers is required; while on the other hand, it is clear that the quality of recovered paper for recycling is decreasing. The paper types are also undergoing constant change.

In order to reduce costs, ever-increasing amounts of filler are used and, at the same time, the basis weight is diminishing. Ever-higher yields and faster production are expected using ever-decreasing amounts of fiber. The fact that quality demands are simultaneously increasing is not surprising. This all creates enormous pressure to innovate, which can only be successfully responded to through a systematic development, the One Platform Concept.

The demands mentioned above cannot be met simply by building faster and more complex paper machines. These demands can only be met if the paper manufacturing process is analyzed in context and comprehensive solutions are developed. The following examples show how complex the interrelationships are.

Two Examples of Challenges

1. Example: Use of Recovered Paper for Recycling

Voith Paper can, without reservation, be called a leader in secondary fiber preparation. Voith Paper has a long history of experience in the design and outfitting of secondary fiber preparation facilities (dispersion, flotation and sorting), but who decides how the finished prepared stock must look?

- How many dirt specks are permissible?
- How much ash is needed?
- How is the calenderability?
- How suitable is it for coating?
- Or, is this the maximum yield?

All of these questions can only be answered in the overall context of the manufacturing process and the end quality requirements. This is precisely where the One Platform Concept begins.

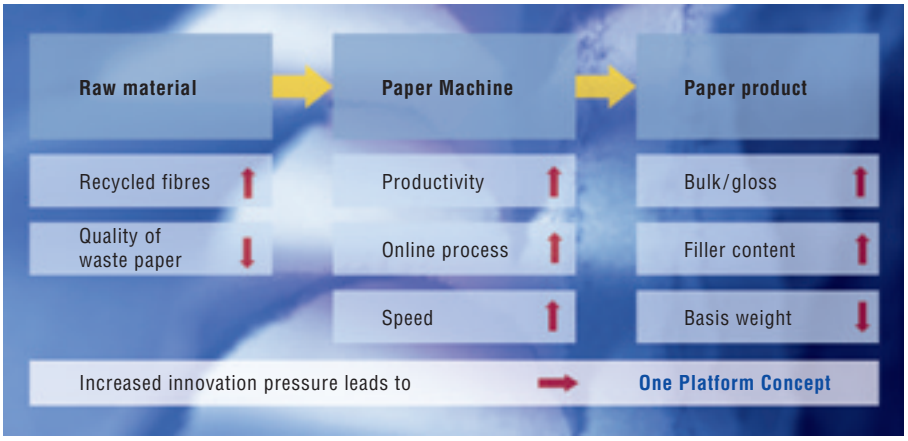
Fig. 1: Challenges to the One Platform Concept.

Fig. 2: Extent of the One Platform Concept.

2. Example: Base Paper Requirements

A second example says: "In order to produce standard LWC paper, which is film-coated and calendered online, what condition does the base paper have to be in?" It is not enough to define values such as breaking length, smoothness, oil absorption or porosity. The entire process must be reanalyzed. Stock preparation, post refining and base paper production have to be viewed in context and occasionally must also be tested. The result, however, can only be evaluated in paper which has been coated, calendered and printed.

The fundamental principle of the One Platform Concept is to view the individual steps in context.



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The Three Basic Rules

- **One platform for all graphic paper grades**
  In order to permit a comprehensive development for a broad application field, there must be only one platform.

- **Specific modules for the specific paper grades**
  In order to cover the specific requirements of individual paper grades, there are uniform quality modules that are built into this platform:
  1. Paper Contact Systems (clothing, roll covers, special machine elements)
  2. Process Control

- **Suitable for all raw materials**
  The One Platform Concept must be suitable for all available raw materials.

Definition

The One Platform Concept means the comprehensive solution of the stated goal – the production of paper.

This includes:

1. A paper machine with all of the steps (from stock preparation to finishing)
2. Automation of the entire facility
3. Paper technology know-how
4. Optimization of the process
5. All paper-influencing surfaces (clothing, coatings)
6. And comprehensive service concepts.

What is special about this challenge is the dynamics of the stated goal. Demands from the raw materials, market producers and financial markets lead to ever changing peripheral conditions, which must be considered at each start for a solution.

Advantages

If all paper machines are built in accordance with the One Platform Concept, a maximum of experience assures a minimum of risk. This experience, from all of the One Platform Concepts, is immediately available to all.

Operating experience from existing facilities can be used to further optimize individual components and developments. Experience from new facilities can be used to increase the capacity of existing facilities that were placed in service earlier.

At the same time, this accumulated experience leads to improved production facilities with faster start-ups and higher production.

As a whole, the One Platform Concept improves economy and simultaneously minimizes risks in all investments.

The Proven Concept

With all of this experience in several facilities for a wide variety of graphic papers, Voith Paper is in a position to offer a proven One Platform Concept.

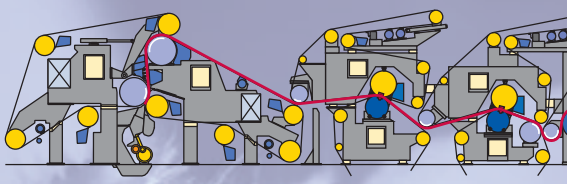
This cumulative experience was the basis for the trust that convinced SCA Laakirchen and Myllykoski to each order a new paper machine using the One Platform Concept from Voith Paper.

This is what new paper machines look like!
The persistent implementation of experience with the One Platform Concept puts Voith Paper in a position to offer optimal paper machines for any desired type of paper.

Newsprint

DuoFormer TQv | Tandem NipcoFlex

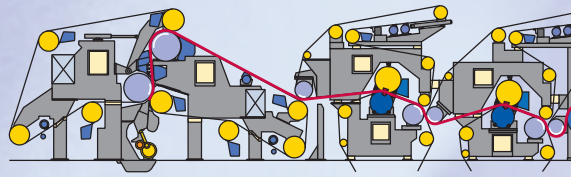
Based on the above-mentioned elements, ModuleJet™, DuoFormer™ TQv, TopDuoRun, EcoSoft™ and Sirius™, the TandemNipcoFlex™ offers an additional degree of freedom. For very light paper grades (under 40 g/m²), a smooth transfer belt has advantages over felt, whereas the asymmetry in the surface can be compensated for in the calender.



Magazine Papers (SC)

DuoFormer TQv | Tandem NipcoFlex

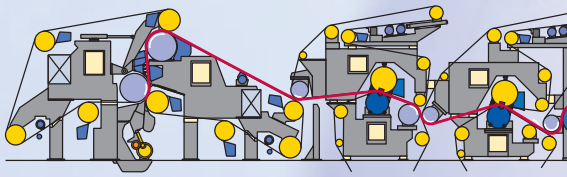
A Janus™ must be used as a quality module. Because of the high demands with regard to symmetry, the TandemNipcoFlex™ press must be equipped with four felts. All other elements were already part of the newsprint concept.



LWC Papers

DuoFormer TQv | Tandem NipcoFlex

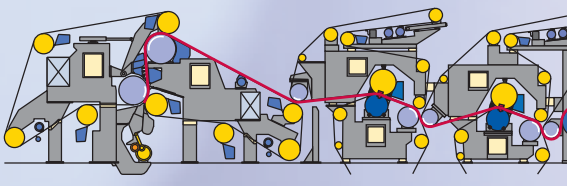
The quality module SpeedCoater™ is integrated for online coating. At the same time, this includes the pre-calendering and the end drying by a ModuleDryer™. The other elements were transferred from the magazine paper concept.



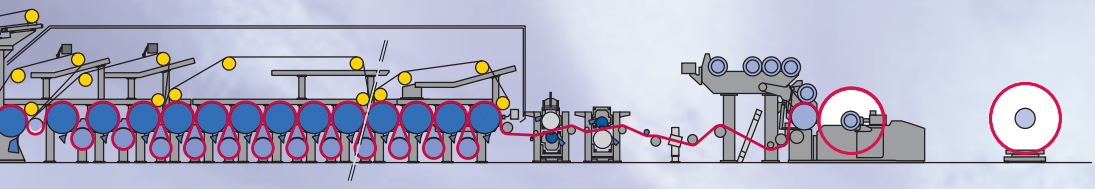
Office Papers

DuoFormer TQv | Tandem NipcoFlex

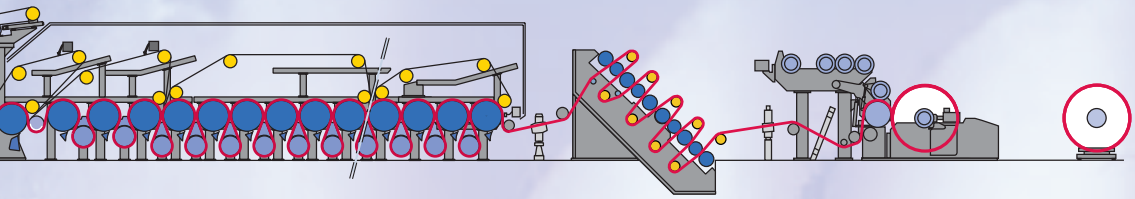
These papers are likewise surface-treated by the SpeedCoater™, but pre-calendering is not required. On the other hand, curl in cutsize papers needs special consideration. Therefore a CombiDuoRun is used. The remaining elements correspond to the basic newsprint concept.



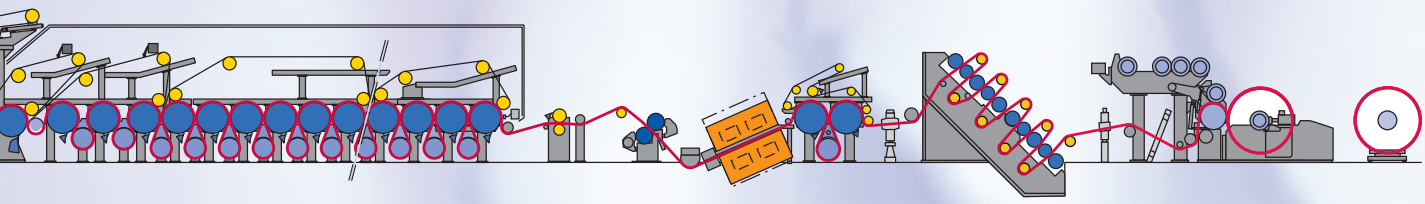
TopDuoRun | Ecosoft | Sirius



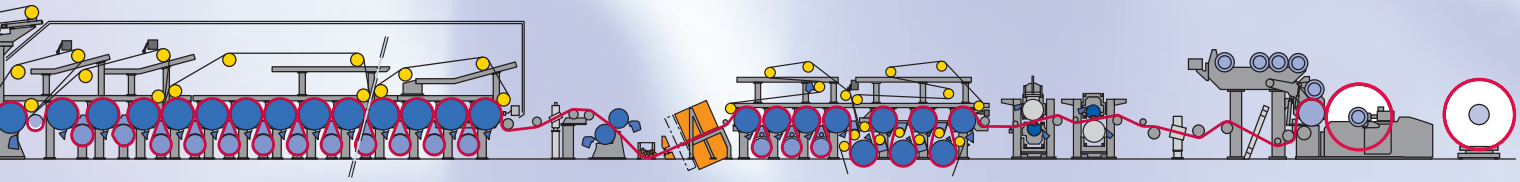
TopDuoRun | Janus MK 2 | Sirius



TopDuoRun | Calender | SpeedCoater | ModuleDryer | Janus MK 2 | Sirius



TopDuoRun | SpeedCoater | CombiDuoRun | Ecosoft | Sirius



Why One Platform Concept?

A discussion with Dr. Hans-Peter Sollinger, Voith Paper, on the backgrounds, strategic targets and customer benefits regarding the modular One Platform Concept.

Could you please give a short outline of the One Platform Concept?

During the last 5 years, Voith Paper has developed a completely new paper machinery concept for graphic grades. No aspect of the paper machinery process was left out. We have launched a new type of production process onto the market.

In this connection, we have tried to combine all the different concepts that existed for the different paper grades into an optimal and modular basic concept applicable to all papers. We call this modular basic concept the **One Platform Concept**.

Why has it been developed?

The reasons for the development of the *One Platform Concept* were the increased demands being made on the entire paper production process from the fibre to the finished paper. Due to the increased use of recovered paper for the reduction of raw material costs with a simultaneous deterioration in the quality of recovered paper, new processes had to be developed. The trend towards online processes for the paper production made considerable investment cost savings possible.

Simultaneously, the demands on the end product have increased and this meant that we had to give intensive thought to the end product and the printing process. In particular, we had to consider the different quality requirements of the graphic grades from newsprint and SC qualities to coated woodfree and wood-containing papers. While maintaining the modular basic concept, this is achieved by developing the systems in contact with paper (fabrics, belts, roll covers and special machine elements) and the process control with regard to the individual requirements. This means that the *One Platform Concept* is a tailor-made solution which takes the local requirements and the customer's production layout into consideration – like a tailor-made suit.

What are the goals?

The *One Platform Concept* by Voith Paper is more than a development and design concept. On the contrary, it is our company philosophy which resulted from the challenges given by the market. It is the key that allows us to reach our company targets and to fully meet the requirements and wishes of our customers.

With the *One Platform Concept*, we have developed a forward-looking, modern concept on which we would like to establish all further steps in the years to come. We feel that sticking to this basic concept is of great importance when we consider risk management. It provides our customers and us with the necessary security.

Fast, reliable and optimal start-ups, safeguarded with regard to quality and reliability, are the benefits that we see in the *One Platform Concept*.

Our customers should already be able to produce profitably during the start-up phase. Despite the image gain, we want to make projects clearly and persistently more profitable with first-class projects

and by a reduction in the project handling costs. This is an advantage which pays off directly for the purchaser and for us as well.

When did you introduce the One Platform Concept?

It is not possible to state a definite date for its introduction, it was introduced step by step. On the basis of our world references between 1994 and 1998 such as Braviken, Triple Star and Dagang, for example, we introduced this concept in different stages. Today, we speak of three stages:

Basic Concept	1998 - 1999
Advanced Concept	1999 - 2000
Consolidated Concept	from 2001.

Have you already been able to use this concept successfully? If so where?

Yes! With the "Basic" phase plants, e.g. Eltmann, we were already able to implement the best production start-up curve for newsprint.

Likewise, with the plants of the "Advanced" phase such as Schongau, for example, where it was possible to attain the highest specific production values of all comparable magazine paper units during the first 6 months.

In the case of Perlen, for example, ("Advanced" phase) we were able to produce high-quality, online coated and calendered magazine paper right from the beginning, although Perlen had not had any experience with coated paper before.

With all the experiences gained from various plants for different graphic grades, Voith Paper is able to offer a proven *One Platform Concept*.

What was the response by the market?

We were really surprised by the industry's great interest in our *One Platform Concept*. The combination – most modern concept and highest possible reliability – is of great concern to the paper industry. In this industry, risk awareness has started to change considerably.

With the *One Platform Concept*, we fully met the spirit of the times in the industry.

Concerning this concept, our sales department receives many words of encouragement from all sides of the paper industry. Races for daily records such as speed (peak results) no longer count. Nowadays, "quality tons on the reel" are important, throughout the year. Quotations of our customers underline this, for example the one by a Finnish customer: *"The production-oriented pulp and paper industry competed for the most beautiful, largest and fastest paper machine. Somewhere in the speed range towards and above 2,000 m/min, the target to produce not only more paper but also to increase profits was forgotten. This has to change fundamentally."*

What can be expected in the future?

We will further develop the basic concept for the *One Platform Concept*. At the moment, we are dealing very intensively with some innovative and very interesting concept solutions. But some time will pass until we have developed them to market maturity and will be able to integrate them into the current *One Platform Concept*.

But above all, we see our future tasks in the further optimisation of the existing *One Platform Concept*. There is still a considerable potential in the optimisation and further development of process control and the systems in contact with paper, i.e. forming fabrics, pressing fabrics and drying fabrics, as well as belts and roll covers. The interplay between machine, systems in contact with the paper and process control has a considerable influence on productivity and product quality.

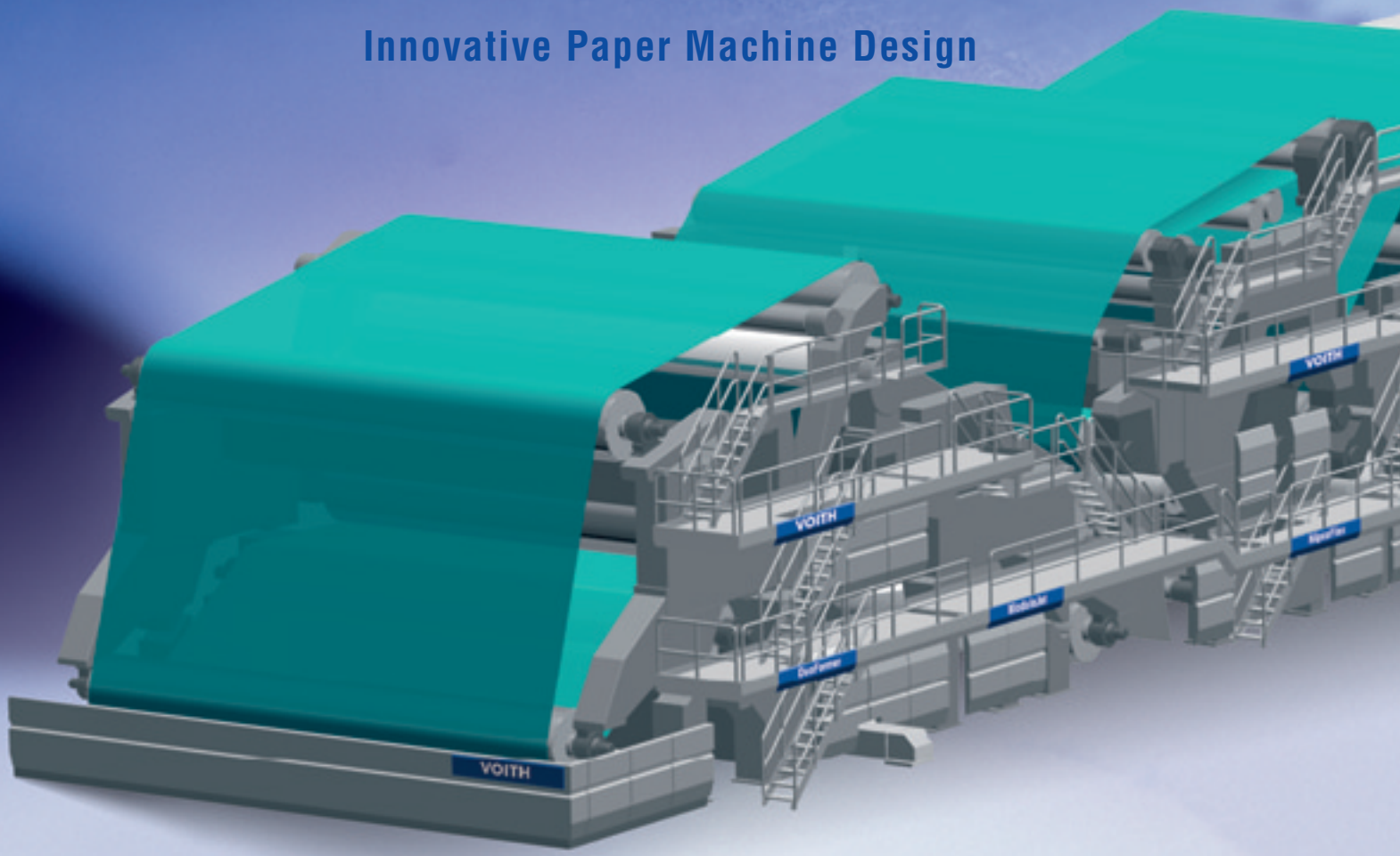
This is a continuous optimisation process which we implement in close co-operation with our customers on their operating production units and on Voith Paper's pilot units, where we are supported by the experts from Voith Paper and Voith Fabrics.

Process optimisation plays an important role with Voith as the preferred process supplier.

Voith offers the best prerequisites for this:

Voith is the only supplier who produces all systems of a paper machine that are in contact with the paper and offers the precondition to systematically implement process optimisation with the *One Platform Concept*.

Innovative Paper Machine Design

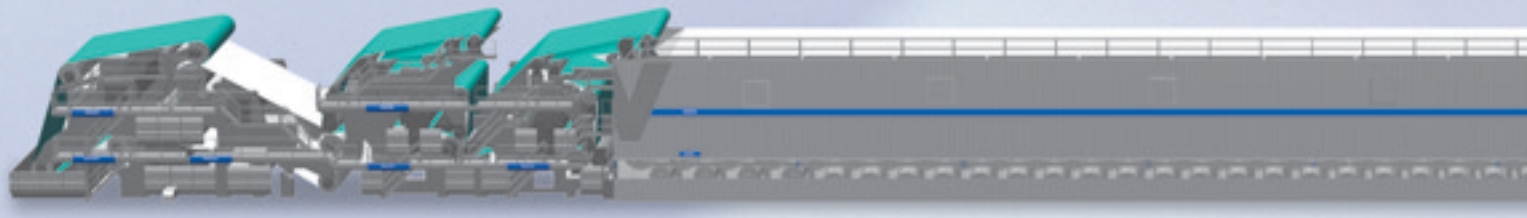


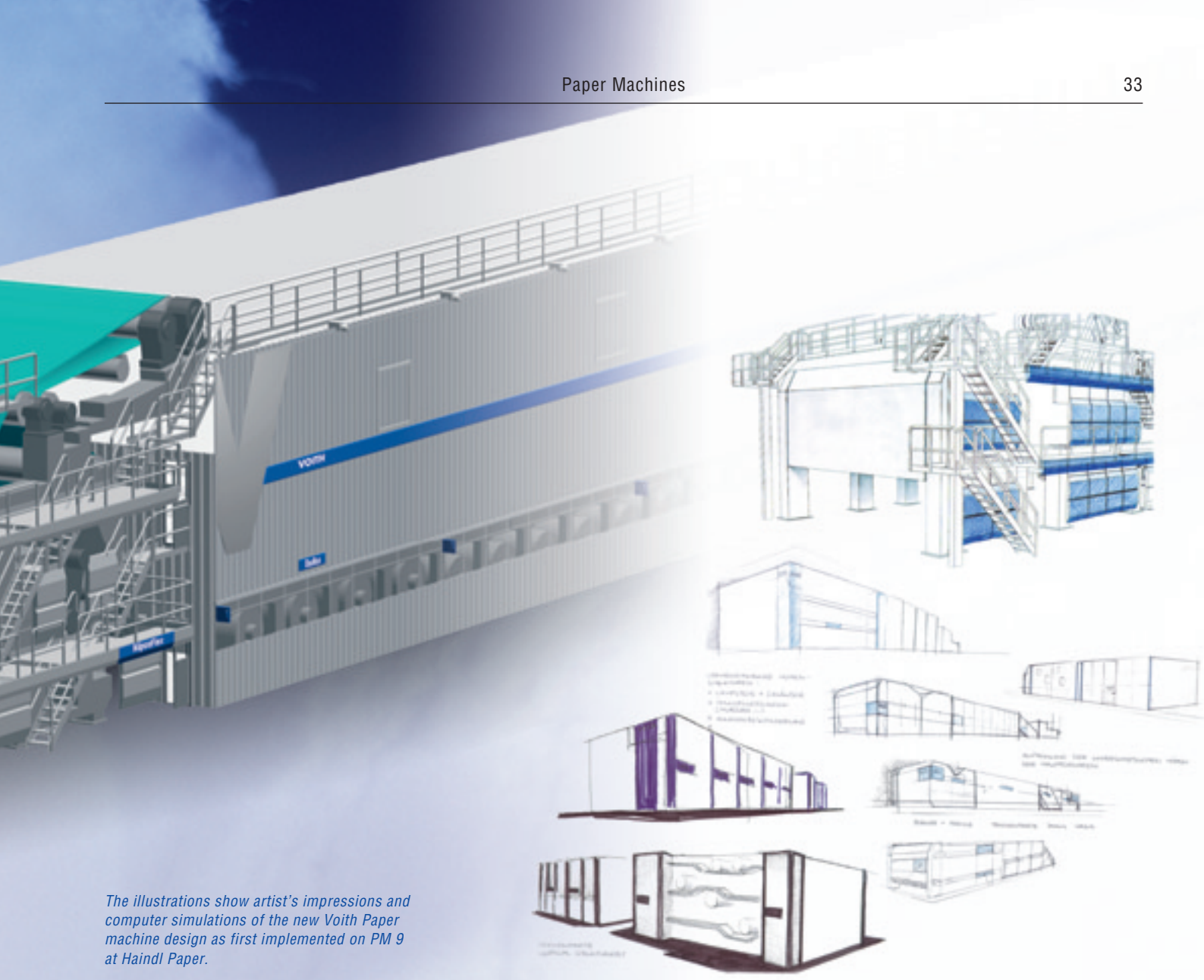
Design is not everything, but without design, everything is nothing!
As demonstrated by aircraft and automobile design ever since streamlining was discovered, elegance and efficiency go hand in hand. And it is equally true that well-designed ergonomic products sell better – as initiated by the legendary "Bauhaus" designers and architects.

It almost goes without saying, therefore, that the special qualities of innovative products should be underlined by their outward appearance.

An exception to this rule has been (and still is to some extent) large installations in the capital goods and machine building industries. Since their design focuses exclusively on the best possible cost/benefit ratio, surely such perfection should speak for itself in terms of outward appearance? So is there any further need for aesthetic design? Maybe this would merely comprise expensive cosmetics? It is because of considerations like this, that plant development engineers have perhaps waited longer than others before integrating aesthetic design concepts into their complex projects.

Those times are definitely over, however!
These days progressive manufacturers, also in the paper industry, no longer re-





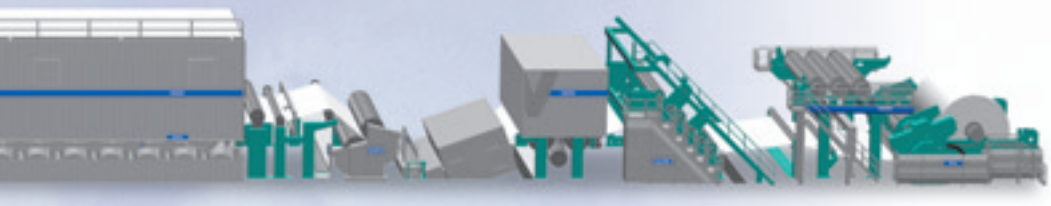
The illustrations show artist's impressions and computer simulations of the new Voith Paper machine design as first implemented on PM 9 at Haindl Paper.

gard good architecture in new plants or rebuilds merely as a space and cost saving advantage. They deliberately employ good aesthetic design as a marketing tool for enhancing their corporate image. And this applies inside the mill as well as outside.

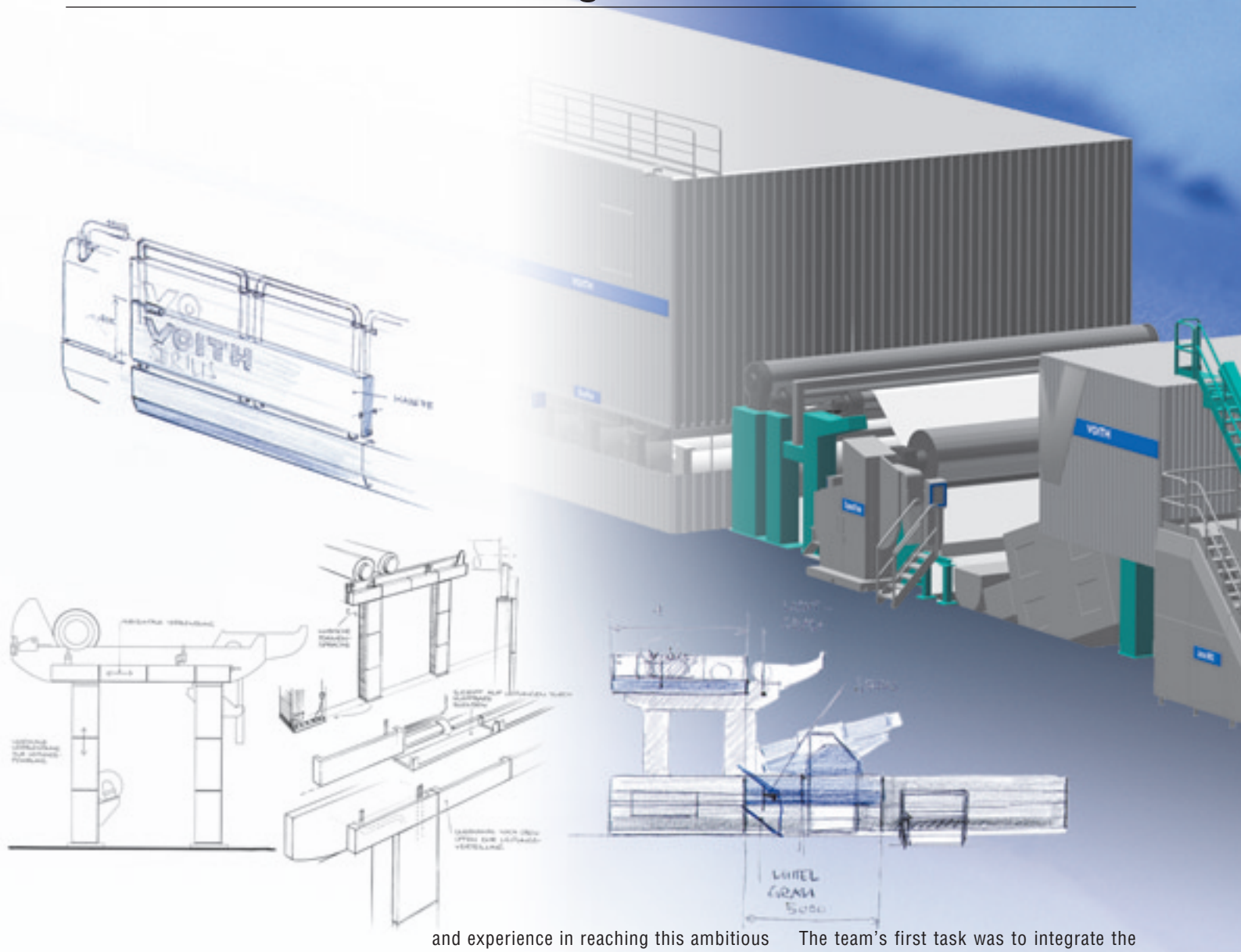
How can good design be defined? At any rate, it has nothing to do with superficial cosmetics or fashion. Based on thoroughly systematic aesthetics, it also incorporates greater product benefit and value-added, enhanced work safety and ergonomy, better handling and maintenance. It furthermore brings material and cost savings wherever possible, both in plant construction and installation. Ecological aspects such as energy and resource conservation also play a growing role in good design these days.

For some time now the basic development team at Voith Paper has been assessing important innovations for optimal design. Paper machine design studies have been also assigned both en bloc and in part to leading universities and technical institutions.

Since the introduction of our "One Platform Concept" of modular system components on an interlinking basis, all our designs are now checked for perfect integration of all modules. In this connection the opportunity arose to integrate such a new and comprehensive design – for innovation has to be systematic!



Prof. Horst Diener and his colleagues Dipl. Ing. Peter Koloch and Dipl. Ing. (FH) Reinhard Frank of Designpraxis Diener in Ulm partnered us with their competence



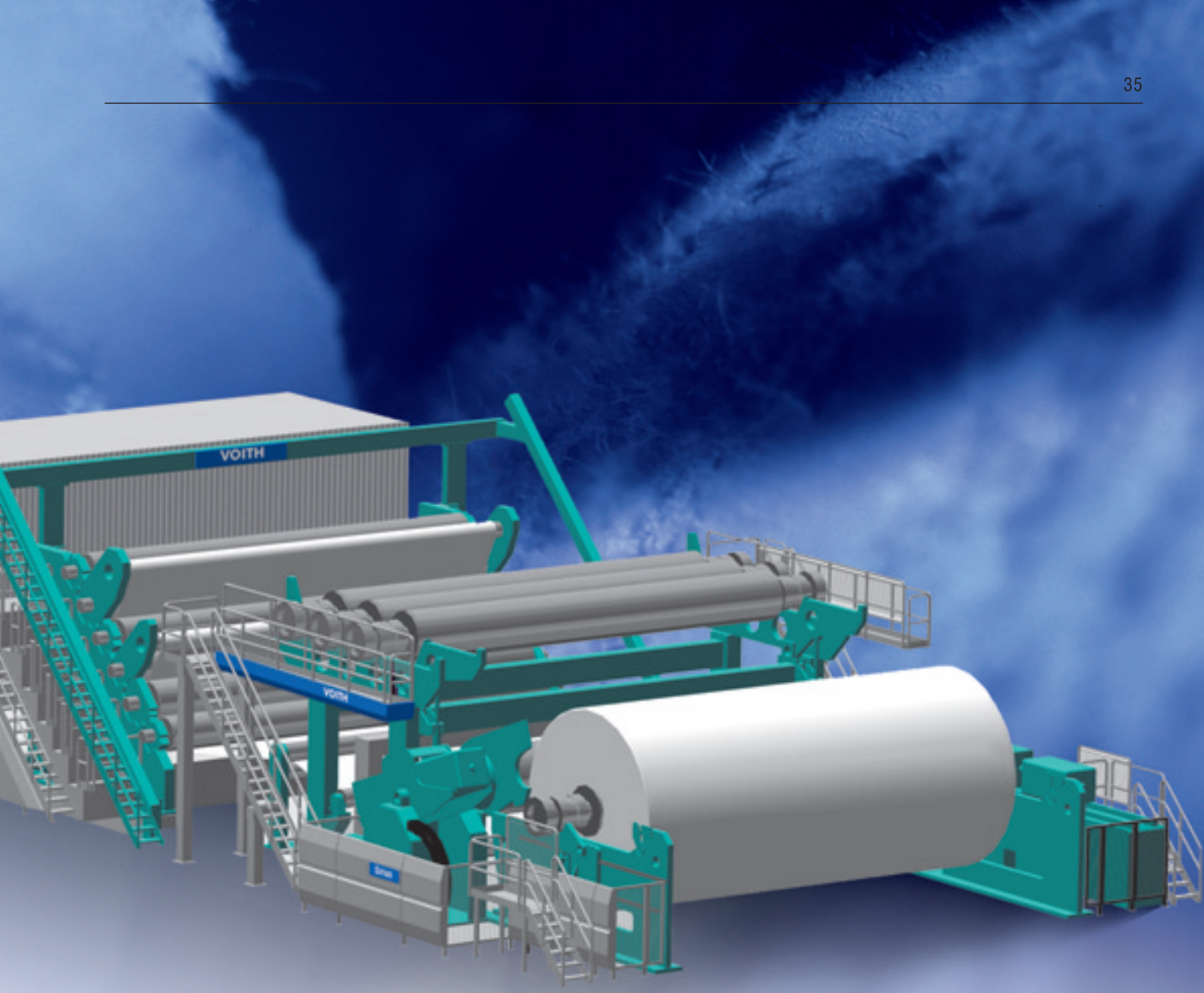
and experience in reaching this ambitious goal. Thanks to intensive dialogue between the Voith Paper development engineers, the corporate marketing people and the independent design team, all tasks and implementation phases crystallized step by step out of the detailed situation analysis.

Visualize quality – comprehensively and homogeneously! This summarizes the goal of the last few months' work. Although all the individual sections of a Voith Paper machine such as the former, press and dryer sections and reel section work together outstandingly well, the visual impact of each component has so far been treated relatively individually.

The team's first task was to integrate the optical design of a typical Voith Paper production line. In view of the plant size and complexity, an overall design concept was first worked out and its implementation divided into short, medium and long-term measures.

One of the first measures taken was on the walkways, which greatly affect the overall appearance of the paper machine.

Together with the machine designers the walkway system at the former and press sections was therefore revised, and divided into two levels or "storeys" as far as possible. The stairways at the former were integrated into a kind of staircase.



The result of this work is not only a more orderly impression, but also easier access for operation and maintenance. The walkways were fitted with panels, which serve several purposes:

They prevent dazzling by the lighting installations, while also improving the cable run and access. As a welcome side effect, these panels provide enough surface area for clearly labelling each system component.

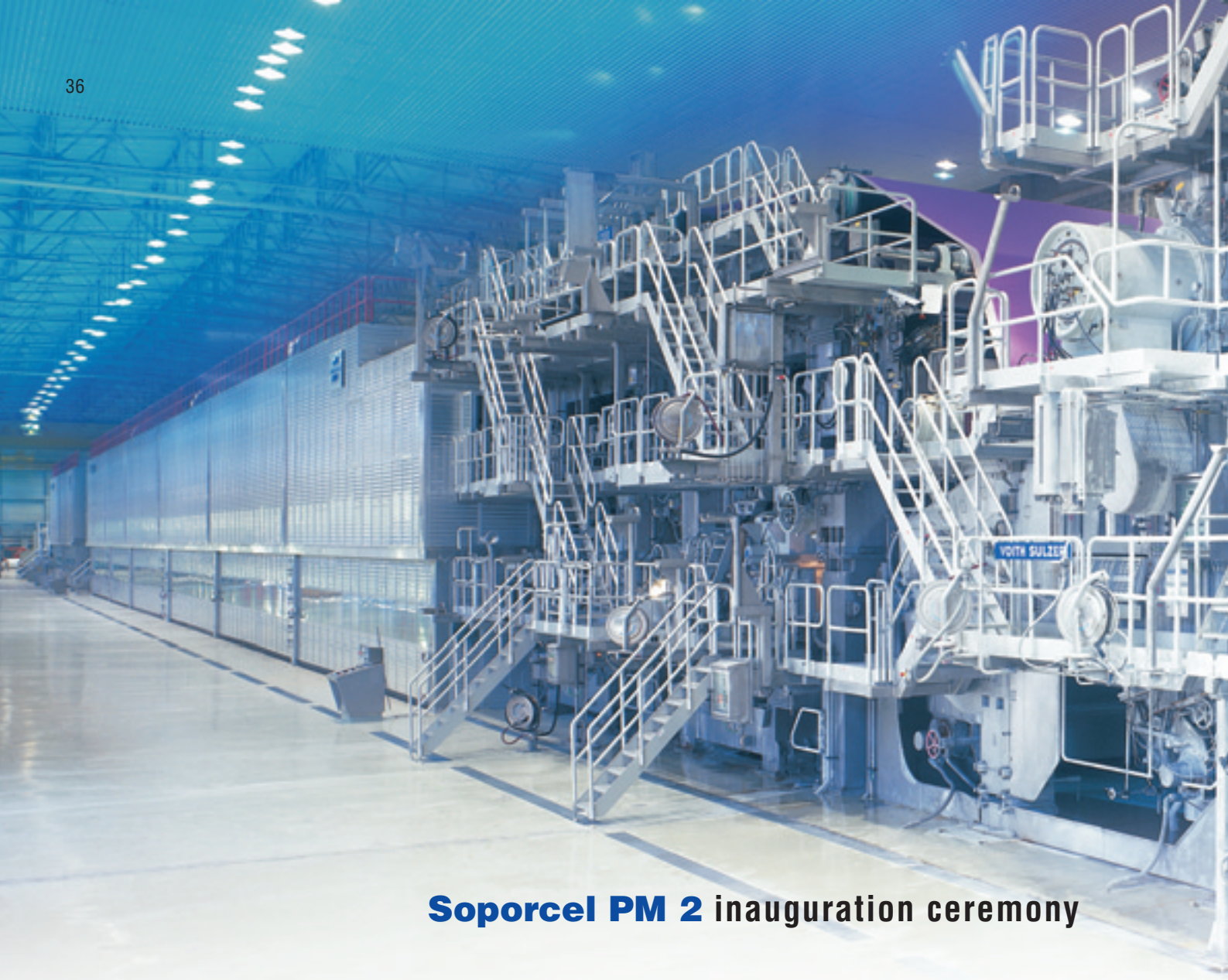
Based on Voith corporate blue, the walkways optically link the modular elements of the One Platform concept into a harmonious whole.

Since the former and press sections get very dirty during operation, the personnel have to spend a lot of time cleaning up to ensure efficiency and safety. This work will be reduced in future thanks to large splash guards. These not only keep off the dirt, but also reduce noise. For wire and roll changing, the guards can easily be moved or swung away like doors. Together with the walkways, they also serve for optically harmonizing the machinery complex.

The splash guards on the former and press section are similarly installed in the reel section, but for protection purposes. In this connection a new modular cladding and support element system has been developed which fits various machine layouts.

Whether walkway panels, exhaust hoods, splash guards or partitions – all these design elements fit well together both optically and dimensionally. Overall, they form the new image of Voith Paper machinery and are a protected part of the Voith corporate design.

Step by step the new Voith Paper design is being implemented. After its successful premiere on PM 9 at Haindl Paper, the design team is working on further machine concepts and going into greater depth with regard to operational, maintenance and rationalization benefits.

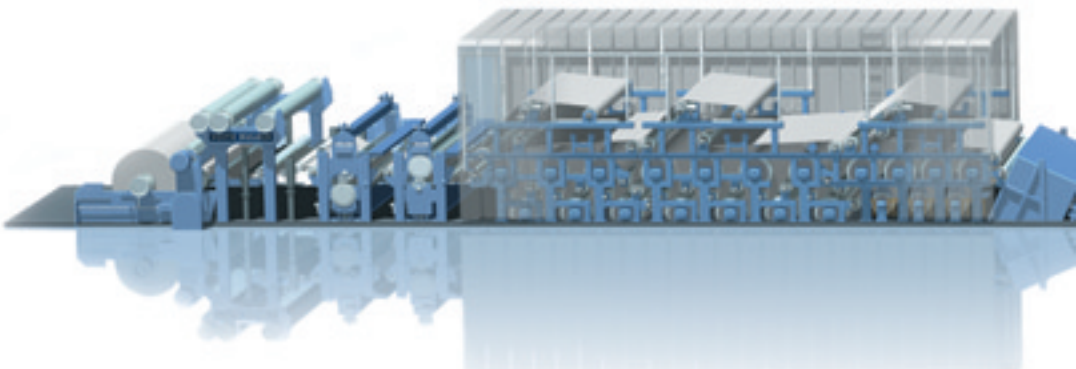


Soporcel PM 2 inauguration ceremony

The author:
Dieter Babucke,
Paper Machines Graphic

On October 18, 2000 Soporcel's new PM 2 production line was officially handed over in the presence of political and industrial leaders including Dr. Jorge Sampaio, President of the Republic of Portugal, Minister of Economy Mário Cristina Sousa, and State Secretary José Junqueiro.

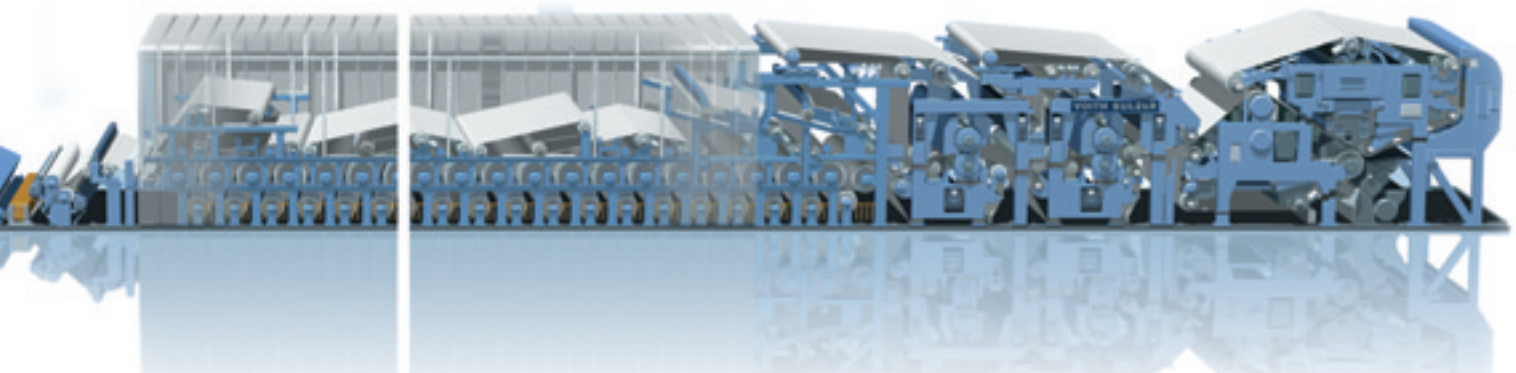
October 18 is a particularly important date for Soporcel: on that date in 1984 their new pulp mill was inaugurated – according to former President Antonio Ramalho Eanes "Portugal's most important industrial project". On October 18, 1991 their PM 1 went into operation. So for Soporcel it is now a tradition to celebrate the company's most important events on October 18. They take it as a good omen for ongoing expansion in the future.



President Sampaio congratulated the Soporcel management in his speech on the company's successful growth so far and this courageous new step into the future, their strategy of cost-effectively implementing the PM 2 project in tune with Portuguese market capacities. Economy Minister Sousa emphasized that the success and quality of Soporcel papers and the capacity expansion now attained with PM 2 should not be measured in tonnes alone, but rather as the result of entrepreneurial vision and purposeful implementation.

Board Chairman Alvaro Barreto referred afterwards to the special mission followed by Soporcel: the goal already set in 1984 of integrating all production processes as comprehensively as possible in the company's environmental responsibility – ranging from sustainable forestry to the finished paper products. He pointed out that Soporcel is already

Technical data of PM 2, built on the "One Platform Concept":
Wire width 9,350 mm
Web width 8,600 mm
Overall paper machine length 182 m
Grades: wood-free graphic papers from 60 to 110 g/m²
Annual output 400,000 t
Production speed 1,500 m/min at 80 g/m²
Design speed 1,700 m/min



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responsible for 55,000 hectares of forest covering about 30 % of current raw materials needs, furthermore that thanks to a model agricultural programme, more than one hundred thousand additional hectares are being re-afforested in an ideally eco-economical manner.

In this connection the Board Chairman mentioned another notable company investment of exemplary character: over the last few years Soporcel had spent about 100 million Euro on state-of-the-art clean-air technology and anti-pollution measures. The company had attained a standard thereby which not only improves on the EU air pollution limits, but is also much lower than main international benchmark levels.

For the 900 Soporcel employees, this PM 2 inauguration was certainly a source of pride and satisfaction. But it was also an important step toward breaking new ground. *"Our market expansion in the South European countries is notable, but due to lack of production capacities we are only just starting to find our feet in central and northern Europe. Our declared target is therefore not only to strengthen our presence in the traditional markets of Portugal, Spain, France and Italy, but also to expand beyond these markets. In terms of figures, we plan over the next three years to increase our market share in the European Union from 7 to 11 % for office papers and from 6 to 10 % for offset printing papers"*, said Alvaro Barreto. With 730,000 tonnes annual output capacity, Soporcel is now Europe's leading producer of office papers.

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In closing, the Board Chairman paid tribute to the PM 2 project team for their outstanding performance and excellent cooperation with Voith Paper. PM 2 had been implemented two months earlier than planned, including a very modern, gas-operated power plant with 67 MW output, thus improving significantly on the budgeted costs.

After reaching the final production speed of 1,500 m/min at 80 g/m^2 basis weight, Soporcel PM 2 will be the fastest and most efficient production line in the world for wood-free graphic papers made of eucalyptus furnish. Decisively important for the efficient planning and implementation of this project was the excellent cooperation of the Soporcel team, under Chief Executive Officer Luis Deslandes, with the Voith Paper project team. Thanks to this partnerly teamwork and constructive dialogue at all times, even the most difficult problems in the critical deadline situation typical of such ambitious projects were solved to the complete satisfaction of all concerned.

During the year preceding this PM 2 inauguration, CEO Luis Deslandes was particularly honoured by being appointed chairman for the next two years of the FAO advisory committee for paper and forestry products. Congratulations! This unique committee, comprising members from more than thirty countries on all continents, supports the head of the FAO in all matters concerning worldwide demand for forestry and paper products, including production aspects.

A detailed description of the Soporcel PM 2 project is given in *twogether 8*, pages 18-20.

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Fig. 1: Dr. Jorge Sampaio, President of the Republic of Portugal, giving his address at the Soporcel PM 2 inauguration.

Fig. 2: Board Chairman Alvaro Barreto talking about Soporcel's special mission.

Fig. 3: Luis Deslandes, CEO Soporcel, and Hans Müller, Voith Paper.

Fig. 4: PM 2 reel section.

Fig. 5: Part of the stock preparation line.

Quena –
Successful start-up of the world's most modern bagasse paper mill

The author:
Bernhard Häussler,
Paper Machines Graphic

Egypt's largest mill for graphic papers and newsprint started up in December 2000 when the first finished paper roll was turned out by PM1. Meanwhile production output has developed according to plan, meeting all expectations for high quality grades.

At the beginning of 1998 Quena Newsprint Company, Kous/Egypt ordered from Voith Paper a complete production plant for graphic grades using bagasse furnish. Kous is located in Quena province, upper Egypt, only about one hour from historical Luxor where papyrus paper was already made four thousand years ago. The mill is right next door to a sugar factory, which provides bagasse – or cane trash – as raw material for the neighbouring stock preparation line.

Quena Newsprint Paper Co. (QNPC) is a private investment company whose shareholders include some of the largest banks, insurance companies, sugar and food industry organizations. Headquartered in Cairo, QNPC has greatly expanded its activities over the last few years.

This turnkey project was realized in an amazingly short time. The impressive size of the Kous mill reflects the owner's fore-

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Fig. 1: Quena PM 1.

Fig. 2: The paper machine building at Quena Newsprint Company's Kous mill in Egypt.

sight and pride in future-oriented technology for high quality products at competitive market prices.

Decisive for this contract award were Voith Paper's outstanding references and technological leadership in machinery for producing newsprint and graphic grades from yearling bagasse. Voith Paper is the only comprehensive supplier worldwide of this technology, covering both stock preparation and paper machinery. Voith Paper reference plants using bagasse furnish are operating in India, Indonesia, Pakistan, Bangladesh and Iraq.

Ever since the Kous mill was commissioned in mid-December 2000, it has been producing high quality graphic papers from bagasse – a very difficult raw material to prepare and process. Smooth and successful commissioning was ensured by Quena and Voith Paper engineers together with a team of experts from Tamil Nadu in India.

Tamil Nadu Newsprint and Papers Ltd. have been producing newsprint commercially from bagasse in India since 1996 on a Voith Paper line. This was the first time in the history of newsprint production that 100% bagasse had ever been used as raw material. Right from the beginning of the Quena project, full advantage was taken of the experience gained in India.

Quena will be producing in their new mill 144,000 t.p.a. of graphic papers and newsprint with basis weights from 40 to 80 g/m^2. The furnish used will comprise 70-85% bagasse. This makes Quena's Kous mill the largest of its kind in the whole of Africa.

Thanks to mature process technology and the perfectly integrated functioning of all Voith Paper components, this plant operates smoothly and completely trouble-free.

The ModuleJet™ headbox ensures an extremely stable basis weight cross-profile, with an independently controllable fibre orientation cross-profile. Optimal formation and runability are ensured by the DuoFormer CFD gapformer, which enables active control of ash and fillers distribution on the z-axis.

PM 1 is equipped with the extremely reliable NipcoFlex™ shoe press technology, for maximum dry content after the press with optimal sheet volume retention. The TopDuoRun dry section ensures unsurpassed drying efficiency, while

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Fig. 3: SpeedSizer.

Fig. 4: The bagasse raw material depot.

Fig. 5: PM 1 reel section.

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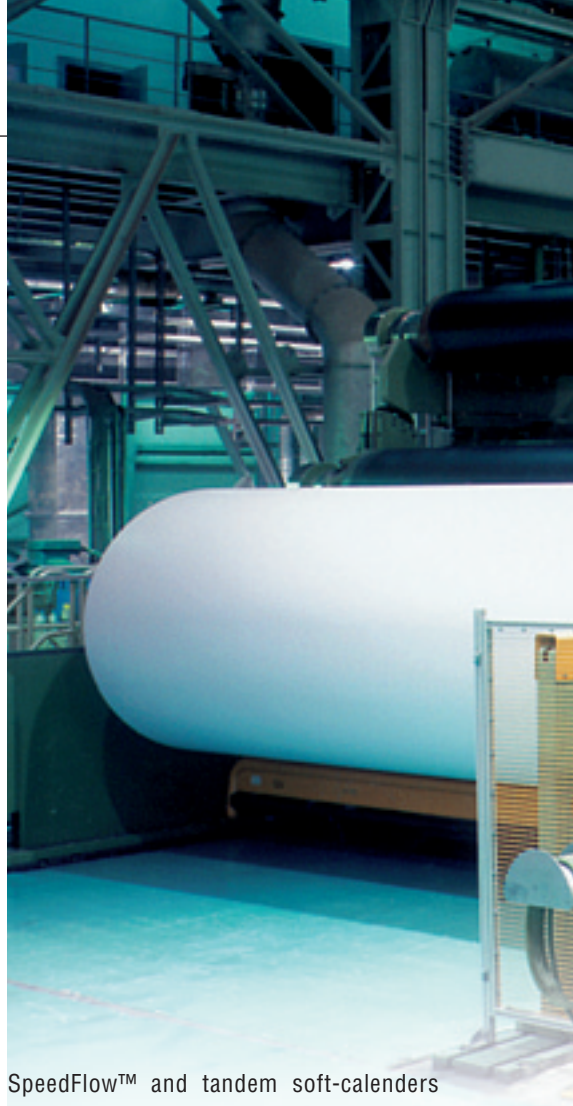
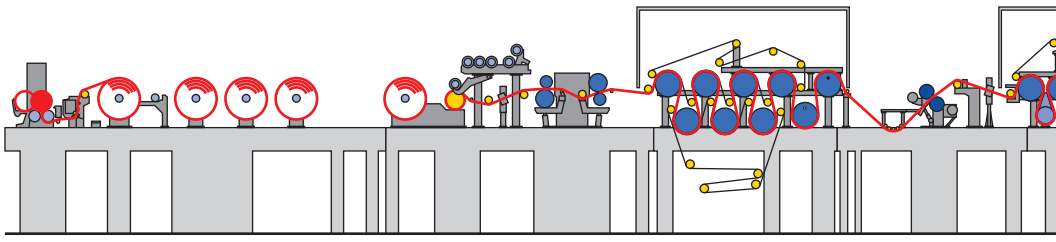


SpeedFlow™ and tandem soft-calenders ensure perfect sheet surface quality.

Apart from the complete paper machine, the Voith Paper scope of supply also included the entire stock preparation line, the approach flow section, whitewater systems and rejects processing.

Stock preparation is initially in four lines. The first two lines process mechanically and chemically bleached bagasse pulp respectively. The other two stock preparation lines process imported chemo-thermomechanical pulp (CTMP) and bleached pine kraft pulp (NBKP). These

Main paper machine data:
Design speed 1,300 m/min
Wire width 6,800 mm
Sheet width on poperoller 6,180 mm
Full paper reel diameter 2,800 mm
Max. weight of full paper reel 35 t
Production output 400 t/24 h
Max. reeling speed 2,500 m/min
Max. roll diameter 1,500 mm



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two bagasse and two imported pulp grades are combined in the mixing chest with recirculated broke, and then processed through the trim refiner. Newsprint is produced here with about 40 % mechanically and chemically processed bagasse, and 10 % each of CTMP and NBKP. The graphic papers made here comprise 75 % chemically processed bagasse and 25 % NBKP.

The main components of the approach flow section are a 5-stage cleaner and a 3-stage screener. A disk filter supplied by Andritz AG, Graz ensure optimal fibre recovery.

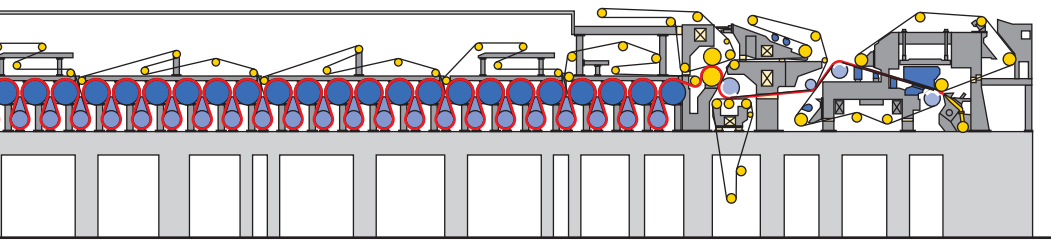
The Voith Paper scope of delivery also included a TORO winder with roll transport and packaging system, furthermore the additives processing system with piping and vats, and the overall process control system. Our consortial partner Alstom supplied the drive systems and all electrical installations including the DCS and QCS systems.

Electrical power is generated on site by an oil-fired high pressure steam turbine aggregate. Pass-out steam is taken from this boiler for low pressure process requirements. Modern water treatment and effluent systems ensure freshwater purity and environment-friendly wastewater disposal. Well-equipped servicing and maintenance facilities are also provided.

Due to the extremely tight schedule for paper machine manufacture and preassembly, including all main line components, logistics coordination among the suppliers was a large-scale operation. Site erection was carried out by Egyptian subcontractors with the support of Voith Paper supervisors.

Voith Paper took over all plant engineering, and was also responsible for the entire scope of delivery including comprehensive technical installations inside the paper machine building. Except for excavation and structural work, the complete turnkey paper mill was thus delivered to the customer's full satisfaction.

A further paper machine is planned for the future, and the necessary infrastructure is already installed.



Perlen PM 4 “Pionier”

An illustrious inauguration ceremony and open day

The author:
Bernhard Stützle,
Paper Machines Graphic

On Friday May 4, 2001 Perlen’s new paper machine PM 4 “Pioneer” was inaugurated. Starting at the wood yard, visitors enjoyed a tour of the TMP and deinking stock preparation line right through to the finished paper roll dispatch. All points of interest were posted along the route, including auxiliary systems such as effluent treatment, the in-house hydropower plant and boiler room. Perlen Paper personnel were on hand at every point for answering detailed questions.

This comprehensive tour showed in particular how the PM 4 line is custom-tailored to specific market needs as well as various logistics and infrastructure factors:

- The production capacity of PM 4 is adjusted on the one hand to regional furnish availability, and on the other hand to local paper market capacity within a certain radius.
- The uniformly high furnish quality required for LWC grades was ensured not only by rebuilding the modern TMP line already existing, but also with a new post-treatment line precisely

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Fig. 1: Perlen PM 4.

Fig. 2: SpeedFlow.

adapted to these needs. Perlen is the only paper mill so far where this concept has been realized.

- As another special feature, semi-finished stock preparation capacities for TMP and DIP are sufficient for newsprint production both on PM 4 and on PM 5. This ensures a high degree of flexibility and adaptability to market fluctuations.

- The new line is installed right in the heart of the existing mill, in the space previously occupied by an old paper machine.

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The highlight of this one-hour tour was of course PM 4 itself – already in commercial operation. More than five hundred invited guests were able to see for themselves the online production of "Perlentop" coated high-gloss offset paper. PM 4 lived up to its "Pioneer" name by producing nearly 500 tonnes of "Perlentop" in 24 hours without a single tear-off.

On the following open day, the same tour was available to the public. Once again, PM 4 production in shift operation went smoothly, undisturbed by no less than thirteen thousand visitors filing continuously past the machine.

Operations were equally continuous at the other end of the line in the restaurant marquee, where visitors enjoyed the hospitality of Perlen Paper Ltd. The logistics functioned perfectly – as would be expected of Perlen Paper – with a shuttle bus service to Perlen from the enormous parking lot on the military airfield nearby, and even a special train to and from Lucerne.

To celebrate the occasion, this special train was pulled by Perlen Paper's lovingly restored steam locomotive dating back to 1911 – a great attraction for visitors!

Right through the day, Perlen Paper Managing Directors Schaller and Maisch were on the spot with their entire team to ensure smooth operations. Feedback from 13,000 guests – including about one hundred Voith Paper technology people – was very enthusiastic.

Ever since the beginning of this project, the Perlen-Voith team and a good many other suppliers had been working intensively toward this inauguration highlight – with some astonishing achievements since then as well.

In a system consortium comprising delegates from Perlen, Voith and partners, Omya and Dow Europe, a good deal of development work was done already before the order was received, together with extensive tests on pilot plants. The entire team always worked together on the whole process line, focusing above all on stock preparation, coating and calendering. Overall results were regularly checked by printing tests in practice.

The intensive preparations bore first fruit at the commissioning in September 2000. After a brief start-up phase with newsprint, LWC was already being produced in

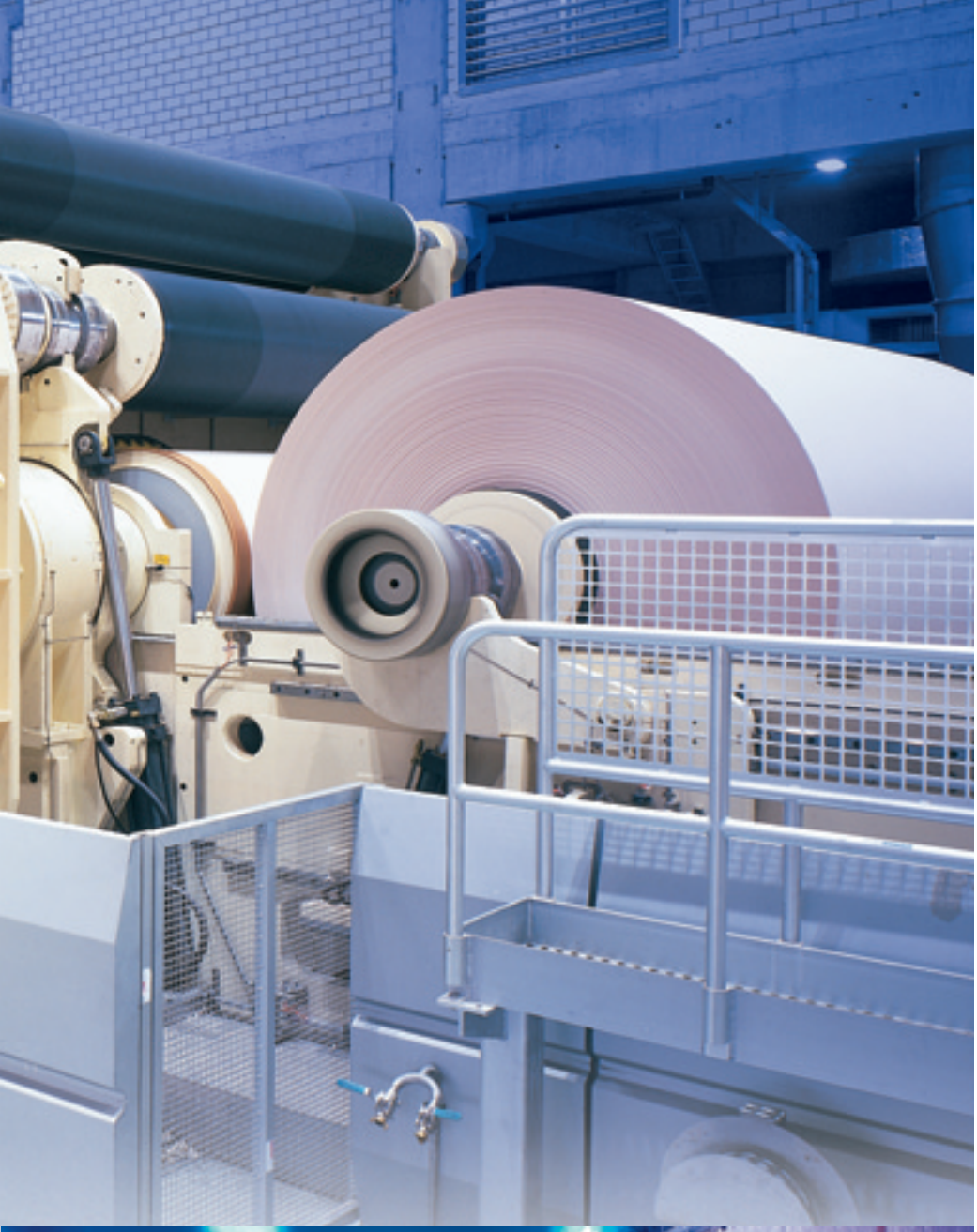

Fig. 3: Janus MK 2 and Sirius.

Fig. 4: Visitors to Perlen on open day.

Fig. 5: Reel section.

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5 October 2000. The specified product quality characteristics – gloss, printability and press room runnability – were attained unusually quickly.

The very high yardstick set for overall machine efficiency was not attained as rapidly as planned. During the commissioning and optimization phase, however, the entire well-versed team of experts was on hand with all the experience they had gathered during this project. Individual optimization steps were planned and implemented in working groups, with such success that in the meantime production output is well above the start-up curve. Daily outputs of around 550 tonnes are in the vicinity of the calculated gross production output. In April 2001 the operating efficiency of PM 4 had already reached about 82 % – an excellent level

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Fig. 6: Perlen's veteran steam locomotive.

Fig. 7: The Swiss doctor and balloonist Bertrand Piccard.

Fig. 8: Perlen Paper Managing Directors Schaller (right) and Maisch (centre) welcoming guests.

Fig. 9: A group of visitors admiring PM 4.

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for a machine with on-line coater and on-line calender.

At the inauguration ceremony, a brilliant address on Excellence was given by the Swiss doctor Bertrand Piccard, who in 1999 was the first to circle the globe non-stop in a hot-air balloon in only 20 days.

He emphasized that this record-breaking achievement was only possible thanks to teamwork, and explained the success factors which such a project team must fulfil. For the Perlen PM 4 "Pioneer" team, this was an excellent opportunity to draw parallels with their own work. For our ongoing teamwork in this system partnership, we shall pay particular attention to one of Dr. Piccard's principles: Never give up until you have reached the target. It is certainly a realistic medium-term target not only to attain the specified performance figures with PM 4, but to exceed them.

1

Kaukas PM 1 –
A Finnish success story

The author:
Klaus Hutter,
Paper Machines Graphic

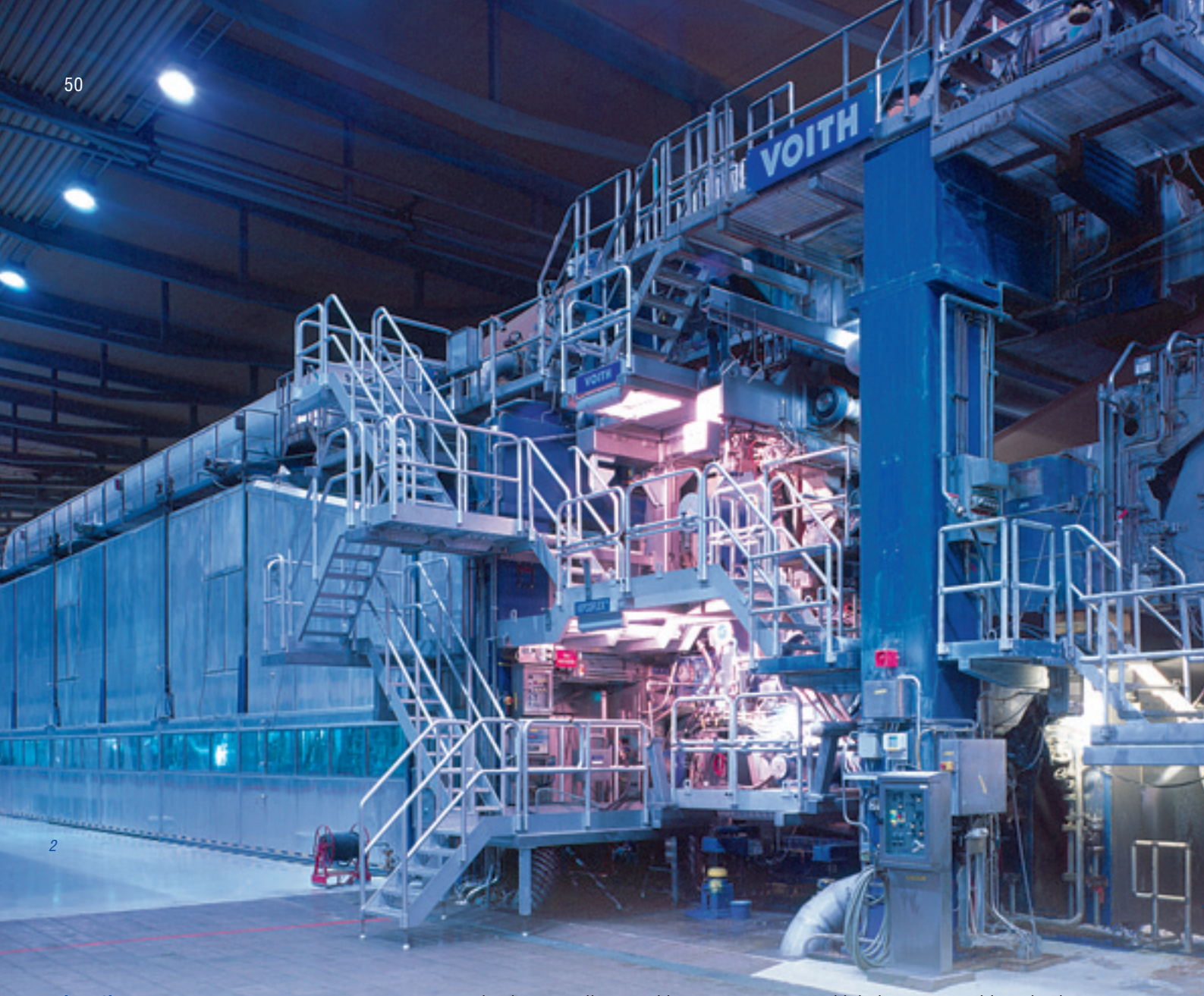
In March 2000 the UPM Kymmene Corporation, Helsinki, Finland awarded Voith Paper a rebuild contract for paper machine 1 and coating machine 1 in their Kaukas mill. In January 2001 this large Finnish project with a total investment volume of 30 million Euro was crowned by successful commissioning right on schedule.

Case history

The first production line at UPM Kymmene went into operation back in 1975. Designed for manufacturing LWC and MWC rotogravure and rotary offset magazine printing grades, the machine had been producing 2-sided coated grades since 1988. At the beginning of 2000, UPM Kymmene decided to optimize this line, and placed their trust in Voith Paper.

Decision

Decisive for the award of this order to Voith Paper was not only the well-founded technical concept, but also the satisfaction of UPM Kymmene with their JetFlow-F coating aggregates delivered by Voith Paper in 1996. Other important grounds were the outstanding reputation of the DuoCentri-NipcoFlex press and the extreme compactness of the new ModuleCoater, making it ideal for installation in the existing coating machine.



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Location

The UPM Kymmene Corporation's Kaukas mill is located about 150 kilometres east of Helsinki in Lappeenranta. This comprehensive plant incorporates the following facilities: sawmill, in-house power station, chipboard, pulp and paper production. About two thousand three hundred people work here. The Kaukas mill has customers throughout Europe, its main market being Germany.

Rebuild goals and scope of delivery

The purpose of this rebuild was to further improve the high quality of magazine paper production as well as machine capacity. To achieve this, some innovative rebuild measures were necessary:
The paper machine operating speed was raised by 300 m/min to 1,600 m/min. Simultaneous pre-coating was integrated into the coating machine, whose speed was raised to 1,800 m/min.

The scope of supply included the following machine components and aggregates:

Paper machine:

- New bottom wire return to ensure stable running in the wire section.
- New PM press concept comprising a DuoCentri-NipcoFlex press with shoe-press in the third nip. This ensures a very high dry content with optimal sheet volume.
- EnviroScan system for measuring humidity cross-profile after the press section.
- Dryer section rebuild to the DryStar concept, for greater reliability and stability of ropeless end transfer.
- Complete new hard-nip calender with thermo and Nipcorect rolls for cross-profile correction.
- Fibron threading systems for ropeless transfer through the calender to the poperoller.

Coating machine:

- ModuleCoater installation comprising a SpeedCoater coating aggregate and a ModuleDryer afterdrying section.

Fig. 1: UPM Kymmene Corporation's Kaukas mill in Lappeenranta.

Fig. 2: Kaukas PM 1.

Fig. 3: NipcoFlex press section.

Fig. 4: Comparison: before and after rebuild.

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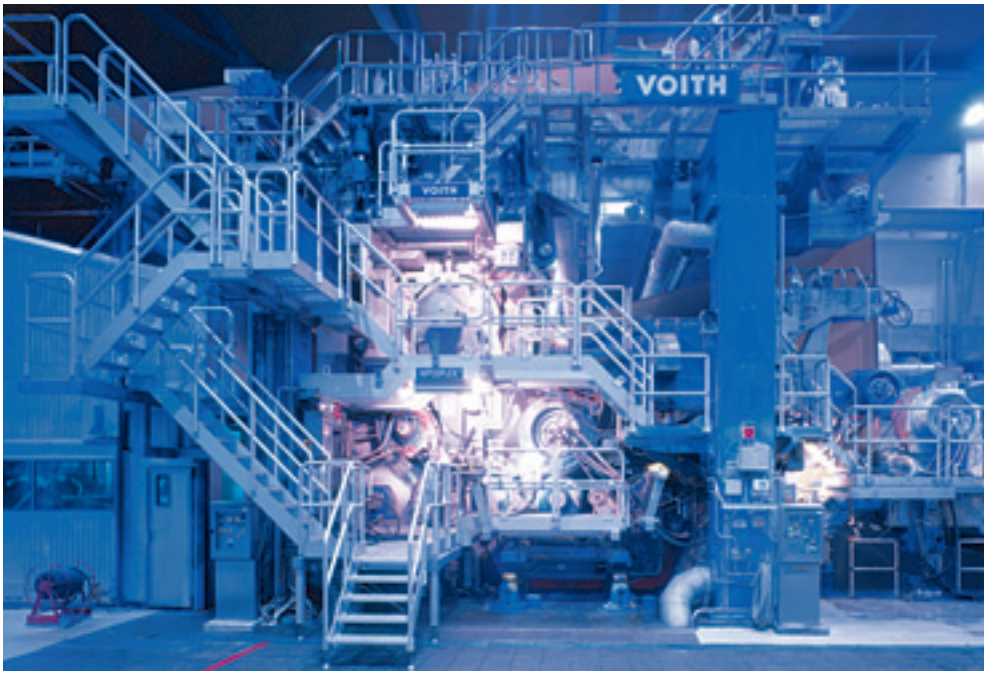

Special features

For the first time worldwide in an offline coater, simultaneous precoating by SpeedCoater has been implemented. The ModuleDryer newly developed in teamwork with Spooner Industries enables 2-sided contactless drying over a very short distance. With this Voith Paper technology application, double-coated MWC paper can be produced at the Kaukas mill in a single run instead of using two offline coaters as previously. Due to the high resultant efficiency, the investment is very worthwhile.

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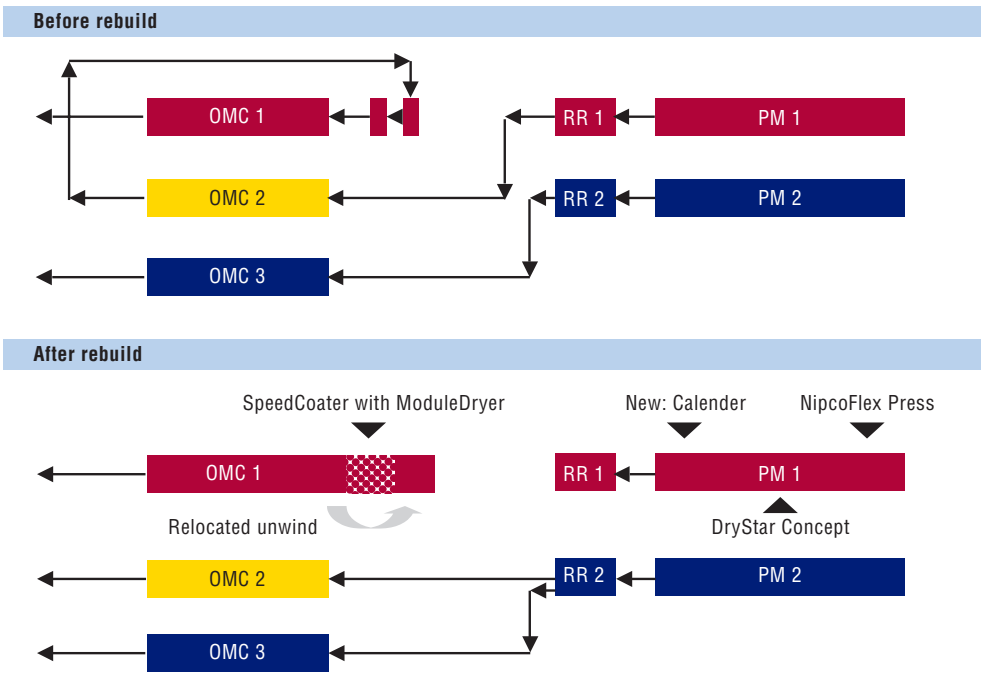

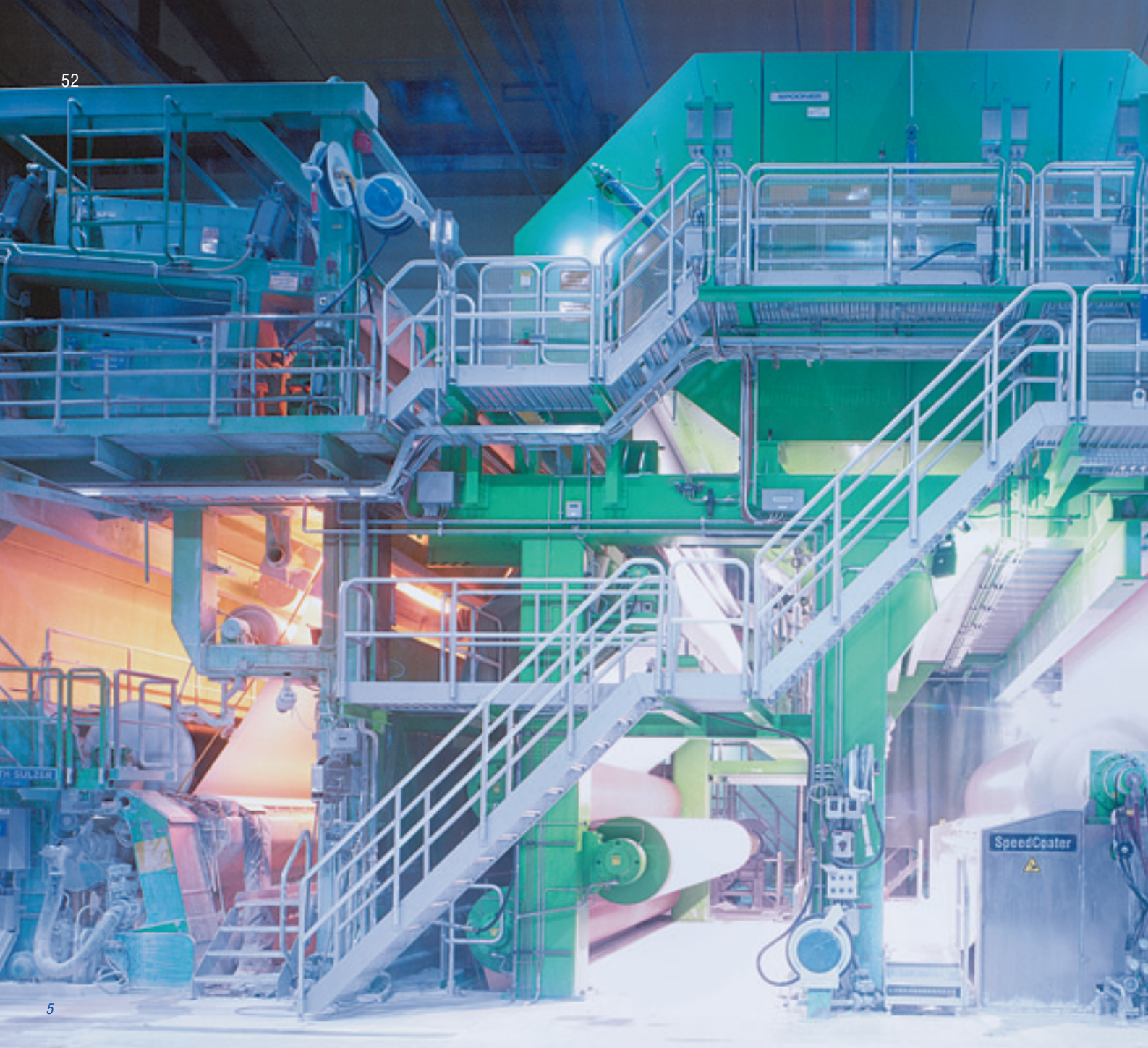

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Planning, design and installation

The first building modifications were carried out only three months after receipt of order. Rebuild planning and design was completed in less then seven months.

To ensure smooth and trouble-free installation, all aggregates were works-assembled in Heidenheim and Krefeld. Almost 100 truckloads were required for transporting the components to Lappeenranta.

During the main installation phase, the Kaukas workforce grew by more than 800 people, about 400 of whom from Voith Paper. Operating trials started before the installation completion deadline, and the control system was tested for the first time under actual operating conditions. Two months before, FA tests had been carried out under dry conditions at Honeywell Measurex.

More than twenty commissioning engineers ensured that all paper machine and coating machine aggregates were thoroughly tested and coordinated.

Commissioning

Since January 2001 the Kaukas production line 1 has been turning out double-coated MWC paper in STAR quality. On January 14 commercial paper production was attained for the first time, at a speed almost as high as the top speed prior to rebuild. Likewise in January 2001, the

Fig. 5: Kaukas coating machine 1.

Fig. 6: Layout of coating machine 1.

Fig. 7: The Kaukas project and commissioning team.

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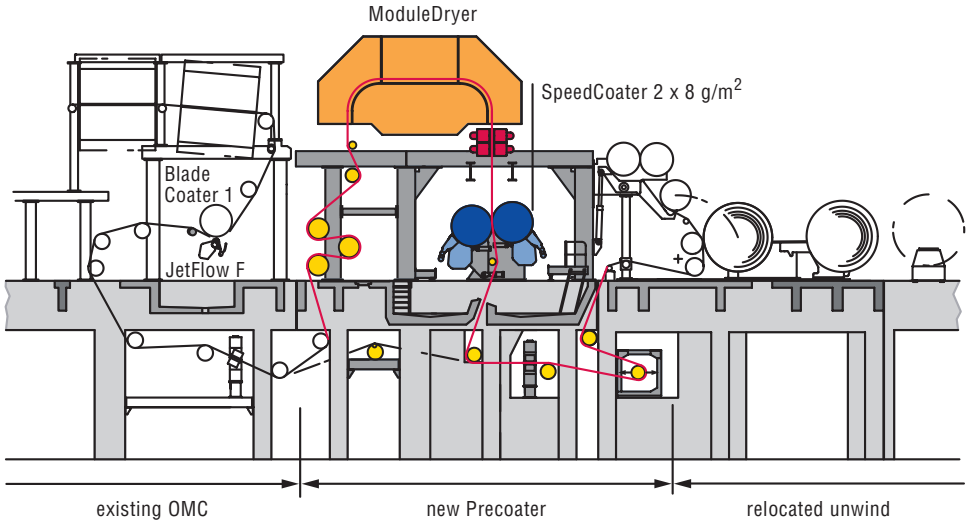

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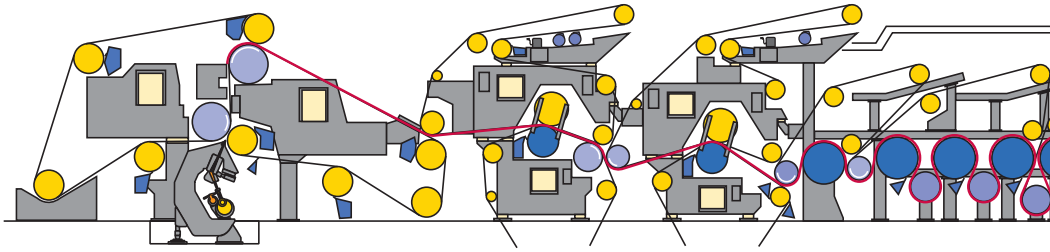
mill production and speed records were broken. Only three months after commissioning, an operating speed of 1450 m/min was attained. Dry content after the press section at this time was already more than 50%. The coating machine commissioning was also extremely successful, with operation for up to twelve hours shortly afterwards free of any tear-off.

The customer was very impressed with the smooth and trouble-free installation, optimal commissioning, and perfect teamwork with Voith Paper.

Statement by Pentti Hirvonen
Kaukas Project Director

The teamwork in handling and successfully completing this project is an exemplary reference for future projects. All the new components and modules were optimally integrated in the existing line, thus not only ensuring successful commissioning, but already breaking our mill production and speed records.

Hürth PM 1 –
The most cost-effective production line for standard newsprint

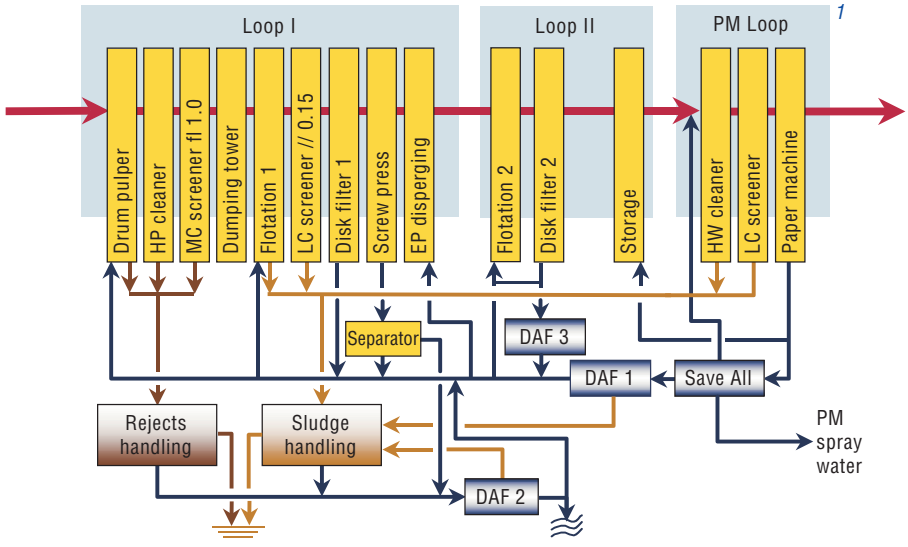


The author:
Thomas Schaible,
Paper Machines Graphic

At the beginning of March 2001 – only 18 months after starting up PM 5 at the 100 % Myllykoski subsidiary Lang Papier in Ettringen – Myllykoski again decided for Voith Paper. This time as supplier of the new production line for newsprint at the Hürth mill near Cologne.

The Myllykoski project team finalized their specification for the stock preparation and paper machine lines in a very short time: from mid-December 2000 to the end of February 2001. Only 16 months later on August 1, 2002, the new line built on the "One Platform Concept" has to start producing standard newsprint from 100 % recovered paper.

The overall investment budget of 280 million Euro for this new production line includes not only the paper machine, buildings and infrastructures, but also the complete stock preparation line as shown in *Fig. 1*. The scope of supply covers a new pulping and screening drum concept with a feeding system supplied by B+G, hole and slotted screening, preflotation and afterflotation, disperging,



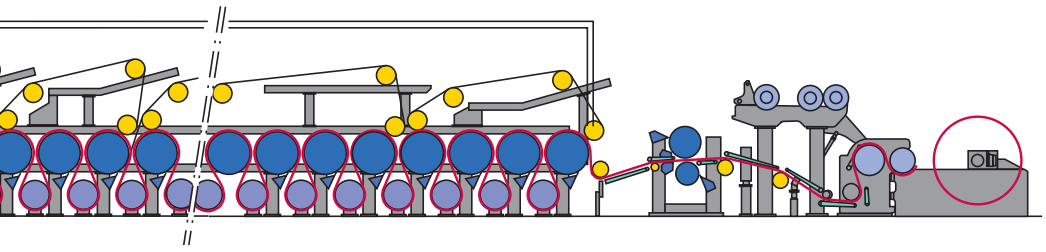


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Fig. 1: Deinking line, 2-loop system.

Fig. 2: Layout of Hürth PM 1.

Fig. 3: The contract signing ceremony (from left to right): Harry Hackl, Dr. Hans-Peter Sollinger, Thomas Nysten, Managing Director Myllykoski Continental, and Bernhard Ludwig, Managing Director Lang Utzenstorf.

and the entire stock/water loop system including rejects handling. Our joint venture partner Meri is supplying the water/rejects handling systems, while the dewatering machinery is supplied by our licensee Andritz as consortial partner. In addition to the paper machine Voith Paper is also supplying the quality control system, sheet inspection and tear-off analysis system, and all local controls.

The Hürth location was chosen for various reasons: power, steam and water are provided here from a local power station, plenty of recovered paper is available as raw material, and the end customers are not far away.

Hürth PM 1 comprises a ModuleJet headbox, DuoFormer TQv, Tandem NipcoFlex press, TopDuoRun dryer section, single soft-nip Calender and Sirius. Since the introduction of this concept, the new paper machine already incorporates the eighth Tandem NipcoFlex press and the fifth DuoFormer TQv – thus making it the seventh line in only two years to be built on the "One Platform Concept".

Decisive for the award of this contract was not only Voith Paper's outstanding system competence, but in particular the experience with newsprint production from 100 % recovered paper.

The concept for this new line was drawn up to meet the following requirements: budget compliance without sacrificing quality or existing standards; full integration of feedback and findings from previous projects for optimal copying effect with additional plant components; the concept must take full account of market requirements on standard newsprint over the next ten years.

By using well-proven components, systems and process stages, the shortest possible commissioning time should be ensured and the design production output reached as quickly as possible. The goal agreed between Voith Paper and Myllykoski for Hürth PM 1 is to attain the world's best start-up curve for this kind of line.

1

Kehl PM 2 –
Large new production line ordered for special graphical grades

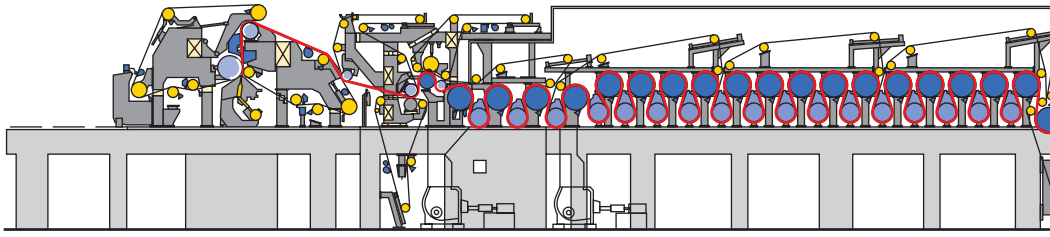
The author:
Heinz Braun,
Paper Machines Graphic

Eleven months after the successful commissioning of their new PM 6 for decor papers, August Koehler AG, Oberkirch again placed a large order for expanding their Kehl mill: a new production line for thermo-papers.

Installation work on this new line has already begun. Production is to start in only sixteen months' time, and commissioning is scheduled for December 2001. That will mark the start-up of Europe's most modern and powerful production line for non-impact printing papers.

Non-impact or thermo-papers comprise special wood-free grades which can be printed thermally, and without contact as for example in inkjet printing. The printer is heated electrically up to about 160° C, at which temperature the inks combine with developers to generate a printed image on the thermoreactive paper surface. Since thermal printers and copying machines save considerable time and costs in office communications compared with conventional printing methods, there is a growing demand for thermopapers. This growth is likely to continue for some time, since the processing possibilities, rapidity and flexibility of thermoprinting have not yet been fully exploited by any means.

It was only logical, therefore, for August Koehler AG as a leading producer of special graphical grades to expand their thermopaper production according to market demand. Decisive for their choice of Voith Paper as supplier of this new production line was our outstanding partnership recently in the planning, installation and commissioning of PM 6 for decor papers.



Main data of Kehl PM 2:
Product thermal basis papers, 40-80 g/m²
Web width on roller 4,200 mm
Design speed 1,500 m/min
Operating speed 1,400 m/min
Gross output up to 390 t/24 h
Production capacity about 120,000 t.p.a.

Fig. 1: The August Köhler AG Kehl mill.

Fig. 2: Coating machine layout.

Fig. 3: Layout of the new PM 2.

Apart from design planning and engineering, this large new order also covers substantial parts of the stock preparation line such as the charging, pulping and refining aggregates, rejects handling and the approach flow section. Main focus is on the new PM 2 and on the offline coating machine for thermal printing paper. The scope of supply also includes the rereeler, paper roll transport system and packaging machine.

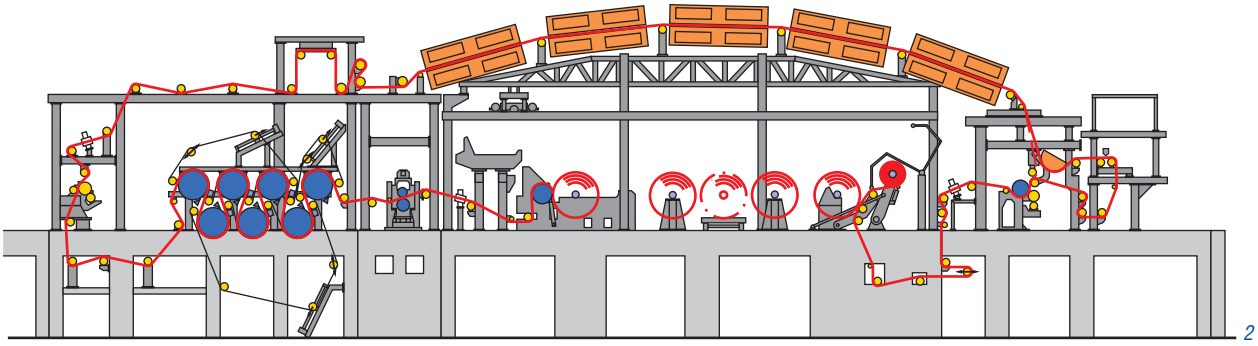
The Kehl mill's new PM 2 will set new milestones in thermo basis paper production.

To meet the high quality demands, the latest components of the Voith Paper "One Platform Concept" will be integrated in PM 2:

- **MasterJet G** headbox and **DuoFormer TQv** (vertical gapformer) in the forming section to ensure optimal uniformity in the macro range (cross-profile and machine-profile) and micro range (formation).
- **DuoCentri-NipcoFlex press** for outstanding runability with high dry content and high pre-coating smoothness on the reverse side for thermo printing.
- Single row **TopDuoRun** dryer section for rapid drying and optimal availability.
- **EcoSoft** softcalender after the predrying section for efficient precalendering and a uniform thickness cross-profile.
- **SpeedCoater** for good contour or insulation coverage as basis coating for thermo-printing on the reverse side.

In the offline coating machine, the sheet is covered with a thermosensitive surfacing. Particularly important here is a uniform, high quality coating, which is ensured by a special coating aggregate developed for this purpose by Voith Paper in teamwork with the customer. The joint venture signed between Voith Paper and IHI, Japan, also enables in Kehl the first application of a **curtain coater** working on the uniform 1:1 coverage principle. August Koehler is the first paper manufacturer to use a curtain coater at operating speeds above 1,000 m/min for this special product – a pioneering milestone!

After commissioning, this new production line will be described in detail in one of the next editions of "twogether". It will certainly expand the position of August Koehler AG in the high grade thermopaper sector and consolidate the company's market leadership in Europe.



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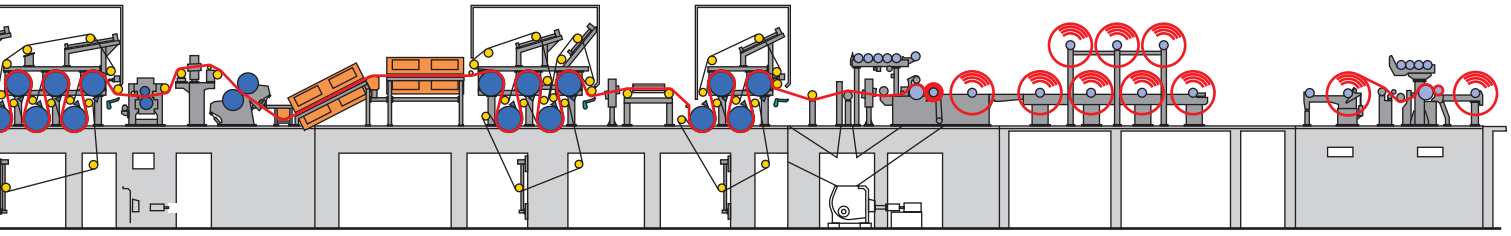

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The authors:
Peter Herbrik,
Franz-Josef Schmitt,
Christian Münch,
Finishing

... continuation.
Janus™ MK 2 for Schongau PM 9

Review: when our previous article on the PM 9 rebuild in Schongau went to press, we were just about to embark on one of the most demanding installation and commissioning projects ever undertaken worldwide. In only 56 days, not only did an existing paper machine have to be dismantled and systematically packaged for shipping to its new owner in China, but its place had to be taken by a new line due to start production at the end of June 2000.

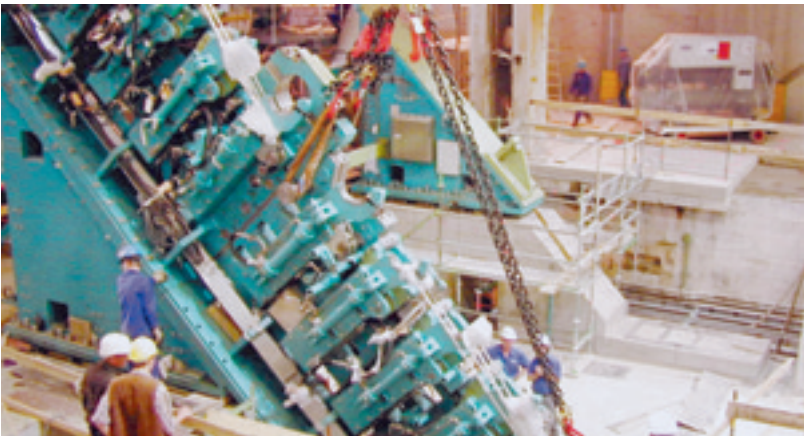
The new PM 9 is equipped with a Janus™ MK 2 – the most modern calendering technology currently available on the market. The concept was new, it had to be installed and commissioned in record time, and the start-up curve was dauntingly steep.

All technical preparations for this project had been made in close teamwork between the customer and the supplier. Standstill time was scheduled right down to the last hour. All units had been commissioned previously next to the operating paper machine. In Krefeld a task force team of designers, automation and production experts was on hand around the clock for fast response to unavoidable surprises, as far as possible leaving nothing to chance. All possible preparations had thus been made – but were they enough?

Fig. 1: The first paper roll produced by PM 9.

Figs. 2 and 3: Frame erection and roll installation.

Fig. 4: Regular commissioning conferences – outside in the sunshine whenever possible.



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To put the reader's mind at rest – the answer is yes. In *Fig. 1* you can see the exhausted but happy commissioning team next morning on June 28, 2000, standing in front of the first paper roll turned out by PM 9.

Let us now go back in time, however. Punctually on May 2, 2000 the old PM 9 produced its last paper roll and was ready for dismantling. At the same time in Krefeld the 400-tonne Janus MK 2 calender was being dismantled and packaged in erection-friendly units for transport. The task of setting up the frames was practised once again – for there would be no time for mistakes later on. Dismantling of the old paper machine was not even finished when the end aggregate foundations for the new one were already installed. And when the ModuleJet™ headbox foundations were poured, the Janus MK 2 frame was already in place. This high-precision teamwork between the customer and supplier, civil works contractor and erection people was fascinating indeed. By May 25, 2000 the Janus MK 2 had been completely installed, ready for commissioning *(Figs. 2 and 3)*.

Old hands at commissionings know only too well what surprises they can bring – and Schongau was no exception. There were not only surprises, mostly of the unwelcome kind, but also breakdowns and extremely frustrating delays. But the situation was always saved by the well-versed customer-supplier teams, who had spent twelve months preparing themselves technically and getting to know each other personally. This disciplined teamwork between the highly motivated Haindl people and Voith Paper's expert commissioning engineers worked so perfectly, that even the most obstinate problem was solved in the end.

Coordination was time-consuming. Two commissioning conferences were held every day between the customer, supplier and subcontractors *(Fig. 4)*.

On June 8, 2000 the rolls were heated up to 240 °C oil temperature, and on June 15 the Janus MK 2 hydraulic system was operational. On June 18 the drives were run up to 2,200 m/min, and three days later both stacks were closed for the first time at full speed and loaded to maximum pressure.

When the countdown had reached 96 hours to zero, the end aggregate transfer system was started up with an unroll stand specially developed for this project.

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Figs. 5 and 6: Final optimization work by the transfer team.

Fig. 6: Start-up curve of PM 9 in Schongau.

Figs. 7 and 8: The Janus MK 2 calender.

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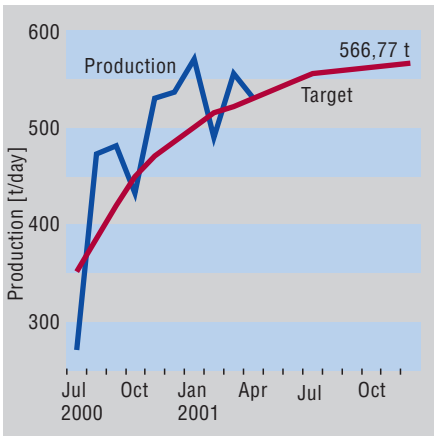

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This was when the *transfer team* came into play. Day and night they balanced the commissioning parameters between dryer cylinder 38, the Fibron vacuum tapes, the rope guide system, the pull stack and the Sirius™ winder. In the meantime the sheet reached dryer cylinder 38 several times. By now, the commissioning preparations on the paper machine were almost complete, and the Janus team would soon be able to transfer their first sheet *(Fig. 5)*.

On June 28 the big day came. The sheet was running at 1,330 m/min on dryer cylinder 38 in the pulper. Everyone held their breath when the commands “Janus transfer on” and then “Sirius transfer” were given. The first shot was a bullseye! The double blade cutter divided the web, and the first reel was soon wound... although at first with a thickness of 250 mm *(Fig. 6)*.

The next few weeks were demanding but rewarding. The transfer system had started up with impressive precision, and continued to do its job reliably. As shown by the start-up curve for the first month in *Fig. 6*, performance expectations were significantly exceeded. The paper machine efficiency already reached 78 % only two months after commissioning, and improved to 85 % after six months. At the present time, more than 500 tonnes of paper are being calendered in the Janus every day.

The *roll change team* performance was particularly outstanding. Even the first roll change went precisely according to plan, and after a while, roll changes were taking significantly less than the guaran-

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teed time. Meanwhile, roll changing has become a routine task.

Teamwork between the automation groups was likewise exemplary. After intensive preparations followed by FAT (Factory Acceptance Test) runs, the control system, process regulation and drive aggregate teams were well harmonized and able to solve all problems in a very short time. Despite the very tight schedule, all the necessary adjustments and improvements were still completed during the commissioning phase. This achievement was only possible thanks to optimal coordination and the high motivation of all concerned.

What now? All working groups have been dissolved since then except for the *quality team*, but the personal contacts made are still in place. Over the next few months, in well-proven teamwork between the customer and supplier, the demanding quality criteria for SCB production from 100 % DIP must be complied with. The *quality team* continues to meet regularly for jointly optimizing the paper quality parameters on a systematic basis.

The Schongau PM 9 project has shown that through optimal planning and close cooperation with the customer, short standstill times and steep start-up curves are possible. We pay tribute to all those who participated in making this project such a success.

1

New **Service Center** in Indonesia

The author:
Martin Scherrer,
Service Center Jakarta

On April 19, 2001 in the presence of numerous customers, high-ranking representatives of the Indonesian Ministry of Trade and Industry, and the German ambassador, a new Voith Paper Service Center was inaugurated about 60 km east of Jakarta. This is situated in Karawang Industrial Estate, well connected logistically with the West Javanese pulp and paper industry and not far from Jakarta airport and harbour.

The opening of this new service center underlines the importance attached by Voith Paper to growth of the paper and board industry in South-East Asia, Australia and New Zealand, Taiwan, China and South Korea. True to our principle of fast and partnerly customer service on the spot, this new center offers everything required for professional customer support – consulting and analysis, maintenance and overhauls, and in particular fast service for wear parts such as roll covers and stock preparation line components. The main goal is to minimize all risks for the customer – including time and cost outlay – through really professional services on the spot.

The new service center, which has nearly 7,000 square metres of shop floor area to start with, already employs 50 professionals, and medium-term expansion to a staff of around 100 is planned. The crane systems and the machine park, with modern CNC turning and grinding centers, multi-spindle boring machines and dynamic balancing units, can already handle all roll types up to 15 metres long, weighing up to 100 tonnes and up to 2,000 mm in diameter. Capacity can be added at any time according to need.

The entire Voith Paper coating technology, both in rubber and polyurethane, is already available here or possible at short notice. The new service center thus offers exactly the same processes, materials, quality and delivery logistics as all other Voith Paper service points in Europe or America. This also includes the former Scapa technology acquired by Voith Paper in 1999. And in the near future, the

Fig. 1: The new Service Center in Karawang.

Fig. 2: Mertin Scherrer welcoming guests at the official opening.

Fig. 3: Ray Hall holding his welcome address.

Fig. 4: Roll center.

Fig. 5: Indonesian women in traditional costumes at the inauguration ceremony.

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mechanical roll service equipment will be complemented by a Nipco test stand. Furthermore, the new service center will soon be offering comprehensive servicing for anti-deflection rolls. So far most Indonesian customers had to send rolls of this type to Europe or the USA for reconditioning. By the year 2002 the manufacture of composite covers for calender rolls is also planned here.

It goes without saying that field service is also provided, such as vibration measurements, headbox repairs, dryer section repairs, roll changing assistance, and mobile roll grinding and thermal spray coating.

Voith Paper is the only provider in the entire South Pacific region of such wide-ranging services on the spot. Not to be forgotten is the worldwide backing of Voith Paper research and development potential, which can be directly accessed at all times. Thanks to close teamwork with Voith Paper's R&D people in North America and Europe, the latest state of technology has now been transferred to Indonesia.

Guests invited to the opening of this new service center were able to see for themselves the impressive offering. Welding specialists demonstrated how rotors for stock preparation units are reconditioned in Europe – a service also available in Indonesia in future. Voith Fabrics people explained the latest state of clothing technology. Since January 1, 2001 Voith Fabrics serves the Indonesian market with its own qualified staff instead of via local agents.

The substantial investment made by Voith Paper in this new service and support center will consolidate and expand on a long-term basis our fruitful cooperation not only with existing customers in the growing South-East Asian paper and board industry, but also with new ones.

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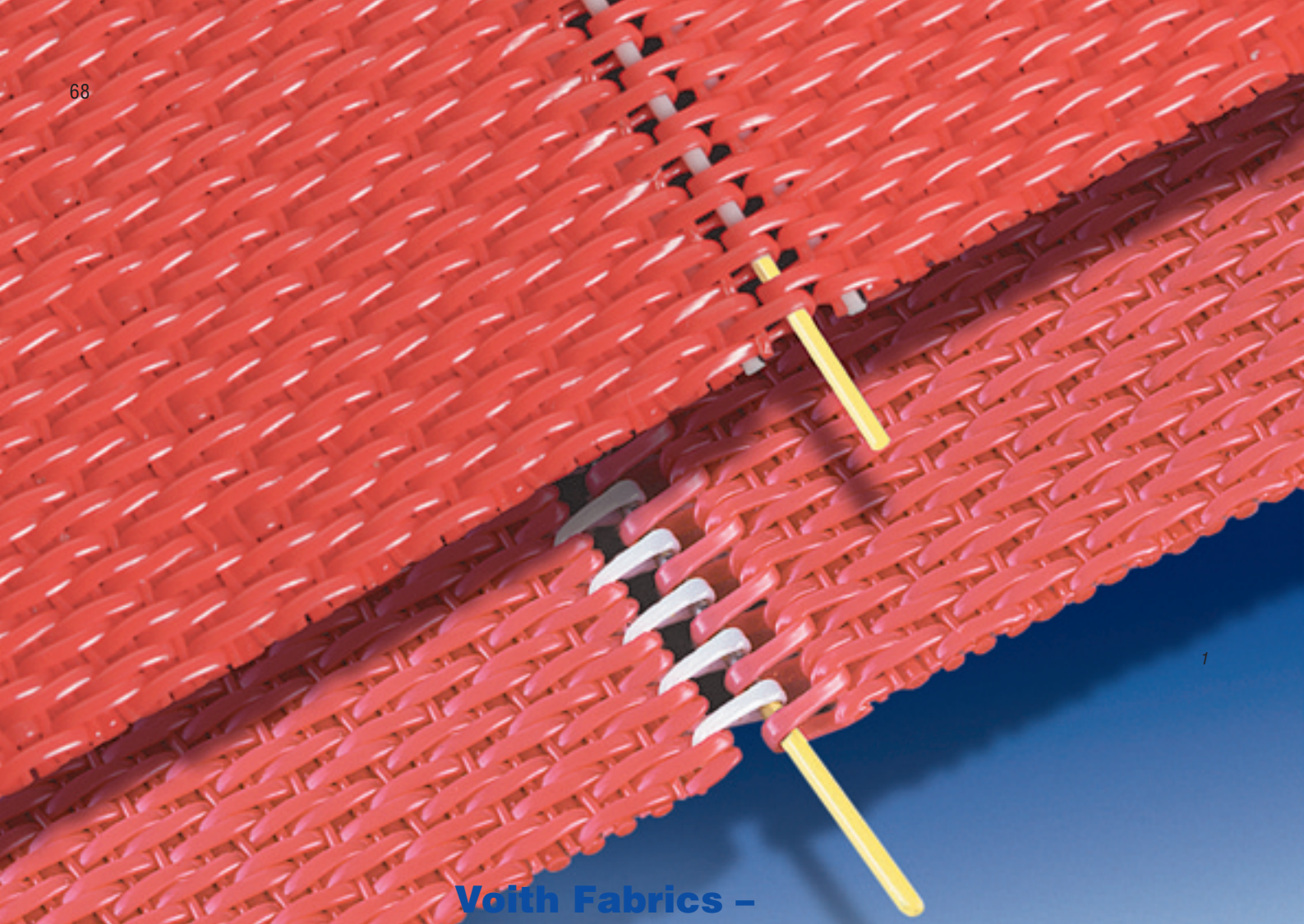

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Voith Fabrics – A new millennium of paper machine clothing: Quantum II dryer fabrics

The author: Mark Hodson, Voith Fabrics

Choosing a supplier to the dryer part of a paper machine has become more critical as we enter the new millennium. This is because modern dryer section geometry has evolved with the increasing requirements for faster machine speeds, higher quality papers and better fabric lives. Voith Fabrics continues to develop its dryer fabric product range in order to maximise fabric performance on both new and existing paper machines.

Graphic Papers

Investment in the European paper industry during the year 2000 saw the start up of the new machines of Haindl Augsburg PM 3, Haindl Schongau PM 9, Hermes PM 5, Soporcel PM 2 and Perlen PM 4. Voith Fabrics is the only paper machine clothing supplier to be chosen for the dryer part on all of these new machines. The Hermes, Perlen and Schongau machines started up with 100% dryer clothing from Voith Fabrics.

In addition to the success on new machines Voith Fabrics have also supplied clothing to major rebuilds of European

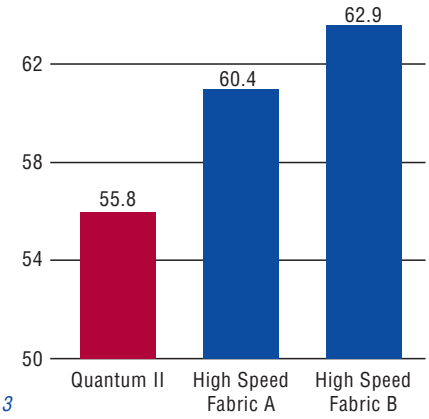

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Fig. 1: Small Loop and In-line Spiral seams of Quantum II.

Fig. 2: Modern dryer section geometry.

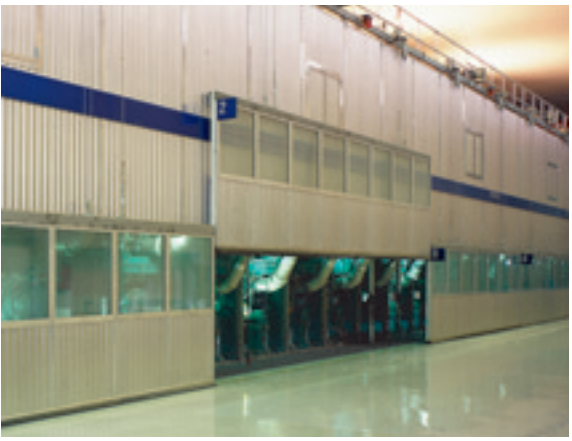
Fig. 3: Air volume (mm^3/mm^2) of dryer fabric surfaces.

paper machines. These include the rebuilt dryer parts of Holmen Hallsta PM 2, Sappi Gratkorn PM 9, Nordland Papier PM 4 and Haindl Schongau PM 7. In April 2001 PM 7 started up with Voith Fabrics on the 1st, 2nd, 3rd, 4th and 5th single tier sections together with a fabric on the 6th top position. Quantum II from Voith Fabrics runs on the world's fastest machines producing graphic papers.

Ease of installation and safety

Improved seam technology and the seaming aids used with the Quantum II *(Fig. 1)* design enable the dryer fabric to be easily installed on sections where

- there are narrow clearances within the fabric run,
- either long or short length fabrics have limited stretch rack movement,
- access is limited for seaming.



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Voith Fabric's products were fitted on the first sections of Aylesford PM 14 (9.95 m wide) and Augsburg PM 3 (10.40 m wide) on 14th February 2001. The seams on these fabrics were meshed, seam wire inserted and finished by the machine crews in less than fifteen minutes each. The seaming process requires fewer people to join the fabric, leaving operatives free for other duties. Changing dryer fabrics can be very uncomfortable for machine crews due to the temperature in the hood during "crash shuts". The ease of seaming means that the machine crew is in the hood for a shorter period of time and that the machine is soon available to start production.

Fabric life, stability and performance

Quantum II has a high material content and CMD stiffness. This is important because dryer fabrics on high speed sections *(Fig. 2)* have to be more stable than normal designs due to

- short length or wear prone positions,
- fabric return runs with no outside felt rolls,
- fitting allowances of only 1% and fabric extension during life limited to 1% with high running tensions,
- long unsupported runs between felt rolls
- high under pressures from sheet control equipment.

Quantum II gives effective transmittance of under pressures to the surface of the sheet for good sheet control. In addition the available volume of air in the fabric surfaces is very low *(Fig. 3)* and this improves both tail feeding and sheet runnability. Quantum II is already running successfully at pilot machine speeds of 2000 m/min.

The success of Quantum II is repeated on the high-speed machines in Asia. The absence of seam mark in the paper was an important requirement of dryer fabrics for the start-up of the 1500 m/min PM 1 of Malaysian Newsprint Industries in December 1998. Quantum II fabrics gave the best performance on the machine and are now running on 100% of the dryer sections. Several of these fabrics exceeded lives of 15 months and were still in good condition when safely removed at planned shuts.

In North America Quantum II is becoming established as the high-speed fabric on critical sections of the paper machine. It has replaced other fabric designs at Alabama River News PM 1, Madison Paper PM 3, Appleton Papers PM 7 and the rebuild start up of Willamette Johnsonburg PM 5.

The performance of Quantum II in Europe, Asia and North America shows it to be a truly global product.

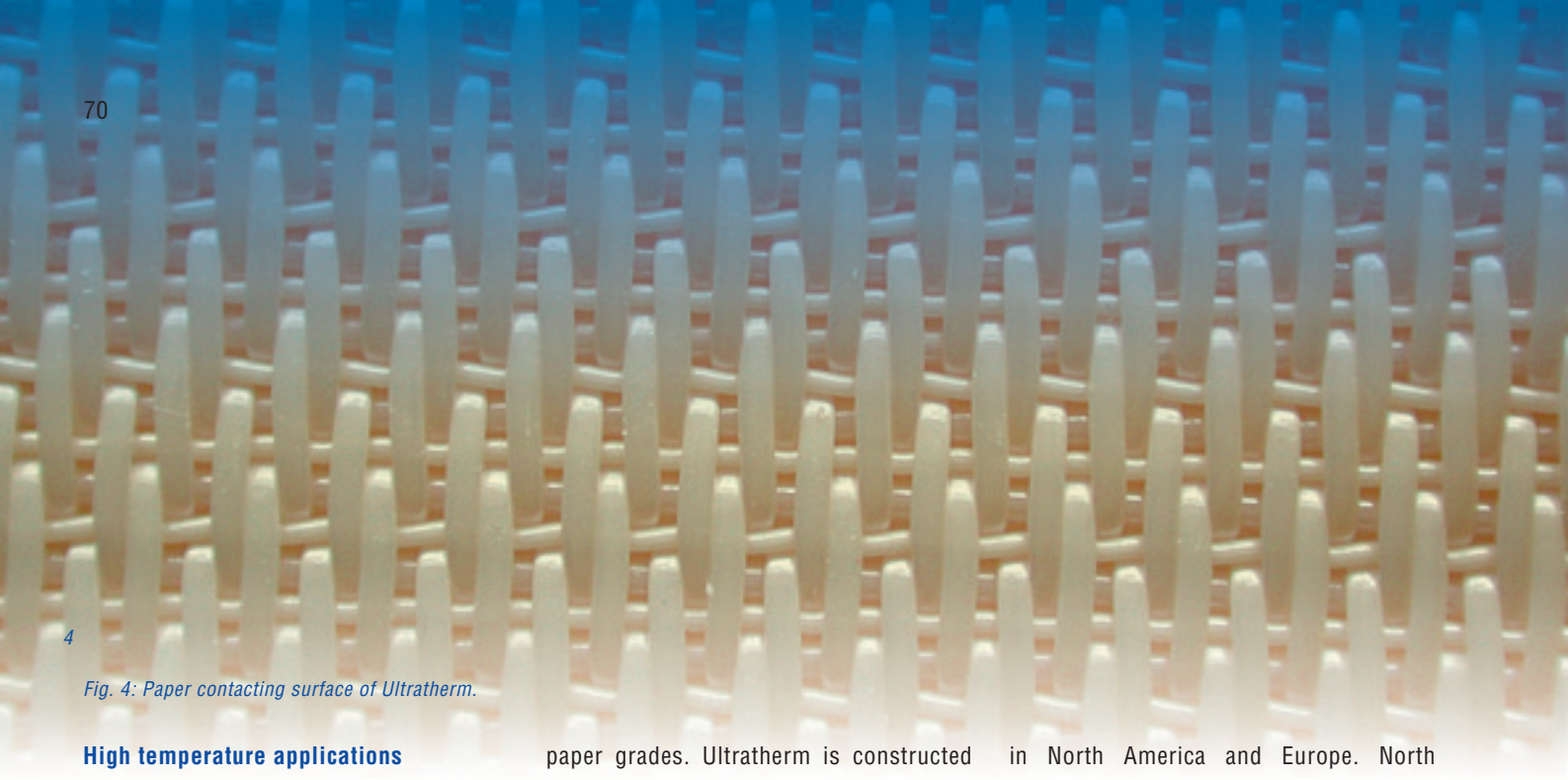

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Fig. 4: Paper contacting surface of Ultratherm.

High temperature applications

Many sections of packaging machines are able to achieve good lives with dryer fabrics that are made of polyester or modified polyester material. However, higher steam pressures can lead to degradation of the fabric edges outside the sheet deckle and it is necessary to run fabrics with PPS material at the edges to improve fabric life. PPS is unaffected by the heat and hydrolytic conditions within the dryer section. Steam groups within the dryer part can be up to 8 bar pressure with cylinder temperatures of 160 °C (320 °F). PPS material is also used when chemical conditions on the machine are a cause of degradation. Voith Fabrics manufacture several different PPS content fabrics including Ultratherm and Enduro for sections with high-pressure cylinders, depending on the severity of conditions within the hood.

Maximum resistance to degradation

Ultratherm is an established product line that provides ultimate resistance to the highest levels of temperature and humidity *(Fig. 4)*. It is mainly supplied to packaging machines, although its applications include writings and printings and coated paper grades. Ultratherm is constructed from PPS monofilaments in both the machine and cross machine direction. It is available with the same smooth contact area and aerodynamic surface of the Quantum II fabric construction. This makes Ultratherm an ideal choice for the new generation of high-speed packaging machines.

Improved fabric life on wear prone sections

Voith Fabrics introduced their latest dryer product line of Enduro in autumn 2000. It is primarily designed to resist wear from poor felt roll conditions on hydrolysis prone positions. Enduro is a unique dryer fabric construction that consists of large, square PPS and PCTA machine direction monofilaments. The design gives a significant increase in the amount of material presented to the fabric surfaces, resulting in better fabric lives on wear prone positions. Most applications are on machines producing packaging grades of paper. However the surface is smoother than the normal coarse fabrics supplied to these applications, resulting in a finer, more uniform contact with the paper. This also makes the fabric suitable for other paper grades. Enduro trials have been supplied in North America and Europe. North American successful installations on board and packaging machines include Westvaco Evadale, Inland Rome and United Corstac Reading. Enduro fabric performances have exceeded the normal lives of polyester fabrics and thinner calliper 100% PPS or 100% PCTA designs on abrasion prone positions.

New generation of fabrics

Dryer fabrics are an essential part of the paper making process from the physical requirements of transmitting the drive between cylinders to the reduction of shrinkage at the sheet edges. Modifications to dryer fabric materials can be achieved ‘in house’ through co-operative development at our SynStrand monofilament extrusion facility. Trials on Voith Paper pilot machines ensure that fabric designs are proven to work on new section geometry, prior to their installation on the paper machine.

Voith Fabrics designers, application engineers and service specialists are integrating with Voith Paper as one team. This will provide a unique customer based influence, feedback and knowledge that will redefine the direction we travel in the future.

Fibron TT3000™ – Innovative tail threading at Lang Papier has proven a success

The authors:
Sylvain Demers,
Fibron Machine Corporation;
Wolfgang Drefs,
Voith Paper
Paper Machines Graphic;
Jim Dadd,
Fibron Machine Corporation

New Product

It is known that the efficiency of tail threading from the last dryer is often impaired on paper machines producing grades with a high filler content (e.g. SC, LWC) due to an overstressed doctor function in the tailing region.

High-pressure water-jet tailcutters being operated at a very high cutting pressure (more than 900-1,000 bar) produce a large quantity of cutting pulp at the take-off doctor at high speeds.

If the tailcutter is operated for a long time, this build up of pulp at the doctor results in adhesion of small paper shreds at the doctor blade in the area of the cut. These obstacles prevent the threading tail from stabilizing properly off in the pivoting tail threading element, the flip tray, fastened under the doctor blade. Tail take-off and transfer into the following part of the threading system is therefore unreliable and inaccurate. Tails with very long and uncontrolled loops, called double tail, are often produced. In a very demanding threading path such as a rope transfer system in an online Janus calender, this double tail often results in the destruction of the actual threading tail during threading due to the knocking-around, tear-off and adhesion it creates.

Alternative doctor blades, precise adjustment of the doctor combined with regular cleaning and regular blade changes only resulted in slight improvements in threading performance.

Additionally, in the event of a sheet break, such time-consuming disturbances and cleaning at the take-off doctor distinctly extend the production downtime and reduce system efficiency, which is so important, particularly with online paper machines.

To ensure constant, reliable threading and an improvement in the entire threading process, especially on high-speed machines with online Janus calenders, it was therefore necessary to develop a new method for the take-off of the threading tail. This method is based on the basic idea of taking the tail directly off the dryer surface in order to be independent of any malfunctions at the take-off doctor.

The concept of using the already known principle of the so-called “Bullhorn” take-off seemed to suggest itself as this principle had already been used successfully on other similar applications.

This principle was already tested some time ago at the last dryer of a production machine. However, for lack of testing time, sufficient flexibility of the testing equipment and of a sufficient number of tests, this test did not produce any reasonable results.

It became obvious from this experience:

- that such a development could only be implemented in the fastest and most efficient way on a pilot stand which simulates the real situation during the run-off of the paper sheet and cutting of the threading tail as precisely as possible at the last dryer of a paper machine;

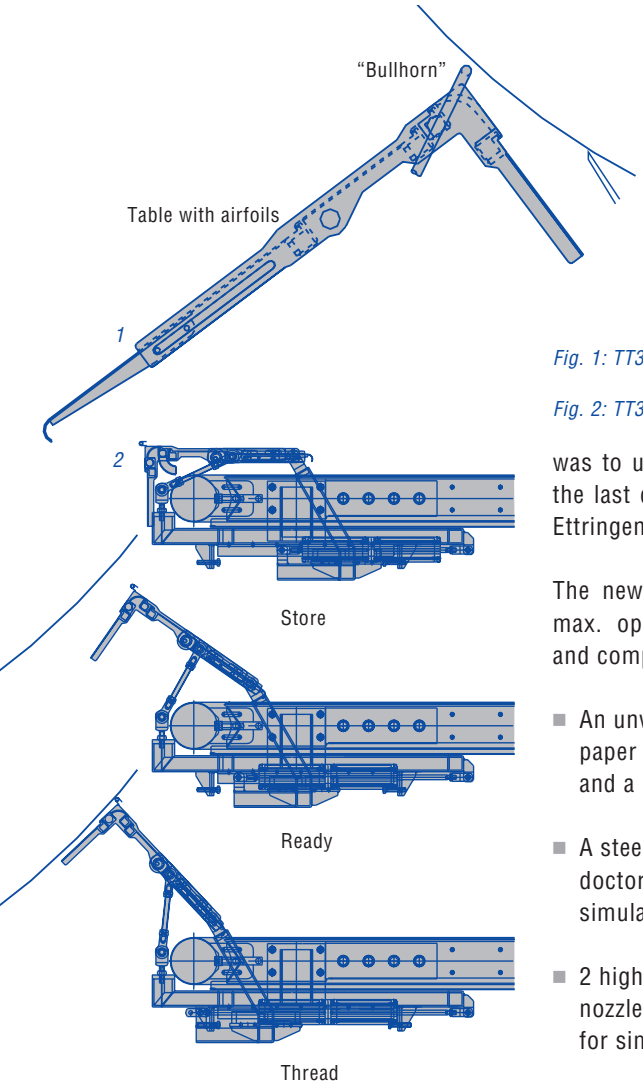

Fig. 1: TT3000™ foil configuration.

Fig. 2: TT3000™ in three positions.

- that a large number of tests have to be conducted using real operating parameters and taking speed, paper quality, basis weight, etc., into account;
- that a functional reliability of almost 100% must be achieved under test conditions before installation in a running paper machine can be released so that the risk of a time-consuming restoration of the old components and the production losses resulting from this are minimized in the event of insufficient function.

At the beginning of November 2000 it was decided to start a development project in the R&D center in Heidenheim. If successful, the objective of this project was to use the new threading system on the last dryer on PM 5 at Lang Papier in Ettringen.

The new test stand was designed for a max. operating speed of 2,000 m/min. and comprised the following elements:

- An unwind device for feeding the test paper with a roll diameter of 125 cm and a roll width of 60 cm;
- A steel cylinder with pressure roll and doctor, arranged above a pulper, for simulating the last dryer;
- 2 high-pressure water-jet cutting nozzles cutting on the steel cylinder for simulating the tailcutter;
- Moisturizing nozzles for paper-sheet conditioning;
- A new, long Fibron conveyor are designed for installation at Lang Papier PM 5;
- A test "Bullhorn" take-off device.

The test was set up to simulate the actual installation situation at Lang Papier PM 5 as precisely as possible.

During the setup of the test stand, already existing components and machine parts from different Voith Paper locations could be used to a large extent. Because of this, the development time was very short.

The development of the new peeling-off and threading unit was based on the following criteria:

The concept

- Threading to be independent of the doctor function
- Threading at any machine speed
- No looping (double tail) during take-off
- Precise control of the threading tail during take-off
- Functional reliability

The device

- Operationally reliable
- Few moving parts
- Self-cleaning

Characteristics

- Immediate readiness for threading, without time-consuming doctor cleaning and other maintenance steps
- Safe initial tearing and separation of the tail
- Simple operation
- Non-contact solution
- Maintenance-free
- Retrofittable on existing systems possible

The construction of the test stand was started in the middle of December 2000.

More than 400 threading tests were carried out and documented from the end of January to the middle of March 2001 by the R&D team consisting of employees from Voith Paper Coquitlam (Fibron), Voith Paper Heidenheim and Voith Paper Krefeld.

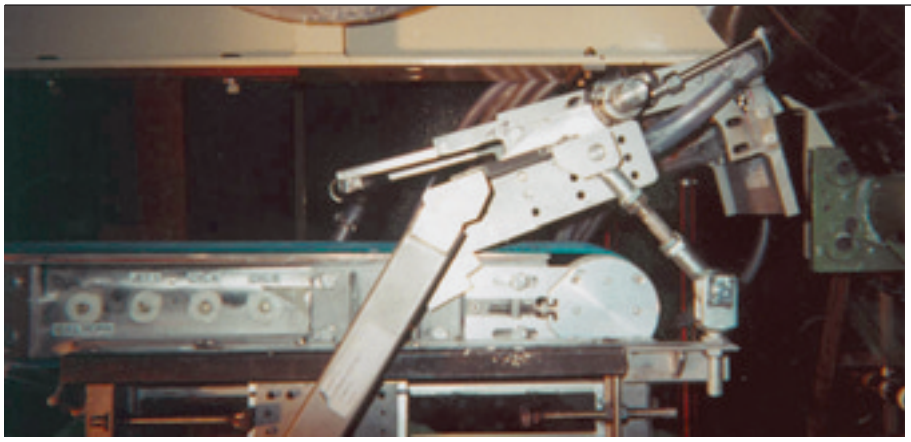

Fig. 3: Prototype TT3000™.

Fig. 4: Production unit installed at Lang Papier, Germany.

A great number of nozzle and Airfoil arrangements were tested during this period.

The use of a high-speed camera with 500 single pictures per second turned out to be invaluable for the documentation of all nozzle and Airfoil arrangements and their effects on the peeling-off and threading process.

Only the evaluation of the high-speed videos enabled us to fully understand the complex peeling-off process and thus to optimize blowing sequence and blowing time of the nozzles and Airfoils in the millisecond range.

The breakthrough with the threading tests at the R&D center in Heidenheim came at the beginning of March 2001. A functional reliability of almost 100% was reached at a test speed of 1,800 m/min with the test "Bullhorn" take-off device *(Fig. 3)*. Shortly afterwards, the manufacture of the final design of the "Bullhorn" take-off device for installation on PM 5 at Lang Papier was started. In mid-March the device was pre-assembled in the R&D center. The installation in PM 5 took place on 26 March 2001 and the start-up from 30 March 2001.

The final design of the "Bullhorn" take-off device consists of a table with four different Airfoils (Curly Foil, Foil 0, Foil 1 and Foil 2) and two laterally attached nozzles of the "Bullhorn" type. *Fig. 1* shows this arrangement.

By the explosion-like air blast from the two "Bullhorn" nozzles, the threading tail is initially torn at the side and then torn through and lifted off the dryer. The new beginning of the tail resulting from this is seized by the Airfoils in the table and guided to the subsequent Fibron conveyor. In this connection the "Bullhorn" nozzles and Airfoils are controlled according to a sequence which was optimized in the course of the tests to minimize blowing time and maximize control and guiding of the threading tail. The duration of the entire blowing sequence is far below 1 second.

The new take-off device was launched onto the market under the name **Tear and Transfer 3000™ (TT3000™)**.

Fig. 2 shows the three positions of the TT3000™: the park position, the ready position and the threading position. *Fig. 4* show the device installed at Lang Papier.

When the TT3000™ was started up on PM 5, it turned out that there was an essential difference from the tests at the Research Center in that the threading tail adheres much less to the dryer during practical operation. Peeling-off of the threading tail from the dryer was much easier, but the lateral tear-in and tear-through of the tail necessary for the creation of a new tail beginning without a loop (double tail) was equally made more difficult.

One of the causes of this phenomenon was the initially extremely high cutting pressure of 1,500 bar at the tailcutter. The consequence of this was that the cutting edges of the tail no longer rested flatly on the dryer surface and that blow air could already get behind the tail and peel it off the dryer before it was initially torn. The cutting pressure was reduced to 800-900 bar in the course of optimization.

The most important result after a total period of 6 weeks of optimization with all operating modes, paper grades, basis weights and speeds:

The production downtime after a sheet break has been significantly reduced, primarily due to the elimination of the time-consuming disturbances and cleaning requirements at the take-off doctor.

Our customer, too, who has favored and supported this new development, has confirmed the functional and operational reliability of the new device.

Congratulations to the entire project team for a job well done and completed on schedule.

Creativity with Paper

Despite the availability of plastics and a whole range of kits made up of perfectly reproduced pieces, the good old technique of modelling with paper and card is currently undergoing a worldwide renaissance. Unlike almost any other type of hobby involving personal skill and creativity, it inspires dreams and flights of imagination in the hearts of children and adults alike. Where were the first ready-made sheets of modelling card produced? In Esslingen, near Stuttgart, there is a small museum where visitors can admire treasures from the early days of modelling paper and card printing.

An accurate model of a ship, the set of Goethe's Faust in miniature, a model of the human body that can be taken apart to show the various organs – what do they all have in common? They are on display at the J.F. Schreiber Museum in the south German town of Esslingen, situated on the River Neckar. And they are all made of paper or card.

The J.F. Schreiber Museum tells the story of world-famous publishers J.F. Schreiber, still a going concern in Esslingen. With its picture books, sheets of modelling card and children's books with moving parts, this company has contributed

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something significant to Germany's cultural history.

When you enter the museum, which is housed in a historic building on the edge of the old quarter of Esslingen, you immediately feel you have stepped back in time. At the beginning of the tour, you cross a corridor with display cabinets containing among other things paper reproductions of historical buildings and battles from previous centuries. Next, you enter an accurately reproduced lithographic workshop which gives you an authentic impression of the early history of picture printing. At that time, new techniques such as lithography were giving wide public access to visual reproductions of many different kinds. In a side room, there is a theatrical set reproduced in paper and, as you continue, you will see examples from an extensive range of

Fig. 1: Everything is to scale in paper and card – whether it's a historic castle, a crane portal, the "Imperator" express steamer, an aircraft or a local tram on the Teltow line.

Fig. 2: The lithographic printing technique, in which illustrations engraved on steatite are pressed on to the paper, permitted long and therefore inexpensive print runs.

Figs 3 and 4: "Pictures for Visual Instruction from Esslingen" – accurate reproductions of animals and plants on boards for use in the classroom.

Fig. 5: Paper theatres were very popular among educated people at the turn of the century.

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cardboard models, display boards used for educational purposes and historic children's books from the publisher's archives.

J.F. Schreiber – a revolutionary in the graphic arts

Who was Jakob Ferdinand Schreiber? The founder of the publishing house that bears his name was born in 1809 and grew up as an orphan. His talent for drawing, which was discovered at an early age, led him to the art academy run by Georg Ebner, where he worked as a draughtsman and illustrator. It was there that he discovered an enthusiasm for the "new and amazing potential for graphic and artistic creativity". He was fascinated by the problem of reproducing and distributing these creations in a relatively short time.

Pictures of the saints

Schreiber grew up at a time when Europe was being swept by a fashion for "visualisation in book production". New printing techniques such as lithography were making it possible to produce illustrated books at considerably lower cost – and Schreiber was a master of this technique.

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The publisher's business was originally focused on holy pictures and pictures of the saints. Schreiber was very successful at marketing them.

Boards pave the way to a full publisher's list

In 1833, Schreiber began to publish colour illustrations for schools and other educational institutions. These "Pictures for Visual Instruction from Esslingen" were a decisive step in expanding the publisher's list. They replaced the more or less primitive visual aids then available with accurate pictures. In 1850, there were already 90 of these boards, illustrating trades, agriculture and aspects of the animal and plant world. They also illustrated special geographic features of Germany, Europe and foreign climes. In the museum, visitors have an opportunity to browse through draft designs that have not previously been seen by the public.

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From 1877 onwards, the paper theatre began its triumphant progress, becoming extremely popular as a form of family entertainment. The museum has various selected examples on display and some of them can be purchased as reproductions.

The publishing house had another success in 1892 with Schreiber's four large anatomical wall panels showing the human body with paper components that could be disassembled.

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Schreiber cutouts were later added to the range. These were handicraft and modelling patterns that could be cut out of sheets showing interesting buildings, cut-and-assemble pictures and activity sheets. The range still includes model-making sheets of cars, aeroplanes and ships. The museum has about 500 examples of these cardboard models.

The "Wurzelkinder" and other picture books

Children's books were an important part of the range. Perhaps the most famous on Schreiber's list, and still a firm favourite today, was "Etwas von den Wurzelkindern" ("The Children of the Root Bowl") by Sibylle von Olfers. There is a special section of the museum devoted to it. The children of the title live underground – and that's where they are in the museum too. In the "root bowl", children can experience the magic of the "little people" for themselves.

The first high-speed printing machine in Germany

In 1832, Schreiber bought its first letterpress printing machine and in 1864, Ferdinand Schreiber, the older of J.F. Schreiber's two sons, imported the first high-speed lithographic press to Germany from France. They were soon able to claim to be "the first printers in Germany to use the letterpress method for lithographic printing". Schreiber was on its way to conquering a world market.The extent to which technology dominates the publishing business was also evident in 1904, when J.F. Schreiber installed an American two-revolution printing press made by Miehle. In the same year, colour illustrations produced by the letterpress technique appeared for the first time as a magazine. Colour printing went through an intensive process of development at the Schreiber company before and after the First World War. In addition, a new department dedicated exclusively to the careful and perfect reproduction of posters, brochures and advertising material by offset and letterpress printing for large-scale industrial and commercial customers was set up.

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J. F. Schreiber has been having renewed worldwide success recently with reprints of pop-up picture books from the last century, presenting as it were the 'history of the story'.

Fig. 6: In the "Root Bowl", adults and children can experience the life of the "little people".

Fig. 7: Even in the computer age, children can still be creative with paper.